

**Draft**  
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# *World Development Report 2008*

## *Agriculture for Development*

This draft has been prepared by a team led by Derek Byerlee and Alain de Janvry and comprising Irina I. Klytchnikova, Elisabeth Sadoulet, and Robert Townsend. The team was assisted by Harold Alderman, Regina Birner, Luc Christiaensen, Peter Hazell, Karen Macours, Paula Savanti, Dina Umali-Deininger, all of whom also contributed in drafting some chapters of the Report, as well as Jorge Aguero, Richard Anson, Beatriz Avalos-Sartorio, Shahrooz Badkoubei, Tidiane Kinda, Melissa Klink, Claudio Montenegro, and Antti Seelaff. The following contributed substantially in preparing the Focuses: Noora Aberman, Lynn Brown, Corinna Hawkes, Shiva Makki, Eija Pehu, Cathy Ragasa, and Vijayendra Rao. Additional important contributions were made by Chris Barrett, Kaushik Basu, Julio Berdegue, Michael Carter, Marie-Helen Collion, Cees de Haan, Klaus Deininger, Nango Dembele, Svetlana Edmeades, Ashok Gulati, Peter Lanjouw, Daniel Lederman, Michael Morris, Pierre Rondot, John Staatz, Alexander Schejtman, Kees van der Meer, and Dominique Van De Walle.

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## **Table of contents**

### **Overview**

#### **Part I Why Use Agriculture for Development?**

Agriculture for development: a synopsis

Agriculture has structural features that make it unique

Agriculture's three worlds

The development potential of agriculture varies by country types

Yet agriculture has been underused for development

Significant improvements are possible

Households can follow multiple pathways out of poverty

#### **Part II What to Do in Using Agriculture for Development?**

Access to assets: A precondition for success in agriculture for development

Make smallholder farming more productive and sustainable through differentiated policies

Beyond farming: A dynamic rural economy and skills to participate in it

#### **Part III How to Implement Agriculture for Development Agendas?**

National agendas for agriculture's three worlds

Success depends on good governance at the local, national, and global levels

Using agriculture for development—a vision for the future

## **PART I WHY USE AGRICULTURE FOR DEVELOPMENT?**

### **Chapter 1 Growth and poverty in agriculture's three worlds**

Agriculture and the structural transformation—two stylized facts

Agriculture and development—three archetypical countries

Agriculture's potential for development has often been shortchanged

Toward a political economic understanding of agricultural policymaking

Concluding remarks

#### ***Focus A Rural poverty is changing***

### **Chapter 2 Agriculture's performance, diversity, and uncertainties**

Agriculture as a global success driven by productivity growth in developing countries

Uneven growth across regions and countries

Performance reflects different underlying conditions

The new agriculture—opportunities through diversification

Future perspectives—rising uncertainty?

Moving forward: Four challenges

#### ***Focus B What is the potential role for biofuels?***

### **Chapter 3 Rural households and pathways out of poverty**

Heterogeneous livelihoods: a typology of rural households  
Rural household asset positions  
Household behavior when markets fail: rational, despite appearances  
Rural income sources and livelihood strategies  
Three complementary pathways out of poverty  
Conclusions

*Focus C Is there a link between agricultural production and food security?*

## **PART II WHAT TO DO IN USING AGRICULTURE FOR DEVELOPMENT?**

### **Chapter 4 Removing costly trade, price, and subsidy policies**

Global welfare costs of current agricultural policies remain high  
Agricultural protection in developed countries  
Agricultural taxation in developing countries  
Gainers and losers from further policy reform  
Conclusions

*Focus D Culture is changing in India's villages*

### **Chapter 5 Bringing agriculture to the market**

Food staples: improving commodity trading and risk management  
Traditional bulk export commodities: maintaining international competitiveness  
Higher value urban markets: linking producers to modern supply chains  
Higher value exports: meeting the product standards in the market  
Conclusion

*Focus E The growth of global agribusiness (forthcoming)*

### **Chapter 6 Supporting smallholder competitiveness through institutional innovations**

Innovations in land policies and administration  
Financial services to enhance the competitiveness of smallholders  
New approaches for risk management and insurance  
Institutional innovations in agricultural input markets  
Producer organizations for smallholder competitiveness  
Capitalizing on synergies between tradition and modernity  
The new agriculture—opportunities through diversification

### **Chapter 7 Innovating through science and technology**

Biological technologies have been enormously successful—but not everywhere  
Management and systems technologies are needed to complement genetic improvement  
Investing more in R&D

Institutional arrangements to increase the efficiency and effectiveness of R&D systems

Better use of available technology through skills and information

Moving forward

***Focus F Capturing the benefits of GMOs for the poor***

**Chapter 8 Making agricultural systems more environmentally sustainable**

What drives resource degradation?

Improving water management in irrigated agriculture

Greening the Green Revolution

Managing intensive livestock systems

Reversing degradation in less-favored areas

Conclusions

***Focus G Using agriculture to mitigate climate change and adapting to it***

**Chapter 9 Using labor markets as pathways out of rural poverty**

The rural employment challenge

Agricultural wage employment

Rural nonagricultural employment—rising

Wages and earnings in the rural labor market

Where you work and how much you earn depend on your skill

The policy response

***Focus H The two-way links between health and agriculture***

**PART III HOW TO IMPLEMENT AGRICULTURE FOR DEVELOPMENT AGENDAS?**

**Chapter 10 Emerging national agendas for agriculture's three worlds**

Four pillars of an agenda to use agriculture for development

Relative importance of the four pillars across country types

Transforming countries—reducing rural-urban income gaps and rural poverty

Urbanized countries—linking smallholders to dynamic markets and creating jobs

Political, administrative, and financial feasibility

***Focus I Rural education and skills (forthcoming)***

**Chapter 11 Strengthening governance, from local to global**

New roles of the state, the private sector and civil society

Formulating sound agricultural development strategies

Governance reforms for better policy implementation

Increasing aid effectiveness for agricultural programs

Progressing on the global agenda

Conclusion

## Figures

- 1 The world's poor are mainly rural, and the number of rural poor is rising in South Asia and Sub-Saharan Africa
  - 2 Agriculture's contribution to growth and the rural share in poverty distinguish three categories of countries: agriculture-based, transforming, and urbanized
  - 3 GDP growth originating in agriculture benefits the poorest two-third most
  - 4 The cereals yield gap between Africa and other regions is widening
  - 5 The share of agriculture in ODA has fallen much faster than rural poverty
  - 6 Four generic components of an agricultural for development agenda
  - 7 High value exports from developing countries are growing rapidly
- 
- 1.1 Cereal yields up, poverty down in South Asia—cereal yields flat, poverty flat in Sub-Saharan Africa 1987-2001
  - 1.2 Shares of labor and GDP in agriculture decline as countries develop
  - 1.3 Income gains from growth originating in agriculture are larger for the poorer expenditure deciles
  - 1.4 Agriculture-based, transforming, and urbanized countries
  - 1.5 The share of food processing in agricultural value added rises with incomes
  - 1.6 Slower growth in agriculture (1991-2005) largely associated with migration of workers from agriculture to nonagriculture
  - 1.7 Official development assistance to agriculture declined sharply between 1975-2004
  - 1.8 Framework to analyze policy processes
- 
- 2.1 Rising cereal yields but not in Sub-Saharan Africa (1961-2005)
  - 2.2 Use of modern inputs has expanded rapidly in nearly all regions
  - 2.3 Regional variations in trends in agricultural GDP, 1980-2004
  - 2.4 Diverse country performance in growth of agricultural GDP per capita of agricultural population (1980-2003)
  - 2.5 Diverse agricultural potential and varying distances to markets (2000)
  - 2.6 The distribution of population densities within a country varies widely (total population)
  - 2.7 Incidence of poverty and geographic characteristics, Brazil and Thailand
  - 2.8 Share of the rural poor and geographic characteristics, Brazil and Thailand
  - 2.9 Per capita food consumption in developing countries is changing
  - 2.10 Per capita meat consumption rises with GDP
  - 2.11 High value exports up—traditional exports down in developing countries
  - 2.12 Arable and permanent cropland per capita in agriculture is falling in most regions
  - 2.13 Renewable water resources in agriculture are drying up
  - 2.14 Growth rates of yields for major cereals are slowing in developing countries
- 
- 3.1 Agricultural income is considerable for rural households in many countries
  - 3.2 Rural household typology

- 3.3 Heterogeneity of educational attainment (by region, adult population: 25-65 years old)
- 3.4 Farm size distributions are often bi-modal
- 3.5 Heterogeneity in income sources along expenditure quintiles
- 3.6 Participation in economic activity, by principal activity and region (ages 15-64)
- 3.7 Small farms lag behind large farms in staples in Brazil and Chile
  
- 4.1 Real international commodity prices have been suppressed by current global trade policies (% of price)
- 4.2 Trade share losses to developing countries due to current global trade policies (% point loss to developing country trade shares)
- 4.3 Producer support as a share of the gross value of farm receipts has declined in the OECD with an increase in ‘decoupled’ payments
- 4.4 Shifting taxation and protection of agriculture by country
- 4.5 Diverging assistance rates for agricultural imports and exports, 2000-04
- 4.6 Two-thirds of the past tariff reductions in developing countries on all merchandise goods from 1983-2003 has been from unilateral reforms, a quarter from multi-lateral agreements and the remaining 10 percent from regional agreements
- 4.7 A majority of the poor may lose from higher food prices
- 4.8 Subsidies have risen relative to public good investment significantly in India
  
- 5.1 Access to roads is limited in many low-income countries
- 5.2 World markets prices for traditional export commodities have been declining
- 5.3 The composition of per capita food expenditures is changing in India
- 5.4 Urbanization drives supermarket growth
  
- 6.1 Credit-constrained households use less inputs and have lower incomes
- 6.2 Transport costs can make up two-thirds or more of the farmgate price of fertilizer in Africa countries, 2005
- 6.3 More than a third of Zambia’s 2004/05 public budget for agriculture went to fertilizer subsidies
  
- 7.1 The continuing green revolution—areas planted to modern varieties, 2000, by region
- 7.2 Estimated returns to agricultural R&D are high in all regions—averaging 43 percent!
- 7.3 Financing for extension services—the traditional approach and the new
  
- 9.1 Agriculture is not absorbing new rural workers
- 9.2 Higher share of wage workers in agricultural employment in countries with higher income per capita
- 9.3 The share of wage labor in agricultural employment is rising in many countries
- 9.4 Formal employment in Brazilian agriculture has become more cyclical
- 9.5 Labor requirements are considerably higher for vegetables than for cereals
- 9.6 Retail trade and services dominate nonfarm wage employment

- 9.7 Most rural nonfarm enterprises have only one or two workers, mostly unpaid (Indonesia 2005)
- 9.8 Wages are much higher in rural nonagricultural employment in India, Mexico, and Uganda
- 9.9 For workers with no education, wages in agricultural and rural nonagricultural employment are not so different across sectors
- 9.10 Agricultural wages—have been declining in Latin America
- 9.11 ... but rising in Asia and Africa
- 9.12 Labor productivity in self-employment is heterogeneous in Indonesia
  
- 10.1 Pathways out of poverty and dimensions of an agriculture-for-development agenda
  
- 11.1 Agriculture-based and transforming countries get low scores for governance
- 11.2 Creating a virtuous cycle of good agricultural sector governance
- 11.3 Changing Role of the State

## **Boxes**

- 1 The country typology is not static
- 2 Why did donor attention to agriculture decline?
  - 1.1 Rural population dynamics and labor availability
  - 1.2 Cross-country evidence on the agricultural growth-poverty reduction linkage
  - 1.3 Historical perspective on agriculture in South Korea's development
  - 1.4 Yes, there is a role for agriculture in Africa's mineral-rich countries
  - 1.5 Dealing with the disparity problem—historical tales from Thailand and Japan
  
- 2.1 Agricultural commodity prices are declining in world markets
- 2.2 The Green Revolution in food staples that didn't happen: Africa's variegated palette
- 2.3 Definitions of rurality
- 2.4 Lagging regions in countries with high agricultural growth: Different causes
- 2.5 The global environmental footprint of China's livestock
  
- 3.1 Constructing comparable measures of income across countries
- 3.2 Returning to the farm in Zambia—subsistence agriculture, AIDS, and economic crisis
- 3.3 Are farms becoming “too small”?
- 3.4 The young and educated leave rural areas in Brazil and Mexico
  
- 4.1 Political economy of reforming developed country policies
- 4.2 The political economy of reform in developing countries
- 4.3 Zambia fertilizer subsidies
- 4.4 Electricity subsidies to agriculture in India

- 5.1 Rural kiosks: The e-Choupal initiative
- 5.2 Price stabilization through international trade—Bangladesh
- 5.3 Zambia and Burkina Faso—contrasting experiences in liberalizing domestic cotton markets
- 5.4 Linking small farmers to high-value chains
- 5.5 French bean exports boosted employment and reduced poverty in rural Senegal
  
- 6.1 Benefits from community-driven land certification in Ethiopia
- 6.2 Improving the efficiency of land administration services in Georgia
- 6.3 How land rentals can increase productivity and equity in China
- 6.4 Rental markets and the impact of restrictions in India
- 6.5 Banrural SA: From ill-performing agrarian bank to profitable public-private financial institution
- 6.6 Mongolia's index-based livestock insurance
- 6.7 When should fertilizer be subsidized?
- 6.8 Thriving rural input supply retailers as agro-dealers in Africa
- 6.9 Producer organizations with international membership
- 6.10 Producer empowerment at the regional and grassroots levels in Senegal
  
- 7.1 When zero means plenty: the benefits of zero-tillage in South Asia's rice-wheat systems
- 7.2 Using legumes to improve soil fertility
- 7.3 Stronger IPRs in developing countries: How will they affect small farmers?
- 7.4 Sub-Saharan Africa's agricultural R&D challenge
- 7.5 Long-term capacity development pays off in Ghana
- 7.6 IPR options to provide the poor access to modern science
- 7.7 Mexican farmers lead research through PRODUCE foundations
- 7.8 Adding value to a poor farmers' crop—cassava in Colombia and Ghana
- 7.9 Private agribusiness and NGOs lead ICT provision to farmers in India
  
- 8.1 Restoring the northern Aral Sea—by doubling the Syr Darya's flow
- 8.2 Enormous potential for expanding irrigation in Sub-Saharan Africa – in the right way
- 8.3 Global experience with formal and informal water markets
- 8.4 Secure water rights—a foundation for equitable reforms
- 8.5 Integrated pest management to control the Andean potato weevil in Peru
- 8.6 Managing poultry intensification in Thailand
- 8.7 Agroforestry in Africa
- 8.8 Managing drought risks in the low-rainfall areas of the Middle East and North Africa
- 8.9 Slowing deforestation by smallholders
  
- 9.1 Female labor supply in a social equilibrium
- 9.2 Horticulture development in Maharashtra
- 9.3 Child labor is pervasive in agriculture—reducing schooling and earnings
- 9.4 Impacts of road infrastructure on markets and productivity

- 9.5 Women's cooperative in India
- 9.6 Diverse nonfarm employment in Bangladesh
- 9.7 Providing direct support to families to reduce child labor in Brazil
- 9.8 The gradual but incomplete move towards cash-based food aid
  
- 10.1 An approach based on smallholder farming
- 10.2 Special features of agriculture in Eastern Europe and Central Asia
  
- 11.1 Translating vision into practice? A minister's view of Uganda's Plan for Modernizing Agriculture
- 11.2 Key elements of an agricultural development strategy
- 11.3 Empowering producer organizations and developing a vision for the agricultural sector in Senegal
- 11.4 Vietnam's progress in revising traditional role of ministries of agriculture
- 11.5 How to make a green revolution happen? Vision and leadership
- 11.6 Decentralization or centralization of agricultural research?
- 11.7 Global action has paid off handsomely in agriculture
- 11.8 Global institutions for agriculture—challenges and reform options
- 11.9 Renewed donor support for agriculture

## **Tables**

- 1 Countries characteristics by category
- 2 Policy priorities for local agriculture-for-development agendas
  
- 1.1 Characteristics of three archetypical economies
- 1.2 Composition of total public expenditures, 1980 and 2004
  
- 3.1 Typology of rural households for three country groups
- 3.2 Changes in farm size and land distribution
- 3.3 Market participation among farming household in Vietnam
  
- 4.1 Global welfare costs are largest for agricultural trade policies
- 4.2 Costs to agricultural output growth of current global trade policies are estimated to be largest for Latin America and Sub-Saharan Africa
- 4.3 Between 1960 and the early 1980s farmers were taxed more in today's agriculture-based countries than in today's transforming and urbanized economies
- 4.4 Nominal rates of assistance by commodity
- 4.5 There will be gainers and losers in developing countries from developed country agricultural trade reform
  
- 5.1 Public and private options for strengthening farmer linkages to the market
- 5.2 Role of public and private sector in enhancing trade-related sanitary and phytosanitary and quality management capacity
  
- 7.1 Total public agricultural R&D expenditures by region, 1981 and 2000

- 7.2 Assets of public and private sectors in agri-biotechnology research
- 7.3 Providing and financing pluralistic agricultural advisory services
  
- 9.1 The rural economy exhibits diversified sources of income
- 9.2 Distribution of rural employment by sector of activity, in selected countries
  
- 10.1 Stylized framework for local, regional and national agriculture-for-development agendas
- 10.2 An agenda for agriculture-based countries
- 10.3 An agenda for transforming countries
- 10.4 An agenda for urbanized countries
- 10.5 Flagging the feasibility deficits of policy and investment instruments
  
- 11.1 State functions in support of the agriculture-for-development agenda
- 11.2 A partial list of global institutions for agriculture

### **Maps**

- 2.1 Agro-ecological zones within the extent of agriculture
- 2.2 Market access within the extent of agriculture for Africa, Asia and Latin America

### **Box tables**

- 4.4.1 US cotton subsidies versus the market value of production
  
- 7.4.1 Comparison of research systems in Sub-Saharan Africa, India and USA around 2000

### **Box figures**

- 1.1 Populations in developing countries remain predominantly rural until 2020
  
- 2.1 Agricultural commodity prices are declining in world markets
- 2.2a Expansion of cereal production has followed very different paths in Sub-Saharan Africa and Asia (1961-65 =100)
- 2.2b Sub-Saharan Africa produces a greater variety of crops than Asia
  
- 3.3.1 Following 1990 population cohorts to 2000 in Zambia
- 3.4.1 Young Brazilian women migrate more than young men; less educated migrate less
- 3.4.2 Almost a quarter of the 15-24 cohort from 1990 had left rural Mexico by 2000
  
- 5.5.1 Household participation in French bean export production in Senegal
- 5.5.2 Incidence of poverty and extreme poverty among participating households
  
- 8.1 Some Sub-Saharan Africa subregions have developed more irrigation than others

- 8.2 Thailand is shifting the concentration of poultry away from Bangkok
- 9.6 Nonfarm rural wages fall with increased travel time to the closest urban center
- 11.6 Maize breeding in China—several times more costly when targeted on small areas

## **Acronyms**

CDD	Community-driven development
CGIAR	Consultative Group on International Agricultural Research
CNCR	Conseil National de Concertation et de Cooperation des Ruraux
EAP	East Asia and Pacific
FAO	Food and Agriculture Organization of the United Nations
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GMO	Genetically modified organism
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome
ICTs	Information and Communication Technologies
IFAD	International Fund for Agricultural Development
IFAP	International Federation of Agricultural Producers
IFPRI	International Food Policy Research Institute
ILO	International Labor Organization
IPCC	Intergovernmental Panel on Climate Change
IPR	Intellectual Property Rights
LAC	Latin America and Caribbean
MDG	Millennium Development Goal
MFI	Microfinance Institution
MNA	Middle East and North Africa
NGO	Non-governmental Organization
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
SAS	South Asia
SEWA	The Self-Employed Women's Association (India)
SSA	Sub-Saharan Africa
SWApS	sector-wide approaches
UNCTAD	United Nations Conference on Trade and Development
UNFCCC	<a href="#">United Nations Framework Convention on Climate Change</a>
WDR	World Development Report
WHO	World Health Organization
WTO	World Trade Organization

## OVERVIEW

### **Agriculture for development: a synopsis**

1. The international community chose reducing world poverty as the first Millennium Development Goal (MDG). What is striking is that three of every four people in developing countries are rural, 2.1 billion individuals below a \$2 a day poverty line, one third of humanity. Most depend directly or indirectly on agriculture for their livelihoods. While agriculture is not the only instrument that can take them out of poverty, it is a highly effective source of growth for doing just that. What is clear is that the first MDG will be met in poorer countries only with a sharper focus on agriculture as an instrument for development.
2. How agriculture can contribute to development differs across three categories of countries: agriculture-based, transforming, and urbanized. In the first, which comprises most of the Sub-Saharan African countries, agriculture accounts for a large share of GDP growth and most of the poor are in the rural sector. To grow and reduce mass poverty, these countries have little option than a well performing agriculture. In transforming countries, which include most of Asia, the Middle East and North Africa (MENA), and part of Europe and Central Asia, economic growth is rapid in other sectors but a large share of the poor remain in rural areas. Growth in agriculture and in the associated rural nonfarm economy is needed to reduce poverty and confront rising rural-urban income disparities. In urbanized countries, which include most of Latin America and part of Europe and Central Asia, poverty is predominantly urban and agriculture is an economic sector that can be quite dynamic but contributes a small share of GDP growth. There, agriculture can be effective in reducing the remaining rural poverty by including the rural poor as direct producers and creating good jobs for them.
3. In all three country contexts, agriculture is a user of natural resources and a provider of environmental services. Environmental amenities have a strong international dimension, placing the environmental value of agriculture high on the global agenda. At the same time, the poor are the main victims of environmental degradation, giving environmental sustainability an important place in national agricultural development agendas.
4. Despite all this, the power of agriculture for development has too often been underused. With industrialization dominating policy debates, development through agriculture was often not even considered as a policy option. Developing countries show widespread underinvestment and misinvestment in agriculture as well as policy biases against agriculture and against the rural poor. And donors turned their back on agriculture. This neglect of agriculture has had high costs for growth, welfare, and the environment.
5. Why the urgency to act? Because of new opportunities, new challenges, and new uncertainties. Opportunities originate in a dynamic market-driven “new agriculture” led by high value activities. They originate in major institutional and technological innovations and in new roles for the state, for powerful private actors, and for civil

society organizations in using agriculture—new and old—more effectively for development. Challenges are to include smallholders in agricultural growth and to benefit the rural poor through agricultural and rural nonfarm employment. Uncertainties are rising on many fronts, including the future international trade regime for agriculture, the acceptance of genetically modified foods, the rising temperatures and unstable weather patterns, higher energy prices, the impact of biofuel production on food prices and the environment, and the ability to contain human, animal, and plant diseases.

6. The potential of agriculture for development varies sharply by country categories, and by regions within a country, so agriculture-for-development agendas must be tailored to the context. Those agendas, if well implemented, can offer rural households pathways out of poverty through smallholder farming, through employment in agriculture and the rural nonfarm economy, and through migration. Policies to widen these pathways need to be differentiated to better address the specific needs and opportunities of a highly heterogeneous rural population. Some are market-participant smallholders who sell a large part of their production. Some are in subsistence farming, consuming most of their own production while participating in other markets, especially as sellers of labor. Policies should be differentiated to enhance market entry for subsistence smallholders, increase the competitiveness of market participants, improve the livelihoods of subsistence farmers and unskilled workers, and raise labor market skills in both agriculture and the rural nonfarm economy.

7. Implementing tailored agriculture-for-development agendas will require political will, resource commitments, and an effective state. Agricultural growth, while driven by the private sector and the market, depends heavily on public support. Yet the state tends to be weakest in the agriculture-based countries where it is most needed, and also weakest in agriculture relative to other sectors. Improving governance and engaging society are thus critical to pursue an agriculture-for-development strategy. Successful implementation requires putting in place mechanisms for the formulation of sound national agriculture for development strategies, public sector management for effective delivery and accountability, decentralization that enhances the support to agriculture, and community roles to coordinate the functions of agriculture for growth, poverty reduction, and the environment. Donors have to commit to these agendas and improve the quality of their support.

8. It is also clear that agriculture alone will not defeat rural poverty. A coordinated approach for rural economic and social development is needed. So is a better investment climate in the rural nonfarm economy. So are opportunities for successful migration out of agriculture. And implementing national agendas depends on a global agenda that is increasingly multidimensional and difficult to manage. Specialized international agencies are now complemented by many new actors on the global scene, from rapidly emerging countries to multinational corporations and philanthropies. The complexity of a multitude of interrelated tasks calls for innovations in global governance to support agriculture for development.

9. How can agriculture be best used for development? This is what this Report tries to answer, addressing the following three questions:

- I. Why use agriculture for development?
- II. How to use agriculture for development?
- III. How to formulate and implement tailored agriculture-for-development agendas?

## **PART I WHY USE AGRICULTURE FOR DEVELOPMENT?**

### **Agriculture has structural features that make it unique**

10. The Report defines “agriculture for development” as an agriculture-centered strategy to achieve sustainable poverty-reduction. “Agriculture” consists of crops, livestock, agro-forestry, and aquaculture. It does not include forestry and catch fisheries because they require a vastly different analysis.

### ***Agriculture has multiple functions for development***

11. Agriculture is a multifunctional sector for development, with three fundamental functions: an economic activity, a way of life, and a provider of environmental services. As an economic activity, it can be a source of growth for the national economy, a provider of investment opportunities for the private sector, and a prime driver of agriculture-related industries and the rural nonfarm economy. As a way of life, it is a source of livelihoods for the majority of rural populations, of food security for people facing food market failures, of jobs for landless workers and marginalized smallholders, a harbor for surplus populations, a provider of “farm-financed social welfare” when there are urban shocks, and a foundation for viable rural communities. As a user and frequently as a mis-user of natural resources, it can create good and bad environmental spillovers both amendable by policy. This multiplicity of functions is what makes it a potentially unique instrument for development, but also an instrument that is not easy to use because there are both complementarities and tradeoffs among the functions.

### ***The scope of agriculture for development is huge***

12. Even with rising urbanization and industrialization, agriculture remains a huge sector in its functions as an economic activity, a way of life, and a provider of environmental services. In the least developed countries agriculture accounts on average for 34 percent of GDP and employs 64 percent of the labor force. Adding the forward and backward linkages to agriculture typically increases the share of extended agriculture in the economy by half or more in middle-income countries. Agriculture is a major determinant of aggregate economic growth, accounting for 20 to 60 percent of GDP growth in agriculture-based countries. It offers important investment opportunities at all levels of economic development. Even in some economies where the share of agriculture in GDP is small, such as Brazil and Chile, agriculture has been the fastest growing sector in the economy for over a decade, driven by major investment opportunities for commercial enterprises and also for large numbers of smallholders.

13. In all regions, including Sub-Saharan Africa, an increasing number of smallholders are successfully producing high value exports for global markets such as

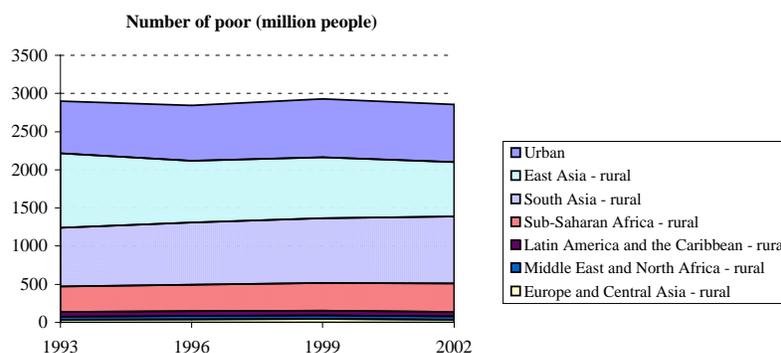
horticulture crops, organic coffee, and fish products. And large commercial farms and integrated food chains are major employers of rural labor. Agriculture can thus be a highly dynamic economic sector, driven by major changes in demand, sustained by the quick pace of technological and institutional innovations.

14. Agriculture is also an important way of life, providing a source of livelihoods for billions of people, many of them poor. And the figures are huge. Of the developing world's 5.5 billion inhabitants, 3 billion live in rural areas, nearly half of humanity. The developing world will remain predominantly rural until 2020. Of these rural inhabitants an estimated 2.5 billion are involved in agriculture, 1.3 billion as smallholders, more than half of them women in Sub-Saharan Africa and many other parts of the world.

15. Agriculture's importance for livelihoods is magnified by the fact that 75 percent of the world's poor, including the poorest of the poor, live in rural areas. The majority of the world's poor thus work in agriculture. And a majority of the world's poor will still be in rural areas in 2040. Over the past 10 years the global decline in the incidence of poverty (8.7 percentage points with a \$2 a day poverty line) has been entirely due to falling rural poverty, while urban poverty increased. An estimated 45 to 55 percent of the decline in the rural poverty rate was due to improved conditions in rural areas, not to migration, rising to the 45 to 80 percent range for Sub-Saharan Africa (focus A). It would thus be wrong to think that migration is the main instrument for rural (and world) poverty reduction. It is not. Improved rural conditions are.

16. This rural success in reducing poverty is insufficient. The total number of poor has remained constant (figure 1). And the poverty declines have been confined to East Asia and the Pacific. In Sub-Saharan Africa and South Asia the number of rural poor has continued to rise. In these regions, the Millennium Development Goal of halving 1990 poverty by 2015 will not be met without a major improvement in living conditions in rural areas led by agricultural growth. In addition, as nonagricultural growth accelerates, rural-urban income disparities tend to widen, creating major social tensions and focal points of insecurity as expectations for better lives remain unfulfilled for a majority of the rural people while urban livelihoods are visibly improving (focus D).

**Figure 1 The world's poor are mainly rural, and the number of rural poor is rising in South Asia and Sub-Saharan Africa (with a \$2 a day poverty line)**



Source: Ravallion, Chen, and Sangraula (2007).

17. Agriculture also remains important for food security. A dozen countries of Sub-Saharan Africa with a combined 200 million inhabitants have insufficient foreign exchange and access to ports to meet their food needs through imports. That leaves them exposed to chronic hunger, recurrent food emergencies, and the uncertainties of food aid. With poor infrastructure and high transactions costs, food markets fail many smallholders, who must rely on their own production to eat. At the global level, food security has not been a major concern for the last 30 years. But accelerating climate change, the looming water crisis, the slow adoption of new biotechnologies, and the burgeoning demand for livestock feed and biofuels are creating new uncertainties about the conditions under which food will be available in the global economy (chapter 2). Keeping vigilant on the world food supply in a context of rising uncertainties and long lags in mobilizing science for a response must be an important part of the global agriculture-for-development agenda.

18. Agriculture is a major user—and abuser—of natural resources. It absorbs 85 percent of the developing countries' fresh water use, in a context of rising scarcity, and 42 percent of the developing world's land mass. It is a major contributor to agro-chemical pollution, soil exhaustion, and global climate change, accounting for about one-third of greenhouse gas emissions (when deforestation to expand the agricultural frontier is attributed to agriculture). With rising water scarcity and increasing concerns about environmental costs, business as usual in the way agriculture uses resources is not an option. Agriculture is also a major provider of environmental services, generally unrecognized and unremunerated, such as sequestering carbon, managing watersheds, and preserving biodiversity. Addressing the relations among agriculture, natural resource conservation, and the environment is thus an integral part of using agriculture for development.

### ***Dualism is pervasive in agriculture and the rural sector***

19. Dualism is one of the defining characteristics of the developing economy. In agriculture it is closely related to the sector's many functions as an economic activity and a way of life. A highly modern sector of commercial farmers, multinational agribusiness firms, and supermarket chains coexists with another sector of tradition and subsistence. This dualism permeates the smallholder population as well. Farm households more closely related to the economic function of agriculture deliver surpluses to product markets, and share in the benefits of expanding markets for traditional staple foods and for the "new agriculture" of high value activities and non-traditional exports. But many other farm households are left out due to lack of control over assets and unfavorable contexts. They are involved in other markets as buyers of food, sellers of labor, and sellers of small amounts of a wide diversity of farm products, but they consume the majority of the food they produce.

20. Dualism is also found in the rural labor market. Low-skill agricultural jobs that are largely seasonal, low productivity, and informal coexist with a few high-skill jobs that can take workers out of poverty (chapter 9). And it is found in the rural nonfarm economy, where low-productivity self-employment in micro-enterprises coexists with self-employment in dynamic and high-value added small and medium enterprises. High

skill and low skill jobs also differentiate wage employment in this rural non-farm economy. Finally, dualism is found in the outcomes of migration, with pull migration taking the rural poor out of poverty, while push migration mainly displaces rural households to urban slums and a continuing life in poverty.

21. The pervasiveness of dualism in agriculture and rural society has deep implications for public policy in using agriculture for development: it requires policies that are differentiated to enhance the competitiveness of market participants, induce market entry, and target social assistance. Differentiated policies are not designed to favor one group over the other, but to better serve all households with policies tailored to their conditions and needs, particularly the poorest. Balancing attention to the dynamic and the lagging sub-sectors can hold inequality in check, enhance demand effects on non-traded goods and services, and reap the long-term growth benefits provided by equal opportunities.

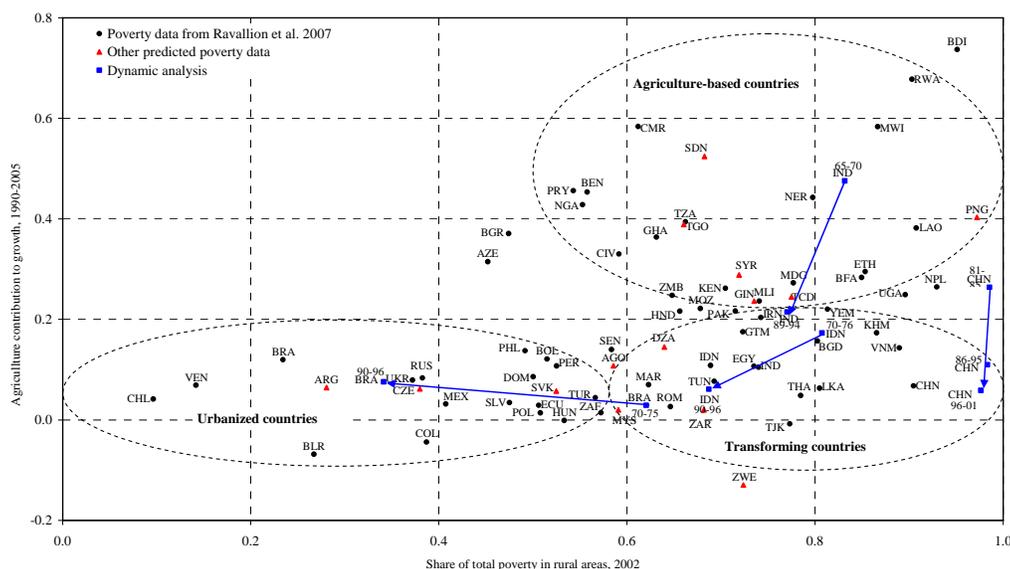
### **Agriculture's three worlds**

#### ***Heterogeneity in the world of agriculture***

22. The way agriculture acts for development is complex and heterogeneous. It varies across a wide range of countries that rely unequally on agriculture as a source of growth and as an instrument for poverty reduction. The contribution that agriculture makes to growth and poverty—within the limits of available data—can be seen by categorizing countries according to the share of aggregate growth originating in agriculture over the last 15 years, and the share of total poverty located in rural areas, using the \$2 a day poverty line (figure 2 and table 1). This typology shows three categories of countries

- ***Agriculture-based countries***—agriculture is important for growth (accounting for 27 percent of GDP growth on average, in part because agriculture is a large share of GDP) and a large share of the poor are in rural areas (70 percent). This category includes 398 million rural inhabitants mainly from Sub-Saharan countries (excluding South Africa and some mineral-rich African exporters). Eighty two percent of the rural Sub-Saharan Africa population live in agriculture-based countries.
- ***Transforming countries***—agriculture is not the main source of aggregate economic growth (contributing on average only 8 percent) but the bulk of national poverty remains rural (79 percent). This category, typified by China, India, Indonesia, Morocco, and Thailand, includes more than 2.2 billion rural inhabitants—98 percent of the rural population in South Asia, 96 percent in East Asia and the Pacific, and 93 percent in the Middle East and North Africa are in transforming countries.
- ***Urbanized countries***—agriculture is no longer the main source of aggregate economic growth (4 percent on average), and poverty is increasingly urban. Even so, rural areas still include 39 percent of the poor. Typical of this group with 260 million rural inhabitants are most countries in Eastern Europe and Central Asia and Latin America—88 percent of the rural populations in both Europe and Central Asia and Latin American are in urbanized countries.

**Figure 2 Agriculture’s contribution to growth and the rural share in poverty distinguish three categories of countries: agriculture-based, transforming, and urbanized**



*Notes:* Agricultural contribution to growth is computed from World Bank DDP (2006). Rural shares in poverty marked with a circle are from Ravallion et al. (2007), using the \$2/day poverty line. Rural shares of poverty marked with a triangle are predicted with an estimated regression of the rural share of poverty on rural share of population, agricultural share in GDP, log of GDP per capita in 2000 US\$, and regional dummies. The dynamic paths are taken from Ravallion and Chen (2004) for China, World Bank (2000) for India, ECLAC for Brazil, Central Bureau of Statistics (BPS) for Indonesia, with poverty rates based on their national poverty lines. Arrows show paths for Brazil, China, India, and Indonesia in previous periods with consistent data. All countries have mean population (1990-2005) greater than 5 million.  
*Source:* WDR 2008 team.

**Table 1 Country characteristics by category**

	Agriculture-based countries	Transforming countries	Urbanized countries
<b>Demographic and economic information in 2002 (74 countries)</b>			
GDP per capita (2000 US\$)	339	873	3,109
Rural population (million)	398	2,190	259
Share of rural population (%)	69	65	27
Share of agriculture in GDP (%)	31	15	6
Share of agriculture in GDP growth (%) (1990-2005)	27	8	4
Agricultural growth (%) (1990-2005)	3.2	2.9	1.6
Non-Agricultural growth (%) (1990-2005)	2.8	7.2	2.2
<b>Poverty (\$2 a day) in 2002 (60 countries)</b>			
Number of rural poor (million)	278	1,530	91
Rural poverty rate (%)	83	73	36
Urban poverty rate (%)	73	36	22
Share of rural poor in total poor (%)	70	79	39

*Notes:* Demographic and economic information data are from DDP (2006). Poverty data are from Ravallion et al. (2007).

*Source:* WDR 2008 team.

23. The typology is not static, and some countries follow their own evolutionary paths that eventually move them from one country type to another (box 1).

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**Box 1 The country typology is not static**

Long time series on growth and poverty allow to track the trajectories of a few countries across the categories in the typology. China and India moved from the agriculture-based category 20 to 30 years earlier, to the transforming category, but with little change in the share of the rural sector in poverty. Indonesia followed a trajectory affecting the shares of both agriculture in growth and the rural sector in poverty that took it gradually toward the urbanized category. Brazil continued to reduce the rural share in poverty, with a low share of agriculture in growth. Striking is absence of countries with a high share of agriculture in growth and a low share of rural poverty. It indicates that when growth accelerates in other sectors of the economy, rural populations tend to be left behind, with the rural sector dominating poverty. The rural-urban income disparity problem is thus a challenge that almost all countries will have to address.

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***The heterogeneity of regions within countries adds another layer to differentiated approaches***

24. All countries have sharp geographical disparities, with booming and lagging regions. Brazil has the northeast, Peru the Andean plateau, India the state of Bihar, and China the interior provinces. With GIS information, regions can be classified according to their (1) agricultural potential, (2) access to markets, and (3) population density. Where the poor are located matters in defining regional agriculture-for-development agendas.

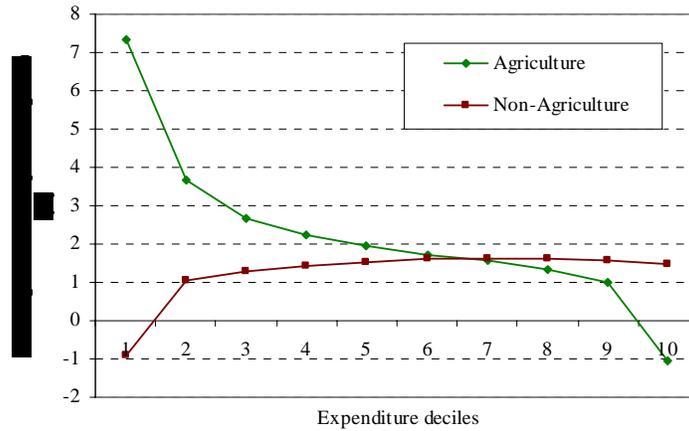
25. Overlays of regional characteristics with poverty maps in five countries show that most of the poor are in favorable areas defined by one or more of these three characteristics. Regions with high agricultural potential and weak market access are prime candidates for infrastructure investment. Regions with high population densities are candidates for investments in human skills to qualify the rural poor for jobs in the rural nonfarm sector or out migration. In designing national agendas for each country category (chapter 10), differentiated policies need to reflect the heterogeneity of households and the regional context for households to use their assets.

**The development potential of agriculture varies by country types**

***The special powers of agriculture in reducing poverty***

26. Agricultural growth has special power in reducing poverty (figure 3). Using a cross-country estimate for 42 countries over 20 years shows that for the two-third poorest in the distribution of income, GDP growth originating in agriculture has more impact on income than growth originating in nonagriculture, which benefits the richest third more. For China, aggregate growth originating in agriculture is estimated to have been 3.5 times more effective in reducing poverty than growth originating in non-agriculture. For Latin America, the ratio is 2.7.

Figure 3 GDP growth originating in agriculture benefits the poorest two-third most



Source: Ligon and Others (2006).

**Can agriculture be an engine of growth?**

27. Agriculture can be an especially effective instrument for poverty reduction given where the poor are located and the importance of agriculture in their incomes. But can agriculture also be the cornerstone of a growth strategy? If so it can deliver the double benefit of jumpstarting growth and strongly reducing poverty.

28. There are several interpretations as to how agriculture can deliver national growth. One is simply arithmetic: it can be a very large sector of the economy, and it has strong and largely untapped growth potential. This is the case for most of the agriculture-based countries where past contributions to growth mainly relate to sector size, and where there are wide gaps to be exploited through productivity gains.

29. The second interpretation is by conceptualizing the process by which growth is happening. Relevant here is the traditional closed economy model of the role of agriculture in development. In spite of globalization, non-tradability of food still applies across much of Sub-Saharan Africa and other agriculture-based countries for two reasons: high transactions cost due to poor infrastructure compounded further in the many landlocked countries; and staple foods such as roots and tubers and secondary grains that are not internationally traded. Agricultural productivity growth in such a closed system leads to declining food prices and lower wages to other sectors which consequently grow faster. The result: agriculture’s shares of GDP and the labor force both decline in the well known structural transformation of an economy led by a well performing agricultural sector. Poverty declines also thanks to productivity gains for smallholders and rising real wages for workers in all sectors induced by lower food prices.

30. This price effect is enhanced by agriculture’s well recognized (yet poorly measured) growth linkages with other sectors of the economy, especially those provided by rising farm incomes which stimulate the demand for non-tradable consumer products and services, the Agriculture Demand-Led Industrialization (ADLI) effect. Empirical measures of such multipliers show large effects. The growth inducement effects of

agricultural labor productivity on the rest of the economy is four times more frequently observed across countries than the reverse relation between the rest of the economy and agriculture (chapter 1). These interpretations of agriculture as a source of aggregate growth apply well to large segments of the agriculture-based countries. They suggest that agriculture can indeed be a good bet for these countries in achieving growth, indeed in many situations the only option, and through this poverty reduction.

31. Even under open economy conditions in agriculture-based countries, agriculture (and mineral resources) tend to have comparative advantage in international markets due to land abundance and low labor skills. Poor infrastructure and weak investment climate also create a business environment that hurts industry more than the primary sectors. Hence, agriculture is likely to remain a major source of growth when the economy opens and transactions costs are reduced.

32. Success stories in using agriculture for growth and poverty reduction abound, and they show what can be done. Agricultural revolutions were precursors to the industrial revolutions that spread across the temperate world from England in the mid-18th century to Japan in the late 19th century. By the middle of the 20th century Asia's green revolutions showed that agricultural technology could produce comparable changes in developing countries, with agricultural growth and declining real prices of food staples a precursor to the acceleration of nonagricultural growth. These countries also demonstrated the value of agricultural growth as an instrument for poverty reduction. In China rapid agricultural growth following institutional innovations (the household responsibility system and market liberalization) and in India following technological innovations (the diffusion of high yielding varieties together with fertilizer use and irrigation) were accompanied by major declines in rural poverty.

33. Rapidly growing agricultural subsectors also show the growth opportunities offered by agriculture. Consider high value crops for the domestic, regional, and international markets in Sub-Saharan Africa (dairying in East Africa, cut flowers in Ethiopia, horticulture in Kenya and the Sahel, specialty coffee in Rwanda) and in Latin America (fruits in Chile, cut flowers in Colombia, horticulture in Guatemala). Also consider livestock in Asia and the production of soybeans for exports and sugar for biofuels in Brazil. Local successes in traditional Sub-Saharan African agriculture (rice in Mali, cassava in Nigeria, maize in Ghana) provide lessons for the design and implementation of programs to accelerate agricultural growth. The challenge is to scale up these success stories to make them into effective national sources of growth and poverty reduction.

### **Yet agriculture has been underused for development**

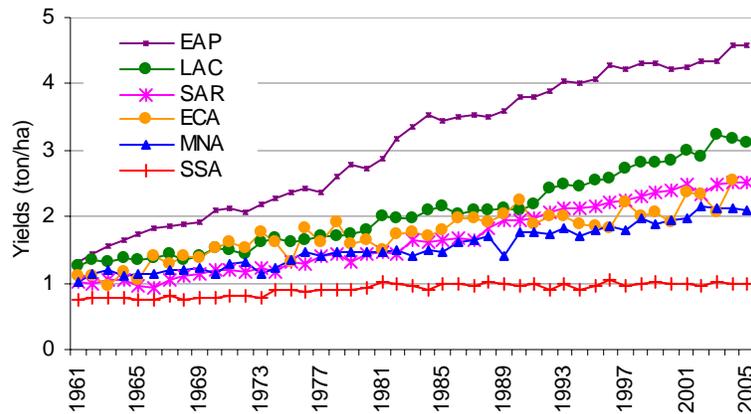
34. Parallel to these successes are numerous failures to use agriculture for development. Many of Africa's economies still display anemic growth and little structural transformation. Large areas within countries in all regions have yet to experience sustained agricultural growth and continue to suffer from mass poverty and food insecurity, with subsistence farming providing a vast system of self-financed social welfare. Rapid population growth, falling soil fertility, and missing opportunities for

income diversification and migration create distress. In countries with rapid growth in nonagricultural sectors, especially in Asia, the reallocation of labor out of agriculture is typically lagging, leaving large numbers of impoverished people in rural areas and widening rural-income gaps that can fuel political tensions and insecurity. In all these cases, agriculture has potential as an instrument for development. Why this has not been the case requires explanation. Whether there may be a new chance to use agriculture to solve these problems also needs to be explored.

***Developing countries and donors have turned their backs on agriculture***

35. Failure of agriculture to perform is associated with a burdensome legacy of policy neglect and of underinvestment and misinvestment in agriculture in the countries where it matters most. The heavy taxation of agriculture has come down since the early 1980s, but net taxation is still widespread in the agriculture-based countries, reducing the incentives to invest (chapter 4). Public expenditure in agriculture as a share of agricultural GDP has increased in Asia from 9.5 percent in 1980 to 11.0 percent in 2004, but it has fallen in Sub-Saharan Africa from 7.4 percent to 6.5 percent over the same period. The unsurprising consequence: cereal yields have stagnated in Sub-Saharan over the last 35 years, in marked contrast to Asia and the rest of the world (figure 4).

**Figure 4 The cereals yield gap between Africa and other regions is widening**



Source: FAO (2006).

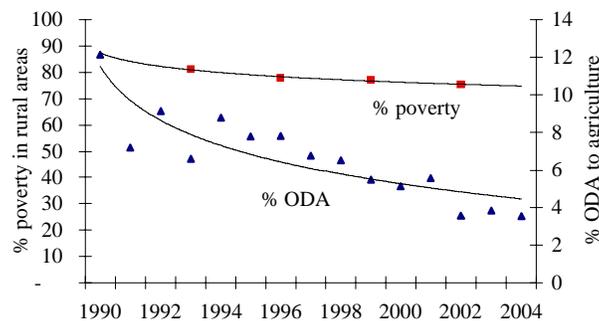
36. Donors have also turned their backs on agriculture over the last 15 years (box 2). The share of official development assistance going to agriculture fell by two-thirds between 1990 and 2004, to only 4 percent, while the share of rural poverty declined only by 12 percent over the period (figure 5). Underinvestment in agricultural research and extension is also pervasive, despite estimated rates of return that remain consistently in the range of 35 percent (Sub-Saharan Africa) to 50 percent (Asia), far above the cost of money accessible to developing countries.

**Box 2 Why did donor attention to agriculture decline?**

Nearly every donor agency began reducing assistance to developing country agriculture and rural development in the mid-1990s. World Bank lending to agriculture declined from about \$3.5 billion a year in 1995 to less than \$1 billion in 2001. The reasons for this decline in donor support include the following.

- Falling international commodity prices for staple foods made investing in agriculture less profitable.
- Failures to reform OECD farm policies induced developing countries to introduce their own compensating protection and subsidies, making donor support to agricultural budgets less attractive.
- ODA allocations to agriculture were replaced by other priorities, particularly balance of payment relief, meeting conditions on HIPC to qualify for debt relief through quick poverty reducing initiatives, short-run interventions to meet the Millennium Development Goals, and emergency relief in response to numerous crises.
- Donors became more demand-driven by developing country governments that did not prioritize agriculture.
- Agricultural projects are by nature interdisciplinary and multisectoral, and implementation difficulties were not adequately addressed, discouraging investment.
- Environmental groups often opposed investment projects in agriculture as they looked at agriculture as a contributor to natural resource destruction, environmental pollution, and global warming.

**Figure 5 The share of agriculture in official development assistance has fallen much faster than rural poverty**



Source: OECD, Creditor Reporting System (2006), Ravallion, Chen, and Sangraula (2007).

37. There has been much misinvestment as well. Even with reduced budgets, public expenditures on agriculture have too often drifted toward unproductive subsidies and socially regressive transfers—rather than toward investment in core public goods that can sustain productivity growth, such as agricultural research, infrastructure, and rural health and education. This is seen in India’s agricultural subsidies, which rose from 25 percent of agricultural GDP in 1975 to 61 percent in 2002, while public investment fell from 40 percent to 16 percent of agricultural GDP. In Zambia 37 percent of the public budget for agriculture in 2005 was devoted to fertilizer subsidies. Econometric evidence for India and Latin America shows that the shift away from investing in public goods has had a heavy toll on agricultural growth.

38. The misinvestment in agriculture worsens underinvestment because it undermines the political capital for allocating higher shares of public budgets and foreign aid to agriculture, a key condition for private investment and growth. Addressing the quality of agricultural public investment is thus essential to credibly raise the current level of public investment.

### ***Political economy issues drive the policy agenda***

39. The three worlds of agriculture correspond to three political dilemmas for the role of agriculture in development that drive the policy agendas. In the agriculture-based countries, when agriculture dominates the growth process and agriculture is largely nontradable, the key policy dilemma is to maintain incentives for farmers to invest in sources of productivity growth while prices are falling. Addressing the “food problem” requires sustained public investments in sources of productivity gains, combined with income effects in the demand for food to curtail the downward pressure on prices. Income effects are enhanced by policies that promote a more equitable distribution of income.

40. As growth in other sectors of the economy accelerates in the transforming economies, rigidities in inter-sectoral labor reallocation result in rising rural-urban income gaps, and severe political tensions. This “disparity problem” leads to demands by the farm population for rising transfers to agriculture and for protection. But weak fiscal capacity to sustain large enough transfers to erase the income gap and continuing demands for low food prices to feed the urban poor create a policy dilemma that has not been adequately resolved. In the urbanized countries, as GDP per capita continues to rise and economies industrialize and urbanize, the “farm subsidies problem” for agriculture becomes one of containing pressures for rising protection and subsidies that can result in huge costs on the rest of the economy—another policy dilemma that has been poorly addressed, including in most high income countries.

### **Significant improvements are possible**

#### ***New opportunities, new challenges, and rising uncertainties***

41. The world of agriculture has changed dramatically since the last WDR on agriculture in 1982, offering new opportunities in using agriculture for development, if with new challenges and new uncertainties. 1982 was before the debt crisis, when the state had a big role in agriculture, and smallholders were part of the green revolution sweeping through Asia and much of Latin America. Since 1982 the globalization of the world economy has vastly increased international flows of information, goods, financial capital, technology, ideas, and people. The new context for agriculture is defined by globalization and the emergence of new markets, far reaching technological and institutional innovations, and new roles for the state and civil society. It is characterized by:

- Global market shifts, with a rise in demand for high value products, integrated food supply chains, giant agribusiness corporations, the supermarket revolution at the retail level, requirements for suppliers to meet strict quality standards, a secular decline in the price of staple foods and tropical exports in international markets, proliferations of niche markets such as organics and fair trade, and new markets for animal feed and biofuels in rapidly expanding economies.
- Technological and institutional innovations that increase productivity, but also introduce new requirements for competitiveness. The innovations provide the

capacity and the flexibility to seize dynamic market opportunities. But economies of scale and demanding product standards can easily exclude large numbers of smallholders insufficiently capitalized and organized to meet the conditions for competitiveness.

- The downscaling of the state in directly providing goods and services to agriculture through parastatal agencies, replaced by an increasing role in providing public goods, regulating market activity, compensating for undesirable social outcomes, and managing environmental externalities. The policy process in mobilizing the power of the state for agriculture and rural development has also changed drastically, with the spread of participatory democracy, redefinitions of the roles of ministries of agriculture, and the decentralization of governance.
- The proliferation and rising power of civil society organizations, gaining freedom from the state and taking on a wide range of forms and functions to help compensate for some market and state failures. These include seeking to achieve market power for smallholders, and providing the farm constituency with a stronger voice and influence over political affairs and the provision of services.

42. The “new agriculture” is market-driven, state-assisted, civil society-influenced, and grounded in technological and institutional innovations. It is led by private entrepreneurs in extended supply chains linking producers to consumers and including many entrepreneurial smallholders. It competes with and influences the “old agriculture” of staple foods and tropical export commodities, which becomes more market integrated and more differentiated to meet changing consumer demands. The welfare effects of these changes depend on the extent to which the rural poor capture direct benefits as net sellers and indirect benefits as workers and consumers of food. The outcomes will have major growth effects for countries where agriculture is the main economic sector and major welfare effects on the lives of more than a billion smallholders and rural poor.

43. At a global level agriculture has been largely successful in meeting the world’s food needs. But looking forward there are substantial uncertainties. Supply-side factors such as climate change, environmental degradation, higher energy prices, and doubts about future rates of technical change all present challenges and risks. To meet projected demand, cereal production will have to increase by nearly 50 percent from 2000 to 2030, and meat production by 120 percent. Added to this is the burgeoning demand for agricultural feedstocks for biofuels, which could push up world food prices. How can the increased demand for agricultural products be met in the face of growing natural resource constraints and unanticipated shocks? How can less favored countries and regions within countries be included in growth processes?

### ***A new agenda requires political will and resource commitments***

44. There are good reasons for a new agriculture-for-development agenda to have a greater chance of success than in the past. One is *greater capacity* to do so effectively, thanks to greater attention to learning from national success in China, India, Indonesia, and Vietnam and local successes in Africa and across the world. The improved performance of investment projects in agriculture is testimony to this greater capacity.

45. Another is *greater opportunity*. Responses to the economic crises of the 1980s helped put the macro fundamentals for growth solidly in place. Few countries now have high rates of inflation or large imbalances in their real exchange rates. Progress has been made worldwide with democracy, decentralization, and political stability, including reduced civil strife in Africa. And there have been major gains in the empowerment of civil society, particularly through the proliferation of producer organizations.

46. Added to this is *greater willingness* to invest in agriculture for growth, poverty reduction, and environmental gains. This is seen in the recent reversal of the decline in public spending for agriculture in Sub-Saharan Africa, in political commitments to allocate more funds to agriculture (NEPAD's guidelines), in recent increase in ODA allocations to agriculture, and in the attention to agriculture by global actors who see agriculture as a key to global agendas in poverty, health, environment, and security.

47. In the end, using agriculture for development is a matter of political will. Agendas proposing to use agriculture for development are not new—they were formulated in the 1982 WDR for the context then prevailing. Political lessons have been learned as well. Key to the success of new agriculture-for-development agendas is to build political capital that supports agriculture but without falling into the subsidy or protection traps when growth in the rest of the economy accelerates. Supportive political economy conditions are necessary not only to design policies but also to implement comprehensive programs that will achieve the desired results. This is a difficult process, and much is left to be learned in how to manage the political economy of agriculture for development.

### **Households can follow multiple pathways out of poverty**

#### ***Widening the pathways requires differentiated policies***

48. Rural individuals of working age engage in self-employment in farming, agricultural wage labor, self-employment in rural nonfarm activities, wage employment in the rural nonfarm economy, and migration. Households pursue livelihoods comprising of portfolios of activities that allow them to capitalize on the different skills of individual members and to diversify risks.

49. Pathways out of poverty are successful livelihood strategies to overcome poverty that can be led by (1) smallholder farming, (2) wage employment in the agricultural labor market and wage and self-employment in the rural non-farm economy, and (3) migration. Making agriculture more effective for development thus consists in defining differentiated policies to better serve each category of households by enhancing (figure 6):

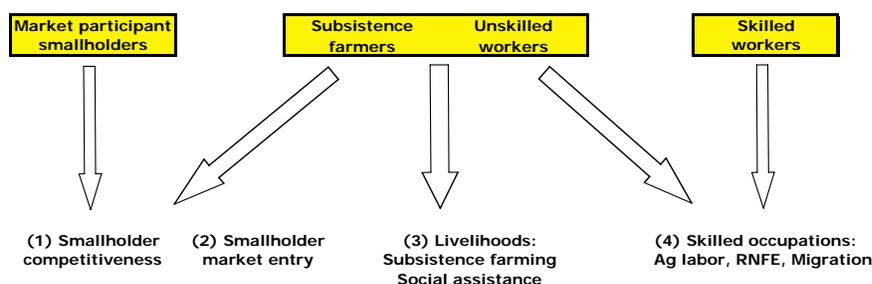
(1) *Smallholder competitiveness*: Increasing the competitiveness of market-oriented smallholders through better technology, risk management, and lowering market transactions.

(2) *Smallholder market entry*: Inducing shifts from subsistence to market-oriented farming, where the key policy instrument is increased access to assets (land, human capital, social capital), and investment in infrastructure.

(3) *Subsistence livelihoods*: Improving conditions for the poorest segments of the rural population engaged in subsistence farming and low skill jobs by raising the productivity of labor in these activities and social assistance.

(4) *Skilled occupations*: Enhancing skills for rural and urban labor markets through education, specific labor skills, and entrepreneurship for small enterprises.

**Figure 6 Four generic components of an agricultural for development agenda**



50. The character of rural populations is far from static, influencing the strategies that can be pursued in using agriculture for development. Market opportunities can induce quick transitions from subsistence to market-oriented farming. In Vietnam, with economic liberalization and rapid economic growth, two-thirds of the smallholders engaged in subsistence farming in 1992 were market participants by 1998.

## **PART II HOW TO USE AGRICULTURE FOR DEVELOPMENT**

### **Access to assets: A precondition for success in agriculture for development**

51. Household asset positions are a major determinant of market participation and skilled occupations. Three core assets are land, human capital, and social capital. The poor everywhere lack one or more of these assets. Nowhere is the deficit greater than in Sub-Saharan Africa, where farm size in many of the more densely populated areas are unsustainably small, and poor health and lack of education are major contributors to low productivity and high poverty. Enhancing asset positions sometimes requires significant public investments, as in health, but in nearly all cases, and especially for social capital in the form of farmer organizations, the biggest challenge is good governance and inclusiveness, especially for women.

52. The development of land markets, particularly rental markets, is important to raising productivity, diversifying household incomes, and facilitating exit from agriculture. As farmers age, rural economies diversify, and migration accelerates, well functioning land markets are needed to transfer land to the most productive users and promote participation in the rural nonfarm sector and migration out of agriculture. In China, land rentals increased agricultural productivity by about 60 percent in rented plots and diversified incomes for those renting land out. But in many countries, insecure property rights, poor contract enforcement, and stringent legal restrictions limit the performance of land markets.

53. While land remains a critical asset, education is often now the most valuable asset to enable rural people to take advantage of opportunities provided by the new agriculture, to get skilled jobs in the rural nonfarm economy, and to migrate out of rural areas. Educational levels in rural areas tend to be dismally low worldwide, averaging less than four years for rural adult males and less than three years for rural adult females in Sub-Saharan Africa, South Asia, and the Middle East and North Africa. More demand for education has to be induced among rural households—as through conditional food transfers in Bangladesh and conditional cash transfers in Brazil and Mexico—and the quality of rural education improved. Education should be conceived broadly to include vocational training that can provide technical skills and improve entrepreneurship in the new agriculture and in the rural nonfarm economy.

54. Agriculture and health are increasingly interlinked, and coordinated efforts in the two sectors can provide dividends for productivity and welfare. Agriculture poses threats to the health of the rural poor (focus G). Irrigation sometimes increases the incidence of malaria and illness, and deaths from pesticide poisoning are not uncommon. Widespread illness and death from HIV/AIDS and malaria reduce agricultural productivity through losses of labor and local knowledge of productive adults. Because the majority of people affected by HIV/AIDS in the world earn their livelihoods through agriculture, the disease is devastating the sector in some countries. In rural Zambia population declines are especially steep for young adults (19 percent for those 15-24 in 1990), their most productive age. Neither the agriculture nor the health agendas can succeed without more attention to these interrelationships.

55. Collective action by farmer organizations is fundamental to reducing transaction costs in markets, achieving some market power, and raising farmers' voices in national and international policy forums. Farmer organizations have expanded rapidly in number and membership, often to fill the void left by the state's withdrawal from marketing, input provision, and credit. Between 1982 and 2002 the number of villages with farmer organizations in Senegal rose from 8 to 65 percent and from 21 to 91 percent in Burkina Faso. Membership can be huge, as in the Indian Dairy Cooperatives Network, with 1.1 million village cooperatives and 12.3 million members, many of them landless and women, producing 22 percent of India's milk.

56. But their effectiveness—constrained by legal restrictions, low managerial capacity, elite capture, exclusion of the poor, and failures to be recognized full partners by the state—has to be improved. Donors and governments can assist by facilitating the right to organize, training leaders and managers, and empowering weaker members, including women and young farmers. Providing this assistance without creating dependency remains a challenge.

### **Make smallholder farming more productive and sustainable through differentiated policies**

57. Improving the productivity, profitability, and sustainability of smallholder farming is the most important pathway out of poverty in using agriculture for development. Policy instruments apply differentially to smallholders participating in the

market and engaged in subsistence farming. Most important is to induce market entry by subsistence farmers.

58. What will this take? A broad array of instruments is available: getting price incentives right and increasing the quality and quantity of public investment (chapter 4); making product (chapter 5) and factor markets (chapter 6) work better; improving access to financial services and reducing exposure to uninsured risks (chapter 6); promoting institutional innovations in science and technology (chapter 7); and making agriculture more sustainable and a provider of environmental services (chapter 8).

***Get price incentives right and increase the quality and quantity of public investment***

59. Global agricultural trade policies continue to impose large costs on poor farmers. They depress international commodity prices on average by 5 percent, erode the developing country share in global agricultural trade by about 9 percentage points, and suppress agricultural output growth in developing countries on average by about 0.4 percent a year. Agricultural trade policies cost developing countries about \$50 billion in forgone gains each year, about 15 times the foreign aid for the sector.

60. OECD agricultural tariffs and subsidies have declined and shifted to less distorting forms (chapter 4). But progress varies by OECD country and product. Needed now is to accelerate reductions in distortionary support for products that matter most to developing countries, such as cotton and sugar, where progress has been slowest. Progress in the Doha round of trade negotiations, international pressures, and local media attention can help. The bargaining capacity of developing countries in trade agreements also needs to be enhanced. Complementary policies and programs are needed to compensate losers from trade reforms in developing countries, and to facilitate rapid and equitable adjustment to emerging comparative advantages.

61. Trade reform must be accompanied by further efforts in developing countries themselves to reduce the remaining taxation of agricultural exports and counter the rising protection of agricultural imports. Net taxation has on average declined sharply across agriculture-based, transforming, and urbanized countries. But some of the net effect is due to rising protection of agricultural imports with remaining high taxation of exports in many countries—imposing additional costs on South-South trade. Building on local support to strengthen coalitions for reform, and ensuring that complementary programs facilitate the transition (but avoid drifts to protection and subsidy traps) can produce further efficiency gains. Programs such as technical assistance and one-off grants that support farmers to move toward products for which there is a comparative advantage are especially important to smooth the transition.

62. Political economy will determine the pace and extent of reform and has to be addressed in both developed and developing countries. Building the political capital of coalitions supporting reforms can help. Membership of the WTO has induced reform, and local media have played a complementary role (as in US cotton). In some cases bargained compromises and compensation schemes for the losers may be needed—as in the new Japan rice policy reforms, the EU sugar reforms, and Mexico's 1990s reforms.

And linking domestic agricultural reforms to a broader set of economywide reforms can strengthen the political capital of reform coalitions, and increase the likelihood of successful reform, as in many developing countries in the 1980s and 1990s.

63. Success with reform of trade and price policies is closely linked to actions to remove regressive subsidies and improve the quality of public expenditures. More and better public expenditures are an important part of ‘behind the border’ measures to facilitate market adjustment. Information gaps in public knowledge of budget allocations and impacts of public spending on agriculture have to be closed through greater publicity and transparency of budget allocation and analysis. Accountability mechanisms at both national and local government levels have to be improved through strengthening the voice and influence of rural producers in allocation decisions. And commitment devices have to guarantee compensation for losers from the reforms, such as legislated transfers and long-term investment to facilitate adjustment.

***Make product and factor markets work better***

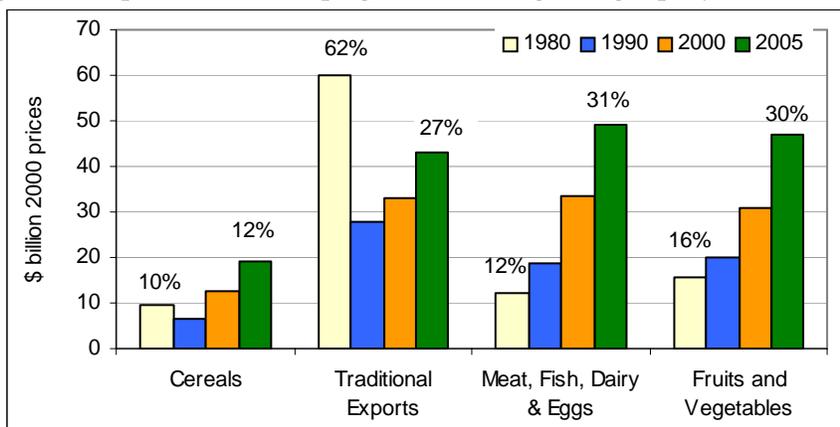
64. With major changes in agricultural markets and the entry of powerful new actors, the key issue for development is to enhance inclusion of a smallholder sector. A number of options exist for this. Reducing the transaction costs and risks in food staple markets in agriculture-based and transforming countries can be a win-win strategy for promoting faster growth while benefiting the poor. Beyond investments in infrastructure, a number of innovations are reducing transactions costs and risks. They include commodity exchanges, information technologies, warehouse receipts, and market-based risk management tools (chapter 5). Insurance through exchange-traded futures contracts can manage the price volatility of food staples (in regional markets that use the South African commodity exchange). Risk management can also be enhanced by more open borders, as in the successful management of the Bangladesh food crisis in 1998.

65. Improving quality premiums for traditional exports is critical for competitiveness. The long-term downward trend in world market prices of such traditional exports as coffee and cotton threatens the livelihoods of millions of producers. Reduced taxation and greater liberalization of export markets has improved incomes in many settings. But developing mechanisms to tap quality premiums will still be essential for them to remain competitive—as through outgrower companies contracting of 200,000 smallholder cotton farmers in Zambia.

66. The participation of smallholders can also be enhanced in domestic and global high value markets. High value product markets for domestic consumption are the fastest growing agricultural markets in most developing countries (chapter 2). For example, the demand for poultry products has increased by 7 percent per year and for vegetables by 6.4 percent per year over the past 15 years. In export markets, fresh and processed fruits and vegetables, fish and fish products, meat, nuts, spices, and floriculture now account for 58 percent of agro-food exports from developing countries, about \$106 billion dollars in 2003/04 (figure 7). The poverty impacts of this growth depend on how smallholders participate in high-value crops and livestock products, either directly or through the labor market. Enhancing their participation needs market infrastructure, upgrading farmer

technical capacity, risk management instruments, and collective action through producer organization. Addressing the stringent sanitary and phytosanitary standards in global markets is an even bigger challenge. Doing it well depends on joint public and private efforts in policy (food safety legislation), research (risk assessment, good practices), and management (disease surveillance, export processing facilities).

**Figure 7 High value exports from developing countries are growing rapidly**



*Note:* Traditional exports include coffee, cocoa, tea, rubber cotton, sugar, spices, and tobacco. Number above bars represents the percent of total exports

*Source:* Data from COMTRADE.

67. Input market failures especially for seed and fertilizer continue to be common in Sub-Saharan Africa (chapter 6). The renewed interest in fertilizer subsidies needs to focus on sustainable solutions to these market failures. “Market smart” approaches to jump-start agricultural input markets include targeted vouchers for the distribution of free “starter packs” to farmers, and matching grants to encourage private distributors to enter risky input markets. Many of these initiatives require fine-tuning, but some now show great promise for scaling up.

***Improve access to financial services and reduce exposure to uninsured risks***

68. Financial constraints in agriculture remain pervasive, and they are costly and inequitably distributed. The constraints on access to capital and risk management instruments reduce smallholders’ ability to compete in the globalized agricultural economy. They originate in property rights (wealth rationing) and in the reticence to put collateral at risk (risk rationing). The demise of special credit lines to agriculture through state programs or banks has left a huge gap in financial services, yet to be filled.

69. Despite the microfinance revolution, building efficient finance markets for the rural poor remains one of the major challenges in using agriculture for development. The microfinance revolution, supplying credit without formal collateral, has failed to solve and provide access to financial services for smallholders, except in high turnover activities such as small livestock and vegetables. But linked savings and loan services, and links between loans and insurance, are supporting greater use of microfinance loans in agriculture. With the rise of integrated supply chains and contract farming, financial intermediation through interlinked agents is becoming more common. Information

technologies are reducing transaction costs and making loans less costly in rural areas, as with the use of agricultural credit cards for input credit. Credit reporting bureaus for microfinance institutions also help smallholders capitalize on their reputations as microfinance borrowers to access larger and more commercial loans for agriculture.

70. Exposure to uninsured risks remains unduly high in agriculture, contributing to the reproduction of poverty and falling into poverty traps. Uninsured risks—due to natural disasters, health shocks, and policy changes—have high efficiency and welfare costs for rural households. To reduce the exposure to these risks, farmers have to forgo activities with higher expected incomes. Coping with shocks by sacrificing assets can have high long-term costs because they create irreversibilities in the ownership of agricultural assets (following distress sales of land and livestock) and in child education and health (taking children out of school in response to shocks and exposure to early periods of malnutrition lead to intergenerational transfers of poverty).

71. Formal insurance mechanisms have inherent market imperfections, but state interventions to address these limitations have proven costly. Index-based weather insurance, now being scaled up by private initiatives in India, can reduce risks to borrowers and lenders, and unlock agricultural finance. But formal insurance is still not widely available, and it is unlikely to be used by the poorest households unless there is a subsidy, at least for the fixed costs of marketing and monitoring.

### ***Promote innovation through science and technology***

72. Investment in R&D is one of the most effective ways to gain competitiveness. It is also critical to securing livelihoods in less favored regions. And growing resource constraints and uncertainties at the global level increase the role of science in global food supplies.

73. To narrow the knowledge divide, sharply increased investment R&D must be at the top of the policy agenda. International and national investments in R&D have paid off handsomely, with an average internal rate of return of 43 percent in 700 R&D projects evaluated in developing countries, in all regions (chapter 7). But global and national market failures are leading to serious underinvestment in R&D and in innovation systems more generally, particularly in the agriculture-based countries, where agricultural growth is needed most. The result: a growing divide in the growth of investment in R&D, which tripled in China and India over the last 20 years, but increased by barely a fifth in Sub-Saharan Africa. Including both public and private investment, developing countries invest only a ninth of what industrial countries put into agriculture R&D, as a share in agricultural GDP.

74. Low spending is only part of the problem. Many public research organizations face serious institutional constraints that inhibit their ability to meet rapidly changing demands for innovation. The rise of higher value markets is opening new opportunities in the private sector to foster innovation along the value chain, often involving collective action by the public sector, private sector, farmers, and civil society, and learning and feedback among the various actors. Needed now is understanding what works well in

what context and to adapt that understanding to ensure wider participation of poor farmers.

75. A second challenge is to narrow the income and productivity gaps between favored and less favored regions through better technologies for soil, water, and livestock management and more sustainable and resilient agricultural systems, including varieties more tolerant of pests and diseases, and drought. One of agriculture's major success stories in the past two decades is conservation or zero tillage, especially in commercial agriculture in Latin America, but also among smallholders in South Asia's rice-wheat systems and increasingly by smallholders in Sub-Saharan Africa (Cameroon, Ghana, and Zambia). Frequently location-specific, these types of technological innovations require more decentralized and participatory approaches, typically combined with collective action by farmers and communities.

76. Revolutionary advances in biotechnology offer potentially large benefits to poor producers and poor consumers. But today's investments in biotechnology are largely concentrated in the private sector, driven by commercial interests. Developing technologies for poor farmers and consumers has been slow because of low public investment in biotechnology and because of controversies over food and environmental safety. The international development community should support a concerted effort by interested countries to develop and evaluate safe transgenics for priority crops important to the poor, in collaboration with key stakeholders in the public and private sectors.

***Make agriculture more sustainable and a provider of environmental services***

77. The environmental footprint of agriculture has been large, but there are many opportunities for reducing it (chapter 8). Since the 1992 Earth Summit in Rio it is generally accepted that the environmental sustainability agenda is inseparable from the broader agenda of agriculture for development.

78. Intensive and extensive agriculture both face environmental problems, but of a different kind. Agricultural intensification has generated environmental problems from mismanagement of irrigation water, fertilizers, pesticides, and animal waste. Globally, one-fifth of irrigated areas may suffer from salinization and waterlogging, and 11 billion hectares (1 percent of irrigated land) are lost annually because of severe degradation. Many less favored areas that missed out on past rounds of agricultural intensification are also experiencing environmental degradation but of a different kind—deforestation, soil erosion, and pastoral degradation. Every year around 13 million hectares of tropical forest are degraded or disappear, and more than 60 percent of deforestation in developing countries has been attributed to encroachment by agriculture, often through the pressure of poverty and rapid population growth. The answer is not to slow agricultural development in either situation, but to seek more sustainable production systems with minimum tradeoffs with growth and poverty reduction, and to make agriculture a provider of environmental services.

79. Many promising technological and institutional innovations can make agriculture more sustainable. Water use efficiency can be raised in irrigated farming while

substantially reducing total water use, water pollution, and the unsustainable mining of groundwater. This depends on mechanisms of cost recovery, greater devolution of water management decisions to local user groups, and more effective regulation of externalities. Likewise, better technologies and better ways of managing modern farm inputs can make intensive farming more sustainable (integrated pest management and using geographic information systems in livestock farming and irrigation). In less favored regions a wide array of natural resource management practices and successful community-based approaches to natural resource management offer much promise.

80. Getting incentives right is the first step toward sustainable resource management. Widespread adoption of more sustainable approaches is often hindered by inappropriate pricing and subsidy policies and the failure to manage externalities. Required in both intensive and extensive farming areas are strengthening property rights, providing long-term financing for natural resource management with off-farm benefits, and removing incentives to waste resources—such as electricity subsidies for groundwater pumping.

81. Payments for environmental services can help manage environmental externalities. Watershed protection and carbon sequestration create positive externalities in less favored regions. Pilot projects for carbon sequestration in Colombia, Costa Rica, and Nicaragua have induced desired changes in land use, while ensuring active participation of poor households. Such schemes have been launched on a massive scale in China—the Sloping Land Conversion Program—and look promising for promoting agroforestry among smallholders in parts of Africa. Scaling up carbon trading to the global level and improving incentives for technology transfer hold enormous potential to mitigate climate change through agriculture, a major source of greenhouse gases.

82. The international community needs to scale up its support for developing country adaptations to climate change. Agriculture in poor countries and the people who depend on it are most vulnerable to climate change (focus G). Increased risk of crop failures and livestock deaths are already imposing high economic losses and undermining food security, and they will get far more severe as global warming continues. More frequent droughts and water scarcity may devastate large parts of the tropics and undermine supply of irrigation and drinking water in entire communities of already poor and vulnerable populations. So far global commitments in support of the newly created adaptation fund have been inadequate, and much greater efforts and new sources of international financing will be needed.

83. Agriculture can mitigate climate change by producing biofuels but only in some situations (focus B). High energy prices present enormous opportunities for biofuels, but environmental benefits depend on the way they are produced. There may be few economic and environmental benefits and even negative effects for many feedstocks using current technologies, such as energy-intensive maize production in the U.S. ethanol industry. Likewise expanding oil palm, sugarcane, and soybean to produce biofuels in tropical areas should take into account deforestation and degradation of land and water resources. Investing in research and development for second-generation biofuels technologies adapted to sustainable smallholder farming systems, should be priority.

### **Beyond farming: A dynamic rural economy and skills to participate in it**

84. The rural employment problem is huge and insufficiently recognized. Between 45 and 60 percent of the rural labor force is primarily engaged in the agricultural labor market and the rural non-farm economy in South Asia, East Asia, the Middle East and North Africa, and Latin America. Only in Sub-Saharan Africa is self-employment in agriculture still by far the dominant activity for the rural labor force, especially women. But with growing rural populations and declining farm sizes, the rural employment problem will need to be addressed there as well.

85. The labor market and migration are becoming important sources of employment and income for the rural population, but they work better for the skilled. Agriculture and the rural nonfarm sector offer high paying jobs for the skilled, and low paying jobs for the unskilled. Similarly migration can be a successful climb up the income ladder for well prepared skilled workers, or a simple displacement of poverty to the urban slums.

86. The first policy priority is to focus on the creation of more jobs, even if low paying, both in agriculture and in the rural nonfarm economy. The most basic ingredients of a dynamic rural non-farm economy are a rapidly growing agriculture and a good investment climate for investment in the rural nonfarm sector. Critical for the latter is linking the local economy to broader markets by reducing transaction costs, investing in infrastructure, and providing business services and market intelligence. A territorial approach where agro-based clusters allow firms to coordinate to better compete in servicing dynamic markets has been effective, for instance for non-traditional exports in the San Francisco Valley of Brazil and for dairy production in Peru and Ecuador.

87. But the real challenge is to help the transition of the rural population into high paying jobs, particularly formal jobs that provide better conditions for workers. This requires adapting labor regulations to be consistent with the incorporation of a large share of rural workers into the formal market. On the supply side, the message is education, skills, and entrepreneurship—through incentives for parents to educate their children better, but also improving the quality of schools and redefining the nature of rural education so that it is relevant to gainful employment.

88. Providing social assistance to the chronic and transitory poor can increase both efficiency and welfare. It includes support to the chronic poor with food aid or cash transfers. In urbanized countries such as Brazil and South Africa, rural non-contributory pension funds protect the aged, facilitate earlier land transfers to the younger generation, relieve the age group best placed to invest savings productively from the burden of supporting the elderly, and have important spillovers on the health and education of the pensioners' children and grandchildren. Safety nets, such as guaranteed workfare programs and food aid or cash transfers, also have an insurance function to protect the most vulnerable against shocks. These programs have to be organized so that they do not undermine the local food economy, do not create work disincentives for beneficiaries, and do reach “just in time” those most in need.

**Part III HOW TO DEFINE AND IMPLEMENT AGRICULTURE FOR DEVELOPMENT AGENDAS**

**National agendas for agriculture’s three worlds**

89. The options for public policy and investment explored in the Report can be integrated into elements of agriculture-for-development agendas for the agriculture-based, transforming, and urbanized countries (chapter 10). An agenda to use agriculture for development has four pillars to widen pathways out of poverty: market entry, competitiveness, livelihoods, and skills. Policy priority in the use of these instruments across country categories is summarized in Table 2.

**Table 2 Policy priorities for local agriculture-for-development agendas**

<b>Agenda</b>	<b>Agriculture -based</b>	<b>Transforming</b>	<b>Urbanized</b>
1. Smallholder competitiveness	+++	++	+
2. Smallholder market entry	++	+	+
3. Livelihoods			
Subsistence farming	++	+	+
Social assistance	++	++	+
4. Skilled occupations			
Agricultural labor			++
Rural non-farm	+	++	++
Migration		++	++

***Agriculture-based countries: An agenda to secure growth and food security***

90. Sub-Saharan countries account for 90 percent of the world rural population in the agriculture-based countries. There, agriculture must serve as the engine of national economic growth and the instrument for mass poverty reduction. Commercial smallholders will drive agricultural growth. For this to happen, farmers must be connected to effective input delivery systems, financial markets, and to consumers through product processing, handling, transport, and distribution systems. Greater value addition through the value chain will further enhance employment generation and poverty reduction. The highest priorities are to promote smallholder competitiveness and accelerate market entry for subsistence farmers. Building assets, especially land, skills, and irrigation, and connecting smallholders to markets, largely through investments in infrastructure, can accelerate market entry. Subsistence farmers unable to transit to commercial farming will have to rely more on improved subsistence farming based on low input technologies to manage natural resources and make farming systems more resilient, and on social assistance. The recent improved growth performance of agriculture in Sub-Saharan Africa more generally, and good performance in a number of countries, shows that it can be done.

91. The specifics of the Sub-Saharan African context, so different from that of the green revolution in Asia, imply a different approach that has three elements. First, a multi-sectoral approach must put in place several elements simultaneously to capture the

synergies (health, education, infrastructure, government services, the rural investment climate). Second, approaches must be decentralized to tailor agricultural development actions to the heterogeneity of local conditions. These include community driven approaches in which women, the majority of farmers in Sub-Saharan Africa play a leading role. Third, strategies need to be coordinated across countries to overcome the small country problem to provide an expanded market and achieve economies of scale in some services, such as R&D.

92. This agenda will require sharply increased public investment especially in infrastructure, roads, and communications to improve market access, and R&D to address the relative uniqueness of Sub-Saharan African crops and agro-ecologies. The annual increase in public spending on agriculture required to meet the first MDG is projected to be about 18 percent or \$1 billion. The challenge is formidable, but Sub-Saharan African agriculture was never given a sustained chance to succeed in using agriculture for development. The current window of opportunity—with the improved enabling environment, capacity, and commitments—should not be missed.

***Transforming countries: An agenda to reduce poverty and narrow rural-urban income disparities***

93. In transforming countries, where nonagricultural sectors have been the fastest growing in the world, the main focus of agriculture for development is to reduce rural poverty and narrow rural-urban income disparities while avoiding the subsidy and protection traps, a major unexplored challenge. With political attention to the income disparity problem in India (through electoral pressures) and China (through local protest movements and political debate), the time is ripe for attending more to the role of agriculture for development, and governments have been responding.

94. The strategy must balance agricultural and nonagricultural pathways out of poverty. In agriculture, the rapidly expanding market for high value products offers an opportunity to diversify farming systems in favorable areas and develop a competitive and labor intensive smallholder sector. Sustainable intensification will be especially challenging to overcome acute water scarcities and small and declining farm size. The highest priority is to generate rural employment through diversification into labor intensive high value agriculture linked to a dynamic rural nonfarm sector in secondary towns. Many countries also have high levels of poverty in less favored regions that merit special attention through investments in technologies adapted to those regions, and better infrastructure, investments that have been shown to provide high payoffs in India. Finally, the pacing of imminent massive flows to urban areas, literally hundreds of millions of people, is one of the biggest challenges of the current time. The need to generate more skilled employment in rural areas and to successfully manage rural-urban migration, make major investments in human capital perhaps the highest priority.

***Urbanized economies: An agenda to link smallholders to new markets and create jobs***

95. The main function of agriculture for development in these countries is regionally balanced growth and poverty reduction, driven by business opportunities delivering both profits and social benefits. Social benefits will come from smallholder participation in the dynamic sectors such as supermarkets, in employment in agribusiness investments in labor intensive products, and from the expansion of new employment opportunities for the rural poor in the non-farm sectors of the rural economy. Territorial approaches that promote local employment through interlinked farming and rural agro-industry have proved effective in some settings, especially if they can be inclusive of marginalized groups and of women.

96. Agricultural growth is especially important for poverty reduction in geographical pockets of poverty with agricultural potential. For regions without agricultural potential, the transition out of agriculture and the provision of environmental services offer better prospects, but support for the agricultural component of the livelihood strategies of the rural poor will remain an imperative for many years.

***How feasible are the national agendas?***

97. Effective implementation of the proposed national agendas requires assessing the feasibility of the policy and investment instruments. Feasibility varies significantly by instrument and by country category, particularly the capacity to implement. Understanding the likely political, administrative, and financial hurdles to reforms will improve implementation. If political feasibility is low, improving the political capital of local coalitions advocating for reforms can increase the likelihood of policy change – research-based evidence to inform debates, complementary programs to reduce negative impacts, and commitment devices to secure sustained implementation can help. If administrative capacity is the main feasibility constraint, attention to design programs that can be implemented with local capacity while ensuring increased support for capacity building, can reduce this deficit. If proposed reforms or instruments are not financially affordable, then attention maybe needed on streamlining costs, better sequencing of reforms and investments into affordable packages, developing more innovate public-private partnerships, and working to enhance donor effectiveness.

**Success depends on good governance at the local, national, and global levels**

98. Defining and implementing effective agriculture-for-development strategies requires good governance, especially so since the state is important for confronting the extensive market failures and uncertainties in agriculture. But state interventions give rise to government failures. Market liberalization policies may have reduced the scope for government failures in agriculture, but they did little to improve state capacity in the agricultural sector, and they left important market failures unaddressed. The “third sector”—communities, producer organizations, and NGOs—has a role to play in overcoming some of the market and state failures.

99. Mechanisms for the formulation of effective strategies help mobilize support for the agriculture for development agenda and articulate priorities. These require institutions for citizen participation, strengthening the role of parliaments, and empowering the rural poor to be effectively represented in agricultural policy discussions. In Senegal, for example, CNCR, an umbrella organization of 22 federations of producer organizations spanning agriculture, livestock, women, fisheries, and forests, is actively involved in the development of national agricultural strategies and policies. Strategies are most successful, if their formulation is well grounded on evidence, aligned with the budget exercise, and based on consistent implementation plans.

100. *Governance suffers from a double weakness: in the agriculture-based countries, and in agriculture.* The state can best support market development with core public goods, regulations, programs for poverty reduction and social protection, and managing environmental externalities. But the state is weakest in the agriculture-based countries where it is most needed to compensate for extensive market failures and lack of private investment. And in all country types, governance is generally weaker in agriculture than in other sectors of the economy.

101. Consequently ministries of agriculture, in trying to adjust to new roles, tend to be a weak link in the implementation of agriculture for development strategies. Contracting out, public-private-civil society partnerships, devolution of managerial roles to communities and users, privatization of formerly public services, and emergence of service cooperatives are all improving implementation in a variety of contexts. Uganda, for example, has played a pioneering role in contracting out agricultural advisory services and giving producer organizations a say in awarding the contracts. Introducing innovative mechanisms such as social audits and e-government to fight corruption is also necessary to implement agricultural strategies effectively.

102. Successful implementation also depends on effective coordination across ministries since many of the elements of agriculture for development agendas are multisectoral—trade, health, environment, and commerce. Yet, solutions need to be country-specific, implying a move from “best practice” to “best fit.” Experimentation and evidence can show which governance reforms work, where, and why, thus guiding learning and the identification of best fit options.

103. *Decentralization does not always work in favor of agriculture.* By bringing government closer to rural people, decentralization offers great potential to overcome government failure and to deal with the localized and heterogeneous nature of agriculture. But some public functions of agriculture are better kept centralized to capture economies of scale, such as food safety, disease control, and strategic research, while others are more effectively decentralized to lower territorial or municipal levels, such as extension.

104. Community-driven development, a promising decentralized approach, harnesses the potential of rural communities, their creativity, skills, and social capital for development. This approach is applied today in up to one fourth of World Bank lending. But, just like markets and governments, communities can also fail. Institutional

mechanisms that overcome local elite capture, promote the inclusion of women and marginalized groups, and fill accountability and capacity deficits, are as essential for community-driven development as for decentralization more generally. In India, for example, the reservation of seats for women in local councils, has helped to target public investments better to gender-specific needs. But decentralization and community-driven development often do not immediately result in increased resource allocation to agriculture, especially if basic social needs have not been met.

105. *In the agriculture-based countries, donors are extraordinarily influential, but their effectiveness can be improved.* In 24 Sub-Saharan countries donor contributions represent 28 percent of agricultural development spending, and more than 80 percent in several. With high aid dependence, improving aid effectiveness is a particularly important part of governance. Country-led agricultural strategies can provide the framework for donors to align their support at the sector or sub-sector level and to use the government's fiscal systems.

106. *Delivering on a global agenda requires significant reforms of global institutions.* Success in implementing national agriculture-for-development agendas very much depends on delivering on a global agenda. The global agenda has old elements and new—establishing fair rules for international trade, agreeing on standards and intellectual property rights, providing R&D spillovers for the benefit of the poor, avoiding such negative spillovers as livestock diseases, conserving the world's biodiversity, and mitigating and adapting to climate change. The global institutions created for agriculture in the 20<sup>th</sup> century are, despite of their many achievements, inadequately prepared to meet the challenges of the 21<sup>st</sup> century. The interlinked elements of the current global agenda—agriculture, trade, health, and the environment—require greater coordination across international agencies. Many new actors in the global arena, from civil society, the business sector, and philanthropy, must also be factored in.

### **Using agriculture for development—a vision for the future**

107. In view of the large cost of failures, the challenges of using agriculture for development need to be addressed urgently, and there are huge expected pay-offs. This Report highlights new approaches to use agriculture for development—approaches showing that it can be done. The vision for agriculture is a sector that will live up to its development promise. In 25 years, agriculture will feed more than 8 billion people. It will realize people's rights to development and to follow pathways out of poverty. It will have stopped overusing and abusing the world's natural resources, and instead producing needed environmental services. And it will contribute to solving the world's energy problem. Tomorrow's agriculture will be market-driven, an enabling environment created by an effective state will support it, and people—men and women, as producers, consumers, and citizens—will drive its development.

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## **Part I Why Use Agriculture for Development?**

### **Chapter 1 Growth and poverty in agriculture's three worlds**

*Focus A Rural poverty is changing*

### **Chapter 2 Agriculture's performance, diversity, and uncertainties**

*Focus B What is the potential role for biofuels?*

### **Chapter 3 Rural households and pathways out of poverty**

*Focus C Is there a link between agricultural production and food security?*

## **Chapter 1 Growth and poverty in agriculture's three worlds**

1.1 Three of every four *poor* people<sup>1</sup> in developing countries, 2.1 billion, live in rural areas, fully one third of humanity. Most depend on agriculture for their livelihoods, directly or indirectly. A more efficient and technically dynamic agriculture will dramatically increase the opportunities to lift these rural people out of poverty.

1.2 Success stories of agriculture as an engine of growth and poverty reduction abound. Most dramatically, China's rapid growth in agriculture, thanks to the household responsibility system, the liberalization of markets, and rapid technical change has been largely responsible for the decline in rural poverty from 33 percent in 1978 to 13 percent in 2000. Agricultural growth was the precursor to the acceleration of nonagricultural growth, very much in the way agricultural revolutions predated the industrial revolutions that spread across the temperate world from England in the mid 18<sup>th</sup> century to Japan in the late 19<sup>th</sup> century.<sup>2</sup>

1.3 Agriculture has also offered extraordinary business opportunities, such as high value crops for domestic markets (dairying in Kenya, livestock in Asia, vegetables for supermarkets in Latin America) and the international markets (specialty coffee in Rwanda, horticulture in India, fruits in Chile). There have also been local successes in traditional crops with new applications—such as feed maize exports to China from Laos and sugar for biofuels in Brazil—providing important lessons for the design and implementation of programs to accelerate agricultural growth.

1.4 Parallel to these successes are numerous failures. Most striking is the dismal performance until recently of agriculture in Sub-Saharan Africa, especially when contrasted with the green revolution in South Asia (figure 1.1). In the mid 1980s cereal yields were low and poverty incidence high in both regions. Fifteen years later in South Asia, yields had increased by more than 50 percent and poverty declined by 30 percent. In Sub-Saharan Africa yields and poverty stayed unchanged.

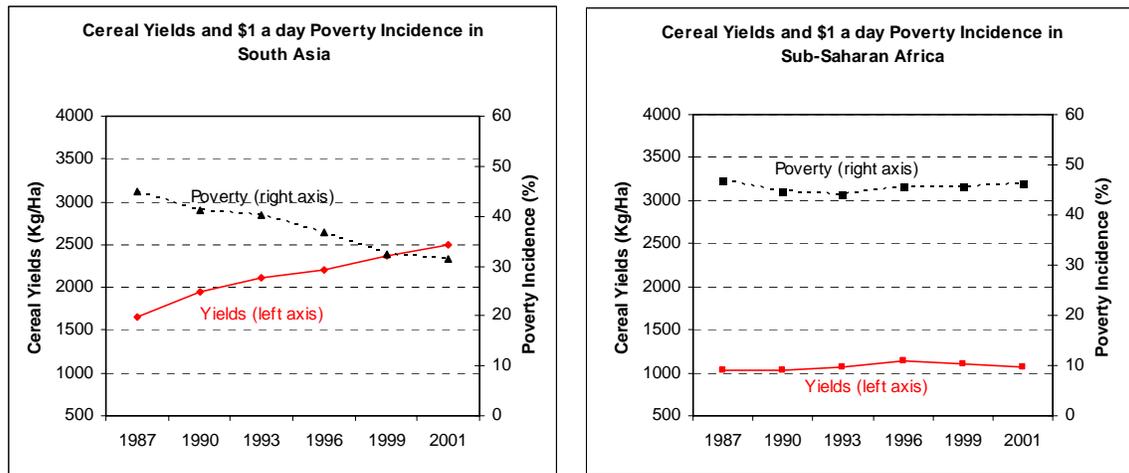
1.5 Important challenges persist in other regions. Where growth in nonagricultural sectors has accelerated, especially in Asia, the reallocation of labor out of agriculture is lagging, concentrating poverty in rural areas and widening rural-urban income gaps, a source of political tension. Where agriculture's share has shrunk significantly, as in Latin America, connecting poor rural households to agriculture's new dynamic subsectors, either as smallholders or as workers, remains a test. And everywhere, agriculture is a major user (and abuser) of natural resources, important for environmentally sustainable growth, by making better use of water and land and providing such environmental services as managing watersheds.

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<sup>1</sup> Defined as living on less than 2\$ a day.

<sup>2</sup> Toynbee (1884), Ohkawa and Rosovsky (1964), Bairoch (1973).

**Figure 1.1 Cereal yields up, poverty down in South Asia—cereal yields flat, poverty flat in Sub-Saharan Africa 1987-2001**



Source: Ravallion and Chen (2004) and World Bank (2006).

1.6 For agriculture to fulfill its development potential, governments must overcome a legacy of policy bias, underinvestment and misinvestment, especially in Sub-Saharan Africa—and donors must remedy their neglect. With globalization, institutional innovations, new biological and information technologies, and changing agro-ecological conditions, opportunities present themselves for a new agriculture, with new challenges. Furthermore, the political will among governments and donors to invest in agriculture for development is on the rise. Democratization and decentralization offer possibilities for poor smallholders to sustain such interests, offering a window of opportunity, if the new political will can be translated into investments, and results on the ground. That requires better understanding of the political economy of agricultural policymaking.

1.7 Taking a macro perspective, this chapter argues that in many settings, it pays to create a more level playing field across incentives facing sectors and to invest more and better in agriculture. It proposes three archetype countries based on agriculture's contribution to growth and poverty reduction—agriculture-based, transforming, and urbanized economies—to help design appropriately differentiated policies across settings. Finally, the chapter briefly reviews past policies and investment patterns and introduces a framework to understand the political economy behind agricultural policies.

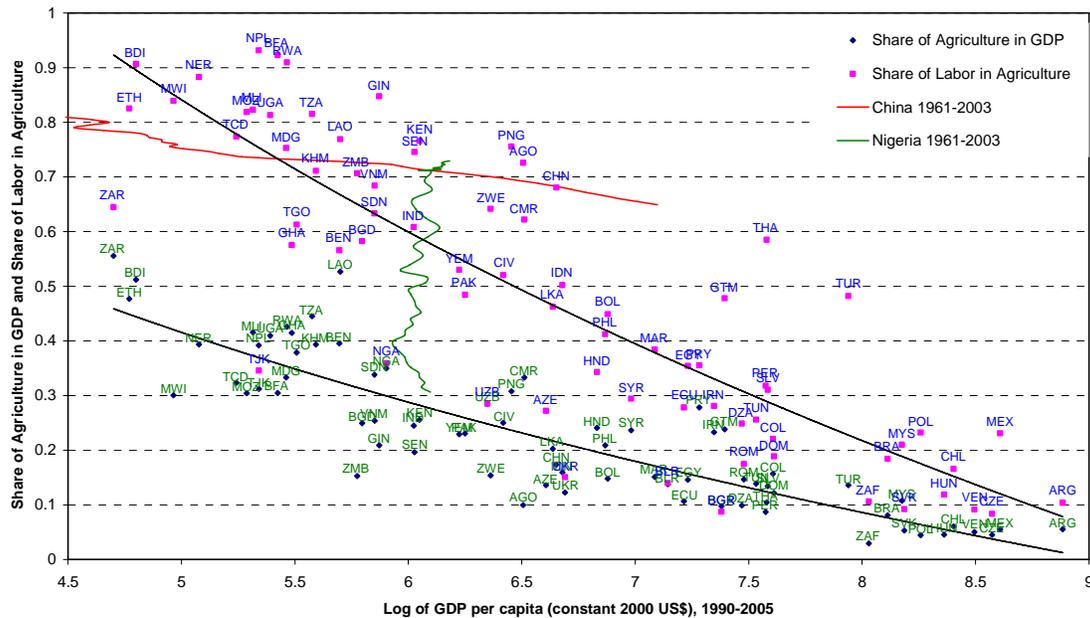
### **Agriculture and the structural transformation—two stylized facts**

1.8 The process of economic development is one of continuous structural transformation of the economy and redefinition of roles of its actors. Two empirical regularities related to this transformation anchor this Report's discussion about the role of agriculture for development. First, at low levels of development, the shares of agriculture in the economy and in employment are large (up to 50 percent and 85 percent respectively), declining as countries develop (figure 1.2).<sup>3</sup> Second, there is a large and

<sup>3</sup> Similar patterns have historically been observed within countries over time.

persistent gap between the share of agriculture in GDP and the labor force, with convergence only at very high levels of development.<sup>4</sup> These two stylized facts suggest an essential but evolving role for agriculture in fostering growth and reducing poverty.

**Figure 1.2 Shares of labor and GDP in agriculture decline as countries develop**



Source: World Bank (2006).

***Agriculture’s essential but declining contribution to growth, as countries develop***

1.9 The structural transformation, with its large but declining share of agriculture in the economy, mirrors demand behavior at the micro level, with people spending proportionally less on food as their incomes increase (Engel’s Law). Importantly, this happens while agricultural output simultaneously increases in absolute value,<sup>5</sup> even though nonagricultural sectors now grow faster.

1.10 Many poor countries still display high agricultural shares in GDP and employment (on average 34 and 64 percent, respectively, in Sub-Saharan Africa).<sup>6</sup> In countries in the \$400 to \$1,800 GDP per capita range,<sup>7</sup> many of them in Asia, agriculture is on average 20 percent of GDP and 43 percent of the labor force—declining to 8 and 22 percent respectively in countries in the \$1,800-\$8,100 GDP per capita range, many of

<sup>4</sup> In the United States, the share of agriculture in employment and GDP did not converge until the 1980s (Gardner (2003)).

<sup>5</sup> Though often forgotten, this is a critical corollary of the structural transformation. Indeed, as the number of farmers falls, total farm output sets new records, exactly what rising productivity is all about.

<sup>6</sup> Excluding South Africa.

<sup>7</sup> To situate these on the graph note that  $\log(403)=6$ ,  $\log(1808)=7.5$  and  $\log(8103)=9$ .

them in Eastern Europe, Central Asia and Latin America. Adding the forward and backward linkages to agriculture (extended agriculture) typically increases the share in the economy by half or more, especially in the richer countries.

1.11 The large share of agriculture in poorer economies suggests that strong growth in agriculture is critical for fostering overall economic growth—seeking to foster growth in these economies without fostering growth in agriculture would be seeking to walk on one leg. As countries develop, agriculture’s share declines, and so does its absolute contribution to economic growth. Increasingly though, agriculture is also a key player in shaping the sustainability of the growth process, across the development spectrum. It is a major user of scarce natural resources (85 percent of fresh water and 33 percent of land)<sup>8</sup> and a largely unrecognized provider of environmental services (sequestering carbon, managing watersheds, and reducing deforestation).

### *Agriculture’s comparative advantage for poverty reduction*

1.12 The large and persistent gap between agriculture’s share in GDP and employment throughout the structural transformation suggests that poverty is concentrated in agriculture and rural areas—and that, as nonagricultural growth accelerates, many of the poor remain poor, definitely in relative terms. Econometric evidence further suggests that the gap between agriculture’s share in GDP and employment actually rises as countries develop, before coming down.<sup>9</sup> These observations are mirrored in the micro evidence.

1.13 Despite rapid urbanization the developing world will remain predominantly rural in most regions until about 2020 (box 1.1). Moreover, three-quarters of the world’s poor, including the poorest of the poor, live in rural areas. There are also clear indications that the majority of the poor will continue to live in rural areas until 2040.<sup>10</sup> Most of the rural poor are in agriculture. That the incidence of poverty among agricultural households is persistently much higher is confirmed by the micro evidence from myriad country poverty studies conducted by the World Bank over the past decades. Furthermore, where nonagricultural growth has accelerated, rural-urban income disparities are widening, as illustrated by the increase in the ratio of rural to urban poverty in East Asia from about 2 to more than 3.5 between 1993 and 2002, despite a substantial decline in absolute poverty (focus A).

1.14 Some deviations from the (generally robust) cross-country pattern are of interest (see figure 1.2). The share of labor in agriculture has declined faster in many Sub-Saharan countries<sup>11</sup>, which in the absence of meaningful growth is consistent with the

<sup>8</sup> In addition, agriculture in developing countries accounts for 33 percent of greenhouse gas emission and interacts strongly with biodiversity resources.

<sup>9</sup> The analysis which controls for country characteristics and time effects, estimates the turning point only at per capita GDP levels of about \$9,000 (Timmer (2007)). A rising discrepancy between farm and nonfarm incomes, or sectoral inequality, does not imply rising overall inequality, although the “sectoral Gini” explains about a quarter of a country’s overall inequality on average.

<sup>10</sup> Ravallion, Chen, and Sangraula (2007).

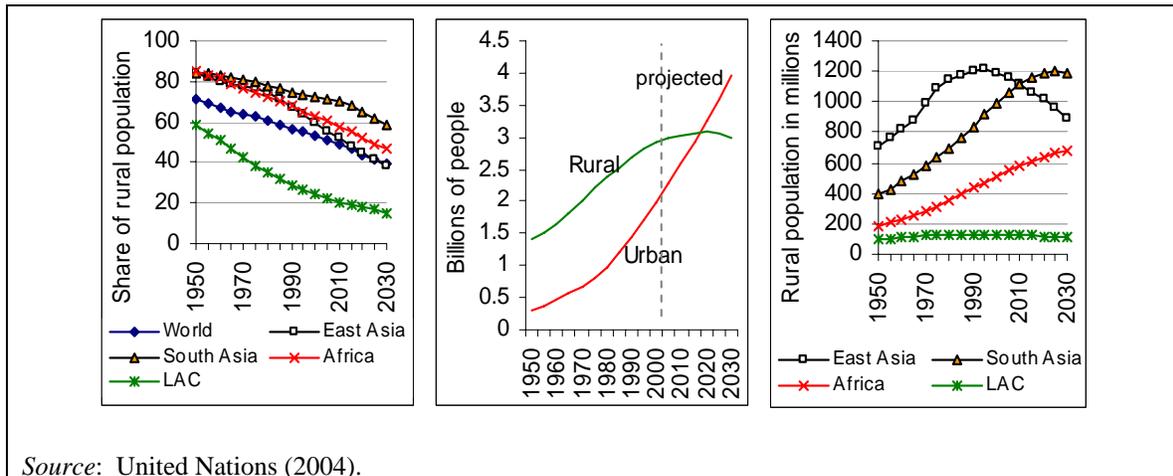
<sup>11</sup> Though only illustrated for Nigeria in figure 1.2, the pattern is observed among many countries in Sub-Saharan Africa.

observed urbanization of poverty (focus A). The reallocation of labor out of agriculture has been slower in China (and Vietnam), partly because of restrictions on labor mobility. Given rapid growth outside agriculture, this is consistent with the observed increase in the rural-urban divide.<sup>12</sup>

**Box 1.1 Rural population dynamics and labor availability**

In total, an estimated 2.5 of the current 3 billion rural inhabitants are involved in agriculture, 1.3 billion of them are smallholders, and more than half of agriculturalists in Africa are women. The size of the rural population that provides the agricultural labor force will continue to grow till 2020 and decline thereafter, due to slowing population growth and rapid urbanization in most countries (Box figure). South Asia will begin such a decline only after 2025, and Africa after 2030 at the earliest. In Ethiopia 85 percent of people still live where they were born, and only 4 percent migrated in a 5-year period. However, rural areas of Latin America and East Asia have been losing people since 1995. For example, in Brazil 20-30 percent of the rural population has been migrating each decade since the 1950s. In China the urban population rose from 19 percent in 1980 to 39 percent in 2002. As a result, increasingly more labor saving technologies will be needed in Asia, while land saving technologies will need to be introduced in Africa (Chapter 7).

**Box figure Populations in developing countries remain predominantly rural until 2020**



Source: United Nations (2004).

1.15 The persistent concentration of (absolute and relative) poverty in rural areas illustrates the difficulty of redistributing income generated outside agriculture and the deep inertia in people’s occupational transformation as economies restructure. Migrating out of agriculture to urban areas is often hampered by information, skill gaps, aging, and family and social ties. This leaves behind many people in rural areas with expectations for better lives unfulfilled, generating social and political tensions, which can jeopardize the growth process.<sup>13</sup> Broad-based growth in the rural economy is thus important for reducing both absolute and relative poverty.

1.16 Over the past decade, the global decline in the number of people in poverty has been entirely due to falling rural poverty, with a minimum of 40 to 50 percent, and most likely up to 75 percent, due to improved conditions in rural areas, not to migration (focus A). The comparative advantage of agricultural growth in reducing poverty is supported

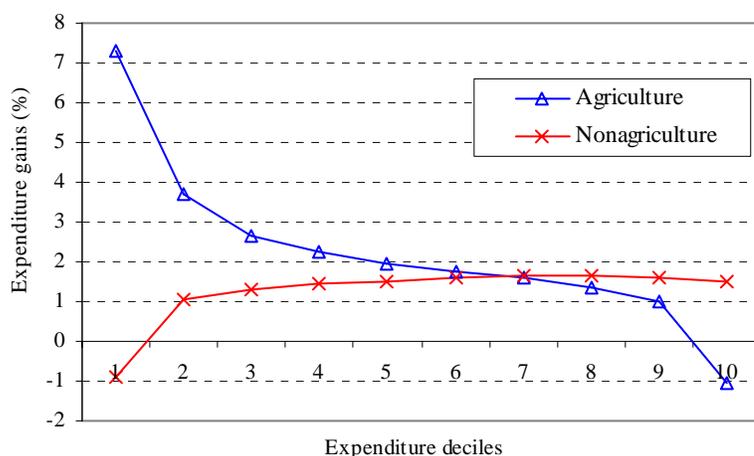
<sup>12</sup> Ravallion and Chen (2007), World Bank (2007).

<sup>13</sup> World Bank (2005b).

by econometric studies. A sector's (short run) contribution to poverty reduction depends on the sector's direct contribution to aggregate growth, and the effect of this growth on overall poverty.<sup>14</sup> The sector's contribution to aggregate growth in turn depends on its per capita growth rate and its share in the economy. Cross-country econometric evidence indicates that growth generated in agriculture has large benefits for the poor and is *on average* about twice as effective in reducing poverty as growth generated in other sectors (controlling for the sector's size).

1.17 For 42 developing countries over 1981-2003, econometric analysis for this Report finds that 1 percent of GDP growth in agriculture increases the incomes of the three poorest deciles by at least 2.7 percent and that it is at least twice as effective in increasing their income as growth in the rest of the economy (figure 1.3). These findings are consistent with those from other studies for different samples and periods (box 1.2). As countries get richer, the comparative advantage of agriculture in providing benefits for those living on less than \$1 a day appears to decline.<sup>15</sup>

**Figure 1.3 Income gains from growth originating in agriculture are larger for the poorer expenditure deciles**



Source: Ligon and Others (2006).

### Box 1.2 Cross-country evidence on the agricultural growth-poverty reduction linkage

Focusing on relative poverty, Valdés and Foster (2005), based on estimates by Bravo-Ortega and Lederman (2005) find that an aggregate increase in GDP coming from agricultural labor productivity is on average 2.9 times more effective in raising the incomes of the poorest quintiles in developing countries and 2.5 times more effective for countries in Latin America than an equivalent increase in GDP coming from nonagricultural labor productivity.

<sup>14</sup> Ravallion and Datt (1996), Christiaensen and Demery (2007).

<sup>15</sup> Christiaensen and Demery (2007) report that the comparative advantage of agriculture declined from being 2.7 times more effective in reducing \$1/day poverty incidence in the 25 percent poorest countries in their sample to two times more effective in the 25 percent richest countries.

Focusing on absolute poverty, and based on observations from 80 countries during 1980-2001, Christiaensen and Demery (2007) estimated that one percentage point aggregate growth in agriculture reduces the incidence of \$1 a day poverty on average 2.3 times more than an equivalent amount of growth originated in nonagriculture. These findings are similar in magnitude to those in figure 1.3. Using cross-country regressions per region and looking at \$2 a day poverty, Hasan and Quibriam (2004) find larger effects from agricultural growth on poverty reduction in Sub-Saharan Africa and South Asia, but larger poverty-reducing effects of growth in other sectors in East Asia and Latin America.

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1.18 Even so, cross-country analyses provide only an average view of the world. The magnitude of the (absolute and relative) poverty effects of growth in agriculture likely differs depending on the initial distribution of the assets<sup>16</sup> (especially land but also education and health) and the nature of the production process (intensive in labor or capital).<sup>17</sup>

### **Agriculture and development—three archetypical countries**

1.19 In light of the two stylized facts—which suggest an essential, but evolving, role for agriculture in fostering growth and reducing poverty—countries are classified by the share of aggregate growth originating in agriculture and the share of aggregate (\$2 a day) poverty in the rural sector. Three clusters of structurally different economies emerge, each with distinct challenges for agricultural policymaking (figure 1.4 and table 1.1). In the agriculture-based economies (most of them in Sub-Saharan Africa), agriculture contributes much to growth, and the poor are concentrated in rural areas. The key policy challenge is for agriculture to generate a surplus that can be extracted (mainly through the provision of lower priced food) without choking investment in agriculture, in order to foster growth in the rest of the economy. Put simply these countries have to manage the “food problem.”<sup>18</sup>

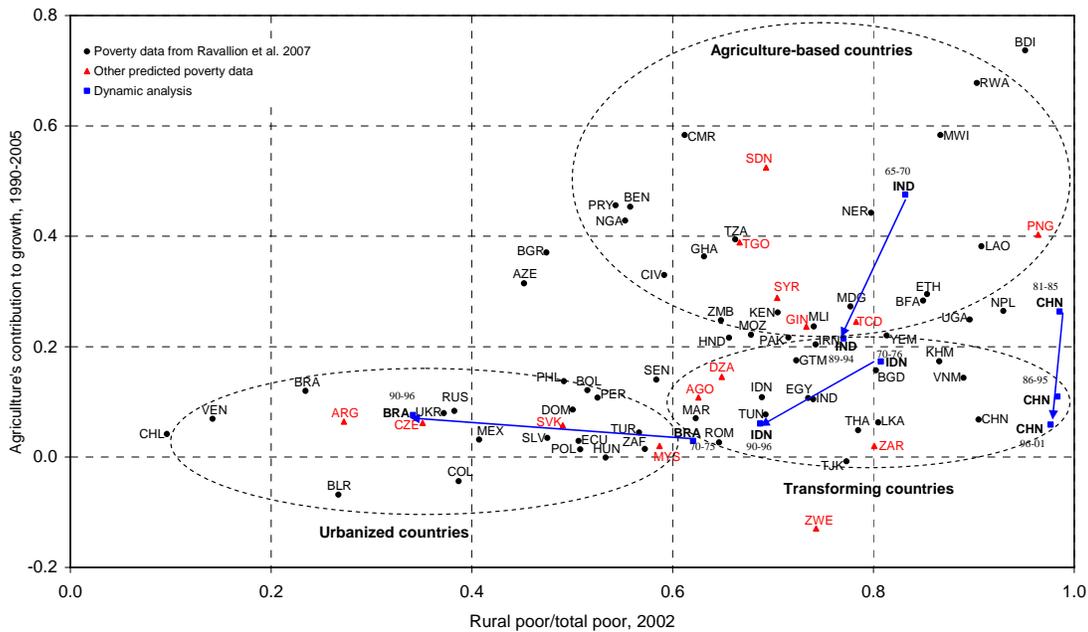
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<sup>16</sup> Ravallion (2001).

<sup>17</sup> Loayza and Raddatz (2006).

<sup>18</sup> Schultz (1953), Schultz (1978), and Hayami (2005).

**Figure 1.4 Agriculture-based, transforming, and urbanized countries**



*Notes:* Agricultural contribution to growth is computed from World Bank DDP (2006). Rural shares in poverty marked with a circle are from Ravallion et al. (2007), using the \$2/day poverty line. Rural shares of poverty marked with a triangle are predicted with an estimated regression of the rural share of poverty on rural share of population, agricultural share in GDP, log of GDP per capita in 2000 US\$, and regional dummies. The dynamic paths are taken from Ravallion and Chen (2004) for China, World Bank (2000) for India, ECLAC for Brazil, Central Bureau of Statistics (BPS) for Indonesia, with poverty rates based on their national poverty lines. Arrows show paths for Brazil, China, India, and Indonesia in previous periods with consistent data.

*Source:* WDR 2008 team.

1.20 In the transforming economies (mostly in Asia and North Africa), agriculture contributes less to growth, but poverty remains largely rural. The rising rural-urban income gap creates political tensions and a call for protection or subsidization of agriculture in the face of weak fiscal capacity (the “farm subsidy problem”).<sup>19</sup> Managing the tension between this farm problem and the continuing need for cheap food to facilitate labor intensive industrialization (the food problem) is a major policy dilemma, termed the “disparity problem.”<sup>20</sup>

1.21 In urbanized economies agriculture contributes only a little to growth, and poverty is no longer predominantly a rural phenomenon. In these economies (mostly in Eastern Europe, Central Asia, and Latin America), agriculture acts like any other small competitive tradable sector, even though predominating in certain locations. Managing the continuing rural-urban divide and the pressure for agricultural protection is the key policy challenge (the “farm subsidy problem”).

<sup>19</sup> Schultz (1978), Lindert (1991), Hayami (2005). de Gorter and Swinnen (2002) particularly emphasize the importance of the relative income hypothesis (as opposed to absolute poverty) in understanding agricultural policymaking.

<sup>20</sup> Hayami (2005).

**Table 1.1 Characteristics of three country categories**

	Agriculture-based countries	Transforming countries	Urbanized countries
<b>Demographic and economic information in 2002 (74 countries)</b>			
<b>Population</b>			
Total (million)	575	3,380	941
Rural (million)	398	2,190	259
Share of rural population	69	65	27
Population growth (1990-2005)	2.5	1.4	1.0
<b>Geographical distribution of rural population (%)</b>			
Sub-Saharan Africa	81.5	13.9	4.6
South Asia	2.1	97.9	0
East Asia and Pacific Islands	0.9	96.3	2.9
Middle East and North Africa	7.5	92.5	0.0
Eastern Europe and Central Asia	0	11.8	88.2
Latin America and Caribbean	2.3	9.5	88.2
<b>Labor force</b>			
Total (million)	253	1,720	435
Agricultural (million)	166	1,010	83
Share of agriculture (%)	66	59	19
<b>Economy</b>			
GDP per capita (2000 US\$)	339	873	3,109
GDP growth (1990-2005)	3.5	6.5	2.3
<b>Agriculture</b>			
Agriculture value added per capita (2000 US\$)	107	129	201
Share of agriculture in GDP (%)	31	15	6
Share of agriculture in GDP growth (%) (1990-2005)	27	8	4
Agricultural growth (%) (1990-2005)	3.2	2.9	1.6
Non-Agricultural growth (%) (1990-2005)	2.8	7.2	2.2
<b>Poverty in 2002 (60 countries)</b>			
<b>Poverty (\$2 a day)</b>			
Total population (million)	494	3,250	888
Rural population (million)	335	2,100	251
Total poverty rate (%)	80	60	26
Number of rural poor (million)	278	1,530	91
Share of rural poor in total poor (%)	70	79	39
Rural poverty rate (%)	83	73	36
Urban poverty rate (%)	73	36	22
<b>Poverty (\$1 a day)</b>			
Total poverty rate (%)	49	23	8
Number of rural poor (million)	170	592	32
Share of rural poor in total poor (%)	70	81	45
Rural poverty rate (%)	51	28	13
Urban poverty rate (%)	45	12	6

Notes: Demographic and economic information data are from World Bank (2006) except labor force data, which are from FAO (2006). Poverty data are from Ravallion, Chen, and Sangraula (2007). All statistics are population-weighted country averages.

1.22 Although there is no unique route for a country to move from an agriculture-based country to an urbanized country and eventually a high income country, the routes traveled by China (1981-85 to 1996-01), India (1965-70 to 1989-94), Indonesia (1970-76 to 1990-96), and Brazil (1970-75 to 1990-96) are illustrative (figure 1.4). Both India and China moved from the agriculture-based category 20 to 30 years earlier, to the transforming category, but with little change in the share of the rural sector in poverty. Indonesia which was already in the transforming category moved toward the urbanized category, and Brazil in the urbanized category continued to reduce the rural share in poverty.

1.23 The classification captures the distinguishing features in the role of agriculture for growth and poverty reduction across countries and provides a useful framework to focus the discussion and help formulate broad policy guidance. Even so, substantial variation remains among (and within) the countries in each type.

### ***Agriculture-based countries—dealing with the food problem***

1.24 In the agriculture-based countries, most of them in Sub-Saharan Africa, agriculture accounted for about a third of overall growth over 1990-2005. More than half a billion people live in these countries, 49 percent on less than \$1 a day, 73 percent of them in rural areas. Given rapid population growth and the high income elasticity of demand for food, the food supply struggles to keep up with demand, resulting in upward pressures on food prices and pushing up the cost of living and nominal wages of unskilled workers, hampering industrialization and overall economic growth.

1.25 *Agriculture can be the engine of growth.* When agriculture is a large, non-tradable sector, gains in agricultural productivity increase the aggregate food supply and reduce food prices. As a result, nominal wages for unskilled agricultural workers decline and they migrate from agriculture to nonagriculture producing for domestic or foreign markets.<sup>21</sup> Agriculture can thus fuel growth in other sectors through the supply of labor and savings. It keeps the non-agricultural sector competitive by keeping nominal wages of unskilled labor low, even though real wages increase, because of declining food prices (the real wage-good effect).

1.26 In addition to supplying labor and savings, agricultural growth also generates important second-round growth effects through the demand for goods from other sectors.<sup>22</sup> This largely occurs through consumption linkages, where income gains from higher agricultural productivity are spent on domestically produced nontradable goods and services, stimulating demand for domestic industry and services and facilitating the reallocation of labor out of agriculture. Consumption linkages are stronger, the larger and more widespread the income gains, and the larger the supply elasticity of the nonagricultural sector. Production linkages—forward through growth in agro-processing and food marketing, and backward through demand for intermediate inputs and services—further augment the consumption linkage effects. At low levels of

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<sup>21</sup> In equilibrium, wages for unskilled labor in the two sectors are comparable except for residential preferences, differences in cost of living, and costs of migration.

<sup>22</sup> Johnston and Mellor (1961), Schultz (1964).

development, consumption linkages are usually four times stronger than production linkages, though production linkages strengthen as countries develop.<sup>23</sup>

1.27 The poverty-reducing effects of enhancing agricultural productivity depend on the net marketing position of the poor and the price elasticity of food demand.<sup>24</sup> Poor net-food-buying households benefit from lower food prices, as long as the gain from reduced spending on food exceeds the loss from reduced wage income. Poor net-food-selling producers, by contrast, gain only if output grows faster than prices fall. Given that demand for staple crops is usually price-inelastic, they may well lose. Even so, increasing agricultural productivity is usually poverty-reducing overall, because in addition to the urban poor, more than half of poor rural households are typically net food buyers, a little appreciated reality (chapter 4), while the majority of net sellers are large-scale and richer farmers. Rapid declines in food prices must be avoided, as farmers may in response abandon productivity augmenting inputs such as improved seeds and fertilizer, which often induced the productivity gains to begin with.<sup>25</sup>

1.28 Agriculture can thus be the engine of growth and poverty reduction in agriculture-based countries, with lower priced food a key mechanism for extracting part of the agricultural surplus and consumption linkages adding important secondary growth effects through the generation of demand for domestically produced goods and services. Overcoming the “food problem” and extracting the surplus for capital formation necessary for industrial growth without choking (public and private) investment in agriculture are the challenges of agricultural policymaking in these economies. Poverty-reducing effects can be maximized by increasing food demand and sustaining food prices through simultaneous productivity gains in tradable commodities, both agricultural (export crops) and nonagricultural.<sup>26</sup>

1.29 *The historical experience is telling and still relevant today.* A pattern of higher agricultural productivity generating an agricultural surplus taxed to finance industrial development and enable lower food prices underpinned early development in western Europe<sup>27</sup>, and Japan<sup>28</sup>, and later on also in Taiwan, China and South Korea (box 1.3).<sup>29</sup> More recently, rapid agricultural productivity growth in China (through institutional reform: the household responsibility system introduced in 1978)<sup>30</sup> and in India (through

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<sup>23</sup> Haggblade, Steven, Hazell, Peter, and Reardon, Thomas (Forthcoming).

<sup>24</sup> Ravallion (1990) and Christiaensen and Demery (2007) provide a detailed discussion of conditions when landless laborers and net-buying and net-selling smallholders gain or lose from an increase in agricultural productivity.

<sup>25</sup> World Bank (2005a).

<sup>26</sup> de Janvry and Sadoulet (2002).

<sup>27</sup> Toynbee (1884), Bairoch (1973).

<sup>28</sup> In Japan the Meiji government first provided the scientific base for gains in rice and silk productivity to ensure cheap food, surplus labor, and a fiscal base, largely extracted through heavy land taxation, to enable subsequent labor-intensive industrialization in the 1880s (Ohkawa and Rosovsky (1964).

<sup>29</sup> Hayami, Vernon, and Southworth (1979).

<sup>30</sup> Fan (1991), Lin (1992), Fan, Zhang, and Zhang (2004).

technological change: the Green Revolution)<sup>31</sup> have been widely credited with kick-starting the development process and rapid reductions in poverty.

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### **Box 1.3 Historical perspective on agriculture in South Korea's development**

Several prominent analysts have argued that Korea is one clear example of a country that *did not* invest in raising its agricultural productivity before starting rapid industrialization.<sup>32</sup> This interpretation is based on Korea's phenomenal growth after the Korean War, largely due to rapid industrialization. The neglect of agriculture over the first quarter century of this drive, 1955-1980, and the increase in agricultural protection thereafter, are widely acknowledged.<sup>33</sup>

Focusing only on the past half century, however, misses the historical roots of Korea's development, roots that lay in massive investments in agriculture by the colonial ruler, Japan, after 1910.<sup>34</sup> The investments were in rural infrastructure (mainly roads), in irrigation, fertilizer availability, and higher-yielding seed varieties. From 1910 to 1938 (when Japan diverted its industrial capacity in Korea to war preparations), fertilizer consumption increased by 21.9 percent a year, the multiple cropping index by 1.3 percent a year, and the irrigated area by 18.1 percent a year. Between 1920 and 1936 rice production increased by 2.6 percent a year. The value of rice exports from Korea, nearly all to Japan, grew from an average of 72.5 million yen in 1910-19 (in 1934 prices) to 294.1 million yen in 1930-38. Over the same period, land tax collections averaged just over 3 million yen a year.

Why would a government make such massive investments in the agricultural sector when the agricultural revenue it was collecting was so small? The intention was to increase rice production for export to Japan (at low prices to producers), to keep food prices under control there. Similar investments were being made by Japan in its other colony, Taiwan, China. Econometric production function analysis reveals that the returns to investments in higher agricultural productivity were large indeed, even discounting any value from food security for the colonial empire or broader interests in military preparedness. For countries wishing to follow Korea's economic trajectory after 1960, the debate is not just about how to manage growth in manufactured exports. These come late in the game, and the relevant starting point is a half century earlier, 1910. Large investments in the agricultural sector were the precursor to later economic growth.

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1.30 The crucial insight from these historical experiences is that the adverse effects of extraction of agriculture were each time counterbalanced (or predated) by government investment in new scientific research for agricultural technologies and in rural infrastructure including irrigation.

1.31 Despite globalization, the food sector remains largely non-tradable in substantial parts of the agricultural-based countries, either because of the predominance of local staples<sup>35</sup> or because the domestic food economy remains insulated from global markets

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<sup>31</sup> Datt and Ravallion (1998), Rosegrant and Hazell (2001), Timmer (2002).

<sup>32</sup> Amsden (1989), Ban, Moon, and Perkins (1980).

<sup>33</sup> Beghin, Bureau, and Park (2003).

<sup>34</sup> The discussion of Korea's experience is based on Kang and Ramachandran (1999).

<sup>35</sup> Delgado (1992) highlights the non-tradability of staples in West Africa. In an update for Ghana, Baffes and Gardner (2003) find a quasi-complete pass-through of the world price for maize and for rice prices after 3 years (after the reforms), though maize and rice account only for 13 and 7 percent respectively of total calorie consumption in Ghana (FAO (2006)), and their consumption is largely concentrated in the large urban areas. Moreover, world prices account only for 27 and 38 percent of volatility in domestic prices.

by high transport costs, especially in the rural hinterlands<sup>36</sup> and landlocked countries. For example, the price of maize in Ethiopia can fluctuate from around \$75 per ton (the export parity price) to \$225 per ton (the import parity price). So productivity growth (and more efficient marketing) of food staples can have large wage-good effects on growth and benefits for poor consumers through lower prices. In addition, low tradability and limited foreign exchange add a premium to domestic food production for food security, especially in landlocked countries (focus C).

1.32 The central importance of increasing the productivity of staple crops in agriculture-based countries also relates to their dominance in the agricultural sector. In Ghana, a growth success story in this group, starchy staples (mainly roots and tubers, cereals and plantains) made up two-thirds of agricultural value added in 2004 and accounted for three-quarters of agricultural growth during 1990-2004. In Africa more generally, the growth potential of food staples (though not the growth rate) far outpaces the growth potential of traditional exports and higher value products in the foreseeable future.<sup>37</sup>

1.33 Even so, the traditional role of agriculture in staple crop and livestock production is typically complemented by competitive agricultural subsectors of traditional exports, such as coffee or cotton, and by rapidly growing nontraditional tradable crops, such as vegetables, fruits, and flowers. They provide foreign exchange for capital goods. But more important, the poverty-reducing effects of agricultural growth are highest when growth in the (largely nontradable) staple crops is accompanied by growth in tradable agricultural subsectors (or other tradable sectors) to counter the decline in food prices from increasing the productivity of food staples. While globalization and new surplus producers (Vietnam) have increased competition in traditional exports, new niche markets for traditional exports have also opened (such as premium coffees), and new nontraditional exports can have substantial local poverty-reducing effects, as documented in Kenya<sup>38</sup> and Senegal<sup>39</sup> (chapter 5).

1.34 *Empirical evidence from the agricultural-based countries.* Recent empirical evidence supports agriculture's potential as an engine of growth. Fostering growth in agriculture is important not only because of its sheer size but also because of its multiplier effects, estimated on the order of 1.3 to 1.5 in Africa (1 dollar of value added in agriculture generates another 30 to 50 cents in the rest of the economy).<sup>40</sup> These multiplier effects are typically at least as large as the reverse feedback effects from value

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<sup>36</sup> Delgado, Minot, and Tiongco (2005) conclude that in Tanzania, a coastal country, absolute spatial marketing margins remain quite high, with a quarter of the country's maize supply, the major staple crop, effectively behaving as a nontradable.

<sup>37</sup> Diao and others (2006) project an annual increase in demand for food staples of \$50 billion, much of which will translate in market transactions as countries commercialize and urbanize.

<sup>38</sup> Humphrey, McCulloch, and Ota (2004).

<sup>39</sup> The emergence of green bean exports to European markets in the mid-1990s reduced poverty by 12 percentage points in three rural communities situated between Dakar and Thiès, in Senegal, mainly through the labor market (Maertens and Swinnen (2006)).

<sup>40</sup> Dorosh and Haggblade (2003), Haggblade, Steven, Hazell, Peter, and Reardon, Thomas (Forthcoming).

added in nonagriculture to agriculture.<sup>41</sup> While globalization and inexpensive imports of manufactured goods in rural markets—say, from China—may reduce the strength of the linkages from agriculture, the effect of these new developments is likely limited because manufacturing makes up only about one-fifth of the rural nonfarm economy.<sup>42</sup> Nonetheless, the strength of the agricultural multipliers differs depending on a country's economic structure. Small economies with large tradable sectors (Lesotho) have smaller multipliers, and large economies with a high share of nontradable agriculture and services (Cameroon, Nigeria, and Tanzania) have larger multipliers.

1.35 Cross-country econometric evidence from Africa further supports the notion that growth originating in agriculture is especially poverty-reducing.<sup>43</sup> The country specific evidence from Madagascar is illustrative. Although rice is usually tradable, it proved effectively nontradable in rural areas of Madagascar because of remoteness and high transport costs. The analysis of commune census data shows that doubling rice yields reduces the number of food insecurity in the community by 38 percentage points and shrink the hungry period by 1.7 months (or one-third).<sup>44</sup> These poverty effects follow from falling rice prices, and rising nominal wages of agricultural laborers, which boost real wages and especially benefited the poorest, most often net rice buyers supplying labor. Poor net sellers also benefited, as productivity gains compensated for lower food prices.

1.36 With many rural hinterlands in African countries still poorly integrated with the rest of the economy, agriculture's role as engine of growth and poverty reduction will continue for some time. Agricultural intensification will also be critical to reversing the degradation of natural resources, especially land and forests, as a basis for sustainable agricultural growth. In countries, or regions within countries, with poor agro-ecological conditions, agriculture's contributions to growth will be limited, though it is still likely to play an important complementary role in reducing poverty and improving food security (chapter 2 and focus C). And as illustrated by the contrasting experience before 1997 of Indonesia and Nigeria, both large oil exporters, fostering agricultural growth remains appropriate for effective poverty reduction in mineral-rich countries (box 1.4).

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**Box 1.4 Yes, there is a role for agriculture in Africa's mineral-rich countries**

Among African mineral-rich countries, agriculture still makes up one-third of their economy, and between 1985 and 1999 it contributed on average twice as much as industry to overall growth.<sup>45</sup> Poverty remains widespread, despite higher average per capita GDPs than in the mineral-poor countries. The contrasting experience from Indonesia and Nigeria, both large oil exporting countries, prior to 1997 is telling.

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<sup>41</sup> Dorosh and Haggblade (2003). Applying time series econometric techniques to a sample of 66 countries, Tiffin and Irz (2006) find evidence of agricultural labor productivity growth causing growth in the rest of the economy (in the Granger sense, i.e. post hoc, ergo propter hoc) in 35 countries, but evidence of the reverse in only 9 countries. When the countries in the Tiffin/Irz sample are classified according to the three country typologies, 50 percent (12 of 24) of the countries in the agrarian group display Granger causality from agricultural labor productivity to GDP. This ratio declines to 38 percent (5 of 13) among those classified in the transition group and to 20 percent (2 of 10) in the urbanized group.

<sup>42</sup> Haggblade, Steven, Hazell, Peter, and Reardon, Thomas (Forthcoming).

<sup>43</sup> Hasan and Quibriam (2004), Christiaensen and Demery (2007).

<sup>44</sup> Minten and Barrett (2006).

<sup>45</sup> Diao and others (2006).

Indonesia supported the agricultural sector, indirectly through regular devaluations of the exchange rate in support of its export and import-competing crops, and directly through investments of some windfall oil revenues in rural infrastructure, irrigation, agricultural credit, and fertilizer subsidies. Nigeria, in contrast, squeezed the agricultural sector, directly through the marketing boards, and indirectly through its fixed exchange rate, which heavily taxed its agricultural exports and subsidized cheap imports.

In Indonesia \$1 a day poverty declined from 47 percent in 1981 to 14 percent in 1996. In Nigeria it increased from 58 to 70 percent.<sup>46</sup> The different treatment of agriculture explains much of this widely divergent development.<sup>47</sup>

1.37 Premature and unduly high extraction through an urban policy bias and a lack of public investment despite good growth potential in most cases, are highlighted in the next section as key reasons for sluggish agricultural performance in many agriculture-based countries in the past. How policy change, institutional innovations, technological advances, and public investment in rural infrastructure in the face of degrading soils and increasing water scarcity can make agriculture in Africa and other agriculture based countries grow much faster is the key challenge, discussed in chapters 4 to 8.

### ***Transforming economies—dealing with the disparity problem***

1.38 More than two billion people, or about three-quarters of the rural population in developing countries, reside in the rural areas of transforming economies, encompassing most of Asia and North Africa. Although agriculture contributed only 8 percent to growth during 1990-2005, it still makes up about one-sixth of the economy and employs 59 percent of the labor force. And despite rapid growth and declining poverty in many of these countries, poverty remains widespread and largely rural—about 85 percent of the poor live in rural areas. Urban poverty has declined faster than rural poverty. In China the incidence of urban poverty declined twice as fast as that of rural poverty between 1980 and 2001, in Indonesia, 2.5 times as fast, and in Thailand 3.7 times as fast between 1970 and 1999.<sup>48</sup> In addition, natural resources are coming under growing pressure from both the intensification of agriculture and the competition for land and water from rapidly growing urban populations and nonagricultural sectors.

1.39 *Managing the rural-urban divide.* The distinguishing feature of these economies is the emergence of the “farm” problem, while the “food” problem—the need for cheap food to sustain industrialization and remain competitive—has not fully disappeared. Nonagricultural sectors now account for most of the economic growth.<sup>49</sup> But the transition of people out of agriculture and rural areas is not keeping pace with the restructuring of the economies away from agriculture, widening the income gap (relative poverty) between farmers and nonagricultural workers, which results in social tension, even though absolute poverty declines.<sup>50</sup> The co-existence of the farm problem, which

<sup>46</sup> World Bank, Povcalnet, World Bank, <http://iresearch.worldbank.org/PovcalNet/jsp/index.jsp>

<sup>47</sup> World Bank (1982), Mwambu and Thorbecke (2004).

<sup>48</sup> Warr (2001).

<sup>49</sup> Faster growth outside agriculture could happen because of faster growth in total factor productivity, a decline in the agricultural terms of trade (price of agricultural goods/price of nonagricultural goods), or a relative capital intensification of production outside agriculture (Hsieh and Sadoulet (2007)).

<sup>50</sup> The shift in focus from \$1 a day to \$2 a day as the relevant poverty benchmark in the policy dialogue in these countries vividly reflects the reality of this process.

induces calls for protection and subsidies in the face of weak fiscal capacity to sustain sufficiently large transfers to erase the income gap, and the food problem, which still requires extraction from agriculture, is the policy dilemma, the “disparity” problem.

1.40 One policy response is facilitating faster absorption of the agricultural labor force in the urban economy through investments in human capital and labor market policies, such as vocational training, transport services, and job matching programs (chapter 9). But the time lags in educating people are substantial. Moreover, labor market policies promoting entry in the modern sector also make migration more attractive, inflating the pool of urban unemployed, leading to urban congestion and an urbanization of poverty. Complementing labor market policies that promote entry in the modern sector with policies that foster rural income growth and slow migration out of the traditional sector can provide important synergies.<sup>51</sup>

1.41 The empirical evidence underscores what rural income growth can do for poverty reduction in the transforming countries (focus A). For example, of the drop in national poverty incidence in China during 1980-2001, 75 to 80 percent was due to reductions in the rural areas, and rural income growth was much more important than urban income growth.<sup>52</sup> A similar pattern was observed in Indonesia where the emergence of rural towns (“urbanization without migration”) was further emphasized.<sup>53</sup>

1.42 *Historically, agricultural protection has offered few prospects.* Fostering rural income growth can be done through income transfers (such as agricultural subsidies and protection), fostering agricultural growth, and generating rural nonfarm employment. Historically, there have been numerous attempts to reduce rural poverty and address the rising income gap by increasing protection, often with limited success (box 1.5). Productivity growth in agriculture and rural nonfarm employment can counter rising pressures for agricultural protection, which often induces huge economic inefficiencies (chapter 4) and usually is there to stay.

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**Box 1.5 Dealing with the disparity problem—historical tales from Thailand and Japan<sup>54</sup>**

**Supporting farmers without a sufficient fiscal base**

Before the 1960s Thailand was an agriculture-based country with rice exports accounting for the bulk of its export earnings. Rice exports were heavily taxed, mainly through a duty (the rice premium) levied proportional to export quantities, which hovered around 30 percent until the mid 1970s. This served the dual purpose of raising government revenue for investment and securing cheap food for urban consumers. As GDP per capita doubled and exports from labor-intensive manufacturing increased (40 percent by the end of the 1970s), widening rural-urban disparities pressured politicians to install visible measures supporting farmers.

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<sup>51</sup> Karp (2007) formalizes this intuition. Though, even using the traditional Harris-Todaro labor market setting and ignoring costs associated with the conversion of agricultural laborers into nonagricultural workers, it can be shown that fostering the traditional sector is unambiguously welfare increasing, while fostering the modern sector is not (Fields (2005)).

<sup>52</sup> Most of the rest is attributable to rural-urban migration. Ravallion and Chen (2007).

<sup>53</sup> MMcCulloch, Weisbrod, and Timmer (2007).

<sup>54</sup> This box is based on Hayami (2005).

Following some political instability, the Farmers' Aid Fund was established in 1974, including a price support program through government rice purchases. Yet the program was soon terminated, largely because rice premium revenues decreased following a decline in world rice prices after the World Food Crisis in 1973-75. This epitomizes the dilemma in formulating sustainable policies to address the disparity problem. The program tried to support farmers without a sufficient fiscal base outside agriculture. Moreover, increasing rice prices, even if successful, would have met strong resistance from poor urban consumers.

As Thailand advanced, the rice premium was gradually reduced and abolished in 1986. New support programs have since been introduced, such as the commodity credit program. Low-interest government loans are given against the pledge of rice, with the pledged rice canceling the debt, when rice prices do not meet a target. Such programs are unlikely to be sustainable or generous enough to close income gaps, as in the United States.

### **Price supports doing little to reduce the income gap**

Japan before World War I was still largely an agriculture-based country—agriculture's share in GDP was 32 percent in 1910. Agricultural policies focused mainly on increasing agricultural productivity to supply cheap food for the development of labor-intensive industries. As industrialization progressed rapidly, the disparity problem emerged, and as early as 1913 political powerful landlords successfully lobbied for a specific duty on rice imports. Lower costs of production and transportation of rice from Southeast Asia progressively increased the pressure for protection after World War I, leading to price support programs, with government procurement and storage of rice. These measures were complemented by a reduction in the direct tax rates from 15 percent in 1880 and 11 percent in 1910 (compared with 2 percent and 5 percent for nonfarmers respectively) to about 6 percent in 1930 (similar to those for nonfarmers). Low interest loans to farmers were also provided, and investment in rural infrastructure to promote off-farm employment was increased. But as in Thailand, these measures had limited success in reducing the income gap.

1.43 *Pro-poor agricultural growth is needed, increasingly in high value products.* In agriculture the food staple sector still dominates (slightly more than a third of agricultural output in China and India, and slightly more than half in Vietnam). Increasing yields in staple crops will remain important to keep food prices low, to foster growth,<sup>55</sup> and in some countries that are large players in international markets, to ensure national food security. But rising incomes, following nonfarm income growth and urbanization, shift the composition of food expenditure from basic and unprocessed staple foods to more varied diets with processed foods (Bennett's Law, chapter 2). Consequently, growth in agriculture is increasingly driven by the rapidly expanding demand for livestock products and high value crops.<sup>56</sup>

1.44 The poverty impact of growth in the agricultural sector will thus depend increasingly on the extent to which the poor can connect to these new growth processes, either as smallholders or as laborers. Vertically integrated supply chains may pose

<sup>55</sup> In India, for example, the sluggish performance of agriculture over the past decade, which still accounts for almost one fifth of the economy, has posed an important drag on its otherwise very robust growth performance. Agricultural GDP per capita grew only at 0.66 percent per year, and cereal yields only at 1.15 percent.

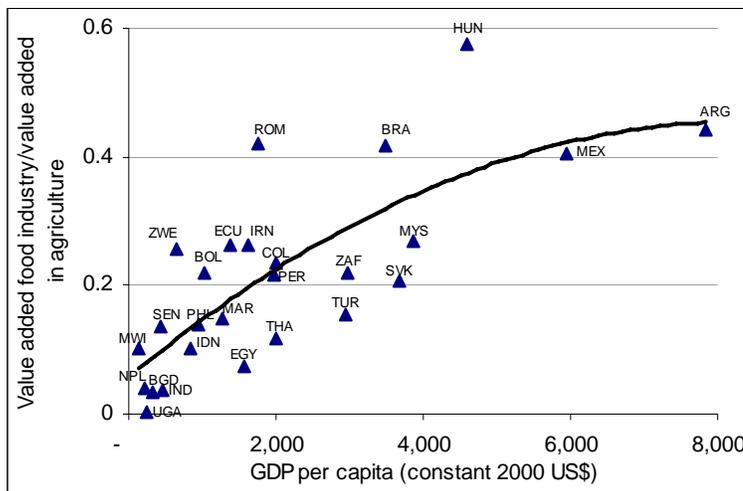
<sup>56</sup> Income elasticities of demand among rural consumers in Bangladesh were estimated at 0.3 for cereals, 0.7 for non-cereal crops, 1.1 for fruits and fish, and 1.5 for livestock products (Hossain (2004). Beghin (2006) and Dong (2006) project substantial growth potential for dairy in the Asian markets both in light of the substantial scope for dairy yield improvements and the rapidly increasing domestic demand, following strong income (and population) growth.

particular challenges in this (chapter 5), though recent evidence from China suggests that small and poor farmers take active part in China’s horticulture economy.<sup>57</sup>

1.45 *But agriculture cannot do it alone, and rural nonfarm employment, often linked, is equally important.* The potential of agriculture to contribute to rural poverty reduction differs across countries. In China, where land is relatively equally distributed, the reduction in poverty was almost four times higher from (aggregate) growth in agriculture than from (aggregate) growth in industry or services.<sup>58</sup> Rapid agricultural development also contributed substantially to the dramatic poverty reduction in Vietnam over the past 15 years<sup>59</sup> and is likely to remain an important route out of poverty for many of Vietnam’s poor.<sup>60</sup> In India and Indonesia growth in rural services was estimated to be at least as poverty-reducing as growth in agriculture.<sup>61</sup> In India the poverty-reducing effects of nonfarm economic growth across states are larger the higher the initial levels of farm productivity and rural living standards—and the lower the landlessness.<sup>62</sup>

1.46 The rural nonfarm sector is an important buffer to absorb the growing labor force and reduce the rural-urban divide. Growth in rural nonfarm employment remains often closely linked to growth in agriculture, increasingly through production linkages, because of higher demand for intermediate inputs (backward linkages), but especially because agriculture becomes a more significant supplier of intermediate inputs to other sectors such as processed foods (forward linkages) (figure 1.5). Rural trading and transport, often of food, make up about 30 percent of rural nonfarm employment.<sup>63</sup>

**Figure 1.5 The share of food processing in agricultural value added rises with incomes**



Source: World Bank (2006) and UNIDO.

<sup>57</sup> Wang and others (2006).

<sup>58</sup> Ravallion and Chen (2007).

<sup>59</sup> Bonschab and Klump (2006).

<sup>60</sup> van de Walle and Cratty (2004) indicate that the location of nonfarm activity growth and the household characteristics of many of the poor (in particular the ethnic minority) are such that the emerging rural nonfarm sector is unlikely to serve as the main route out of poverty for many of Vietnam’s poor.

<sup>61</sup> Ravallion and Datt (1996), Warr (2001), Suryahadi, Suryadarma, and Sumarto (2006).

<sup>62</sup> Ravallion and Datt (2002).

<sup>63</sup> Haggblade, Steven, Hazell, Peter, and Reardon, Thomas (Forthcoming).

1.47 But, following urbanization and globalization, growth in rural nonfarm employment occurs increasingly also independent from agriculture. Regions in India with the slowest growth in agricultural productivity had the largest increase in the rural non-farm tradable sector.<sup>64</sup> When capital and products are mobile, investors seek low wage opportunities in areas that did not increase their incomes through higher agricultural productivity. Urban overcrowding and higher urban labor costs also stimulated urban-to-rural subcontracting in various sectors throughout East Asia, both for domestic consumption and for export.<sup>65</sup> For example, econometric case evidence shows that without the rapid expansion of rural town and village enterprises, and the associated increase in rural nonfarm employment, rural poverty and inequality would have been significantly higher in China's central province of Hubei.<sup>66</sup>

1.48 Poverty reduction through rural nonfarm employment is often indirect, through a tightening of the labor market. Econometric evidence from India and Bangladesh shows that few of the poor gain access to nonfarm jobs because of poor education and credit constraints.<sup>67</sup> Yet by siphoning off non-poor agricultural wage laborers, nonfarm employment generation puts pressure on agricultural wages, benefiting the poor.

### ***Urbanized economies—dealing with the farm subsidy problem***

1.49 Agriculture makes up only nine percent of the urbanized economies and contributes about proportionately to growth. Although almost three-quarters of the population lives in urban areas, about half of the poor live in rural areas, and 19 percent of the labor force still works in agriculture. Most countries from Eastern Europe and Central Asia, and Latin America fall in this category.

1.50 *Agriculture—a good business with poverty-reducing potential.* Given much-strengthened food production capacity and more open economies, the food problem has largely disappeared. Agriculture now acts like other small tradable sectors. It provides growth opportunities in subsectors with a comparative advantage and provides environmental services with new markets for biofuels, carbon trading, and the preservation of biodiversity opening new opportunities yet to be tapped. The rural-urban divide<sup>68</sup> and the pressure for agricultural protection—the farm subsidy problem—largely remain.

1.51 With agriculture mostly tradable, prices will not decline because of elastic demand from world markets,<sup>69</sup> and land owners will capture most of the surplus from growth in productivity. The poverty-reducing effects of growth in agriculture happen

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<sup>64</sup> Foster and Rosenzweig (2004).

<sup>65</sup> Hayami (1998).

<sup>66</sup> de Janvry, Sadoulet, and Nong (2007).

<sup>67</sup> Kijima and Lanjouw (2005), Hossain (2004).

<sup>68</sup> More precisely, the divide is between the traditional rural and the modern rural and urban sector. Especially in Latin America, large modern farming enterprises co-exist with traditional smallholder farms.

<sup>69</sup> In a study of eight countries and 10 commodities, a total of 31 country/commodity pairs, Baffes and Gardner (2003) find that Argentina, Chile, and Mexico are the only countries whose domestic commodity markets were integrated with world markets with variations in domestic food prices closely following world prices. The other countries included Ghana, Madagascar, Indonesia, Egypt, and Colombia.

mainly through the labor market, either through wage increases in a tightening labor market, or through employment of unskilled labor. The distribution of land and the labor intensity of production govern the poverty-reducing effects. The challenge is to create opportunities for smallholders in the growing agricultural sectors and good jobs in agriculture and the rural nonfarm economy (chapter 9). The rapid increase in concentration in agribusiness and food retailing exacerbates this challenge (chapter 5). Depending on the subsector and farm structure, and their linkages with the rural non-farm economy, agriculture can be important in reducing poverty and narrowing income disparities between the traditional and modern sectors.

1.52 *Agricultural growth with poverty reduction in Chile, but not in Brazil.* As in the transforming countries, econometric evidence confirms that rural income growth has been more poverty-reducing than urban income growth.<sup>70</sup> Rural nonfarm income in these countries often makes up 40 to 60 percent of total income, with substantial heterogeneity in how much growth in the rural nonfarm economy originates in agriculture. For example, Chile has the strongest production linkages (largely forward), while there is no evidence of linkages in Colombia.<sup>71</sup> Rural subcontracting, the *maquila* phenomenon, appears to be gaining traction, as in Asia.<sup>72</sup>

1.53 Much of the expansion of Chile's agricultural GDP can be attributed to a labor-intensive agro-export boom over the past two decades. While poor farmers did not directly participate in this growth, they benefited indirectly through their employment by large-scale farmers and agro-processors, including many jobs taken by women. The poverty-reducing impact has been substantial, despite vertically integrated supply chains. The expansion of agricultural and agro-processing output by 1 percent is estimated to reduce national poverty by 0.6-1.2 percent.<sup>73</sup>

1.54 But success in agriculture does not always translate into poverty reduction. While Brazil experienced dramatic growth in agriculture during the 1990s following trade liberalization and an improvement of price incentives, it is unclear how much the agricultural boom contributed to the observed reduction in rural poverty since labor demand in agriculture declined and agricultural employment shifted to higher skilled wage workers as production became more capital intensive.<sup>74</sup> Most of the reduction in rural poverty was due to income transfers and reduced inflation.<sup>75</sup>

### **Agriculture's potential for development has often been shortchanged**

1.55 The agriculture-for-development connections revealed by the theoretical, historical, and empirical evidence reviewed above are not always fully exploited on the ground. Certainly agriculture has yet to be an engine of growth in most countries of Africa where poverty is slowly urbanizing. But even in the transforming countries, with

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<sup>70</sup> As illustrated for Mexico by Soloaga and Torres (2003).

<sup>71</sup> De Ferranti and others (2005).

<sup>72</sup> Haggblade, Steven, Hazell, Peter, and Reardon, Thomas (Forthcoming).

<sup>73</sup> Anriquez and López (Forthcoming).

<sup>74</sup> De Ferranti and others (2005).

<sup>75</sup> Paes de Barros (2003), Ferreira, Leite, and Litchfield (2006).

about 600 million people still living in rural areas on less than \$1 a day, and about 1.5 billion on less than \$2 a day (table 1.1), the (rural) poverty challenge remains huge, despite spectacular progress in some countries. Agricultural growth has also slowed in some countries, as in India, where per capita agricultural GDP grew only at 0.66 percent a year over the past 12 years.

1.56 Four hypotheses could explain this divide between promise and reality.

- Agricultural growth through productivity improvement may be intrinsically slow, making it hard to realize its growth and poverty-reducing potential.
- Macroeconomic and price policies may have unduly discriminated against agriculture.
- There may have been an urban bias in the allocation of public investment as well as misinvestment within the sector.
- Official development assistance to agriculture may have declined.

***Is the agricultural sector less productive?***

1.57 Some refer to the oft-observed slower growth in agriculture than in the rest of the economy to argue that agriculture is inherently less dynamic. The argument goes as far back as Adam Smith, who posited that due to greater impediments to specialization and labor division in agricultural production, productivity was bound to grow slower in agriculture than in manufacturing. More recently it is argued, especially in the African context, that rapid agricultural growth will be difficult to achieve due to an inherently unfavorable agro-ecological base for agriculture, rapid soil degradation, low population density, poorly functioning markets, and competition from the rest of the world.<sup>76</sup>

1.58 In this debate, it is important to distinguish between the rate of growth in output or value added from agriculture, and the rate of growth in some measure of productivity, such as labor productivity or total factor productivity. Comparing the rate of growth in value added from agriculture and the nonagricultural sectors over the past 15 years confirms that agriculture has grown slower, though the gap is especially large in the transforming countries (two percentage points) and negligible in the agriculture-based economies (figure 1.6). A simple decomposition of these growth rates into productivity growth per worker in the sector and the growth in the number of workers in the sector illustrates that growth in nonagricultural sectors has been largely associated with migration of workers from agriculture to nonagriculture.

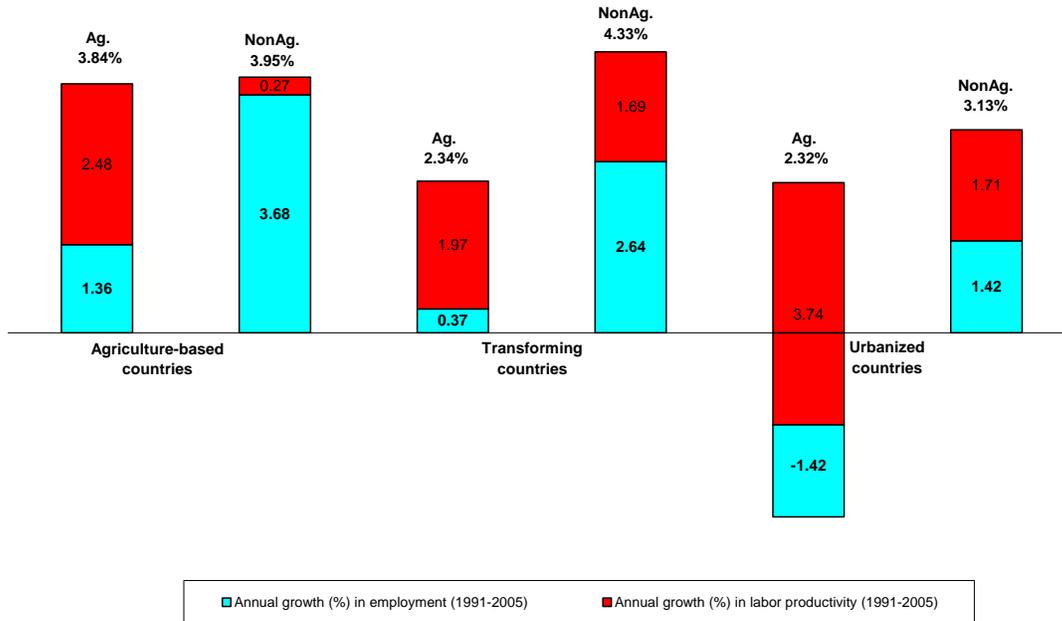
1.59 Labor productivity in agriculture grew faster than in the nonagricultural sectors in each of the three archetypical economies. This may reflect an equilibrating movement of labor out of agriculture in response to the higher marginal product of labor (and thus wages) in nonagriculture (industrial pull). Or productivity increases in agriculture turned the terms of trade against the sector, lowered the returns to the factors used in agricultural

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<sup>76</sup> Maxwell, Ian, and Ashley (2001).

production, and induced net migration of labor (and capital) out of agriculture (agricultural push).

**Figure 1.6 Labor productivity has been a more important source of growth (1991-2005) in agriculture than in nonagriculture**



Source: FAO (2006).

1.60 Total factor productivity (TFP) in agriculture has grown faster in agriculture than in industry in many settings, supporting an “agricultural push” interpretation of the data on labor productivity. In 14 industrial countries TFP grew at 2.6 percent per year in agriculture, compared with 1.2 percent in industry and 0.7 per cent in services between the early 1970s and the late 1980s.<sup>77</sup> For 50 low and middle income countries during 1967-1992 the average growth in TFP was 0.5 to 1.5 percentage points higher in agriculture than in nonagricultural sectors, differences valid across the development spectrum.<sup>78</sup>

1.61 These findings are not taken to claim superiority in agricultural TFP growth over the past decades, but to debunk the notion that agriculture is a backward sector, where investment and policies are automatically less effective in generating growth. Brazil and Chile—where agricultural commodities have become mostly tradable and where growth in agriculture has exceeded growth in nonagricultural sectors for more than a decade—confirm that agriculture can be a dynamic sector. Historically though, both industrial pull and agricultural push have been at work and on average, across the world and thus in

<sup>77</sup> Bernard and Jones (1996).

<sup>78</sup> Martin and Mitra (2001).

many countries, agriculture is likely to grow slower than nonagricultural sectors, given Engel's Law.

***Are macroeconomic and price policies discriminating against agriculture?***

1.62 In any economy, a first economics principle is to ensure a level playing field for macroeconomic and sectoral policies that allow each sector to express its comparative advantage in the growth process. Despite this, there is considerable evidence that slower growth in agriculture relates to the historic bias in macro and sectoral policies against it. The landmark Krueger, Schiff, and Valdes study published in 1991, *The Plundering of Agriculture*, clearly documented that in 18 countries agriculture was taxed relative to other sectors at a rate of 30 percent, reducing the terms of trade of agricultural products relative to nonagricultural products. This policy bias was largest in agriculture-based countries of Africa, with overvalued exchange rates, high tariff protection on industry, and taxes on agricultural exports as the largest contributors to the bias. It was estimated that a 10 percentage point reduction in total taxation to the sector would increase overall annual growth by 0.43 percentage points.

1.63 Most developing countries have substantially reduced these biases against agriculture, and macroeconomic-induced distortions are much less now (chapter 4). Industrial tariffs have also fallen sharply. Country evidence shows that after reforms, periods of rapid growth in agriculture and substantial poverty reduction have followed. In Uganda the increase in coffee prices—largely brought about by domestic market liberalization but also by the devaluation of the exchange rate and favorable world prices—substantially reduced rural poverty during 1992-2000 by spurring a supply response. It is estimated that a 10 percent increase in the coffee price reduces the poverty headcount by six percentage points.<sup>79</sup> In China 60 percent of the dramatic expansion of agricultural output and 51 percent of the reduction in rural poverty from 33 to 11 percentage points between 1978 and 1984 have been attributed to institutional reforms, especially the household production responsibility system, and to price reforms.<sup>80</sup> But reforms have not always translated into poverty reduction, as seen for Brazil.<sup>81</sup>

***Urban biases in public spending?***

1.64 It was not only the degree of unduly policy bias which has been burdensome for agricultural development. All successful developers have taxed agriculture (directly and indirectly) to finance industrial development.<sup>82</sup> It was the heavy exploitation of agriculture in the absence of meaningful (public) investment in agricultural development that proved lethal, especially in Africa. The goose was often killed before it could lay its

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<sup>79</sup> Deininger and Okidi (2003). The reverse also holds: a decrease in the world market price of 10 percent would increase poverty by 6 percent, highlighting the importance of strengthening coffee farmers' risk coping capacity.

<sup>80</sup> Fan, Zhang, and Zhang (2004).

<sup>81</sup> De Ferranti and others (2005).

<sup>82</sup> Teranishi (1997). Optimal levels of taxation in contexts where agriculture (most often agricultural exports) forms the key tax and export earnings base, are discussed in World Bank (2000).

golden egg.<sup>83</sup> The finding that the share of spending on agriculture in Africa is significantly less than in Asia, even at the start of Asia's agricultural growth spurt, is striking (table 1.2). Moreover, the share of public spending on agriculture in Africa began to fall long before countries had invested sufficiently in agricultural R&D and rural infrastructure for sustained growth to occur. The commitment by the New Economic Program for African Development (NEPAD) to increase agricultural spending to 10 percent of national budgets aims to reverse this trend.

**Table 1.2 Public spending on agriculture over the past 25 years**

	Africa		Asia		Latin America	
	1980	2004	1980	2004	1980	2004
Public spending on agriculture as a share of total public spending (%)	6.4	5.0	14.8	7.4	8.0	2.7
Public spending on agriculture as a share of agricultural GDP (%)	7.4	6.6	9.4	11.0	19.5	12.7
Share of agriculture in GDP (%)	25.3	26.8	31.9	18.4	14.0	11.6

*Note:* Numbers for Africa based on 17 countries, numbers for Asia on 11, and numbers for Latin America on 16.

*Source:* Fan and Rao (2003).

1.65 The high returns to agricultural research and extension have been soundly documented, with a recent meta-analysis situating the rates of returns in the range of 35 (Sub-Saharan Africa) to 50 percent (Asia), far above the cost of money accessible to developing countries<sup>84</sup> (chapter 7). Methodological difficulties and spotty data on other agricultural and rural expenditures, and their effects, result in there being only limited evidence on the returns to other investments in agriculture and the rural sector (beyond project cost-benefit analyses). So this is an important area for future research. The available evidence from simulations with a computable general equilibrium model, calibrated on a typical African country, indicates that poverty declines most rapidly when public spending is increased in agriculture, rather than in human capital or transport.<sup>85</sup> Econometric case evidence from rural Uganda also ranks agricultural R&D as the most profitable investment (also for poverty reduction), closely followed by investment in rural feeder roads.<sup>86</sup>

1.66 In Asia and Latin America the decline in public funding for agriculture partly reflects agriculture's declining importance in the economy (table 1.2). Even so, application of the share rule of spending suggests underinvestment in rural areas in many

<sup>83</sup> Thorbecke and Wan Jr. (2004).

<sup>84</sup> Alston and others (2000).

<sup>85</sup> Logfren and Robinson (1999).

<sup>86</sup> Fan and Chan-Kang (2005).

urbanized economies.<sup>87</sup> There have been recent reversals in several countries, including China, India, and Mexico,<sup>88</sup> motivated by the need to fight poverty and address the widening rural-urban income gap. This is consistent with the high returns to agricultural R&D, also for poverty reduction. Investment in rural education also produces high returns.<sup>89</sup> Returns differ across regions and are often higher in more remote areas (as in the western provinces in rural China and in the rural north in Thailand).<sup>90</sup> The reduction in poverty is also stronger with a more equal initial distribution of assets—the poverty elasticity of increased public spending on agricultural R&D appears to be considerably lower in Latin America than other regions with more equal land distribution.<sup>91</sup>

1.67 Agricultural spending has often been biased toward subsidizing private goods (fertilizer, credit) and making socially regressive transfers. Econometric evidence shows that these are substantially less productive than investments in core public goods such as agricultural research, rural infrastructure, education, and health.<sup>92</sup> This bias often worsens as countries develop, as vividly illustrated in India, where agricultural subsidies rose from 40 percent of agricultural GDP in 1975 to 75 percent in 2002 (chapter 4). In other words, underinvestment in agriculture, especially pronounced in the agriculture-based economies, is further compounded by misinvestment, especially in the transforming and urbanized countries.

### ***Development assistance to agriculture declined dramatically***

1.68 The share of agriculture in official development assistance (ODA)<sup>93</sup> declined sharply over the past two decades, from a high of 18.1 percent in 1979 to 3.5 percent in 2004 (figure 1.7). It also declined in absolute terms from a high of \$8.3 billion (2004US\$) in 1984 to \$3.4 billion in 2004. In the late 1970s and early 1980s the bulk of agricultural ODA went to Asia, especially India, in support of the Green Revolution, though this declined dramatically thereafter. Total ODA to agriculture in Africa<sup>94</sup> also increased somewhat during the 1980s, but is now back to its 1975 level of about \$1.2

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<sup>87</sup> According to the share rule of spending, public investment should be allocated according to the relative size of the sectors in national GDP (De Ferranti and others (2005)). But this rule only holds if additional public investment is equally efficient in promoting growth in agriculture and nonagricultural sectors, if there are no cross-sector growth effects, and if growth in both sectors is equally efficient at reducing poverty. These are strong assumptions, and empirical evidence is usually lacking to make a full comparison of sectoral payoffs to public expenditures. Further complicating this is the fact that much public spending necessary for agriculture (rural roads, education, health) also benefits the rural nonfarm economy (outside agriculture, but in rural areas).

<sup>88</sup> In China public spending on agriculture increased by 15 percent a year between 1995 and 2005 compared with a freeze (or even slight decline) in the first half of the 1990s. 11<sup>th</sup> Five Year Plan (Government of India: Planning Commission (2006)); World Bank's rural Public Expenditure Review in Mexico.

<sup>89</sup> Fan, Hazell, and Sukhadeo (2000), Fan, Zhang, and Zhang (2004).

<sup>90</sup> Fan and Rao (2006).

<sup>91</sup> Thirtle and others (2003).

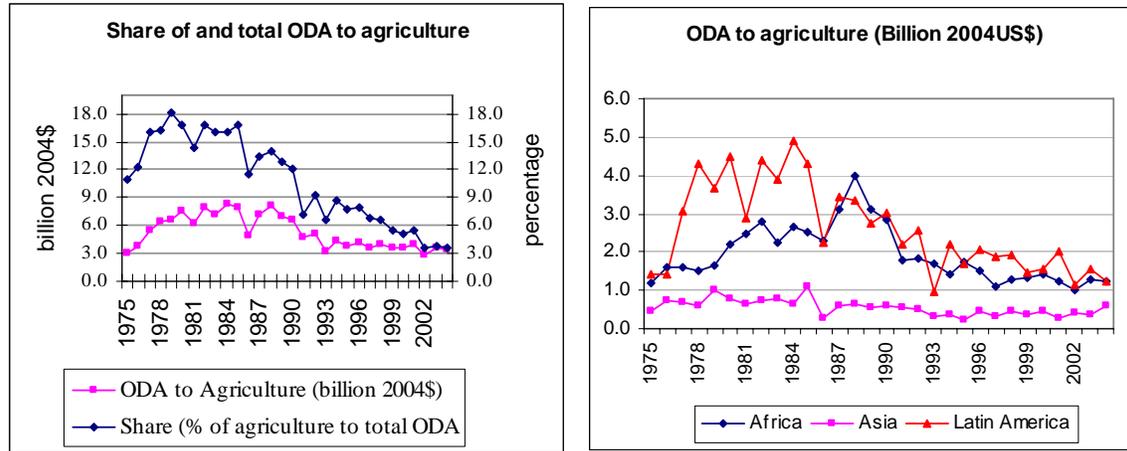
<sup>92</sup> Lopez and Gregmar (Forthcoming).

<sup>93</sup> The OECD/DAC statistical code of “agriculture” does not include “rural development” which is classified as multi-sector aid, and “food aid” (a sub-category of general program assistance). The recent trend towards program-based approaches and multi-sectoral projects is not reflected either.

<sup>94</sup> This includes both Sub-Saharan and North Africa.

billion (2004US\$). During this period, its population more than doubled. Most recently, ODA to agriculture has started to increase again (chapter 11).

**Figure 1.7 Official development assistance<sup>95</sup> to agriculture declined sharply between 1975-2004**



Source: OECD (2006).

### Toward a political economic understanding of agricultural policymaking

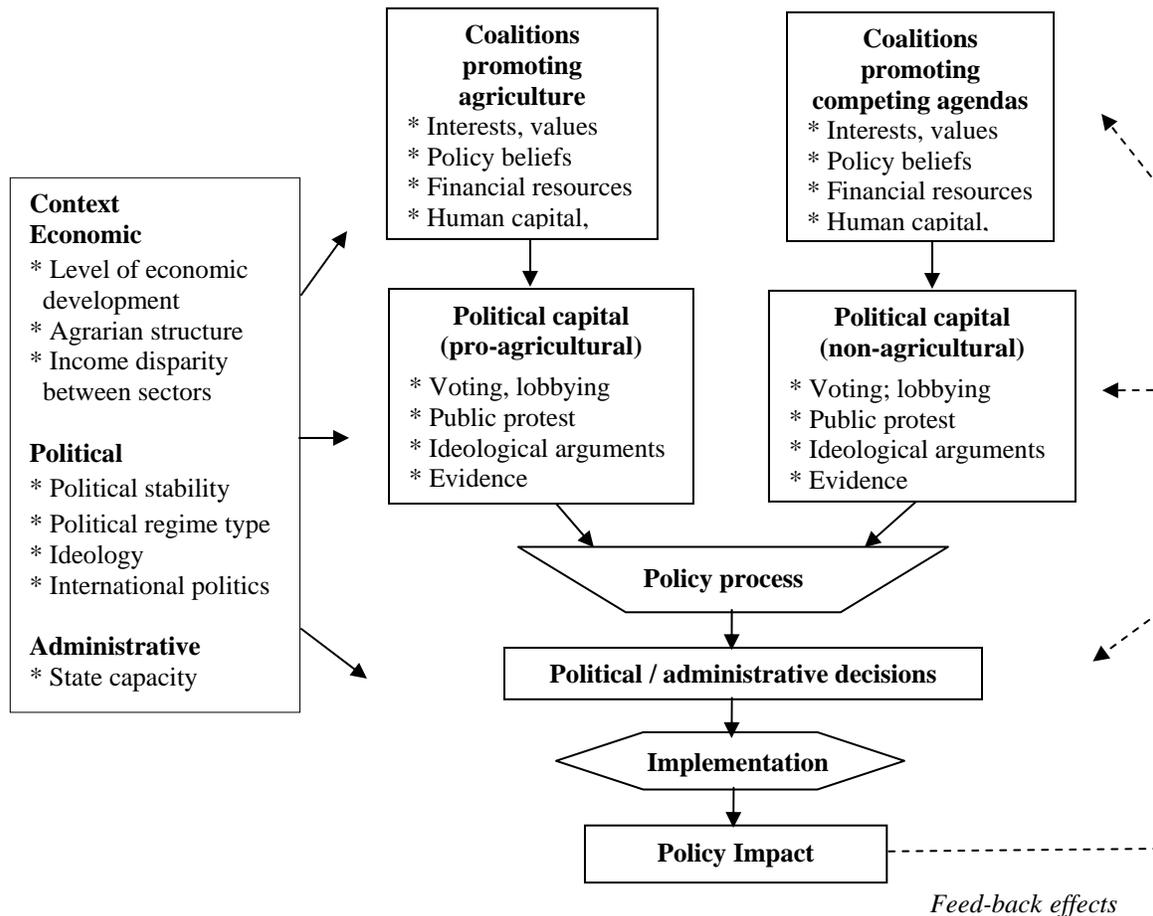
1.69 The discrepancy between development potential and policy neglect of agriculture begs some political economy questions. Why have African countries opted for extraction of agriculture without appropriate investment, while Asian countries launched the Green Revolution? Why is agricultural spending often biased towards subsidizing private goods which are less effective in promoting pro-poor growth? And why has donor support to agriculture declined so dramatically?

1.70 Agricultural policymaking can be seen as the outcome of a political struggle between coalitions of actors that promote pro-agricultural policies, and those that promote nonagricultural policies competing for the same scarce resources (figure 1.8).<sup>96</sup> Such coalitions may consist of interest and lobby groups, such as farmer or industry organizations, but they often also include other political actors, such as public officials, parliamentarians, think tanks, NGOs, and donors. To understand why certain policies are in place and how they change, the interests, policy beliefs and expectations of these coalitions need to be identified, and their ability to create “political capital” analyzed.

<sup>95</sup> The OECD Creditor Reporting System (CRS) reports *commitments*, not the actually disbursed funds.

<sup>96</sup> See review by Binswanger and Deininger (1997). The framework suggested here combines a modified version of the Advocacy Coalition Framework developed by Sabatier and Sabatier and Jenkins-Smith (1993) and political resource theory (Birner and Wittmer (2003)).

Figure 1.8 Framework to analyze policy processes



Source: Modified from Birner and Wittmer (2003) and Sabatier and Jenkins-Smith (1993).

***The challenge of collective action and the critical role of beliefs and the state in generating political commitment***

1.71 Political capital can be defined as the resources that an actor can use to influence political decision-making.<sup>97</sup> Strategies to create political capital include lobbying, organizing public protest, using ideological arguments in the public discourse, invoking research-based evidence, and relying on international influence. In democracies the votes of farmers can be a source of political capital. The 2004 elections in India, for example, were won by a party coalition that promised to resolve the problem of “agrarian distress.”<sup>98</sup>

1.72 To create political capital actors need financial resources—for example, to contribute to political campaigns. They also need human resources, such as the skills to influence politics. And—importantly—they need social capital, such as membership

<sup>97</sup> Birner and Wittmer (2003), page 289.

<sup>98</sup> Suri (2006) page 1520.

organizations that can be mobilized for demonstrations and lobbying. The economic and political conditions obviously influence the possibilities that actors have to create political capital and influence political outcomes. In agriculture-based economies, farmers, especially poor smallholders, face difficulties in creating the social capital to form effective political interest groups. Their transaction costs in collective action are high in view of their large numbers, dispersed nature, high transportation and information costs, poverty, and the need to avoid risks.

1.73 In contrast, the urban poor do not need a high degree of organization to stage public protest, as with food riots. Industrial groups usually have more financial resources to influence politics, and they often belong to social elites, whose social capital facilitates lobbying. As countries urbanize and industrialize, farmers face fewer challenges to collective action. Their numbers decrease and their access to resources increases while the widening income gap between the agricultural and nonagricultural sectors provides a cause for action. Historically, in industrialized economies, farmers have been able to form astonishingly effective pressure groups to pursue agricultural protection.<sup>99</sup>

1.74 While collective action arguments go a long way in explaining the shift from agricultural taxation to protection in economic development, the role of ideas or policy beliefs in shaping agricultural policy should not be underestimated. A major reason why the newly independent countries in Asia and Africa neglected agriculture after independence was the fervent policy belief in industrialization and urbanization as the engines of development, paired with the view—still common in development economics at that time—that investment in agriculture is not necessary to achieve industrialization.<sup>100</sup>

1.75 Apart from policy beliefs, political conditions and the role of the state matter.<sup>101</sup> The green revolution in Asia was led by the state, in both democratic and nondemocratic political systems. In India farmers had political voice since independence, but the driving force of the green revolution was the political will to become food self-sufficient, once the U.S. government decided in the mid 1960s to use food aid as an instrument of foreign policy.<sup>102</sup> China and Indonesia (under Suharto) are examples of single party regimes that launched a green revolution. To what extent the commitment to agriculture in Asia's nondemocratic political systems was driven by the desire to avoid food shortages and

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<sup>99</sup> There is a large literature on this issue. See, e.g., Anderson (2004).

<sup>100</sup> Bates (1981), Krueger, Schiff, and Valdés (1991), Binswanger and Deininger (1997).

<sup>101</sup> This point is emphasized by Van de Walle (2001), who argues that the role of the “neo-patrimonial” state rather than interest group pressures account for economic failure in Africa.

<sup>102</sup> The political consensus on food security in itself was not enough, however, to make the Green Revolution happen. The autobiography of the C. Subramaniam, Minister of Agriculture at that time, reveals how much leadership it took to convince the skeptics, including parliamentarians, that modernizing India's agriculture on the basis of science and technology was feasible. Putting the appropriate public policies in place, such as reforming the agricultural research system, and overcoming restrictive seed import regulations, was a challenge, too. When Subramaniam took over the Ministry of Agriculture in 1964, it was considered to be the least prestigious of all ministries (“a political trap”), reflecting the image of backwardness that agriculture had in India prior to the Green Revolution (Subramaniam, 1995, quoted in Visvanathan (2003)). See also Swaminathan (1993).

associated political unrest, by the raise of developmental states<sup>103</sup> and a development-oriented ideology, or by the long time horizon of these regimes remains an open question. Once the green revolution took off, it served as an example to political leaders in neighboring countries, facilitating the adoption of similar policies.

1.76 Nondemocratic political systems in Africa apparently had fewer political incentives to support smallholder agriculture. African states used both violence and strategically supported larger farmers to suppress opposition against agricultural pricing policies that taxed agriculture.<sup>104</sup> There are also numerous cases in which African states did make serious efforts to intensify agricultural production, but unlike in Asia, they focused almost universally on large-scale production, without sustained success.<sup>105</sup>

1.77 The process of democratization has increased the possibilities of small-holder farmers to form organizations and transform this type of social capital into political capital to influence agricultural politics.<sup>106</sup> In West Africa, for example, producer organizations and Parliaments are increasingly involved in the formulation of agricultural strategies and policies (chapter 11).<sup>107</sup> Whether the formulation of these agricultural policies will increase the budget allocations to agriculture remains to be seen, however

### ***From political commitment to instrument choice and implementation***

1.78 While the louder political voice of farmers is critical to increase the political commitment to agriculture, it is equally essential to select the right policy instruments (chapter 4), and to implement them effectively, a challenge addressed throughout this Report. Farmer organizations often demand policy instruments, such as import protection, input subsidies, and price supports. In transforming economies the political pressure for such policies is rising (Chapter 4). These policies usually benefit large farmers more than smallholders, and are almost always inefficient and distorting to both agriculture and the rest of the economy. While this is partly due to the greater influence of large farmers in farmer organizations, farmers may, in view of past experiences, also lack trust in the capacity of the state to implement other policy instruments, such as public investment or targeted subsidies, in a way that will ultimately benefit them. Hence, increasing state capacity (chapter 11) is an important condition to create political capital for the choice of appropriate policy instruments (figure 1.8).

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<sup>103</sup> Djurfeldt, Jirstroml, and Larsson (2005).

<sup>104</sup> Bates (1981).

<sup>105</sup> See Djurfeldt, Jirstroml, and Larsson (2005). The authors point out that two policy beliefs held by the ruling urban elites were important for this policy choice: (1) that smallholders are resistant to change, and (2) that large-scale production is superior. In India such beliefs were also common prior to the Green Revolution, but there were strong political incentives to include smallholders nevertheless in the ongoing efforts to improve food production (compare Subramaniam, quoted in Swaminathan (1993)).

<sup>106</sup> Diamond (2003) notes that since the “third wave” of democratization began in 1974, the number of democratic countries has grown threefold from 41 to 121 by 2002. But these totals reflect electoral democracies rather than fully consolidated democracies.

<sup>107</sup> Mercoiret (2005).

### ***Why did the donors reduce their support?***

1.79 Failed agricultural development efforts can influence the policy beliefs and expectations of political actors, including farmers, politicians, and donors (see feedback arrows in figure 1.8). The “agro-skepticism” of many African leaders as well as donors today may well be related to their experience with past unsuccessful interventions in agriculture, such as large-scale integrated rural development, the training and visit system of extension,<sup>108</sup> and agricultural mechanization. Weak governance and the push of donor organizations for “one-size-fits-all” approaches contributed to the failures. This experience underlines the need to strengthen country capacity for policy analysis and to invest in governance and institutions for effective policy implementation. Most recently, the tide among donors and governments appears to be turning (Chapter 11).

### **Concluding remarks**

1.80 The case for fostering agriculture for development is still very much alive today, even though its rationale differs substantially across country settings. Despite gigantic successes in the past, agriculture has often been unable to realize its potential, especially in Sub-Saharan Africa, due to policy bias and underinvestment, often compounded by misinvestment and donor neglect. New opportunities for realizing this potential present themselves today—following globalization, institutional innovations in factor and service delivery, technological developments, and environmental change—even though they also come with new challenges.

1.81 The new agriculture will be market-driven, state-assisted, and civil-society-influenced. It will gradually shift from staple to high value products, increasingly operating in a globalized market that opens new growth opportunities, but also poses a challenge to ensure that the rural poor will benefit either directly as net sellers or indirectly as workers or consumers (chapters 4 and 5). It will be grounded in institutional change, with the state increasingly focused on providing public goods and regulating market activity, relegating the direct provision of goods and services to producer organizations and interlinked markets (chapter 6). It will take full advantage of new biological and informational technologies, provided the knowledge and digital divide can be overcome (chapter 7). And it will have to operate in an environment of global warming and growing degradation of and competition over natural resources, which raise the barriers it has to overcome to fulfill its role. The emergence of new markets for biofuels, carbon trading, and biodiversity preservation also open new opportunities yet to be tapped (chapter 8).

1.82 But agriculture cannot do it alone: growth in the rural nonfarm economy, often linked to growth in agriculture, and migration to dynamic urban centers will provide important and necessary alternative pathways out of poverty (chapter 9). How these different forces of change result in a new policy agenda for agricultural development with maximal poverty-reducing impact across the three country types is summarized in chapter 10. Equally important, ways to strengthen the capacity to implement policies that

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<sup>108</sup> Anderson, Feder, and Ganguly (2006).

stimulate agriculture for development, and the associated global agenda are reviewed in chapter 11. Whether the new agriculture will foster environmentally sustainable growth and reduce poverty is a matter of policy design and political will. And much remains to be learned about the political economy of agricultural policymaking, a theme running throughout the Report.

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## Focus A Rural poverty is changing

*Poverty rates in rural areas have declined over the last decade, mostly due to the impressive gains in China. However, 75 percent of the world's poor still live in rural areas, and rural poverty rates remain stubbornly high in South Asia and Sub Saharan Africa. Rural-urban income gaps have narrowed in most regions except Asia, where the widening gap is a source of political tension and a motive behind renewed efforts to stimulate agricultural and rural development. Higher urban incomes have pulled rural-urban migration flows, which are often credited for rural poverty reduction. Yet, even assuming that only the poor migrate out of rural areas, only 19 percent of observed poverty reduction in rural areas can be explained by out-migration. The contribution of rural poverty reduction to overall poverty reduction is estimated at above 45 percent.*

### **Regional and country differences in rural poverty dynamics have been large**

A.1 Poverty is concentrated in rural areas: 75 percent of the developing world's poor live in rural areas while only 58 percent of its population is rural.

A.2 Poverty rates in rural areas have declined in the last 10 years, but remain extremely high (figure A.1). With an international poverty line of \$2.15 a day, poverty rates in rural areas declined from 78 percent in 1993 to 70 percent in 2002 for the world as a whole.<sup>1</sup> Outside China, though, the results are less impressive with a decline from 74 percent to 71 percent. The number of poor people in rural areas has remained roughly constant at 2.1 billion people. With a lower poverty line (\$1.08 a day) the poverty rates declined from 37 percent to 30 percent, but the number of poor people fell only slightly, from 1 billion to 0.9 billion people.

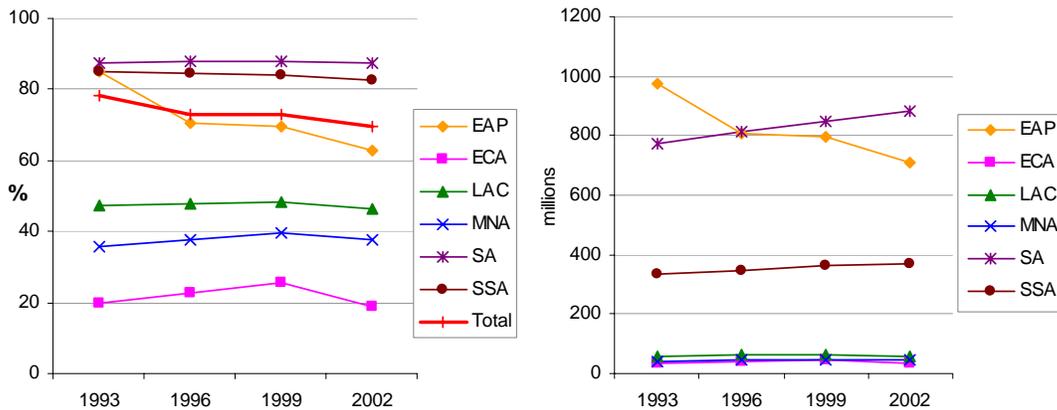
A.3 These global trends hide variations in the evolution of poverty across regions and countries. In Europe and Central Asia, rural poverty rates actually increased from 1993 to 1999, though they returned to 1993 levels by 2002. East Asia shows a steep decline from 85 percent in 1993 to 63 percent in 2002, lifting more than 250 million people out of poverty, much determined by China's success in reducing poverty from 89 percent to 65 percent. But the rest of the region also performed well, with poverty declining from 75 percent to 58 percent. Rural poverty rates remain frustratingly high and tenacious in South Asia and Sub-Saharan Africa.

A.4 Looking at the absolute number of poor, East Asia shows a significant decline; while both South Asia and Sub-Saharan Africa show increases over the period.

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<sup>1</sup> In 1993 PPP, and properly adjusted for difference in cost of living in urban and rural areas. Ravallion, Chen, and Sangraula (2007).

**Figure A.1 Rural poverty rates and number of rural poor (\$2.15 a day poverty line)**



Source: Ravallion, Chen, and Sangraula (2007).

A.5 Construction of regional poverty aggregates as reported above requires the use of internationally comparable poverty lines. However, different countries have different definitions of what “poverty” means, and correspondingly use national poverty lines that are not directly comparable. Table A.1 shows changes in rural poverty using each country’s poverty line. Even though these numbers cannot be compared across countries, they are adequate for assessing the evolution of poverty over time in each country.

A.6 They show great heterogeneity in performance. In Sub-Saharan Africa, Benin and Zimbabwe show increases in poverty of more than 2 percentage points a year, while Ghana, Nigeria, and Uganda show decreases in rural poverty of almost 2 percentage points a year. In Uganda’s case, the performance is particularly impressive, since it spans 10 years. Countries in Latin America show generally small progress, with annual reductions of less than a percentage point. Chile and El Salvador are exceptions.

A.7 Many countries that witnessed fairly high agricultural growth rates saw substantial reductions in rural poverty. In Vietnam, land reform and trade and price liberalization stimulated one of the world’s fastest agricultural growth rates in the 1990s. Of the workers exiting poverty, 70 percent either remained primarily employed in agriculture or even moved into agriculture.<sup>2</sup> In Moldova, land distribution provided strong incentives and reversed the declining trend in agriculture. In Bangladesh, with fairly strong agricultural growth in the 1990s, rising farm and rural nonfarm earnings and lower rice prices from adopting modern varieties and irrigation helped bring rural poverty down. In Uganda, too, poverty fell because of reforms and a resulting boom in coffee production. There are also lessons about the role of agriculture in China’s massive and unprecedented reductions in rural poverty and India’s slower but still substantial long-term decline (boxes A.1 and A.2).

A.8 But there are cases where rural poverty, despite agricultural growth, did not decline. Brazil experienced one of Latin America’s highest agricultural growth rates, yet

<sup>2</sup> Bernabe and Krstic (2007).

rural poverty fell only marginally. Brazilian agricultural growth is concentrated in a dynamic export-oriented sector of very large farms that does not reach the rural northeast, where most of Brazil's rural poor live. In Bolivia agricultural growth was also dominated by expansion of the commercial export-oriented sector, leaving the rural poor behind, especially indigenous groups in the highlands.

A.9 In other cases, declines in rural poverty were unrelated to agriculture. Despite weak agricultural growth in El Salvador, rural poverty fell largely because of rising non-farm incomes and remittances.<sup>3</sup> The same is true for Nepal.

A.10 Looking at the future, the urban population share for the developing world is expected to reach 60 percent by 2030.<sup>4</sup> At that rate, the urban share of \$1.08 a day poverty—now 25 percent—will reach 39 percent by 2030.<sup>5</sup> With a \$2.15 a day poverty line, the urban share of the poor will be 51 percent. These projections are an approximation since the pace of urbanization will depend on the extent and pattern of future economic growth. But from what is now known, it appears very likely that the majority of the world's poor will still be in rural areas for several decades to come.

### **The rural-urban divide**

A.11 In almost all parts of the world, rural poverty rates are higher than urban ones, and the depth of poverty is often greater. The global poverty rate was 70 percent for developing countries' rural areas in 2002, twice the 34 percent for urban areas, using the \$2.15 a day poverty line.<sup>6</sup> This average hides regional variations in urban poverty from 11 percent in Eastern Europe and East Asia to 76 percent in South Asia. Rural poverty rates are more than three times higher than urban rates in Guatemala, Nepal, Tunisia, Uganda, and Vietnam (table A.1).

A.12 Differences in income between rural and urban areas illustrate the rural-urban disparity problem. In half the countries the median urban income (consumption) is at least 80 percent higher than rural income (figure A.2). Rural-urban differences have been increasing in many countries. In India rural and urban incomes were fairly similar in 1951 but the gap has widened substantially since then (box A.2). In China the gap between rural and urban incomes narrowed in the early reform years when rapid agricultural growth drove overall economic growth, but it has since opened again (box A.1).<sup>7</sup> The widening gap in rapidly transforming Asia is a source of growing political tension and major motive behind renewed efforts to stimulate agricultural and rural development.

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<sup>3</sup> Byerlee, Diao, and Jackson (2005).

<sup>4</sup> United Nations (2004).

<sup>5</sup> Ravallion, Chen, and Sangraula (2007).

<sup>6</sup> Ravallion, Chen, and Sangraula (2007).

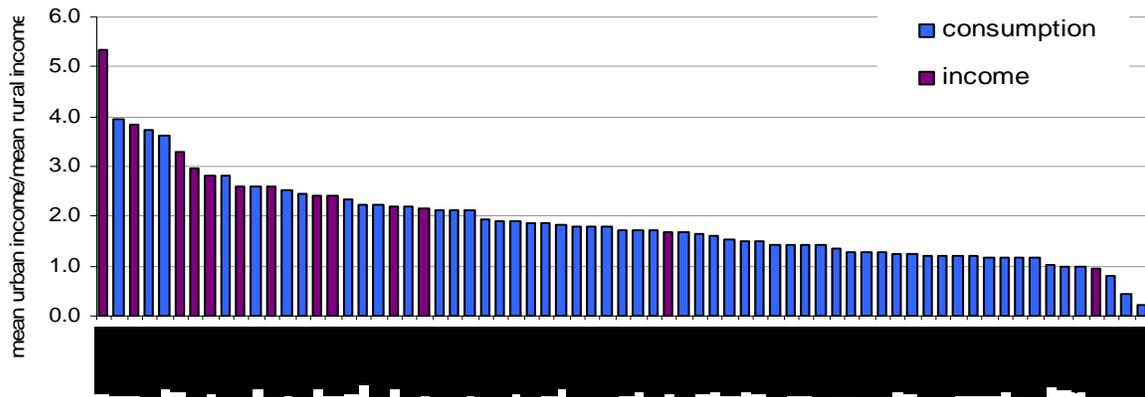
<sup>7</sup> Yang (1994), Ravallion and Chen (2007).

**Table A.1 Changes in rural poverty by country, based on national poverty lines**

	Source	Period	% point change per year in rural	Situation in end-year Poverty rate		Share of poor in rural
				Rural	Urban	
<b>Sub-Sahara Africa</b>						
Benin	(1)	1995 1999	2.0	33	23	70
Burkina Faso	(3)	1994 2003	-1.1	53	20	92
Cameroon	(1)	1996 2001	-1.9	50	22	61
Ethiopia	(1)	1996 2000	-0.5	45	37	87
Ghana	(3)	1992 1999	-2.0	49	19	77
Madagascar	(2)	1993 1999	0.4	77	52	84
Malawi	(2)	1998 2005	-0.3	56	25	95
Nigeria	(1)	1985 1992	-1.9	36	30	67
Senegal	(3)	1994 2001	-0.8	65	46	60
Tanzania	(1)	1991 2001	-0.2	39	29	84
Uganda	(3)	1992 2002	-1.8	42	12	96
Zambia	(3)	1991 1998	-0.3	86	58	72
Zimbabwe	(1)	1991 1996	2.4	48	8	93
<b>South Asia</b>						
Bangladesh	(3)	1992 2000	-1.2	44	26	85
India	(6)	1988 2000	-1.1	26	24	n.a.
Nepal	(1)	1996 2003	-1.2	35	10	96
Pakistan	(1)	1993 1998	0.5	36	24	74
Sri Lanka	(1)	1991 1995	1.3	27	15	90
<b>East Asia Pacific</b>						
China	(1)	1980 2001	-3.0	12	1	n.a.
Indonesia	(3)	1996 2002	2.3	34	16	72
Lao PDR	(1)	1993 1998	-1.5	41	27	87
Vietnam	(3)	1993 2002	-2.3	46	9	94
<b>Middle East and North Africa</b>						
Algeria	(1)	1988 1995	2.0	30	15	59
Morocco	(1)	1991 1999	1.2	27	12	65
Tunisia	(3)	1990 2000	-0.2	10	2	79
<b>Eastern Europe and Central Asia</b>						
Armenia	(4)	1998 2003	1.0	57	46	46
Georgia	(4)	1997 2003	1.7	62	41	61
Moldova	(4)	1998 2002	-3.3	61	47	69
Tajikistan	(4)	1999 2003	-4.0	76	67	76
<b>Latin America and Caribbean</b>						
Bolivia	(3)	1989 2002	-0.5	84	55	47
Brazil	(3)	1993 2001	-0.7	78	47	27
Chile	(5)	1990 2003	-1.4	20	19	14
Colombia	(5)	1991 1999	0.1	62	51	32
Costa Rica	(5)	1990 2002	-0.3	24	18	48
Dominican Rep.	(1)	1992 1998	-1.2	42	21	58
El Salvador	(3)	1991 2000	-1.6	55	29	58
Guatemala	(1)	1989 2000	0.2	75	27	73
Honduras	(5)	1990 2002	-0.2	86	67	61
Mexico	(5)	1989 2004	-0.8	44	33	29
Nicaragua	(5)	1993 2001	-0.7	77	64	47
Peru	(5)	1986 2003	0.2	76	43	39

Source: (1) World Bank DDP; (2) World Bank Poverty Assessments; (3) World Bank Pro-poor growth study; (4) World Bank, ECAPOVII study; (5) ECLAC (6) Deaton and Dreze (2006)

**Figure A.2 Median urban income is at least 80 percent higher than median rural income**



Source: WDR team.

A.13 The rural-urban primary income ratios<sup>8</sup> narrow in all regions over the past 20 years. But both China and India have registered growing inequality.

**Table A.2 Projected rural-urban primary income ratios, purchasing power adjusted**

	1980	1990	2000
Sub-Saharan Africa	0.26	0.41	0.49
Asia (without China and India)	0.29	0.31	0.33
Middle East and North Africa	0.34	0.60	0.47
Latin America and the Caribbean	0.32	0.44	0.49
Europe and Central Asia	0.66	0.67	0.69
India	0.17	0.16	0.11
China	0.41	0.39	0.34

Source: Bezemer and Hazell (2007).

### Why the decline in rural areas—rural development or migration?

A.14 Higher urban incomes have pulled rural-urban migration flows. But to what extent are reductions in rural poverty due to migration or to a genuine decline in poverty among the nonmigrants who stay in rural areas? The answer depends on the patterns of migration.

A.15 Assuming poverty-neutral migration—that is, the poor and nonpoor migrate at the same rate—the observed decline in the rural poverty rate is equal to the actual decline in poverty of rural residents. But if the nonpoor are more likely to migrate—as is documented for many countries—the reduction in rural poverty due to non-migratory causes is even higher than the observed decline in poverty. At the other extreme, if all

<sup>8</sup> Following FAO methodology, ‘rural’ people are defined as households that obtain the majority of their income from agriculture, and conversely for ‘urban’ and non-agricultural income. Agricultural value added is then divided by rural population and nonagricultural value added by urban population. Adjusting for urban-rural price differentials, this gives the rural urban primary income ratio. Bezemer and Hazell (2007).

migrants are assumed to be poor, a lower bound for the genuine reduction of poverty in rural areas is obtained.

A.16 Assuming that all those who migrate are poor, the rural poverty-reducing effect of migration is maximal, yet 81 percent of the reduction in rural poverty (6.8 percentage points of an 8.4 percentage point reduction) is still due to reduction of poverty among rural residents, not to migration (table A.3). Indeed, almost all the decline in South Asia and East Asia is due to a genuine decline in poverty in rural areas. Even when excluding China from the sample, 64 percent of the reduction in rural poverty is from nonmigratory causes. Note, however, that this decomposition is an accounting decomposition and thus does not speak to the indirect ways (such as remittances) through which migration and urban growth contribute to rural poverty alleviation.

**Table A.3 Even assuming that all migrants are poor, 81 percent of poverty reduction in rural areas is due to lower poverty among rural residents**

Region	Rural poverty rate		Change in rural poverty rate for nonmigrants	
	1993	2002	Poverty-neutral migration	All migrants
East Asia Pacific	85.0	63.0	-21.9	-20.0
China	88.6	65.1	-23.6	-22.1
Eastern Europe and Central Asia	19.8	18.7	-1.14	-0.28
Latin America & Caribbean	47.3	46.4	-0.91	7.76
Middle East and North Africa	35.7	37.6	1.89	6.14
South Asia	87.6	87.2	-0.40	-0.03
India	91.6	89.1	-2.43	-2.21
Sub-Saharan Africa	85.3	82.4	-2.77	-1.52
<b>Total</b>	<b>78.1</b>	<b>69.7</b>	<b>-8.40</b>	<b>-6.80</b>
Less China	73.7	71.4	-2.29	-1.47

Notes: Poverty rates are estimated using the 1993 \$2.15 a day poverty line.

Source: WDR calculations, based on data in Ravallion, Chen, and Sangraula (2007).

### Rural areas contribute a large share to the decline in national poverty

A.17 What, then, is the contribution of rural poverty reduction to overall poverty reduction?

A.18 The following equation shows a standard decomposition of the aggregate change in poverty into sectoral changes (rural contribution and urban contribution) and a population shift component. This third component can be interpreted as the change in poverty associated with a migration pattern that would not affect poverty rates in either urban or rural areas.

$$H_t - H_{t-1} = \underbrace{S_t^r (H_t^r - H_{t-1}^r)}_{\text{Rural contribution}} + \underbrace{S_t^u (H_t^u - H_{t-1}^u)}_{\text{Urban contribution}} + \underbrace{(H_{t-1}^u - H_{t-1}^r)(S_t^u - S_{t-1}^u)}_{\text{Rural-urban migration}}$$

A.19 In this equation the rural contribution is the reduction of the rural poverty rate applied to the rural population in 2002. The migration contribution is the transition from rural to urban poverty rate of the migrants, and the urban contribution is the reduction in the urban poverty rate applied to the 2002 urban population (the urban population of 1993 plus the migrants).

A.20 A second specification assumes that all migrants are poor. By assuming migration to contribute maximally to the reduction of poverty in rural areas, this decomposition gives a lower bound for the genuine reduction of aggregate poverty achieved in rural areas. This specification leads to the following decomposition:

$$H_t - H_{t-1} = \underbrace{S_t^r H_t^r - S_{t-1}^r H_{t-1}^r}_{\text{Rural contribution}} + \underbrace{(S_{t-1}^r - S_t^r)}_{\text{Urban contribution (on urban population)}} + \underbrace{S_{t-1}^u H_t^u - S_{t-1}^u H_{t-1}^u}_{\text{Urban contribution (on migrants)}} + \underbrace{(S_t^u - S_{t-1}^u)}_{\text{Urban contribution (on migrants)}} (H_t^u - 1),$$

A.21 In this equation, the rural contribution is due to the reduction of poverty in rural areas for the remaining rural residents, and the urban contribution is the reduction of poverty of the whole urban population (including the migrants). As before, this is a decomposition, which does not preclude that migration or urban growth indirectly contribute to rural poverty alleviation.

A.22 A lower bound for the contribution of the rural sector to the decline in overall poverty is 45 percent, and a more likely contribution is above 55 percent (table A.4). Outside China, the contribution of rural areas is likely to be 83 percent (certainly not less than 53 percent), and in Sub-Saharan Africa more than 80 percent. As in Tanzania, migration and urban success in poverty reduction are not enough in countries that remain largely rural (box A.3). Rural development is thus essential to reduce poverty and achieve the Millennium Development Goal of halving the aggregate poverty rate.

**Table A.4 Contribution of rural sector to aggregate poverty change**

Region	Aggregate poverty rate			Contribution of rural sector to aggregate poverty change	
	1993	2002	change 1993-2002	Poverty-neutral migration	All migrants poor
East Asia Pacific	70.5	45.5	-25.0	53.5	48.9
China	73.8	43.8	-30.0	49.0	46.0
Eastern Europe and Central Asia	16.6	13.6	-3.0	14.1	3.5
Latin America & Caribbean	29.6	32.0	2.4	-8.9	75.9
Middle East and North Africa	23.5	23.5	0.0	--	--
South Asia	85.4	84.2	-1.2	22.6	2.0
India	89.5	86.6	-2.9	60.3	54.7
Sub-Saharan Africa	79.8	77.5	-2.3	81.2	44.7
<b>Total</b>	<b>63.3</b>	<b>54.6</b>	<b>-8.7</b>	<b>55.6</b>	<b>45.0</b>
Less China	59.7	58.2	-1.5	82.6	53.0

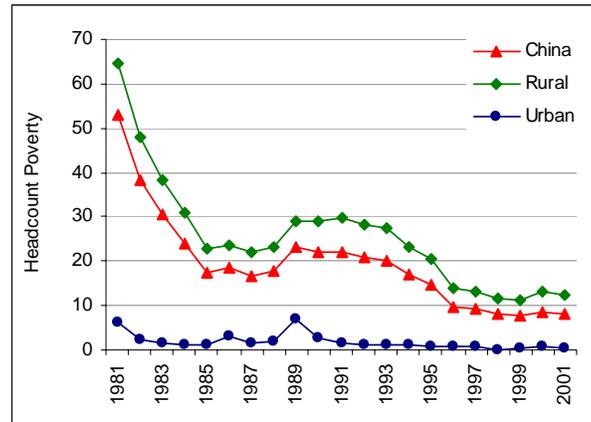
Notes: Poverty rates are estimated using the 1993 \$2.15 a day poverty line.

Source: WDR calculations, based on data in Ravallion, Chen, and Sangraula (2007).

### Box A.1 China's unprecedented reduction in rural poverty

China's poverty reduction in the last 25 years is unprecedented. Estimates by Ravallion and Chen (2007) indicate that poverty fell from 53 percent in 1981 to 8 percent in 2001, pulling about 500 million people out of poverty. Rural poverty decreased from 76 percent in 1980 to 12 percent in 2001, three-quarters of the total (box figure). The evolution of poverty has been very uneven over time, however. The sharpest reduction was in the early 1980s, with some reversals in the late 1980s and early 1990s.

#### Box figure Urban and rural poverty in China



Source: Ravallion and Chen (2007).

#### The policies behind it

The sharp decline in poverty from 1981 to 1985 was spurred by agricultural reforms started in 1978. The household responsibility system, which assigned strong user rights for individual plots of land to rural households, the increase in the government procurement prices, and a partial price liberalization through the dual-track pricing system—all had strong positive effects on incentives for individual farmers. In the initial years of the reforms agricultural production and productivity increased drastically, in part also through farmer's adoption of high-yielding rice varieties.<sup>9</sup> Rural incomes rose by 15 percent a year between 1978 and 1984,<sup>10</sup> and the bulk of poverty reduction between 1981 and 1985 can be attributed to this set of agrarian reforms.

The role of agricultural growth in poverty reduction remained important in the subsequent years, as the reforms led to creation of the rural nonfarm sector, which provided employment and income to millions of people who no longer worked on farms. The share of the rural nonfarm sector in GDP went from close to zero in 1952 to more than one-third in 2004.<sup>11</sup> Considering the entire period, Ravallion and Chen (2007) conclude that growth in agriculture did more to reduce poverty and inequality than either industry or services.

#### Raising inequalities

Higher incomes for large parts of the population came at the cost of higher inequality. Unlike most developing countries China has greater inequality in rural areas.<sup>12</sup> There are also large regional and sectoral imbalances. Restrictions on internal labor migration, industrial policies that favored China's coastal areas over the poorer inland regions, and service delivery biases that allowed the Chinese rural education and health systems to deteriorate—all are examples of policies that contributed to uneven regional and sectoral economic performances.

<sup>9</sup> Yifu Lin (1992).

<sup>10</sup> Von Braun, Gulati, and Fan (2005).

<sup>11</sup> Von Braun, Gulati, and Fan (2005).

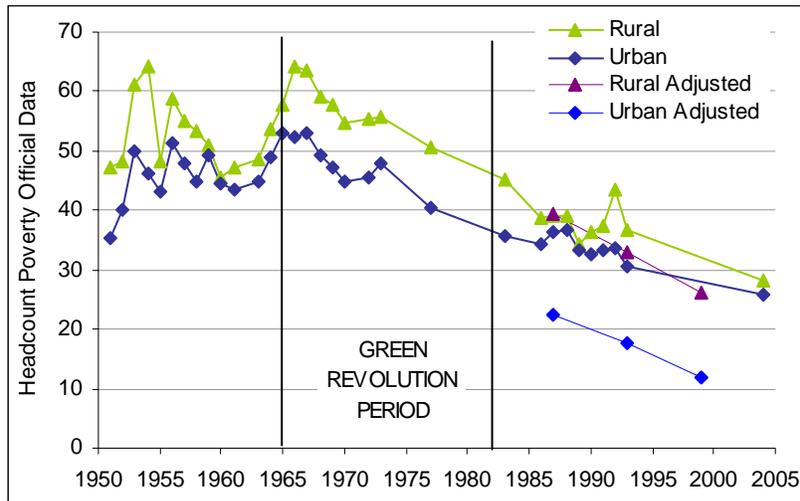
<sup>12</sup> Chaudhuri and Ravallion (2006).

**Box A.2 Reducing rural poverty in India**

**Technology, policies, growth, and poverty reduction**

In the 1960s and 1970s the introduction of modern varieties of wheat and rice led to dramatic leaps in agricultural production and raised farmers’ incomes especially in northwest India. Rural poverty fell from 64 percent in 1967 to 50 percent in 1977 and 34 percent by 1986.<sup>13</sup> Land reform, rural credit, and education policies also played a role in the 1970s and 1980s, even if these redistributive programs might have come at the cost of some economic growth.<sup>14</sup> Beginning in 1991 India instituted macroeconomic and trade reforms that spurred impressive growth in manufacturing and especially in services. Growth had important poverty-reducing effects in both urban and rural areas. According to estimates by Deaton and Dreze (2002) that revise the official poverty lines by adjusting for price differentials, the rural poverty rate fell from 39 percent in 1987-88 to 26 percent in 1999-2000.

**Box figure Urban and rural poverty in India**



Source: Datt (1997,1999) for data until 1993, Official Government estimate for 2004 using Uniform Recall Period (URP) and Deaton and Dreze (2002) for price-adjusted estimates.

**Diverging patterns and a mixed picture of rural welfare**

While there is a consistent poverty-reducing pattern across almost all Indian states, growth has been uneven. States initially poorer grew more slowly, resulting in divergence in both absolute and relative terms. Urban incomes and expenditures also clearly increased faster than rural incomes, reflecting a steady increase in the ratio of urban to rural mean real consumption levels from just below 1.4 in 1983 to about 1.7 in 2000. Even then, India had relatively low-income inequality.<sup>15</sup> Despite impressive growth and poverty reduction in the 1990s, the picture of overall welfare gains is more nuanced, as health outcomes have not improved.<sup>16</sup> India’s recent reforms, unlike China’s, were not directed to the agricultural sectors. Today, there is a renewed policy focus on the agricultural sector in India, as many believe that the full potential of agriculture in India has yet to be unleashed.<sup>17</sup>

<sup>13</sup> World Bank (2000).  
<sup>14</sup> Burgess and Pande (2005).  
<sup>15</sup> Chaudhuri and Ravallion (2006).  
<sup>16</sup> Deaton and Dreze (2002).  
<sup>17</sup> Von Braun, Gulati, and Fan (2005).

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**Box A.3 Slow progress in poverty reduction in Tanzania despite strong urban growth<sup>18</sup>**

Following economic stagnation in the early 1990s, Tanzania has seen sustained gains in per capita output since 1995. But the drop in poverty between 1992 and 2001 was very small: from 38.6 percent to 35.6 percent. Poverty reduction in the capital was much steeper than in the country, declining from 28 percent to 18 percent between 1992 and 2001—this, despite an extremely rapid population growth at an annual rate of 4.4 percent. But only a small fraction of the population lives in Dar Es Salaam, and urbanization in the country is below 20 percent. Overall, 11.6 percent of the decline in the headcount at the national level is attributable to migration from poorer rural areas to wealthier urban areas, mainly the capital, and 55 percent of poverty reduction nationally was attributable to poverty declines in rural areas.

What does this suggest about the potential sources of future poverty reduction in Tanzania? Because both urban poverty reduction and urban rural migration were already rapid during the 1990s, it is very unlikely that either can be an increased source of poverty reduction in the near future. Accelerating the rate of decline of poverty can be accomplished only by reducing poverty in rural areas.

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<sup>18</sup> Box based on Demombynes and Hoogeveen (2004).

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## Chapter 2 Agriculture's performance, diversity, and uncertainties

2.1 In the last World Development Report on agriculture in 1982, a big question was whether agriculture would provide enough food for the world's growing populations. Twenty five years later, it is clear that agriculture has met the demand for food and fiber products *at the global level*. Increasing per capita production, rising productivity, and declining commodity prices all attest to this success. But looking to the future, the world may be entering a period of significant uncertainty—with greater resource scarcity, heightened risks from climate change, and higher energy prices, each having implications for the agriculture-for-development agenda.

2.2 At a disaggregated level, agriculture has been much less successful. It has yet to stimulate sufficient growth in agriculture-based countries, especially in Sub-Saharan Africa, to allow them to achieve a sustained structural transformation (chapter 1). And agricultural incomes almost everywhere are not rising enough to produce rapid reductions in rural poverty, leaving 800 million of the rural population in extreme poverty.

2.3 Even countries with good overall agricultural performance have regions that have not participated in the growth process because of marginal production conditions, poor policies, or low investments. The agricultural challenge in these regions is to sustainably intensify production in diverse farming systems, while improving infrastructure and markets.

2.4 For the countries that have led the global increase in food production, especially the transforming countries of Asia, the challenge is different—how to sustain income growth and poverty reduction in the face of declining prices of grains and traditional tropical exports. Increased demand for high value horticulture and livestock in rapidly growing economies offers farmers opportunities to diversify into new markets.

2.5 This chapter begins with a brief overview of recent trends and varied performance. The considerable diversity of agricultural production conditions highlights different challenges by regions, countries, and zones within countries. New tools provided by geographic information systems are used to characterize agricultural production systems and interpret differences in performance.

### **Agriculture as a global success driven by productivity growth in developing countries**

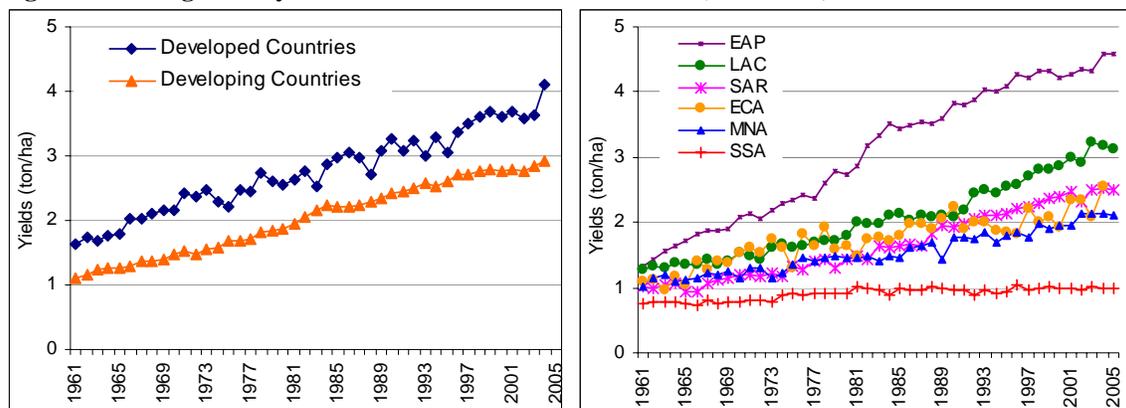
2.6 The global performance of agriculture has been impressive. From 1980 to 2004 total agricultural GDP expanded by an average of 2.0 percent a year, more than population growth of 1.6 percent a year. Growth driven by increasing productivity has led to a decline in the real price of grains of about 1.8 percent per year over the same period.

2.7 Developing countries have achieved much faster growth (2.6 percent a year) than industrial countries (0.9 percent a year). Indeed, they accounted for an impressive 79

percent of overall agricultural growth during this period. Their share of world agricultural GDP has risen from one half in 1970 to nearly two thirds in 2004.

2.8 Developing country performance has been driven largely by the transforming economies in Asia, which accounted for two-thirds of agricultural growth in the developing world<sup>1</sup>. Productivity growth rather than area expansion has been the major contributor to growth in Asia and the developing world more generally. Cereal yields in Asia, for example, have increased by 2.7 percent per year, compared with 1.8 percent in industrial countries in the period 1961-2004 (figure 2.1). Productivity has been rising and prices declining both for cereals, especially for rice the developing world's major food staples, and for traditional developing world export products, such as cotton and coffee (box 2.1).

**Figure 2.1 Rising cereal yields but not in Sub-Saharan Africa (1961-2005)**



Notes: SSA: Sub Saharan Africa, SAR: South Asia, EAP: East Asia Pacific, MNA: Middle East and North Africa, ECA: Eastern Europe and Central Asia; LAC: Latin America and Caribbean. ECA numbers include USSR until 1991.

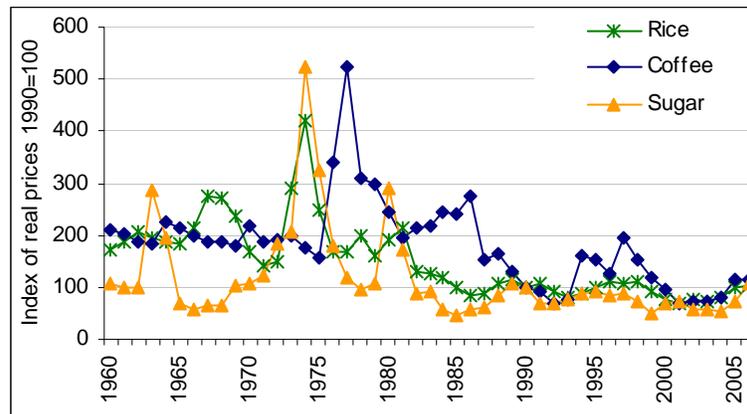
Source: FAO (2006a).

### Box 2.1 Agricultural commodity prices are declining in world markets

Since the early 1960s the value of agricultural exports has quadrupled in real terms, but the share of agricultural trade in total merchandise trade has followed a long downward trend from more than 20 percent in the early 1960s to less than 10 percent in recent years. Strong productivity growth and inelastic demand have pushed down the real prices of agricultural commodities by about 2 percent a year since 1961, continuing a long-term trend over a century.<sup>2</sup> Other factors contributing to this decline include intense global competition, reduced transport costs, and synthetic alternatives to some commodities. In some cases, the appearance of major new producers has also sharply altered the market balance, such as Vietnam's rapid rise to become the world's second largest coffee exporter. Export subsidies in some developed countries have also reduced export earnings of developing countries that export the commodities most affected by these subsidies, such as sugar and cotton (chapter 4).

<sup>1</sup> This chapter presents data according to World Bank regions, which can be approximated to the typology introduced in chapter 1 in the following way: agriculture based: Sub Saharan Africa (SSA); transforming: South Asia (SA), East Asia Pacific (EAP) and Middle East and North Africa (MENA); Urbanized: Eastern Europe and Central Asia (ECA) and Latin America and the Caribbean (LAC) (see table 1.1).

<sup>2</sup> FAO (2004).

**Box figure Agricultural commodity prices are declining in world markets**

Source: Commodity Price Data, Development Prospects Group, World Bank.

2.9 Since the 1960s rising productivity has replaced land expansion as the major source of growth. Widespread use of three major inputs—irrigation, modern varieties, and fertilizer—has resulted in a historically unprecedented increase in crop yields in developing countries, beginning with the Green Revolution in the late 1960s. This success has extended well beyond the irrigated areas to embrace huge areas of rainfed agriculture, but has yet to benefit Sub-Saharan Africa (figure 2.2).

2.10 For millennia, Asian agriculture has been intensified through irrigation, which expanded through the 1990s and into the 2000s. Today 39 percent of the crop area in South Asia is irrigated, 29 percent in East Asia and the Pacific, but only 2.6 percent in Sub-Saharan Africa.

2.11 Modern crop varieties for major food staples, rice, wheat, and maize began to be widely adopted in the 1960s. The area of modern varieties has continued to expand and by 2000 they were sown on 72 percent of the rice area in developing countries, 86 percent of the wheat area, and 56 percent of the maize area, up from an average of 10 percent in 1970.<sup>3</sup>

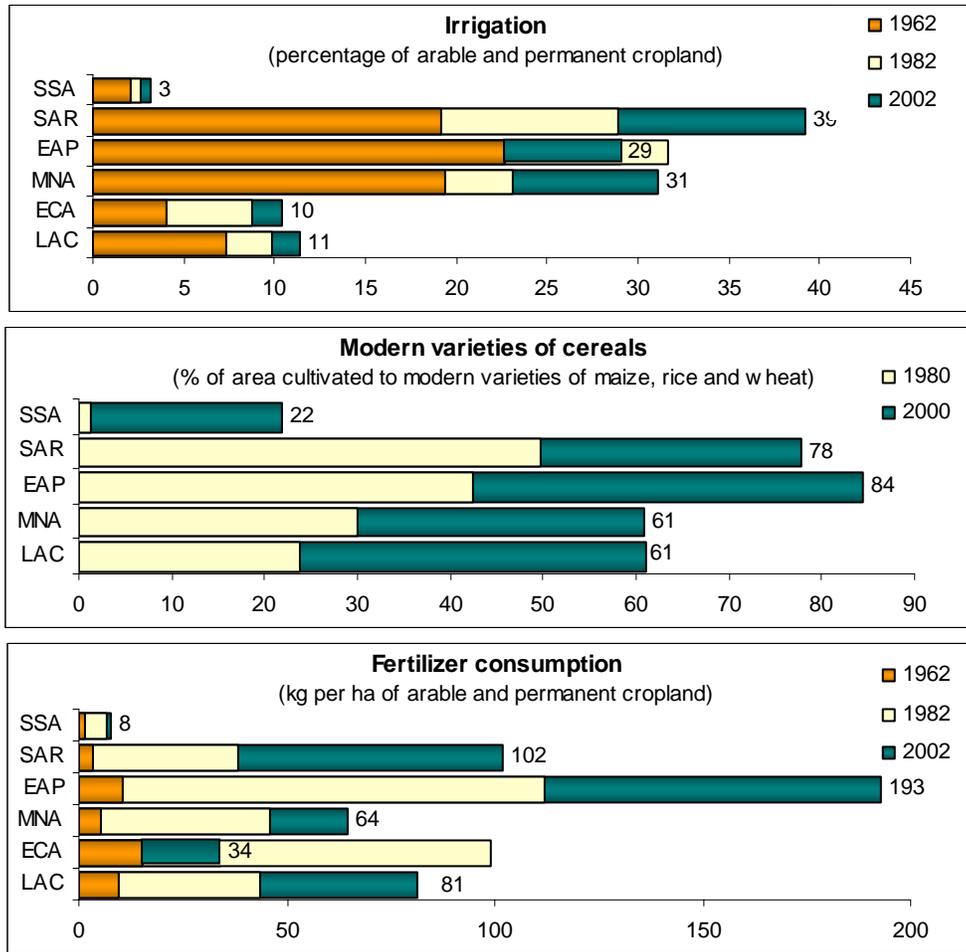
2.12 Chemical fertilizer use has also shown remarkable expansion in much of the developing world. Developing countries' share of global fertilizer consumption has increased from less than 12 percent in the 1960s to more than 60 percent today. Asian farmers are the major users of fertilizer, with consumption sharply increasing from an annual average of 6 kilogram per hectare in 1961-63 to 136 in 2001-03,<sup>4</sup> above the level for developed countries. Studies estimate that higher fertilizer use accounted for at least 20 percent of all growth in developing country agriculture (excluding dryland agriculture) over the past three decades.<sup>5</sup>

<sup>3</sup> Evenson and Gollin (2003).

<sup>4</sup> FAO (2006a).

<sup>5</sup> Based on studies of decomposition of agricultural growth by McKinsey and Evenson (2003), Mundlak, Larson, and Butzer (2004), Huang and Rozelle (1995), Fan and Pardey (1997).

**Figure 2.2 Use of modern inputs has expanded rapidly in nearly all regions**



Notes: SSA: Sub Saharan Africa, SAR: South Asia, EAP: East Asia Pacific, MNA: Middle East and North Africa, LAC: Latin America and Caribbean. No data available on modern varieties adopted in Eastern Europe and Central Asia.

Source: FAO (2006a) and Evenson and Gollin (2003).

2.13 But crop production could not have produced the growth rates achieved without livestock, one of the fastest growing subsectors of agriculture in developing countries, where it already accounts for a third of agricultural GDP.<sup>6</sup> Production of meat has doubled over the last 15 years, led by a 7 percent annual increase in poultry.

2.14 The combination of these breakthroughs led to steady growth in total factor productivity, especially in Asia at 1-2 percent a year.<sup>7,8</sup> It contributed about 50 percent of output growth after 1960 in China and India, and 30-40 percent in Indonesia and Thailand, greatly reducing pressure on increasingly scarce land.<sup>9</sup> Investments in science,

<sup>6</sup> Bruinsma (2003).

<sup>7</sup> Timmer (2002).

<sup>8</sup> Ruttan (2002).

<sup>9</sup> Mundlak, Larson, and Butzer (2004).

roads, and human capital from the 1960s, combined with better policies and institutions, have been the major drivers.<sup>10</sup>

2.15 Decompositions of productivity gains consistently point to investment in R&D and improved varieties.<sup>11</sup> For example, hybrid rice alone is estimated to have contributed half of rice yield gains in China from 1975-90.<sup>12</sup> Likewise, improved varieties contributed 53 percent of total factor productivity gains in the Pakistan Punjab from 1971 to 1994. Even in Africa the impact of R&D has been robustly identified as important in its limited productivity growth.<sup>13</sup> The importance of infrastructure, especially roads, has been shown for Asia. In India, investment in rural roads is estimated to have contributed 25 percent of the growth in agricultural output in the 1970s, with high payoffs.<sup>14</sup> And human capital has been repeatedly shown to increase aggregate productivity through education, health, and nutrition.<sup>15</sup> One study for Sub-Saharan Africa found a significant positive impact of calorie availability on agricultural productivity, providing evidence of the interdependence of malnutrition, hunger, and agricultural growth (focus C).<sup>16</sup>

2.16 Policy and institutional change are also likely to have been major sources of productivity growth, though few studies have explicitly quantified the impacts. One exception is the well documented impact of the household responsibility system in China, where institutional and policy reform was the dominant factor promoting growth and reducing rural poverty during 1978-84.<sup>17</sup> Institutions and policies thus strongly complement investments in R&D, infrastructure, and human capital.

### **Uneven growth across regions and countries**

2.17 The progress in developing countries as a group has been influenced by the significant gains in Asia, most importantly in China. Growth in Sub-Saharan Africa has averaged nearly 3 percent over the past 25 years, around the average for all developing countries. But the growth per capita of agricultural population in Sub-Saharan Africa (a measure of agricultural income), has been only 0.9 percent, less than half of any other region, and well below the star performer, East Asia, with 3.1 percent. Latin America had lower overall agricultural growth than Sub-Saharan Africa but with a declining agricultural population, the per capita growth has averaged a healthy 2.8 percent a year (figure 2.3).

2.18 Within regions there is wide variation in performance among countries, as measured by agricultural GDP per capita of agricultural population (figure 2.4). Countries of Asia with high growth rates, such as China (3.5 percent), Malaysia (3.4

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<sup>10</sup> Based on studies of decomposition of agricultural growth by McKinsey and Evenson (2003), Mundlak, Larson, and Butzer (2004), Huang and Rozelle (1995), Fan and Pardey (1997).

<sup>11</sup> Fan, Zhang, and Zhang (2000), McKinsey and Evenson (2003), Rozelle and others (2003).

<sup>12</sup> Huang and Rozelle (1996).

<sup>13</sup> Thirtle, Hadley, and Townsend (1995), Lusigi and Thirtle (1997).

<sup>14</sup> Binswanger, Khandker, and Rosenzweig (1993), Mundlak, Larson, and Butzer (2004), Fan, Zhang, and Zhang (2000).

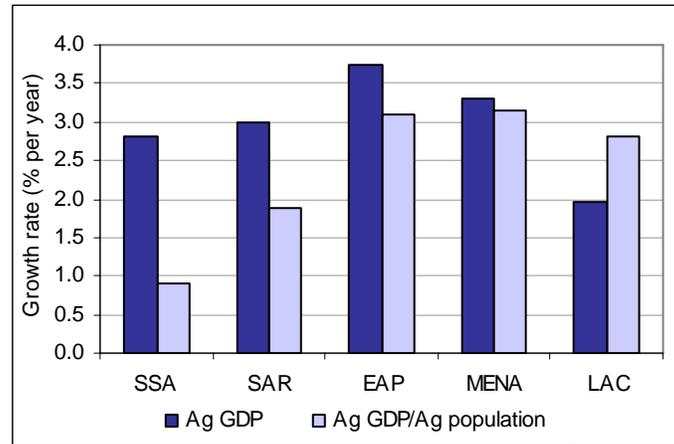
<sup>15</sup> Foster and Rosenzweig (1996).

<sup>16</sup> Frisvold and Ingram (1995).

<sup>17</sup> Fan, Zhang, and Zhang (2004).

percent), and Vietnam (2.4 percent), were also star performers in rural poverty reduction (focus A). But others with relatively high per capita growth rates, such as Pakistan (2.4 percent), have been less successful in reducing poverty, mainly due to highly unequal ownership and access to productive assets such as land and irrigation water.<sup>18</sup> In the urbanized economies, agricultural growth per capita of agricultural population has been generally high, but often not accompanied by significant reduction in rural poverty, as in Brazil.

**Figure 2.3 Regional variations in growth rates in agricultural GDP, 1980-2004**



*Notes:* SSA: Sub Saharan Africa, SAR: South Asia, EAP: East Asia Pacific, MNA: Middle East and North Africa, LAC: Latin America and Caribbean. No data for the period available for Eastern Europe and Central Asia

*Source:* World Bank (2006f) and FAO (2006a).

2.19 The distinguishing feature of Sub-Saharan growth is the high variability among countries and over time. Over the past 25 years only Nigeria, Mozambique, Sudan, and South Africa maintained agricultural per capita growth rates above 2 percent a year. Six countries experienced negative per capita growth, and another seven had rates below 1 percent a year. Many other countries have experienced significant periods of negative growth associated with conflicts or economic crises.

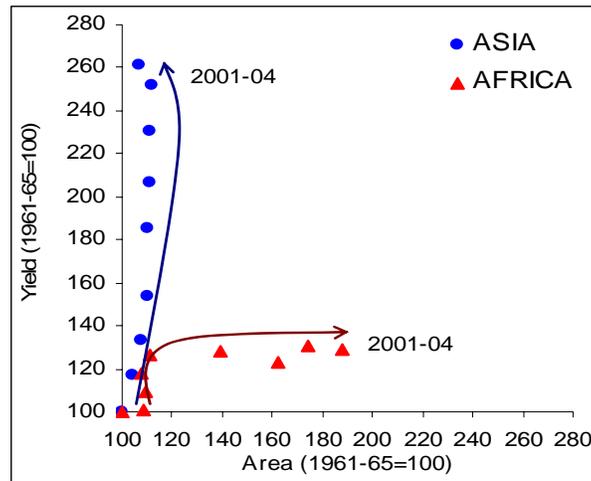
2.20 Another characteristic of Sub-Saharan Africa has been the generally poor performance of yields of food staples. The Green Revolution breakthrough in cereal yields that jump-started Asian agricultural and overall economic growth in the 1960s and 1970s has not reached Africa, where stagnant yields reflect low adoption of productivity-enhancing modern seeds, fertilizer, and irrigation (figure 2.2). There are many reasons for this difference between Asia and Africa—dependence on heterogeneous rainfed agriculture, diversity of food crops, poor infrastructure, policy discrimination against agriculture, and low investment (box 2.2).

<sup>18</sup> World Bank (2006d).

### Box 2.2 The Green Revolution in food staples that didn't happen: Africa's variegated palette<sup>19</sup>

The expansion of food production has taken a quite different course in Sub-Saharan Africa. Increases in food staples have been achieved largely by expanding the area cultivated (box figure). Low productivity and stagnant yields reflect many factors.

#### Box figure A Expansion of cereal production has followed very different paths in Sub-Saharan Africa and Asia (1961-65 =100)



Note: Each point represents five-year averages, starting with 1961-65 =100.

Source: FAO (2006a).

**Population density—low?** To some extent land extensification in Africa reflects differences in population density and land availability. The population density of 29 persons per square kilometer in Sub-Saharan Africa is only one-tenth of that in South Asia. Yet population densities in many areas of Sub-Saharan Africa have reached levels where growth through land expansion under rainfed conditions is no longer sustainable. When population density is adjusted for land quality, densities in much of Sub-Saharan Africa are similar to those in Asia in many countries. For example, the land-quality-adjusted population density in Kenya is estimated to be higher than that of Bangladesh.<sup>20</sup>

**Geography and agro-ecology—diverse.** Other reasons include Africa's intrinsically different agro-ecological characteristics. The main Green Revolution cereals in Asia were wheat and rice, grown largely in irrigated conditions. Only 2.6 percent of Sub-Saharan Africa's arable land is irrigated. Instead, Africa's diverse rainfed agro-ecologies use a wide range of farming systems and a broad number of staples (from cassava in central Africa to millet and sorghum in the Sahel). What does such heterogeneity in crop production and agro-ecological conditions mean? In Africa improved varieties for many different crops will be needed to increase productivity. Outside technologies are not often directly transferable and Africa-specific technologies are needed to improve its agricultural productivity (chapter 7). Yet the trend for R&D spending was stagnant in the 1990s.

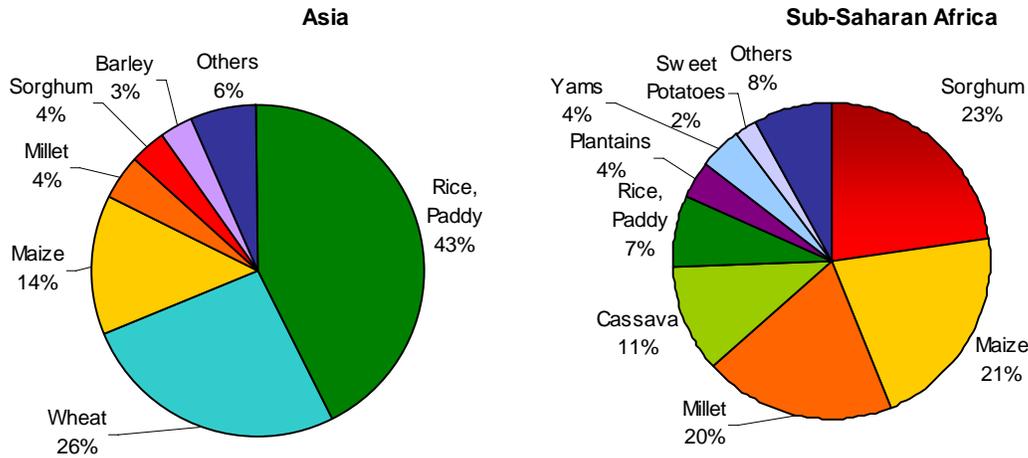
**Infrastructure—undeveloped.** Africa is massively disadvantaged in infrastructure. Its markets are far less developed in part because road densities are also much lower in Africa than they were in Asia at the time of the Green Revolution, increasing transaction costs and market risks. African countries are small, many of them landlocked, and barriers to trade are relatively high due to trade restrictions and prohibitive transport costs. High costs of transport and transactions, coupled with low volumes and uncertain

<sup>19</sup> This box draws on Cummings (2005), Djurfeldt and others (2006), Harrigan (2003), Johnson, Hazell, and Gulati (2003), Maredia, Byerlee, and Pee (2000), Mosley (2002), Pardey and Beintema (2001), Spencer (1994) and Borlaug and Dowswell (2007).

<sup>20</sup> Binswanger and Pingali (1988).

government policies in exchange rates and price setting, have prevented private agents from efficiently engaging in input and output markets.

**Box figure B Sub-Saharan Africa produces a greater variety of crops than Asia**  
(area harvested in hectares, average 2000-2004)



Source: FAO (2006a).

**Fertilizer—low adoption.** Largely due to poorly developed markets, fertilizer use has stagnated at very low levels, one of the main reasons for the region's low agricultural productivity relative to Asia. African farmers must sell on average about twice as much grain as Asian and Latin America farmers to purchase a kilogram of fertilizer given its high price.<sup>21</sup> Low volumes, high prices, high transport costs, and undeveloped private input markets are major barriers to fertilizer adoption in Africa (chapter 6).

**Policies—historically distorted.** Asia overcame some of these problems by providing support prices, credit, and input subsidies to farmers to reduce risks and increase profitability. In Africa governments also intervened heavily in markets, but agriculture was taxed higher than in other regions—and still is (chapter 4). Although Kenya, Malawi, Zambia, and Zimbabwe initiated maize-based revolutions based on hybrid seed and fertilizer, they have been difficult to sustain, due to high marketing costs and frequent weather shocks.

**Soils—degraded.** The combination of shorter fallows, land expansion to more fragile soils, and a lack of use of fertilizer is causing a crisis of soil degradation in Sub-Saharan Africa. About 75 percent of the farmland in Africa is affected by severe degradation, due to mining soil nutrients. According to a recent report by the International Fertilizer Development Center, the average rate of soil nutrient depletion is 52 kilogram of NPK per hectare per year, five times the average application of 10 kilograms per hectare of nutrients through chemical fertilizers.<sup>22</sup> Soil nutrient mining is highest in areas of high population density. For example, the estimated annual productivity loss in the Ethiopian highlands from soil degradation is 2-3 percent of agricultural GDP a year.<sup>23</sup> Clearly the decline of soil fertility is a large part of the reason for Africa's food crisis, so reversing it must be a high priority.

**Turning the corner?** Recent evidence suggests that Sub-Saharan Africa may be turning the corner. There are many localized successes in food crop production, such as maize in several West African countries, beans in Eastern Africa, cassava in many countries, market driven fertilizer expansion for maize in Kenya and many promising technological innovations in the early stages of adoption (chapter 7). The challenge is to achieve productivity gains in diverse rainfed systems by coordinating investments in technology with investments in institutions and infrastructure to provide the complementary development of input and output markets.

<sup>21</sup> Morris and others (2007).

<sup>22</sup> Henao and Baanante (2006).

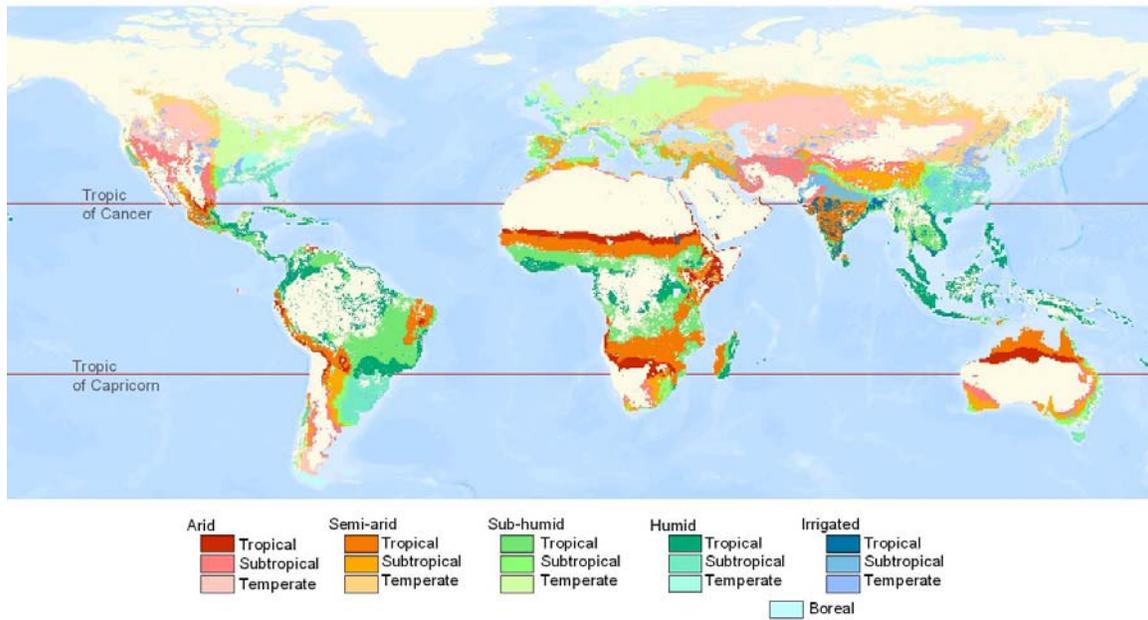
<sup>23</sup> Köhlin (2006).

### Performance reflects different underlying conditions

2.21 The different performance of countries and regions in part reflects the huge diversity of agricultural production systems with respect to agro-climatic potential, population density, investments in infrastructure and technology. Many of these factors can now be readily quantified and mapped against agricultural areas and populations using geographical information systems.

2.22 Agricultural potential, especially that of rainfed agriculture, is obviously sensitive to soils, temperature, and rainfall. At a global level, two-thirds of the developing world’s rural population (2 billion) lives in areas with favorable agro-ecological potential—that is, irrigated areas or rainfed areas with reliable moisture<sup>24</sup> (41 percent and 27 percent of the rural population, respectively) (map 2.1). But one-third (925 million) lives in less favored rainfed regions, characterized by frequent moisture stress that limits agricultural production. Although these areas account for 54 percent of the agricultural area (44 percent of the cropped area), they produce only 30 percent of total value of agricultural production. Latin America, the Middle East and North Africa, and Sub-Saharan Africa all have fairly high shares of rural population in these moisture-stressed areas (figure 2.4).

Map 2.1 Agro-ecological zones within the extent of agriculture



Notes: The extent of agriculture includes areas with at least 10 percent irrigated, cultivated or grazing lands, net of areas with a growing season of zero days.

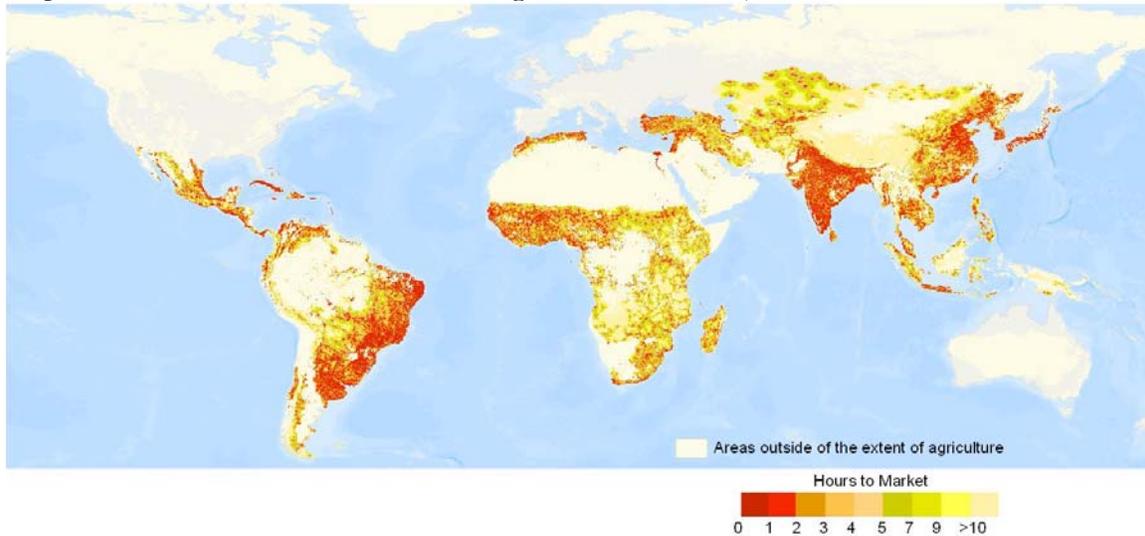
Source: Sebastian (2007a), climate data derived from FAO/IIASA (2001); irrigated areas from Siebert and others (2006), SAGE crop and pasture lands from Ramankutty (2002) and Ramankutty (2005).

2.23 Performance also relates to access to markets and services. Rural areas by definition are spatially dispersed, which affects transport costs, the quality of general

<sup>24</sup> A reliable growing period is defined as having a length of growing period greater than 150 days.

public services and reliance on subsistence production. In developing countries, 16 percent of the rural population (420 million) lives in areas with low market access, measured as more than five hours to reach a market town of 5,000 or more (map 2.2). Note that about half the agricultural area in these remote regions has good agricultural potential but lacks the institutions and infrastructure to integrate into the wider economy. The percentage of the rural population with poor market access is much higher, over 30 percent, in Sub-Saharan Africa and the Middle East and North Africa. In South Asia only 5 percent live in remote areas by this definition and 17 percent in East Asia and the Pacific. In South Asia only 5 percent live in remote areas by this definition and 17 percent in East Asia and the Pacific.

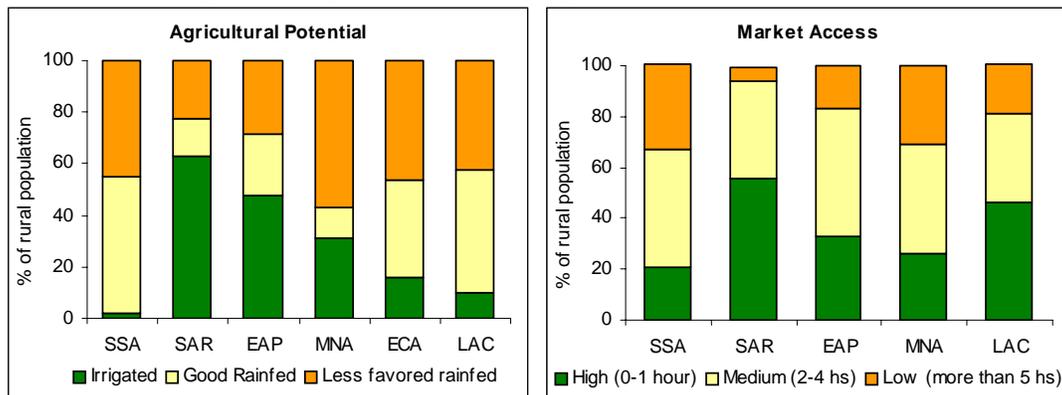
**Map 2.2 Market access within the extent of agriculture for Africa, Asia and Latin America**



*Notes:* The extent of agriculture includes areas with at least 10 percent irrigated, cultivated or grazing lands, net of areas with a growing season of zero days.

*Source:* Nelson (2006) and Sebastian (2007b).

**Figure 2.4 Diverse agricultural potential and varying distances to markets (2000)**

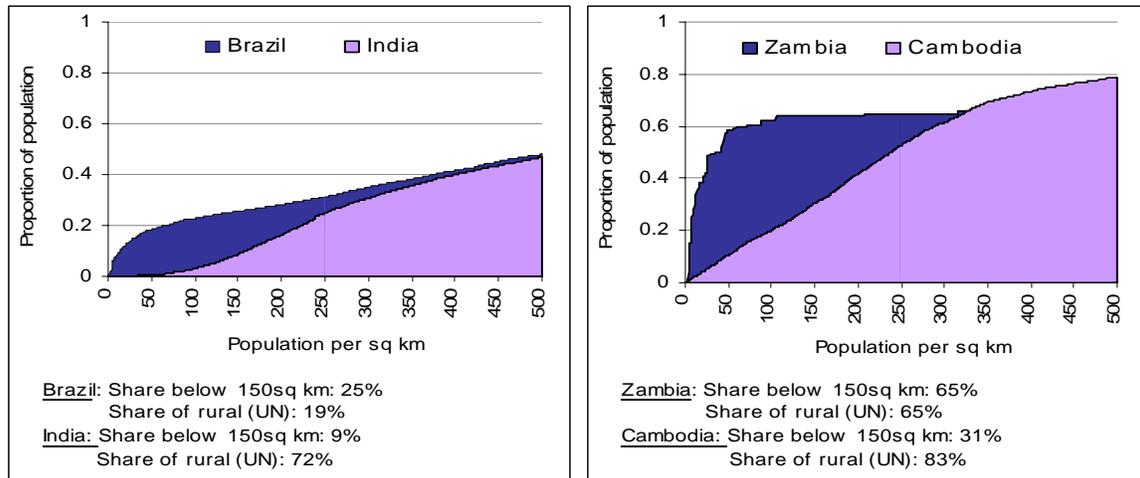


*Notes:* SSA: Sub Saharan Africa, SAR: South Asia, EAP: East Asia Pacific, MNA: Middle East and North Africa, LAC: Latin America and Caribbean. No data for market access are available for Europe and Central Asia

*Source:* Authors calculations based on Sebastian (2007a) and Sebastian (2007b).

2.24 Market access is closely related to population density. Worldwide there is enormous heterogeneity in population densities. In India less than 1 percent of the population lives in areas with fewer than 50 people per square kilometer, compared with 20 percent in Brazil and 60 percent in Zambia (figure 2.5). Zambia’s population distribution is quite uneven, Cambodia’s population is relatively equally distributed.<sup>25</sup> This also means that national definitions of rurality can have quite different meanings in different countries (box 2.3).

**Figure 2.5 The distribution of population densities within a country varies widely (total population)**



Source: Center for International Earth Science Information Network (CIESIN) (2006), United Nations (2004).

**Box 2.3 Definitions of rurality**

Definitions to classify areas as rural differ across countries. Rural areas can be defined by settlement size, population density, distance to metropolitan areas, administrative divisions, and importance of the agricultural sector. For example, Brazil uses administrative divisions, and reports 19 percent of the population as rural. The OECD uses population density of 150 per square kilometers to define what is rural. Applying this definition to Brazil would increase the rural population to 25 percent. India reports 72 percent of the population as rural, but the OECD definition would reduce that to only 9 percent. Even heavily agricultural areas in India would not be rural under this definition.

2.25 Differences in population density and distance to market towns imply very different challenges for infrastructure, service delivery, and rural development. High population density makes it cheaper to provide public goods, such as roads. Low population density increases the cost of such investments but eases constraints of land resources.

2.26 The combination of agro-climatic potential and market access provides a working definition of areas that are marginal for agriculture, at least for market-oriented production. Almost 65 percent of Sub-Saharan Africa’s rural population is found in areas

<sup>25</sup> Some of the differences between the specific country examples cited here might be due to differences in the level of disaggregation at which population density data is available, but the heterogeneity can be found across a wide variety of countries, independent of data quality.

with either low agricultural potential or poor market access, compared with 40 percent for developing countries as a whole, and only 25 percent for South Asia. The most difficult areas have both low agricultural potential and poor market access. Fifteen percent of the population of Sub-Saharan Africa lives in these areas compared with a developing country average of 7.5 percent (3.5 percent in South Asia).

2.27 These characteristics are not immutable. Investments can convert marginal areas defined by low rainfall or poor roads into high potential areas. The most common example is irrigation, which has made some of the world's deserts bloom, transforming agricultural systems and livelihoods.

### ***Within-country heterogeneity: Marginal areas and poverty***

2.28 Even countries that have strong overall agricultural growth have lagging regions where despite high dependence on agricultural incomes, productivity is low (box 2.4). In many cases, these regions are characterized by relatively low agricultural potential or poor market access relative to other regions in the same country. Lagging areas can also be the result of social processes, with specific territories left aside by public policies—as with indigenous communities in Central America—or by poor governance. The most difficult regions are those that combine poor agro-ecological endowments, isolation and social marginalization.

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#### **Box 2.4 Lagging regions in countries with high agricultural growth: Different causes**

##### **Brazil's Northeast—Low agricultural potential next to a bread basket**

Brazil's agricultural growth of 5.3 percent a year during the 1990-2004 period was led by agricultural exports from the south and center regions of the country. Agricultural GDP growth in these states was impressive (Mato Grosso, 14.8 percent a year, Goiás, 6.8, Paraná 6.7 and Mato Grosso do Sul, 5.3). However, this performance does not reflect that of the entire country. Alongside a rural Brazil that is a global leader in several agricultural exports, is another rural Brazil, with widespread poverty and deprivation affecting millions of people in semi-subsistence farming. The northeast of Brazil has the country's highest rural poverty rates (76 percent) and represents largest concentration of rural poor in Latin America.<sup>26</sup> States in the Northeast were among the poorest performers in the country for the period 1990-2004, some with negative growth rates (Ceará -4.3 percent a year, Rio Grande do Norte, -2.3 and Sergipe, -0.5)<sup>27</sup>. The Northeast's paucity of natural resources and climatic instability, (with droughts occurring on an average of every five years), is accentuated by the fragile equilibrium of its ecosystems. Nearly two thirds of its soils are not suitable for farming, a situation only aggravated by centuries of use patterns (particularly for livestock) that degraded soils and limited its capacity to absorb water.

##### **Peruvian Andes—Isolated areas have not participated in rapid agricultural growth**

Recent economic growth in Peru has been driven by growth in the mining and agricultural sectors, with annual growth rates close to 7.9 and 3.8 percent respectively in 1997-2004. Growth in these sectors helps to explain why rural areas appear to have done relatively better than urban ones in terms of poverty reduction after the 1998-99 economic crisis. However, poverty reduction in rural areas has been unequal across geographic regions. Estimates of output-elasticity of poverty show that rural poverty appears to be most responsive to growth in the Coastal regions (output-elasticity between -0.941 and -1.323), and least responsive in the Sierra regions (output-elasticity between -0.559 and -0.873).<sup>28</sup> This fact can be explained

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<sup>26</sup> World Bank (2007a).

<sup>27</sup> Source: IPEA, Agricultural GDP in constant 2000 Reais.

<sup>28</sup> World Bank (2005).

among other reasons by the geography of the Andean region which isolates towns from the rest of the economy. The mountainous structure increases the costs of road construction. In some areas, it is necessary to walk for several hours to get to a market town, health center, or public school. The distance to markets encourages subsistence agriculture using few purchased inputs, with about 20 percent of agricultural production for own consumption, labor exchanges characterized by reciprocity and poor opportunities for nonagricultural income despite the low productivity of land. These isolated areas have the highest poverty rates of the country (\$1 a day poverty rates of more than 65 percent)<sup>29</sup> and even though agricultural income represents more than 75 percent of total income, they did not benefit from recent agricultural growth.

### **India's Bihar - Meeting the challenges of governance in areas with high agricultural potential**

Bihar is well endowed with fertile land and water resources with the potential to achieve productivity levels equivalent to the more developed agrarian states of India.<sup>30</sup> However, the state's agricultural performance lags seriously behind national trends. Employing 80 percent of Bihar's workforce and generating nearly 40 percent of its gross domestic product, agriculture has performed particularly poorly, declining in the early 1990s by 2 percent a year and growing by less than 1 percent a year since 1995, half of the national average. Bihar's agricultural sector has been plagued with numerous problems and constraints for a long time, including low productivity, slow diversification into higher value crops, poorly developed rural infrastructure, inadequate investments to expand and maintain surface irrigation systems, small and fragmented farms with widespread illegal land tenancy, lack of transparency in product marketing and inadequate public research and extension services.

Bihar faces serious challenges to improve growth performance and strengthen public administration, services delivery and the investment climate. Government's efforts in addressing the needs of farmers and delivering on support services have had little success. This lack of success has been due largely to lack of a clear strategy, weak institutional capacity and the absence of accountability, as well as concerns about security and lawlessness. Alternative organizational models focusing on community involvement and transfer of responsibilities in delivering agricultural technology and surface irrigation have emerged and are enjoying some success.<sup>31</sup>

2.29 It is commonly stated that agricultural and rural investments should be directed to marginal areas because poor people are concentrated there. Others dispute this.<sup>32</sup> Recent advances in geographic information systems provide new opportunities to pursue basic questions about the spatial distribution of rural poverty in relation to agriculture.<sup>33</sup>

2.30 Analysis in Brazil, Cambodia, Ecuador, Kenya, and Thailand shows that poverty rates tend to be high in marginal areas defined by low rainfall or poor market access. This is especially true for remoteness. In Brazil, Ecuador, and Thailand poverty headcount rates are higher in low access areas than in more accessible areas. Poverty is also deeper and more severe in the more remote areas of these countries. In Ecuador poverty rates are negatively correlated with agricultural potential, but this association is less clearly marked in Brazil and Thailand (figure 2.6).<sup>34</sup> In Cambodia and Kenya it is even more difficult to discern a systematic association between poverty and either of the

<sup>29</sup> Escobal (2005).

<sup>30</sup> World Bank (2006c).

<sup>31</sup> World Bank (2006b).

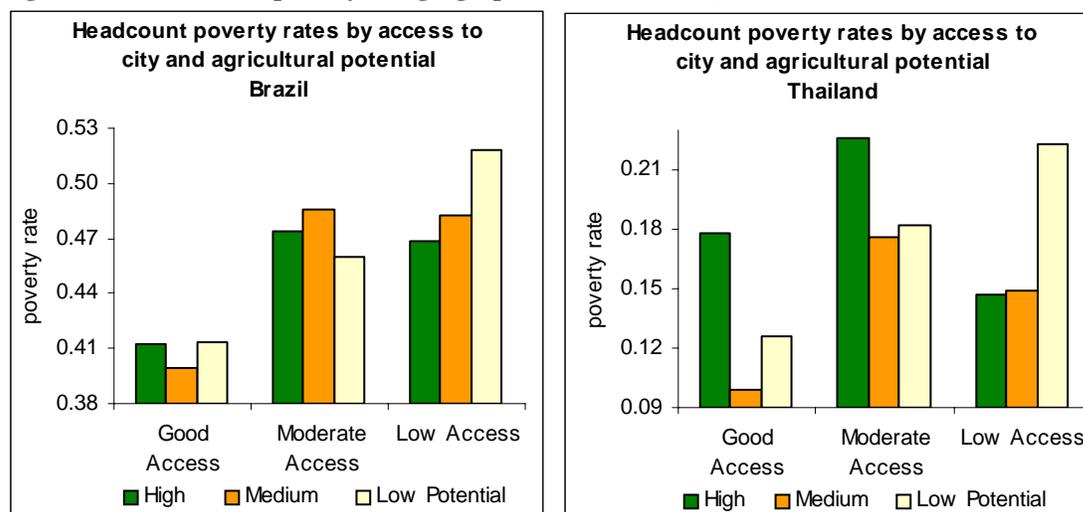
<sup>32</sup> Renkow (2005).

<sup>33</sup> Buys, Ferre, and Lanjouw (2007)

<sup>34</sup> A similar pattern is evident in a recent study in Vietnam Minot, Baulch, and Epprecht (2003).

classifications of accessibility and agro-potential, possibly because poverty rates are very high everywhere, or because integration with international markets is lower.<sup>35</sup>

**Figure 2.6 Incidence of poverty and geographic characteristics, Brazil and Thailand**



*Note:* High agro-potential areas are those with very high or high agro-potential under the GAEZ (Global Agro Ecological Zones) classification, created by FAO and IIASA in 2000. Medium agro-potential areas are those with a medium or moderate GAEZ classification. Low agro-potential areas are those classified as low, marginal, or very marginal in the GAEZ classification. Good access is defined as travel time of no more than two hours to the nearest city with a population of 100,000 or more, moderate between two and five hours, and low access more than five hours. The share of the poor population for Brazil is calculated for rural areas at the district level, and for Thailand at the tambon level.

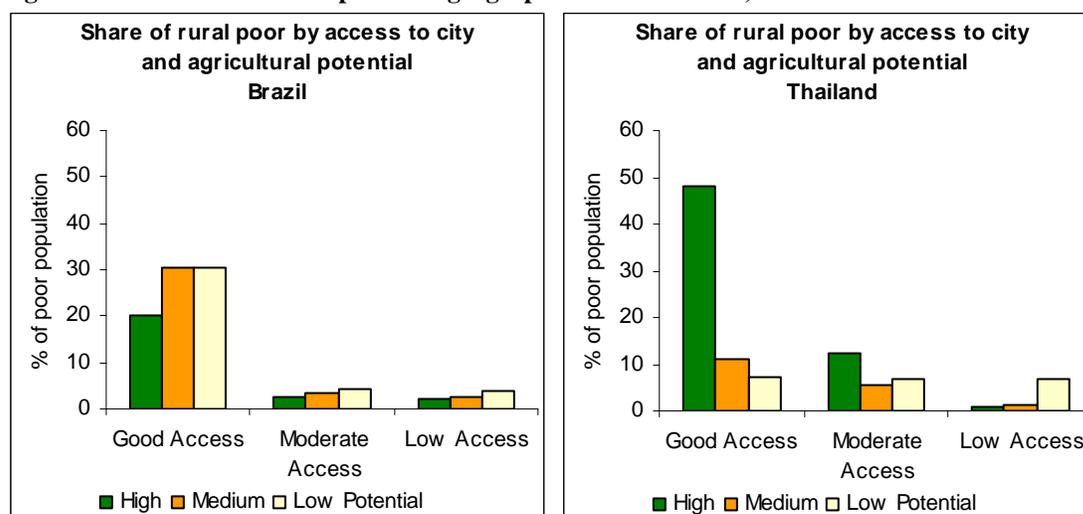
*Source:* Buys, Ferre, and Lanjouw (2007).

2.31 Note that spatial patterns in *poverty rates* (poverty incidence) are generally different from those for the *numbers of poor people* (poverty density). If population density is particularly high in a region, the absolute number of poor people in these localities may still be very high even with low poverty rates. By contrast, poverty rates may be extremely high in more isolated, sparsely populated areas but the absolute number of poor may be significantly lower, given lower population densities. *Indeed, in all five countries studied the majority of the rural poor reside in localities with good accessibility, and the share of rural poor living in marginal areas with poor access or low agricultural potential is low* (figure 2.7).<sup>36</sup> A recent study of Central America also found a high share of the poor living in areas of good accessibility in Guatemala and Nicaragua.<sup>37</sup>

<sup>35</sup> For Malawi, Benson, Chamberlin, and Rhinehart (2005) also find that correlations between poverty and geographic variables capturing suitability of areas to agriculture and accessibility are very weak, and only occasionally statistically significant.

<sup>36</sup> Other countries still have large populations in regions with favourable agricultural potential but with low accessibility, because of infrastructure deficits (see chapter 2).

<sup>37</sup> World Bank (2004b) and World Bank (2004a).

**Figure 2.7 Share of the rural poor and geographic characteristics, Brazil and Thailand**

Note: See Figure 2.7.

Source: Buys, Ferre, and Lanjouw (2007).

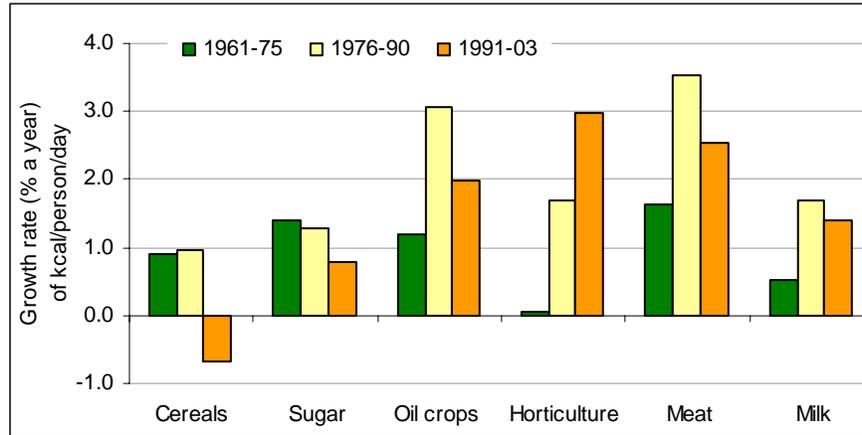
2.32 Where poverty's incidence does not coincide with its density, there are important tradeoffs to consider in the regional targeting of policy interventions.<sup>38</sup> The greatest impact on poverty may be through fostering growth in more favored regions, especially growth that generates incomes for smallholders and creates employment. Yet the extreme poor in more marginal areas are especially vulnerable, and until migration provides alternative opportunities, the challenge is to improve the stability and resilience of farming systems in those regions.

### **The new agriculture—opportunities through diversification**

2.33 Farmers in areas of good agricultural potential and with access to markets—about 60 percent of the agricultural population in the developing world—face a different type of challenge. There, diversification to higher value products to tap emerging markets offers a way to increase incomes of farmers and offset the decline in prices of cereals and traditional exports.

2.34 Changes in consumer diets—brought about by rapid income growth and increasing urbanization—are already driving diversification. Especially in the transforming and urbanized economies, dietary patterns are shifting away from cereals, roots, tubers and pulses to livestock products, vegetable oils, fruits and vegetables (figure 2.8). And consumer preferences in industrial countries toward specialty products and year-round supplies of fresh produce are providing global markets for many of these products. Horticulture and livestock are the fastest expanding markets, with new markets also emerging for feed grains for livestock and for biofuels. The fact that most food products in this new agriculture are perishable, combined with increasing quality and safety standards, has increased vertical integration in food systems.

<sup>38</sup> The strikingly different patterns of poverty incidence versus poverty densities indicate that poor people probably vote with their feet. The number of poor might be increasing in favorable areas, as they attract population from the marginal areas.

**Figure 2.8 Per capita food consumption in developing countries is changing**

Source: FAO (2006a).

### *The horticulture revolution*<sup>39</sup>

2.35 Fruit and vegetables are the fastest growing agricultural markets in developing countries, with production increasing by 3.6 percent a year for fruits and 5.5 percent for vegetables over 1980-2004. During this period, about 58 percent of the increase in horticulture production worldwide came from China, 38 percent from all other developing countries and the remaining 4 percent from developed countries, suggesting that the boom in horticulture is benefiting mainly developing countries. In India fruits and vegetables were the most important growth sector for crop production in the 1990s.<sup>40</sup> Yet fruits and vegetables are still only sown on 8 percent of cropped area in developing countries (6 percent if China is excluded), compared with 20-30 percent in Japan and Korea.

2.36 The horticulture revolution has boosted incomes and employment. It increases the returns to land about ten fold relative to cereals, and generates considerable employment through production (about twice the per hectare input of cereals), and off farm employment where the jobs in processing, packaging, and marketing are much more than in cereals.<sup>41</sup> Women meet much of this increased demand for labor.

2.37 But horticulture also requires considerable adjustment by producers. It is management-intensive, with a variety of crops and heavy use of cash inputs and chemicals. Production and marketing can be risky, due to both pests and price volatility and fruit production requires an investment of several years to recoup costs. There may also be considerable environmental costs—horticulture crops account for 28 percent of global pesticide consumption.<sup>42</sup>

<sup>39</sup> Based on Ali (2006).

<sup>40</sup> Joshi, Singh Birthal, and Minot (2006).

<sup>41</sup> Ali (2006).

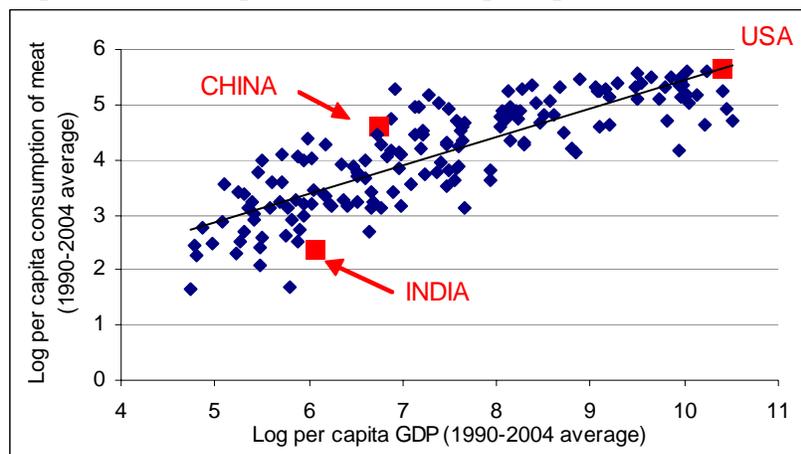
<sup>42</sup> Ali (2006), Dinham (2003).

2.38 The horticulture revolution, unlike the green revolution, has largely been driven by the private sector and the market, as rising incomes and urbanization stimulate demand. This has implications for the organization of value chains, with specialized agribusinesses and supermarkets increasing their share in these markets, especially in the urbanized countries. Grades and standards make it more difficult for smallholders acting alone to participate in these markets, giving rise to two main mechanisms for value chain coordination to achieve economies of scale: contract farming and collective action by producer organizations (chapter 5).

### *The livestock revolution*

2.39 The livestock revolution has been most notable in the transforming and urbanized countries of Asia and Latin America, driven by rising demand for poultry, pork, and eggs (figure 2.9). Beef and milk production have also risen steadily in countries undergoing rapid growth. In India the consumption of milk nearly doubled between the early 1980s and late 1990s.<sup>43</sup>

**Figure 2.9 Per capita meat consumption rises with GDP per capita**



Source: FAO (2006a) and World Bank (2006f).

2.40 Livestock production is switching from extensive (cattle grazing) to intensive (stall fed poultry, pigs, and dairy cows), increasing the demand for feed grains, but at a slower rate than the expansion in production. In developing countries the share of grain consumption used for feed increased from 7 percent in 1960 to 19 percent in 2002. The use of cereals for feed in developing countries is growing slower than meat production due to the substitution of other feedstuffs, such as oilseed meals and cassava for grains, and the growing share of poultry in total meat production (poultry requires only 2-3 kilogram of feed per kilogram of meat, compared with 10 kilogram for beef).<sup>44</sup>

2.41 The livestock revolution is increasing the supply of protein and providing a more diversified diet. But satisfying the increasing demands for animal food products, while sustaining the natural resource base and providing food staples at affordable prices to the

<sup>43</sup> Delgado and others (1999).

<sup>44</sup> De Haan (2001).

poor, is one of the major challenges facing world agriculture. Added to this, the growing concentrations of animals and people near the major cities of developing countries can increase waste pollution and the incidence of such diseases as avian flu. Globalization may further widen the environmental footprint from livestock (box 2.5), a problem that requires policies to prevent irreversible consequences (chapter 8).

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### **Box 2.5 The global environmental footprint of China's livestock**

China's total meat production rose from 45 to 74 million tons between 1994 and 2004, expanding its trade in feed grains and oilseeds. Soybean imports grew exponentially from zero in 1994 to 20 million tons in 2004, half from Argentina and Brazil.

Rapid growth in exports has been supported by bringing new land under cultivation, often at the expense of forests and woodlands. In the northern Salta region of Argentina, half the area under soybean cultivation in 2002-2003 was previously covered by natural vegetation. Much of this area includes the highly threatened *Chaco* ecosystem.<sup>45</sup> In Brazil the states of Goiás, Mato Grosso, and Mato Grosso do Sul doubled the area under soybean cultivation between 1999/2000 and 2004/05 by planting an additional 54,000 square kilometers—an area larger than Costa Rica—much of it by displacing ecologically important savanna woodland (*cerrado*) and forest.<sup>46</sup> The mean annual deforestation rate in the Amazon from 2000 to 2005 (22,392 km<sup>2</sup> per year) was 18 percent higher than in the previous five years (19,018 km<sup>2</sup> per year) partly due to agricultural expansion.<sup>47</sup> Because trees are being burned to create open land in the frontier states of Pará, Mato Grosso, Acre, and Rondônia, Brazil has become one of the world's largest emitters of greenhouse gases. To mitigate negative ecological impacts an alliance of private companies, nongovernmental organizations, and the government signed a two year moratorium on buying soybeans from newly deforested land in the Amazon.<sup>48</sup>

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## ***Biofuels***

2.42 Governments have been aggressively encouraging biofuel production as energy prices have risen and concerns over energy security and the environment have increased. Current biofuel technologies use agricultural feedstocks such as sugar and grains for ethanol and rapeseed, soybean and palm oil for biodiesel. Brazil mandates biofuel consumption and uses about half its sugar cane to produce ethanol. The United States has tax incentives, subsidies, and consumption mandates for biofuel production and uses about 20 percent of its maize crop to produce biofuels. Many developing countries are now launching biofuel programs based on agricultural feedstocks.

2.43 Biofuels offer the potential of huge new markets for agricultural producers. But rapid growth using current technologies could push up cereal prices—a process already evident for sugar and maize in 2006. Projections indicate price increases of as much as 30 percent for wheat, 41 percent for maize and 76 percent for oilseeds by 2020, given projected rates of expansion of biofuels.<sup>49</sup> There is clearly a tradeoff between producer incomes and food prices. Poor consumers would be hurt most by price increases of this magnitude.

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<sup>45</sup> World Bank (2006a).

<sup>46</sup> World Bank (2007b).

<sup>47</sup> Barreto and others (2006).

<sup>48</sup> Sauven (2006).

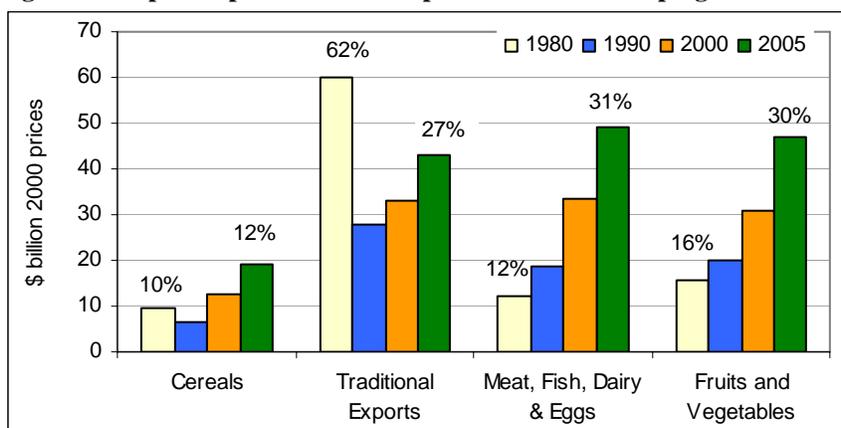
<sup>49</sup> Von Braun and Pachauri (2006).

2.44 Future biofuels technology may rely on agricultural and timber wastes instead of food crops, reducing the pressure on food crop prices and possibly contributing to the supply of more environmentally friendly supplies of liquid biofuels. But the technology is not yet commercially viable—and may not be for many years.

### *Diversifying through export markets*

2.45 High value products also make up a rapidly growing share of international trade in agricultural products. Exports of horticulture, livestock, fish, cut flowers, and organic products now make up 66 percent of all developing country exports, far more than the 21 percent for traditional tropical products (figure 2.10). The real value of traditional exports fell dramatically from 1980 to 1990 and although it has been slowly recovering, the total export value remains lower than what it was in 1980. But across a broad range of nontraditional export products, developing countries have been gaining market share at the expense of developed countries—in 2001, developing countries held a 56 percent share of world trade in nontraditional fruit and vegetables (excluding bananas and citrus).

**Figure 2.10 High value exports up—traditional exports down in developing countries**



*Notes:* Traditional exports include cocoa, tea, coffee, rubber, tobacco, sugar, cotton and spices. Percent numbers represent the share in total exports

*Source:* WITS, United Nations Commodity Trade Statistics Database (COMTRADE).

2.46 Just a handful of countries such as Brazil, Chile, China, Guatemala, and Mexico dominate nontraditional agricultural export markets. But many countries, including some in Sub-Saharan Africa (Kenya), are now gaining share in selected product markets. The least developed countries have very limited participation—only Niger is of relative significance with 2.6 percent of the world’s green bean exports by value<sup>50</sup>—and there have been other recent successes such as cut flowers from Ethiopia. Despite the expansion of nontraditional exports, prices have held up well in real terms. Estimates of the elasticity of export revenues for nontraditional export volumes indicate scope for further market expansion.<sup>51</sup>

<sup>50</sup> Food and Agriculture Organization (2004).

<sup>51</sup> Hallan and others (2004).

2.47 Even traditional export commodities provide opportunities for entering high value markets. The markets for premium quality goods such as coffee, organic and fair trade products have grown considerably in the last decade, if starting from a low base. The fair trade market is most developed in Europe, less so in Japan and the United States. Only coffee sells at any volume in the United States (2,300 tons in 2003, in comparison to 13,500 tons in Europe). But the market for organic produce has grown strongly in both Europe (retail sales of \$10.5 billion in 2003) and the United States (\$12 billion).<sup>52</sup> There is considerable scope for expansion of exports to these niche markets.

### **Future perspectives—rising uncertainty?**

2.48 Even if agricultural and food systems have been broadly successful in some developing regions over the past four decades, can they meet the likely demand for food over the next 25 years? Estimates by IFRPI indicate that given population growth and changing dietary patterns, global cereal demand will grow by 48 percent over the period and meat demand by 84 percent. Almost all of this increase will be accounted for by developing countries (89 and 83 percent, respectively).

2.49 And if the increased demand can be met, can this be done in a sustainable and environmentally friendly way? What are the main uncertainties that can compromise success? Emerging supply constraints—for land, water, and energy—indicate that the challenges in sustainably meeting this demand will be formidable, and the uncertainty surrounding climate change and science’s ability to deliver will be of crucial importance.

### ***Rising land constraints***

2.50 Throughout most of history, agriculture grew by bringing more land under cultivation, driven in part by population growth, and in some cases by investing in labor-saving technologies. But in much of the world, the land frontier has been exhausted. In Asia land scarcity has become acute in most countries, and rapid urbanization is reducing the area available for agriculture, often the best land. Assuming a requirement for housing and infrastructure of 40 hectares per 1000 people, FAO estimates a need for an additional 100 million hectares of urban land in developing countries by 2030 (current arable and permanent cropland worldwide is 1.5 billion hectares).<sup>53</sup>

2.51 In Latin America and Sub-Saharan Africa, where population densities are still relatively low, agricultural growth still comes largely from land expansion (figure 2.11). But in both further expansion would entail significant environmental or health costs or conflicts with traditional users. In Latin America agricultural expansion is driven by exports, often at the expense of cutting subtropical and tropical forests and woodlands.<sup>54</sup> In Sub-Saharan Africa population growth drives expansion into forest or grazing land—or areas subject to human and animal diseases.

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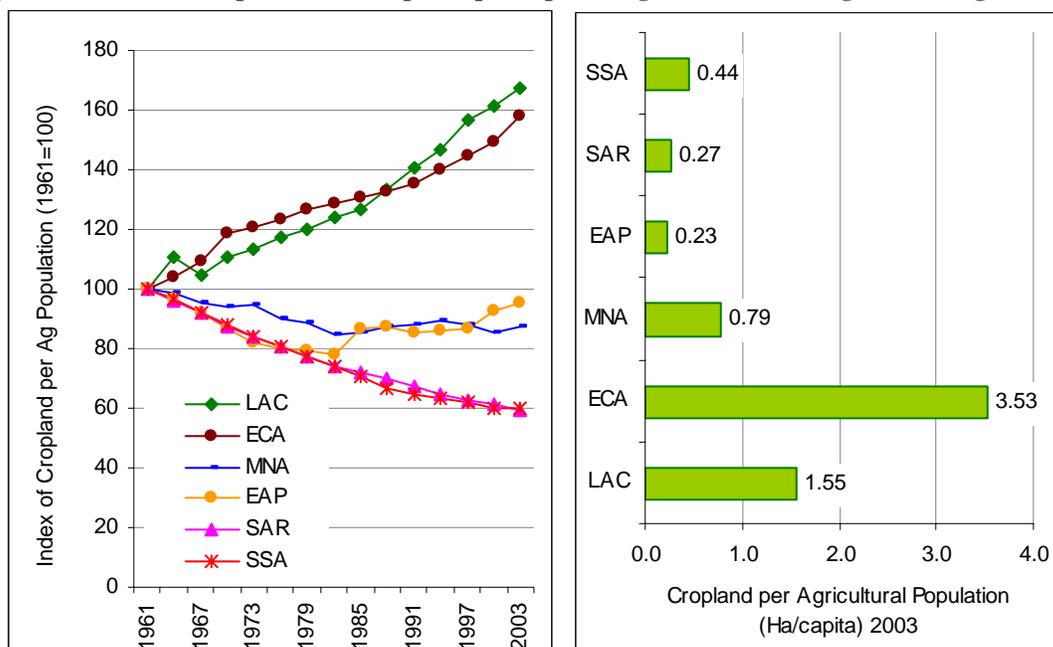
<sup>52</sup> Food and Agriculture Organization (2004).

<sup>53</sup> Cassman and others (2003).

<sup>54</sup> World Bank (2007b).

2.52 Even land currently used for agriculture is threatened. Productivity growth of available land is often undermined by pollution, salinization, and soil degradation from poorly managed intensification, all reducing potential yields. Various sources suggest that globally 5 to 10 million hectares of agricultural land are being lost annually to severe degradation.<sup>55</sup> Studies in China and Pakistan find that as much as a third of the productivity gains have been negated by soil degradation.<sup>56</sup>

**Figure 2.11 Arable and permanent cropland per capita in agriculture is falling in most regions**



*Notes:* Cropland represents both arable and permanent cropland. SSA: Sub Saharan Africa, SAR: South Asia, EAP: East Asia Pacific, MNA: Middle East and North Africa, ECA: Eastern Europe and Central Asia; LAC: Latin America and Caribbean.

*Source:* FAO (2006a).

### ***Acute water scarcity***

2.53 Agriculture uses 85 percent of the water consumed in developing countries and irrigated agriculture accounts for about 40 percent of the value of agricultural production in the developing world.<sup>57</sup> Without irrigation, the increases in yields and output that have fed the world's growing population and stabilized food production would not have been possible.

2.54 But demand for water for both agricultural and nonagricultural uses is rising, and water scarcity is becoming acute in much of the developing world, limiting future expansion of irrigation. According to the Comprehensive Assessment of Water Management in Agriculture,<sup>58</sup> around 900 million people live in river basins where water

<sup>55</sup> Scherr and Yadav (1995).

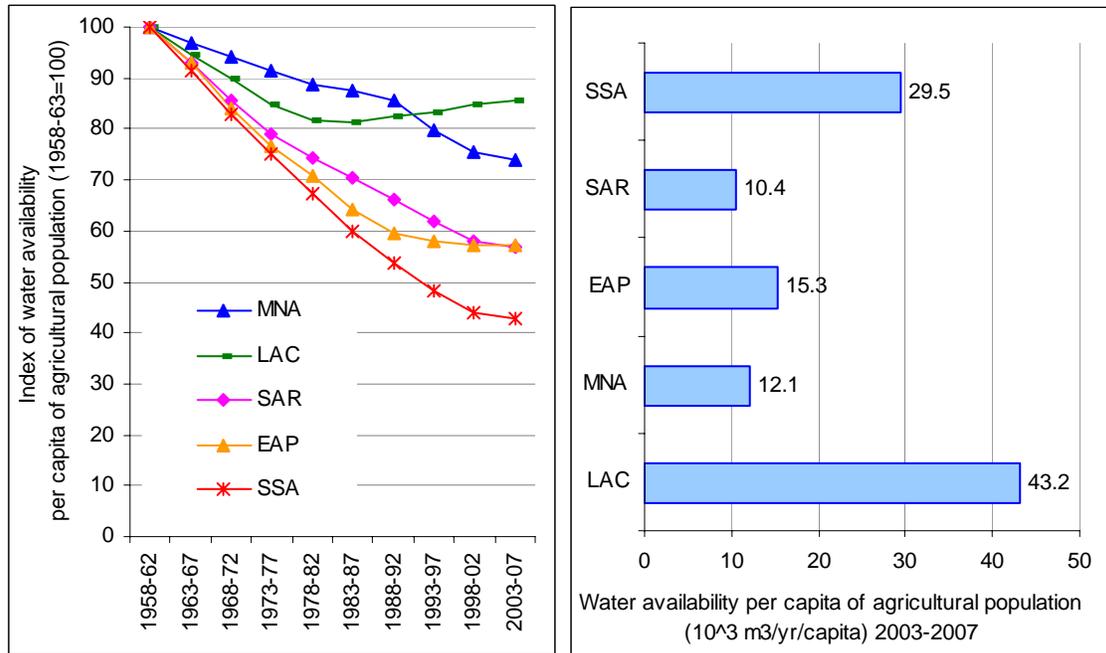
<sup>56</sup> Huang and Rozelle (1995), Ali and Byerlee (2002).

<sup>57</sup> Hazell and Wood (Forthcoming).

<sup>58</sup> Comprehensive Assessment of Water Management in Agriculture (2006).

is scarce, 700 million live in basins where scarcity is fast approaching, and a further 1 billion suffer from inadequate access to water because of a lack of infrastructure or the human and financial capital to mobilize the available resources (figure 2.12). Growing competition for nonagricultural uses will further reduce the water available for agriculture in rapidly growing countries. New sources of water are expensive to develop, limiting the potential for expansion. And developing new dams often imposes high environmental and human resettlement costs.

**Figure 2.12 Renewable water resources in agriculture are drying up**



Notes: No adjustment is made for nonagricultural uses of water, so water availability is overestimated by about 15 percent. SSA: Sub Saharan Africa, SAR: South Asia, EAP: East Asia Pacific, MNA: Middle East and North Africa; LAC: Latin America and Caribbean. No data available for Eastern Europe and Central Asia.

Source: FAO (2006a).

2.55 Large areas of China, South Asia, and the Middle East and North Africa are now maintaining irrigated food production through unsustainable extractions of water from rivers or the ground.<sup>59</sup> The groundwater overdraft rate exceeds 25 percent in China and 56 percent in parts of northwest India.<sup>60</sup> With groundwater use for irrigation expected to continue rising, often driven by subsidized or free electricity, the degradation of groundwater aquifers from over-pumping and pollution is certain to become more severe (chapter 8).<sup>61</sup>

2.56 Only Sub-Saharan Africa and Latin America have large untapped water resources for agriculture. But even in Sub-Saharan Africa, almost a quarter of the population lives

<sup>59</sup> United Nations Development Program (2006).

<sup>60</sup> World Bank (2006e).

<sup>61</sup> Comprehensive Assessment of Water Management in Agriculture (2006).

in a water-stressed country, and the share is rising.<sup>62</sup> Africa's potential to exploit water resources is largely in the humid regions, where the payoffs to irrigation are much lower than in dry regions (chapter 8).

2.57 Despite increasing water scarcity and the wasteful use of existing water supplies, water is generally not treated as a scarce resource. Both domestic and agricultural water uses are often provided with large subsidies on water use in most developing and many developed countries. Such policies will need to change if water supplies are going to remain adequate to meet the needs of agriculture and domestic users in the next half-century (chapter 8).

### *Uncertain effects of climate change*

2.58 Global warming is one of the areas of greatest uncertainty for agriculture. If emissions continue at today's rate, in the next fifty years the stock of greenhouses is predicted to reach twice the pre-industrial level—at which global average temperatures are very likely to rise by 2-3°C compared to the pre-industrial level.<sup>63</sup> Higher average temperatures are already affecting the pattern of precipitation and frequency and intensity of extreme weather events, such as heat waves, droughts, and floods.<sup>64</sup> These effects are not evenly distributed. While many regions have already become wetter, the Sahel, the Mediterranean, southern Africa and parts of southern Asia are drier, and this trend will continue. Sea levels are predicted to rise between 0.18 and 0.59 meters by the end of the century, depending on the scenario, which could have detrimental effects in low-lying areas.<sup>65</sup> Water scarcity will increase in many areas, particularly in the already dry parts of Africa and areas where glacial melt is an important source of runoff water.

2.59 With moderate warming, crop yields are expected to increase in temperate regions and decline in tropical areas. Globally, crop-climate models predict an increase in crop production in slight to medium warming scenarios of less than 3°C.<sup>66</sup> But not all effects of climate change on yields have been included in these models. Nonlinearity of yield response to temperature above threshold levels can result in high losses even in temperate areas, and hence globally, even in moderate warming scenarios.<sup>67</sup> Combined effect of higher average temperatures as well as variability of temperature and precipitation, more frequent and intense droughts and floods, and reduced availability of water for irrigation is very likely to be damaging even at the global level, and can be devastating for agriculture in many tropical regions (Focus G).

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<sup>62</sup> United Nations Development Program (2006).

<sup>63</sup> Stern (2006).

<sup>64</sup> Intergovernmental Panel on Climate Change (IPCC) (2007).

<sup>65</sup> Intergovernmental Panel on Climate Change (IPCC) (2007).

<sup>66</sup> Parry, Rosenzweig, and Livermore (2007), Warren (2006).

<sup>67</sup> Schlenker and Roberts (2006).

### ***High energy prices will hurt agriculture***

2.60 Although there is considerable uncertainty about future energy prices,<sup>68</sup> there is little doubt that energy prices will be higher than in the past 20 years, and that this will increase agricultural production costs and food prices.

2.61 Much of today's agricultural production is fairly energy-intensive, more so in the developed world than in developing countries. Estimates by FAO indicate that 6 thousand MJ of fossil energy—which is equivalent of 160 liters of oil— are used to produce one ton of maize under modern methods in the US. One ton of maize grown in Mexico under traditional methods only uses 180 MJ of energy inputs or the equivalent of 4.8 liters of oil.<sup>69</sup>

2.62 Energy is required directly for the operation of machinery and indirectly for fertilizers and other chemicals. Fertilizer prices, for example, are linked to energy prices because natural gas is a primary component in nitrogen fertilizer production, and represents 75 to 90 percent of fertilizer production costs.<sup>70</sup> In the United States, energy costs accounted for 16 percent of agricultural production costs in 2005, about one-third for fuel and electricity and two-thirds indirectly for energy to produce fertilizer and chemicals.<sup>71</sup> In developing countries too, fertilizer costs represent an increasing share of production costs. In China, these increased from almost zero in 1952 to over 11 percent in 1997.<sup>72</sup> In Mato Grosso, Brazil, fertilizer costs make up 34 percent of the production costs of soybeans.<sup>73</sup> Sharply higher fertilizer prices could have far-reaching effects on developing country agriculture, pushing down fertilizer application rates and crop yields, and raising food prices.

2.63 Beyond the farm gate, there are other energy-dependent food production inputs that will be affected by increasing energy costs, such as transportation and refrigeration. In fact 4 percent of food costs in the US are attributable to transportation expenses alone.<sup>74</sup> In all, econometric analyses suggest that grain prices in the US (which determines world prices) would rise by 18-20 percent of any increase in crude oil prices.<sup>75</sup>

### ***Will science deliver?***

2.64 Although yield gains over the past four decades are impressive, yield increases have been restricted to a narrow range of crops, particularly rice, wheat, and maize. And even for these crops, the growth rate of yields has slowed since the 1970s (figure 2.13).

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<sup>68</sup> The World Bank projects real crude oil prices to fall from current levels by about half from 2006 to 2015. Others, such as the International Energy Agency in Paris, expect real crude oil prices to remain near current levels for the next several decades.

<sup>69</sup> FAO (2000).

<sup>70</sup> U.S.Congressional Research Service (2004).

<sup>71</sup> U.S.Department of Agriculture (USDA) (2006).

<sup>72</sup> Fan and Zhang (2002).

<sup>73</sup> U.S.Department of Agriculture: *Economic Research Service* (2004).

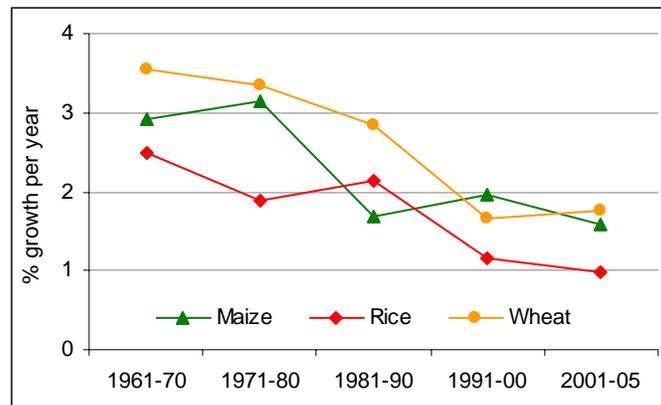
<sup>74</sup> U.S.Congressional Research Service (2004).

<sup>75</sup> Baffes (2006).

With diminishing marginal returns, the easy gains from modern inputs have been made, except in Africa. Yield gains from plant breeding in the developing world have become more costly, and yield potential has stagnated for the world's major food crop, rice.

2.65 As average farm yields approach the yield potential threshold, it becomes more difficult for farmers to sustain yield increases. In general, yield stagnation occurs when average farm yields reach about 80 percent of the yield potential. This is the case for example, in China's major rice producing provinces. In other rice producing areas of Asia, yield stagnation is not associated with diminishing exploitable yield gaps, since yields are well below 80 percent of potential. Instead, available evidence suggests that productivity constraints are due to deterioration of soil and water quality, reduced access to irrigation water and imbalanced nutrient use.<sup>76</sup>

**Figure 2.13 Growth rates of yields for major cereals are slowing in developing countries (1961-2005)**



Note: The final period has only five years of data.

Source: FAO (2006a).

2.66 The world might be poised for another technological revolution in agriculture using the new tools of biotechnology (chapter 7). Already 100 million hectares of crops, or about 8 percent of the cropped area, are sown to transgenic seeds (often known as genetically modified organisms). But there is considerable uncertainty about whether this revolution will become a reality for food production in the developing world because of low public investment in these technologies and controversies over their possible risks (focus F). Other types of biotechnologies, such as genomics are not controversial and their declining costs and wider application should ensure continued technological progress, albeit at slower rates than might be possible if transgenics were widely deployed.

***The bottom line: A more uncertain future?***

2.67 Despite these challenges, it is unlikely that the supply of food will run short at the global level, according to projections by several international organizations.<sup>77</sup> Under “business as usual projections” by IFPRI—assuming a continuation of present trends and

<sup>76</sup> Cassman and others (2003).

<sup>77</sup> Rosegrant and others (2006), Bruinsma (2003), FAO (2006b).

existing strategies in food policy, management, and investment over time—world cereal prices will continue to decline at 1.6 percent a year and world meat prices at 0.9 percent a year to 2030. But large differences in agricultural performance among countries are projected to persist and even deepen. The major challenge is to sustain and deepen the improved performance in Africa, the only region where the absolute number of malnourished children is expected to increase in the business as usual scenario. In a more pessimistic scenario—with slower overall growth, smaller yield gains, and increased resource scarcities—these disparities are even higher, with an absolute decline in average caloric intake in Sub-Saharan Africa, and rising cereal prices at the global level (0.9 per year).

2.68 But there is considerable uncertainty on global food supplies and food prices if several adverse outcomes eventuate. High energy prices combined with increased biofuels production from food crops could lead to large food crop price increases through effects on both supply and demand. Another plausible adverse outcome is that global warming could occur more rapidly than expected and add to already existing water shortages. This would adversely affect irrigated agriculture, with negative impacts on yields and yield stability. A third possibility is that rapid income growth in developing countries, especially for large players like China and India, could lead to a surge in food imports that, combined with higher energy and fertilizer prices, drives up food prices.

2.69 Because of these uncertainties, production shocks could become more frequent at global, national and local levels. All countries will need to increase their capacity to manage shocks through production risk mitigation (better water control or drought tolerant varieties), trade, and insurance in global markets (chapter 5). Countries with rising incomes will be best able to manage these shocks since higher food prices will have less impact on real incomes. The least developed countries would be hit hardest.

### **Moving forward: Four challenges**

2.70 This chapter highlighted four challenges that must be addressed if the agriculture-for-development agenda is to succeed. First, at the global level, uncertainties related to resource scarcity, energy, climate change, and technology suggest that there is little room for complacency in assuring long-term food supplies and a continuation of the long-term decline in food prices for the benefit of poor consumers. This adds urgency to policies that promote sustainable use of natural resources, increase the rate of technological progress, and enable agricultural production systems to adapt and better withstand shocks.

2.71 Second, the recent progress in accelerating growth in the agriculture-based countries, especially in Sub-Saharan Africa, must be sustained in countries already experiencing rapid growth, and broadened to those (often conflict or post-conflict) countries that have not yet participated. Within agriculture-based countries, the challenge is to balance growth in more favored areas—including tapping emerging opportunities in high value products, investing in infrastructure (irrigation and roads), skills, and institutions to extend the boundaries of these favored areas—with improving livelihoods in less favored environments poorly connected to markets. The biggest challenge is to

ensure food security in landlocked countries with high population growth, poor agricultural resources, and difficult access to world food markets.<sup>78</sup>

2.72 Third, higher agricultural incomes are prerequisites to rural poverty reduction in all regions, especially in the agriculture-based and transforming economies. In higher potential areas, the rapidly expanding markets for higher value products, both domestic and global, offer a new opportunity. The challenge is to connect smallholders to these markets, either directly or through labor markets.

2.73 Fourth, the other side of global success is the continued existence of marginalized regions and populations that have not participated in the growth process, even in countries where overall agricultural performance has been good. Although the largest number of poor people may be in the more favored regions, the highest incidence of poverty, and especially extreme poverty, is often in the less favored areas. The challenge is to improve the productivity of subsistence agriculture, diversify to new markets where possible, and open opportunities for nonfarm work and migration as pathways out of poverty (chapter 3).

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<sup>78</sup> Alexandratos (2005).

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## **Focus B What is the potential role for biofuels?**

*A careful evaluation of the opportunities and risks from expanding the biofuels industry needs to be an integral part of the public debate and national strategies. Public funding should be redirected to research and development, especially targeting second generation biofuels in research by industrial countries.*

B.1 With oil prices at an all-time high and few alternative fuels for transport, the European Union, United States, and such developing countries as Brazil, China, India, Indonesia, and Malaysia have embarked on aggressive state-supported programs to produce liquid biofuels: ethanol and biodiesel. Ethanol from sugar or grain and other starch crops is a substitute for gasoline, and biodiesel, from vegetable oils and fats, is a substitute for conventional diesel. Sugarcane and maize are the main feedstock sources for ethanol—rapeseed oil, soybean oil, and palm oil for biodiesel.<sup>1</sup> Because the feedstocks have alternative uses as food or animal feed, biofuels could increase food prices and competition for land and water resources. Second-generation technologies may allow production of biofuels from biomass, such as wood, crop residues, and animal waste.<sup>2</sup>

B.2 Energy diversification, local development, and local and global environmental benefits are cited for providing strong political and financial support to biofuels. In the European Union and the United States, another important driver is protection of domestic agriculture. Many of the benefits of biofuels are specific to the type of feedstock, production process, and changes in land use that may occur. For example, if cultivation of feedstock crops causes deforestation, the contribution of biofuels to reducing greenhouse gas (GHG) emissions is questionable. Similarly, vertical integration and large scale commercial farming may do little to help small-scale farmers. The public debate on biofuels needs to recognize the risks and the context-specific benefits. And the risks, costs and benefits need to be carefully assessed by developing countries before extending public support to large-scale biofuels programs.

B.3 Brazil and the United States are the world's two largest producers of biofuels, ethanol in both cases (figure B.1). Brazil has the longest history of ethanol production. Thanks to favorable climate and a highly efficient production structure, Brazil has the world's lowest costs of sugarcane production. It is also the only country that has integrated sugar production with cane processing for ethanol on a large scale. The main feedstock for ethanol in the United States is maize. Germany is the largest producer of biodiesel, primarily from rapeseed oil, followed by France, Italy and the United States.

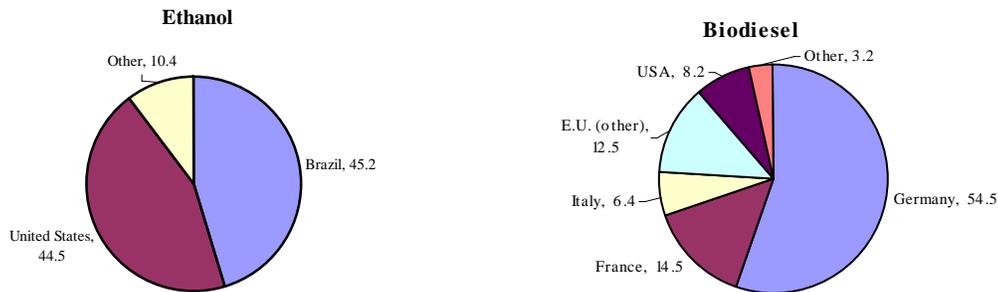
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<sup>1</sup> To a much lesser extent, sugar beets, wheat, cassava, and sorghum are also used for ethanol, and various oilseed plants, including *jatropha*, and soybeans for biodiesel. Microalgae could be used to produce biodiesel in the future.

<sup>2</sup> These technologies may result in substantial social and environmental benefits but in most cases they are probably 10 to 15 years away (if ever) from becoming commercially viable as they are currently only used on pilot basis (International Energy Agency (2004)). Technologies are tested in a pilot-plant scale on individual process steps but not integrated. Scaling up the integrated process will take at least a decade.

B.4 Several developing countries—including Argentina, China, Colombia, India, the Philippines, and Thailand—support their nascent biofuel industries through tax reductions and actual or planned mandates on biofuels use. Others, notably Indonesia and Malaysia, are looking to their comparative advantage in palm oil to establish large-scale biodiesel production for domestic needs and exports.

**Figure B.1 Brazil, United States, and Germany are largest producers of ethanol and biodiesel**



Note: Percent of global production of ethanol and biodiesel in 2005.

Source: Worldwatch Institute (2006).

### **Biofuels have not been economically viable without government support**

B.5 The economic viability of biofuels is widely debated. While higher oil prices are generally considered good for the economics of biofuels, the breakeven price above which a given biofuel becomes economic is a function of several parameters. The most important determining factor is the cost of the feedstock, which constitutes more than half of the biofuel production cost today.

B.6 Biofuel production has pushed up feedstock prices. The clearest example is maize, whose price rose by more than two-thirds over the last two years, largely because of the U.S. ethanol program. Spurred by subsidies and the Renewable Fuel Standard issued in 2005, U.S. ethanol production has been diverting more maize to ethanol production. The stock-to-use ratio in the United States, by far the world’s largest maize exporter, is expected to remain at historic lows in the coming years, maintaining pressure on world cereal prices and foreshadowing possible large price spikes if a harvest fails in a major maize-producing country.<sup>3</sup> Similarly, growing use of oilseed crops for biodiesel production is contributing to rising vegetable oil prices. In 2005–06 palm oil prices rose by 45 percent, soybean oil 34 percent, and rapeseed oil 26 percent.

B.7 These are indications that biofuel feedstock prices could become more correlated with world oil prices as larger fractions of feedstocks are diverted to the biofuel market.<sup>4</sup> Rising agricultural crop prices resulting from rising demand for biofuel feedstocks have come to the fore in the debate about the potential conflict between food and fuel.

<sup>3</sup> U.S. Department of Agriculture (USDA) (2007).

<sup>4</sup> LMC International (2006).

B.8 Overall, biofuels have been uneconomic most of the time around the world. Substantial government support has been provided so that biofuels could compete with gasoline and conventional diesel. Countries with sizable domestic biofuel programs support producers through consumption incentives (fuel tax reductions), production incentives (tax incentives, loan guarantees, direct subsidy payments), and mandatory consumption requirements. According to recent estimates, more than 200 support measures in the United States amount to \$0.38-0.49 per liter of petroleum equivalent for ethanol and \$0.45-0.57 for biodiesel.<sup>5</sup>

B.9 Domestic producers in the European Union, United States and elsewhere receive additional support through import tariffs and duties.<sup>6</sup> Because of these distortions, increasing production volumes in this rapidly growing industry will not be allocated to the most efficient biofuel producers. Whether the financial costs and efficiency losses associated with these support measures are justified depends on the nonmarket benefits of biofuels and their contributions to energy security.

B.10 Except in Brazil, current-technology biofuels can only marginally enhance energy security in individual countries because domestic harvests of feedstock crops meet only a very small part of the demand for transport fuels. With first-generation biofuels, more than a third of all agricultural land would need to be converted to biofuels in major producing countries to raise the share of biofuels in domestic consumption of transport fuels to 10 percent. In the European Union 72 percent of the agricultural land would be required to meet this production target and in the United States nearly one-third. If water requirements are taken into account, then the potential to meet domestic demand through own production is even lower. More than one sixth of the U.S. maize harvest in 2005 displaced only 2-3 percent of gasoline consumption.<sup>7</sup> Growing correlations between feedstock and world oil prices also mean limited benefits from diversifying energy supplies—that is, ensuring an alternative to oil with uncorrelated price fluctuations.<sup>8</sup>

### **Nonmarket benefits, context-specific, need to be evaluated**

B.11 Global environmental benefits—from reducing lifecycle GHG emissions—are frequently cited as reasons to support biofuels in the policy arena. But those benefits cannot be assumed. To be examined are emissions arising from growing feedstocks (including nitrogen emissions from fertilizer use), from manufacturing biofuels, and from transporting biofuels to consumption centers as well as those from changes in land use.<sup>9</sup>

B.12 If increased biofuel production involves deforestation, drained peat land and destroyed cerrado, these land use changes will cancel out the benefits of GHG emission savings, “for decades” according to the 2006 EU Biofuel Strategy.<sup>10</sup> If there is no change

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<sup>5</sup> Koplou (2006).

<sup>6</sup> Kojima, Mitchell, and Ward (2006).

<sup>7</sup> U.S. Department of Agriculture (USDA) (2007).

<sup>8</sup> OECD (2006).

<sup>9</sup> In the extreme, trucking ethanol from midwestern states in the United States to the coastal cities rather than transporting gasoline in pipelines would consume considerably more energy, in the form of diesel.

<sup>10</sup> Commission of the European Communities (2006).

in land use, Brazilian sugar cane is estimated to reduce emissions by about 90 percent compared to gasoline. In contrast, the reduction potential of ethanol from maize in the United States is only in the range of 10 to 30 percent.<sup>11</sup>

B.13 For biodiesel, reductions in carbon emissions are estimated in the range of 50-60 percent, with the economic value of reductions much lower than the subsidies typically given to biofuels. At the market prices forecast for the foreseeable future of between \$8 and \$20 per metric ton of carbon dioxide (CO<sub>2</sub>) equivalent, the value of reductions is likely to fall in the range \$0.01 and \$0.04 per liter of biofuel.<sup>12,13</sup> The cost of reducing GHG emissions is much lower through demand-side and efficiency measures in the transport sector than through replacing part of petroleum fuel consumption with biofuels.<sup>14</sup>

B.14 At the local level, biofuels can have important social benefits and help attain broader developmental objectives. Small-scale production of biodiesel can stimulate growth in poor rural areas, create jobs, and meet local energy demand.<sup>15</sup> Consumption is likely to be limited largely to local markets, in part because of inconsistent quality.

B.15 Some grass varieties and oil-rich plants (*jatropha*) can be grown on marginal land and improve soil quality, while competing little with food crops.<sup>16</sup> But the economics of planting, harvesting, and transporting seeds to a processing plant are not well understood. Nor is it clear how one would ensure that energy crops are confined to marginal land. These opportunities are promising, but arguments in favor of small-scale applications are based on anecdotal evidence (mostly from India) and thorough research is urgently needed to assess the potential benefits from small-scale biodiesel.

B.16 The potential social benefits of other biofuels are likely overstated. Ethanol production with current technologies requires fairly large economies of scale. Whether smallholders will supply feedstock depends on local conditions, especially the equity of land allocation. In some parts of Brazil producer cooperatives have ensured smallholder participation.<sup>17</sup> Second-generation biofuels are likely to require considerably larger economies of scale. Despite technical advances, they also face rising costs due to the rising costs of steel and other construction materials. This raises serious questions about whether small-scale farmers will benefit at all from second-generation biofuels. Investment costs will be in the hundreds of millions of dollars just to build one plant.

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<sup>11</sup> Farrell (2006), Hill and others (2006), Kartha (2006), review of studies reported in Worldwatch Institute (2006) and in Kojima, Mitchell, and Ward (2006).

<sup>12</sup> Kojima, Mitchell, and Ward (2006).

<sup>13</sup> At \$40 per ton, multiple of the current market price of carbon, the maximum carbon credit would be \$0.07 and \$0.11 per liter of ethanol and biodiesel, respectively (Avato (2007)).

<sup>14</sup> Kojima, Mitchell, and Ward (2006).

<sup>15</sup> Worldwatch Institute (2006).

<sup>16</sup> Woods (2006).

<sup>17</sup> FBOMS (2006).

### **Reconsider trade and subsidy distortions and redirect support to research**

B.17 Trade in ethanol and some biodiesel feedstocks, is restricted by import and export tariffs and duties in the largest markets. Liberalizing trade can produce welfare gains for consumers in industrial countries where domestic ethanol prices are kept artificially high because of border restrictions—and for efficient producers in developing countries, some of whom could develop a new export industry.<sup>18</sup> Overall, significant efficiency gains could result in a global reallocation of production to the lowest-cost producers.

B.18 Can other developing countries, apart from Brazil, benefit from developing biofuel industries? These circumstances are rare for first generation technologies and need to be carefully assessed. High petroleum transport costs could make biofuel production economically viable in some oil-importing countries even with current technologies, substantially reducing the need for government subsidies. For example, a landlocked country that is a net exporter of sugar and an importer of gasoline might have found ethanol production from sugarcane economic much of the time since 2003.<sup>19</sup> Second generation technologies promise a much more favorable balance in terms of environmental and, possibly, social benefits.

B.19 The challenge for governments is to avoid putting in place distortionary incentives in support of biofuels that might displace alternative activities with higher return—and to implement regulations that ensure environmental sustainability. To conduct fair assessments, governments need transparent data on total subsidies and other assistance allocated to biofuels, combined with the data on the value of environmental benefits and risks and a pragmatic evaluation of the potential to enhance energy security. Other (possibly more efficient) ways of delivering environmental and social benefits need to be evaluated. Much higher potential benefits of second-generation technologies justify substantial investments in research, including public financing, instead of extending subsidies when nonmarket benefits do not justify them.

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<sup>18</sup> United Nations Conference on Trade and Development (2006), Worldwatch Institute (2006).

<sup>19</sup> Kojima, Mitchell, and Ward (2006).

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## **Chapter 3 Rural households and pathways out of poverty**

3.1 Agriculture continues to be a major source of income for rural households, and the vast majority of farmers are smallholders.<sup>1</sup> Global changes create new opportunities for those smallholders, who also face new and growing challenges to their competitiveness.

3.2 To understand how agricultural growth can reduce rural poverty in that context, this chapter discusses the livelihood strategies of rural households. Livelihood strategies in the agricultural sector can be characterized by dualism between market-oriented smallholder entrepreneurs along with smallholders engaged in subsistence farming. There is a parallel dualism in the labor market between high-skill and low-skill jobs, and in migration between pull and push. Rural households chose any of these strategies based on their asset endowment (education, skills, land, livestock, and social capital) and on the context that determines the productivity of those assets.

3.3 The asset endowments of rural households have been low for generations, an important cause for the persistence of rural poverty. And market failures affecting the returns to those limited assets are pervasive.<sup>2</sup> Conversely, adverse shocks can deplete assets and the inability to cope with shocks may induce households to adopt low return, low risk activities, preventing them from accumulating assets and trapping them in poverty. Dynamics and power plays that determine access to assets and cash within the household are equally important for a person's individual welfare as the household's overall asset position.

3.4 Policies targeted at increasing access to assets or the returns to those assets can help guarantee that households' livelihood strategies lead to successful pathways out of poverty. Many rural households have indeed moved out of poverty through agricultural entrepreneurship, the rural non-farm economy, or by migrating to rural towns, cities, or abroad. The three pathways are highly complementary as nonfarm incomes can enhance the potential of farming as a pathway out of poverty, and agriculture can facilitate the labor and migration pathways.

### **Heterogeneous livelihoods: a typology of rural households**

3.5 Agriculture provides employment to 1.3 billion people worldwide, 97 percent of them in developing countries. In 2004, 52 percent of the economically active population in developing countries was employed in agriculture.<sup>3</sup> An FAO study that allows comparing income sources for rural households shows that between 60 and a 99 percent of rural households derive income from agriculture in 14 countries of Africa, East Asia, South Asia, Latin America, and Eastern Europe and Central Asia (figure 3.1). Not surprisingly, agriculture is an important source of total rural income in most of these countries.

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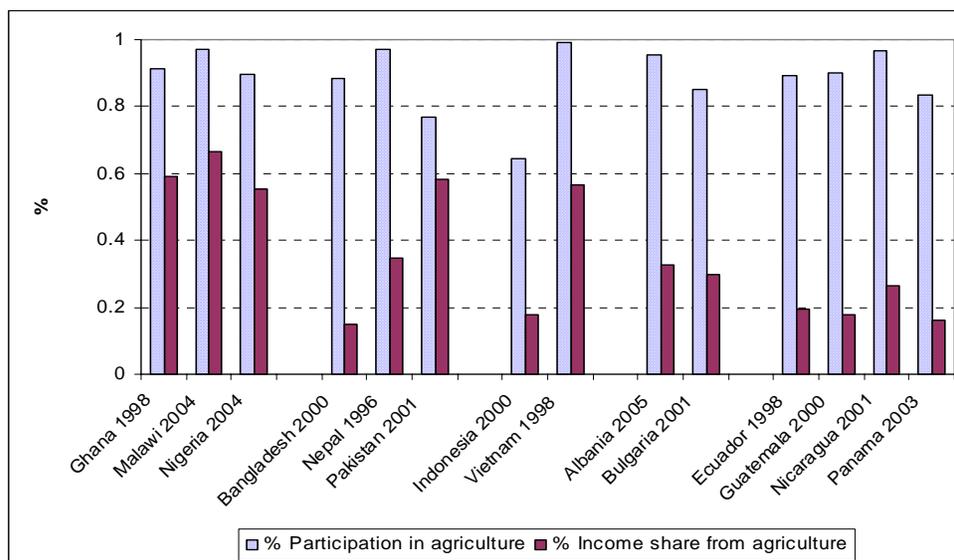
<sup>1</sup> In this chapter, rural households are defined as those households sampled in rural areas, with "rural" defined according to country-specific definitions (see chapter 2).

<sup>2</sup> Chapter 2 has discussed many of the public goods that partly determine the rural context (roads, market access, agro-ecological environment etc.) and hence crucially affect returns.

<sup>3</sup> See <http://www.faostat.fao.org>.

3.6 But contrary to the prototypical image of smallholders as farmers, landed rural households rely on many activities and income sources for their livelihoods. They participate in agricultural labor markets, in self-employment, or in wage employment in the rural nonfarm economy. And they might receive transfers from household members who have migrated.<sup>4</sup>

**Figure 3.1 In many countries, the vast majority of rural households has some agricultural income**



Source: Davis and others (2007).

3.7 While rural households engage in different activities, one usually dominates and five livelihood strategies based on the dominant income source are distinguished (figure 3.2). Some farm households derive most of their income from actively engaging in agricultural markets (*market-oriented smallholders*).<sup>5</sup> Other households also primarily depend on farming for their livelihoods, but use the majority of their produce for home consumption (*subsistence farmers*).<sup>6</sup> Only a very small share of all agricultural products sold is produced by these households. In Malawi they sell about 9 percent, but in Nepal and Vietnam less than 2 percent. Still other households derive the larger part of their incomes from wage work in agriculture or the rural nonfarm economy—or from non-agricultural self-employment (*labor-oriented workers*). Some households might choose

<sup>4</sup> Diversification in rural households mainly comes from individuals with different specializations. In Malawi 27 percent of household heads are engaged in more than one activity, but diversity in household livelihoods is much greater: 32 percent of farm households have two sources of income, and 42 percent three or more. In China 65 percent of households operate in both the farm and non-farm sectors, while only one-third of individuals do so. Household strategies can also be diversified in an urbanized economy such as Mexico, where 36 percent of rural households have two or more activities, but only 10 percent of rural individuals have two or more. Knight and Song (2003), World Bank (2006b) for Malawi. Calculations based on ENIGH (National Survey of Household Incomes & Expenditures 2004) for Mexico.

<sup>5</sup> Large-scale commercial farmers are not considered here as the chapter focuses on pathways out of poverty.

<sup>6</sup> These households are not necessarily autarkic and within the subsistence farmers, there can be both net-buyers and net-sellers of food (see chapter 4). Most of these households engage in markets for food, labor or manufactured goods, but in a more limited way than others.

to leave the rural sector entirely, or become dependent on transfers from members who have migrated (*exiting households*).

Figure 3.2 Rural household typology

Sector of economic activity	What do individuals do? (based on assets & context)	What do households do?		Outcomes: Pathways out of Poverty
		Agricultural market orientation	Household livelihood strategies {portfolios}	
Agriculture	Self-employed farming (F)	Market-oriented farming (Fm)	Market-oriented smallholder {Fm; L,M}	F-led pathway
	Ag wage labor	Subsistence-oriented farming (Fs)	Subsistence-oriented smallholder {Fs; L, M}	
Rural non-farm economy	Self-employed in non-farm economy (L) Non-ag wage labor		Labor-oriented rural household {L; Fs, M} Skilled job/high VA Unskilled job/low VA	L-led pathway
Urban economy	Migration (M)		Exiting from agriculture {M; F, L} Pull mig Push mig	M-led pathway

Source: WDR team

3.8 The relative importance of each of these livelihood strategies differs across the three country types (and likely also across regions within countries). Income sources can be used to classify rural households according to these five livelihood strategies (table 3.1). Farming-led strategies are particularly important in the agriculture-based countries, where subsistence farming often constitute a large share of rural households, as much as 60 percent in Nigeria and 41 percent in Ghana.

3.9 In the transforming and urbanized countries the labor- and migration-oriented households are more common, with shares of labor-oriented households varying from 18 percent in Vietnam to 53 percent in Ecuador.<sup>7</sup> Within those households, wages from agricultural labor are relatively important in some countries (such as Ecuador), while off-farm earnings are more important in others (Pakistan and Vietnam). Despite the importance of the labor-pathway in the transforming countries, the market-oriented category of farming-households remain one of the largest groups in Pakistan and Vietnam.

<sup>7</sup> Note that this quantification does not accurately reflect all aspects of migration as a livelihood strategy, as those households that chose to exit, are not captured by the surveys. The classification captures those households that have remained, but derive the majority of their income from public and private transfers. Many of these are older and female-headed households. In addition to such households, migration is key household livelihood strategy for many young and educated who exit the rural areas, as is discussed further.

**Table 3.1 Typology of rural households for three country groups**

	country	year	Farm-oriented			Labor-oriented	Migration-oriented	Diversified	Total
			market-oriented	subsistence	total				
<b>Agricultural based countries</b>	Nigeria	2004	11	60	71	14	1	14	100
	Ghana	1998	13	41	54	24	3	19	100
	Malawi	2004	20	14	34	24	3	39	100
	Nepal	1996	17	8	25	29	4	42	100
	Nicaragua	2001	18	4	21	45	0	33	100
<b>Transforming countries</b>	Vietnam	1998	38	4	41	18	1	39	100
	Pakistan	2001	29	2	31	34	8	28	100
	Albania	2005	9	10	19	15	10	56	100
	Indonesia	2000	16	0	16	37	12	36	100
	Guatemala	2000	4	7	11	47	3	39	100
	Bangladesh	2000	4	2	6	40	6	48	100
	Panama	2003	1	5	6	50	6	37	100
<b>Urbanized countries</b>	Ecuador	1998	14	11	25	53	2	19	100
	Bulgaria	2001	4	1	5	12	37	46	100

Farm oriented household (more than 75% of total income from farm production)

Farm, market-oriented household (more than 50% of agricultural production sold on market)

Farm, subsistence household (<= 50% of agricultural production sold on market)

Labor-oriented household (more than 75% of total income from wage or nonfarm self employment)

Migration/transfers-oriented household (more than 75% of total income from transfers/other nonlabor sources)

Diversified household: no income source contributes more than 75% of total income

Source: Davis and others (2007).

3.10 Finally, there are diversified households that combine income from farming, paid work and migration. They derive between 20 percent (in Bangladesh) and 49 percent (in Vietnam) of their income from farming. Diversification at the household level is important in all countries (between 14 and 56 percent of households), but many households are specialized and derive the vast majority of their income from one of the three income sources.

3.11 Livelihood strategies can result in pathways out of poverty. And by addressing constraints on asset accumulation and returns, policy can facilitate transitions from subsistence farming to market-oriented, from unskilled low-value jobs to skilled higher-value jobs, and from push to pull migration. As such interventions can facilitate households to move out of poverty along one of the three pathways.

### **Box 3.1 Constructing comparable measures of income across countries**

The analysis of sources of rural income presented is based on income aggregates from the Rural Income Generating Activity (RIGA) database. Some of the country results may differ from results previously published in poverty assessments and other country reports because of concern with insuring comparability across countries. For each country, the income components include wages (separately for agriculture and non-agriculture), self-employment, crops, livestock, transfers, and a final category comprising all remaining non-labor income sources (excluding imputed rent), as reported in each country questionnaire.

All aggregates are estimated in local currency at the household level, annualized, and weighed<sup>8</sup>For further details on the calculation of each of the components, and on the treatment of outliers, see Davis and others (2007). While the standardized calculations across countries assures comparability, it should be noted that the analysis of sources of rural income is constrained by the pervasive weakness of the raw income data in many of the surveys analyzed. Many household surveys likely underestimate several income sources, because of under-reporting, income seasonality, and the difficulty of obtaining reliable income data from households that do not usually attempt to quantify their income sources.

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### **Rural household asset positions**

3.12 Asset positions, the drivers of household welfare, effectively condition household strategies. Market-oriented farming households tend to have a higher land endowment, while labor-oriented households tend to have better educational endowments. Those that migrate are often the young and entrepreneurial. The asset endowments of many rural households have been low for generations, explaining the persistence of rural poverty. While education is becoming more equally distributed, land holdings are becoming either more unequal or very small. In some settings, particularly in arid and semi-arid areas, livestock holdings can be the most important asset for rural households. Social capital endowments also differ widely.

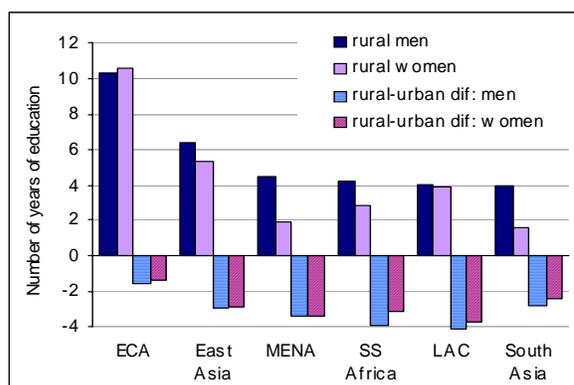
#### ***Human capital endowments are low, unequal, and not always improving***

3.13 Rural-urban gaps in educational attainment and health outcomes remain large. Regional averages for Sub-Saharan Africa, South Asia, and the Middle East and North Africa show that rural adult males have around 4 years of education, and rural adult females 1.5 to 3 years (figure 3.3). Inequality in access to education by ethnic group is also high. Rural Lao-Tai women in Laos have on average five years of education, compared with two years for other ethnic groups.<sup>9</sup> Differences between rural and urban areas are even larger, with adult males in rural Africa and Latin America having around 4 years of education less than their urban counterparts (figure 3.3).

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<sup>8</sup> *Wages* include all income received in the form of employee compensation either in cash or in-kind, in primary, secondary and any other job reported by any household member. *Self-employment* income includes the income from all non-farm household enterprises. Net income is computed by subtracting annualized costs from gross revenues (including all cash and in-kind earnings), even in those cases in which the survey also has a question on net revenues. *Crop* income accounts for the sale of crops, crop by-products, sharecropping income and the consumption of home-grown crops, net of all expenditures, such as seed and fertilizer purchases and the hire of temporary farm labor. The value of the reported quantities of own-consumption are imputed using estimated values at the cluster or higher geographic levels (e.g. district, region, etc.), or using the price questionnaire to impute the missing crop prices. Only when no imputation is possible were self-reported values used. The *livestock* income component includes income from the sale and barter of livestock and livestock by-products (i.e. milk, eggs, honey, etc.), net of expenses related to livestock production, plus the value of household consumption of its own livestock and livestock by-products. The approach to valuing own consumption is the same as for the crop production section of the income aggregate. *Transfers* include both public and private transfers, whether in cash or in-kind. The *Other* income component includes all other non-labor income sources that do not fall into the previous five categories. See [www.fao.org/es/esa/riga/](http://www.fao.org/es/esa/riga/) for further information on methodology.

<sup>9</sup> World Bank (2006a).

**Figure 3.3 Heterogeneity of educational attainment (by region, adult population: 25-65 years old)**

Note: Regional average based on 58 countries (excluding China) with recent household survey data.<sup>10</sup>

Source: WDR team.

3.14 In some countries, such as Mexico, adult education programs have boosted rural literacy rates. And in many countries school enrollment rates have increased considerably. Yet differences in school attendance for children among wealth categories and ethnic groups remain large, and gender differences are still significant in some countries. The quality of education is often drastically lower in rural areas.<sup>11</sup>

3.15 Access to good quality health services is also much lower in rural areas. In many countries the imbalance between rural and urban areas in skilled health workers is extreme. In Africa only half the rural population has access to improved water or improved sanitation, and in Asia only 30 percent.<sup>12</sup> Poor health reduces agricultural productivity. Yet, some agricultural practices also contribute to health problems (see focus H).

3.16 HIV/AIDS takes a heavy toll on rural populations in Africa. Mortality among young adults rose sharply, and life expectancy declined in many countries—in Malawi, from 46 years in 1987 to 37 years in 2002. Early HIV/AIDS incidence is often higher for

<sup>10</sup> Regional averages were calculated using available households and labor force surveys in each region, and using the 2000 populations (as defined by the UN) as weight. For each country, surveys from 2000 or the nearest year available were used, and the population was adjusted to 2000 population to calculate regional averages. Countries included in the calculations for East Asia exclude China, but includes Cambodia, Fiji, Indonesia, Marshall Islands, Thailand, Timor-Leste, and Vietnam, which account for 66 percent of population of East Asia excluding China; South Asia includes Bhutan, India, and Pakistan, which account for 87 percent of population of the region; SS Africa includes Angola, Burundi, Benin, Burkina Faso, Cameroon, Cape Verde, Ethiopia, Ghana, Gambia, Kenya, Lesotho, Madagascar, Mozambique, Rwanda, Sierra Leone, Sao Tome and Principe, South Africa, Uganda, which represents 43 percent of the population of the region; Latin America includes Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Peru, Panama, Paraguay, and El Salvador, representing 85 percent of the population of the region; MENA includes Egypt, Jordan, Morocco, and Yemen, representing 47 percent of the population of the region, and ECA includes Albania, Bosnia&Herzegovina, Croatia, Kyrgyz Republic, Poland, Tajikistan, Turkey, and Ukraine, representing 47 percent of the population of the region. See Bassole and others (2007).

<sup>11</sup> Zezza and others (2007), World Bank (2003b), World Bank (2003b).

<sup>12</sup> World Bank (2003b).

the educated, decimating human capital.<sup>13</sup> HIV/AIDS also reduces adults' capabilities to work, and recent evidence suggests that anti-retroviral treatment can sustain rural households' adult labor force, often to the benefit of children.<sup>14</sup>

3.17 The demographic profile of the rural populations can also be severely affected, through the direct effects on mortality and through migration that helps people cope. The World Health Organization (WHO) (2003) reports a shift of orphans to rural areas.<sup>15</sup> Analysis based on population censuses suggests that countries with high HIV/AIDS incidence in Africa (Botswana, Swaziland, and Zimbabwe) have higher dependency ratios than would be predicted for their level of development.<sup>16</sup> These changes in rural household composition are likely to affect household income strategies, as well as the potential of rural households to benefit from agricultural and rural growth. The changes also have implications for the role of subsistence agriculture for household survival (box 3.2).

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**Box 3.2 Returning to the farm in Zambia—subsistence agriculture, AIDS, and economic crisis**

Cohort analysis with the Zambia census data, sheds light on the changes in the age composition of the urban and rural populations in a country with high HIV/AIDS prevalence rates. The most striking observation is the high mortality rates between 1990 and 2000. In rural Zambia, population declines are especially large among young adults (19 percent for those 15-24 in 1990), indicating that death might hit those in their most productive age the most (box figure).<sup>17</sup> This contrasts with urban areas, where large population declines have occurred across different age groups, with the exception of the youngest.

Domestic migration movements help in understanding these patterns. Net migration reversed from rural-to-urban in 1990 to urban-to-rural in 2000. The reversal is even more extreme when only the last 12 months are considered. Rural-urban migration slowed considerably between 1990 and 2000, but urban-to-rural migration increased. These patterns have been linked to the dearth of employment opportunities in towns and cities, and stagnation in the (largely urban) copper mining industry, triggered by the global slump in copper prices.

Another explanation of the rural-urban differences in age patterns among adults is return migration by HIV affected people. A higher share of households have elderly household heads in rural areas (12.9 percent versus 4.8 in urban).<sup>18</sup> These households rely more on subsistence agriculture and have considerably less access to income from nonfarm sources, including transfers, than other rural households. The majority of the rural elderly households have (AIDS) orphans living with them (on average 0.8 orphans per elderly rural household). Rural population analysis also suggests larger mortality rates among the literate population, (sadly) confirming trends observed elsewhere in Africa.

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<sup>13</sup> Yet in a study in rural Uganda, de Walque (2004) finds that this pattern reversed because the more educated seem to be more responsive to education campaigns and learn faster how to protect themselves. Nevertheless, the loss of active adults, even if formally uneducated, can lead to loss of knowledge and skills for production of high value cash crops (Yamano and Jayne (2004); and World Bank (2006b)).

<sup>14</sup> Thirumurthy, Graff-Zivin, and Goldstein (2005).

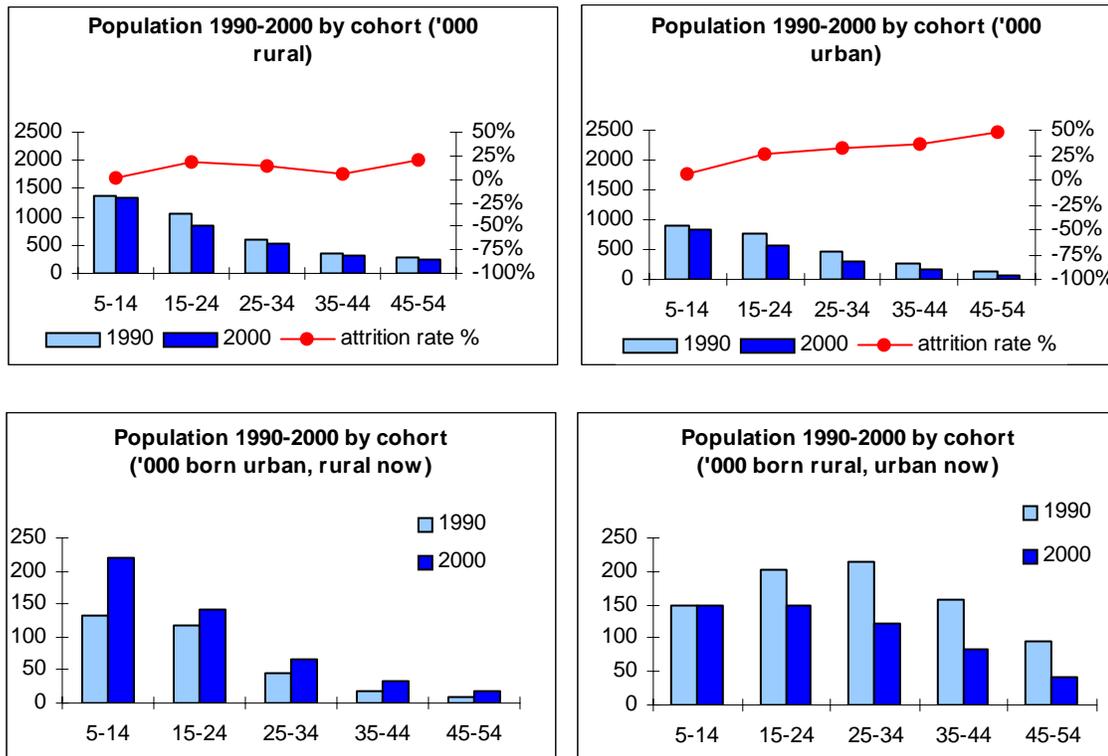
<sup>15</sup> Reviewing evidence of 40 Sub-Saharan Africa countries, Monasch and Boerma (2004) find that HIV orphans are more likely to be found in rural areas in some countries, but not in others.

<sup>16</sup> Anriquez and Bonomi (2007).

<sup>17</sup> Because international migration is very low, the high mortality rates can be inferred from the overall attrition, as attrition rates were negative in both urban and rural areas.

<sup>18</sup> World Bank (2005d).

**Box figure Following 1990 population cohorts to 2000 in Zambia**



*Note:* Columns represent the same cohort at two points in time. Ages refer to cohort ages in 1990  
 Note difference in scale of top panel (population) and bottom panel (net migration over lifetime)  
*Source:* Zambia population census.

***Increasing land pressures and the persistence of dual land distributions***

3.18 As land gets divided through inheritance in a growing population, farm sizes become very small. In India countrywide average landholdings fell from 2.6 hectares in 1960 to 1.4 hectares in 2000, and are still declining. Panel data that followed household heads and their offspring for Bangladesh, the Philippines, and Thailand over roughly 20-year periods both show declines in average farm size and increases in landlessness.<sup>19</sup> In many high-population-density areas of Africa (Ethiopia, Malawi) average farm sizes have also been decreasing. Such land pressures in economies still heavily reliant on agriculture can produce social tensions and have been attributed as factors in civil conflict.<sup>20</sup> This is true even if the division of land holdings may have a downward equalizing effect, as the declining land Gini coefficients for India, Malawi, and Tanzania suggest (table 3.2). In contrast, agricultural land is still expanding in some African and Latin American countries, and farm sizes are increasing (table 3.2 and chapter 2). Survey evidence for cash-cropping regions in Mozambique indicates that such area expansion is reducing poverty.<sup>21</sup>

<sup>19</sup> Otsuka and Yamano (2006).  
<sup>20</sup> See Andre and Platteau (1998) for a study on Rwanda.  
<sup>21</sup> Benfica (2007).

3.19 In Latin America and some countries in Africa, unequal land access is often perpetuated—leaving many households, often ethnic minorities or indigenous people, without access to land or with land plots insufficient to meet their needs. Distributions are highly bi-modal, with most of the land in large farms, while most farms are small.<sup>22</sup> This bi-modality has been increasing in Brazil over the last 30 years, where medium-sized farms have declined while both the small and the very large farms increased. The small control a declining share of the land while the large gained relative access (figure 3.4). In Bangladesh the number of farms doubled in 20 years, and the number of farms under 0.2 hectares increased more than proportionally—but most of the land is in larger farms.

3.20 An important aspect of this inequality is its persistence, through segmented land markets when property rights are insecure, and unequal access to capital and other input or output markets.<sup>23</sup> More generally, the dualistic nature of many rural societies is perpetuated by elite capture in public services, intergenerational transfers of poverty through low education and ill health, and a culture of poverty (slowly changed by greater access to information and opportunities (focus D)).<sup>24</sup>

**Table 3.2 Changes in farm size and land distribution**

Country	Period	Land distribution Gini		Average farm size (ha)		Change total no of farms	Change total area	Land type*
		Start	End	Start	End	% Δ	% Δ	
<b>Decreased farm size, increased inequality</b>								
Bangladesh	1977-96	43.1	48.3	1.4	0.6	103	-13	Total
Pakistan	1990-00	53.5	54.0	3.8	3.1	31	6	Total
Thailand	1978-93	43.5	46.7	3.8	3.4	42	27	Total
Ecuador	1974-00	69.3	71.2	15.4	14.7	63	56	Total
<b>Decreased farm size, decreased inequality</b>								
India	1990-95	46.6	44.8	1.6	1.4	8	-5	Total
Egypt	1990-00	46.5	37.8	1.0	0.8	31	5	Total
Malawi	1981-93	34.4	33.2†	1.2	0.8	37	-8	Cultivated
Tanzania	1971-96	40.5	37.6	1.3	1.0	64	26	Cultivated
Chile	1975-97	60.7	58.2	10.7	7.0	6	-31	Agricultural
Panama	1990-01	77.1	74.5	13.8	11.7	11	-6	Total
<b>Increased farm size, increased inequality</b>								
Botswana	1982-93	39.3	40.5	3.3	4.8	-1	43	Cultivated
Brazil	1985-96	76.5	76.6	64.6	72.8	-16	-6	Total
<b>Increased farm size, decreased inequality</b>								
Togo	1983-96	47.8	42.1	1.6	2.0	64	105	Cultivated
Algeria	1973-01	64.9	60.2	5.8	8.3	14	63	Agricultural

.† Inequality obtained from the Malawi 2004-2005 household survey.

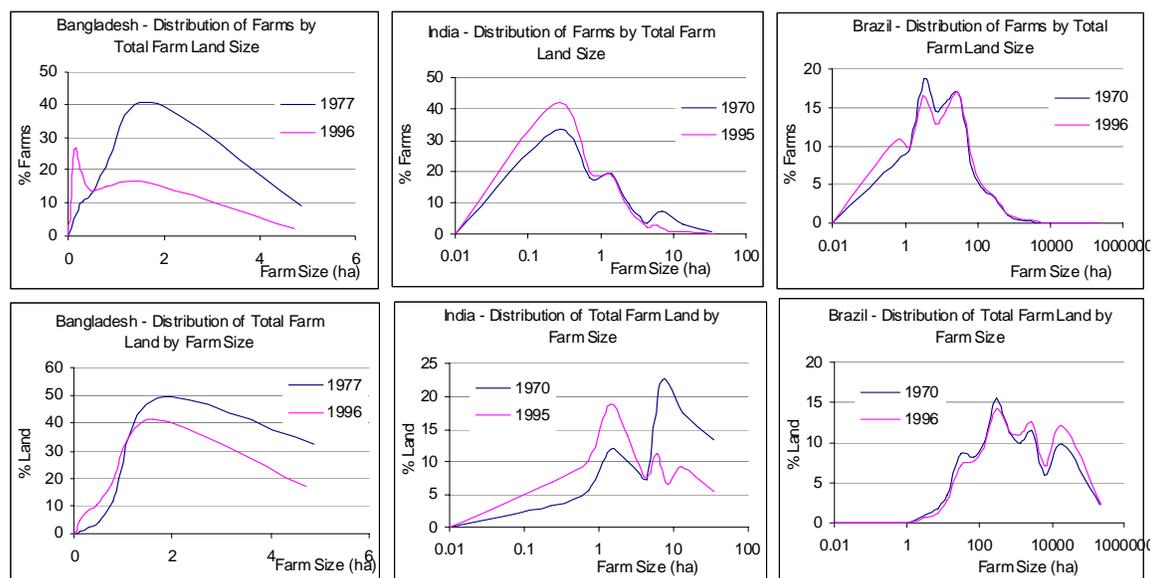
\* Total land area, Agricultural (crop and livestock) land area, or cultivated (planted) crop area.

Source: Anriquez and Bonomi (2007). Calculations based on agricultural censuses

<sup>22</sup> When most of the farms are small, but most of the land is in big farms, the mode of the distribution of farm size is low, while the mode of the distribution of total farm land is much higher, hence the distributions are bi-modal. This bi-modality of land distributions was first discussed by Johnston and Kilby (1975) who indicated that for most countries the unimodal structure is more productive, because it equalizes the marginal product of labor across farms. More recently, Vollrath (2007) has shown a robust negative relationship between land inequality and agricultural productivity.

<sup>23</sup> Macours, de Janvry, and Sadoulet (2004), Macours (2006), Boucher, Barham, and Carter (2005).

<sup>24</sup> Araujo and others (2006), De Ferranti and others (2004).

**Figure 3.4 Farm size distributions are often bi-modal**

Source: Estimations based on agricultural census (Anriquez and Bonomi (2007)).

3.21 Social factors and gender roles often seriously limit women's access to land. In Africa, Latin America, and South Asia women's access to land is often conditioned by unfavorable marital and inheritance laws, family and community norms, and unequal access to markets.<sup>25</sup> Women are less likely to own land, and female land-owners tend to own less land. Evidence from a sample of Latin American countries shows that only 11 to 27 percent of all landowners are women.<sup>26</sup> In Uganda women account for the largest share of agricultural production but own only 5 percent of the land.<sup>27</sup>

3.22 Country examples shed light on some of the underlying mechanisms. Until a recent law change, a married woman in Nepal could not inherit land from her parents. In Malawi widows can lose their land, due to land grabbing by the husband's family.<sup>28</sup> Women's land rights under customary tenure regimes are also much weaker than men's. Evidence from Ghana suggests that shifts to individual ownership in such contexts can strengthen women's land rights.<sup>29</sup>

### ***Livestock is a key asset for the poorest, particularly in arid and semi-arid settings***

3.23 Livestock holdings are often the largest nonland asset in household portfolios. In arid and semi-arid settings in Africa and Asia, they are important assets—often one of the only viable household agricultural strategies. Herd sizes in such settings are linked to welfare dynamics.<sup>30</sup> The rapidly growing demand for livestock products in developing

<sup>25</sup> Deere and Doss (2006), Ramachandran (2006), Agarwal (1994).

<sup>26</sup> Deere and Leon (2003), Katz and Chamorro (2003).

<sup>27</sup> World Bank (2005b).

<sup>28</sup> World Bank (2006b)

<sup>29</sup> Quisumbing and others (2001).

<sup>30</sup> Lybbert and others (2004), Barrett and others (2006).

countries reinforces livestock as part of the household asset portfolio and its potential to reduce poverty, particularly for landless and pastoral households.<sup>31</sup>

3.24 Cross-country comparable data are not available, but examples suggest that livestock account for more than half of rural household wealth in Burkina Faso and Ethiopia.<sup>32</sup> Data from the 14 countries analyzed by Davis and others (2007) indicate that the majority of households own some livestock, with shares above 80 percent in Albania, Ecuador, Nepal, and Vietnam. Even among the poorest households, more than 40 percent own livestock, except in Pakistan. Many livestock holdings consist, however, of smaller animals, and fewer than 40 percent of households own cattle. Households in the top consumption quintile typically own more livestock, and the difference can be as high as 500-600 percent. The share of livestock owned by the top fifth of livestock holders varies between 47 percent and 97 percent, showing that livestock holdings tend to be quite unequal.<sup>33</sup>

***Rural households have differential access to formal and informal social capital***

3.25 Membership in formal or informal organizations and in community or ethnic networks is often considered a major asset of the rural poor. It can be important for access to input and output markets, insurance, trust in market transactions, and influence over political decisions. Exclusion from such networks can thus severely limit the choices of many. Social capital is not only important for farmers; It also determines opportunities in the nonagricultural sectors (for traders or for job referrals) and for migration.<sup>34</sup> For agricultural workers in (often isolated) large estates in Sri Lanka and elsewhere the lack of connectivity and networks is a major constraint limiting upward mobility.<sup>35</sup>

3.26 Producer organizations can be a key part of the social capital of many smallholder households, contributing to smallholder competitiveness. Recent research in Senegal and Burkina Faso highlights the development of producer organizations. Between 1982 and 2002 the proportion of villages with a producer organization rose from 8 to 65 percent in Senegal, and from 21 to 91 percent in Burkina Faso. Overall, 69 percent of Senegal's rural households and 57 percent of Burkina Faso's are now members of producer organizations.<sup>36</sup> On average, however, the more fortunate members of rural society belong to producer organizations in both countries.<sup>37</sup> Data for other African and Latin American countries, though fragmented, also indicate a rapid increase in the number of such local organizations.<sup>38</sup>

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<sup>31</sup> Seré (2007).

<sup>32</sup> Fafchamps, Udry, and Czukas (1998), Rogg (2006).

<sup>33</sup> Zezza and others (2007).

<sup>34</sup> Putnam (1993), Munshi (2003), Fafchamps and Minten (2002), La Ferrara (2003), Fafchamps (2004).

<sup>35</sup> World Bank (2006c).

<sup>36</sup> Bernard and others (2006).

<sup>37</sup> Arcand and Fafchamps (2006).

<sup>38</sup> Agoua, Mercoiret, and Ouikoun (2000), Kaburie and Ruvuga (2006).

### **Household behavior when markets fail: rational, despite appearances**

3.27 Control over assets, by households and their members, affects the participation of individuals in different activities, the returns to these activities, and the distribution of outcomes across and within the household. With market failures, initial resource endowments affect the efficiency of resource use and thus the well-being of households, as discussed extensively in the *2006 World Development Report*.<sup>39</sup> It is well known that rural agents are exposed to multiple market failures that seriously constrain their possible activities.<sup>40</sup> Market failures are indeed so pervasive that Ellis (2003) considers them as the defining feature of smallholder farmers. Household production and consumption decisions become jointly determined, explaining aspects of rural household behavior that would otherwise appear irrational.<sup>41</sup> Consider a few examples.

3.28 Farm households that produce food and cash crops will not always be able to respond to an increase in the price of the cash crop. When transaction costs in food markets are high, and labor markets function imperfectly, the household might not be able to employ more labor and increase cash crop production, while maintaining the necessary food production for its own food security.<sup>42</sup> It is thus confined to responding to price incentives through technological change or more use of fertilizer, but capital market imperfections can also limit these possibilities. As a result, response to price incentives in cash crops is often limited, shrinking the benefits from price and trade policies that increase producer incentives (chapter 4).<sup>43</sup>

3.29 Market imperfections, combined with differences in asset endowments, including social capital, can also shed light on technology adoption (chapter 7). Evidence from India, Ghana, and Mozambique suggests that social learning may be essential for adopting new technologies. Farmers' decisions are influenced by the experiences of farmers in their social networks, which can help reduce asymmetric information regarding the new technology. New technologies often involve uncertainties about appropriate application (such as the optimal amount and timing of fertilizer use) or the suitability for a particular environment. Thus adoption patterns can be slow, as individual farmers gain from waiting and learning from other's mistakes.<sup>44</sup> Sometimes all farmers can deem the evaluation costs too high or uncertain, choosing to stay with the status quo, behavior that can appear inefficient to an outsider.<sup>45</sup>

3.30 Often behavior can be better understood by recognizing that the household is the domain of complicated interactions of cooperation and power plays.<sup>46</sup> A woman's power is often affected by her participation in economic activity, which itself depends on her asset endowment (including human capital) and her access to household assets.

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<sup>39</sup> World Bank (2005c).

<sup>40</sup> de Janvry and Sadoulet (2006).

<sup>41</sup> Singh, Squire, and Strauss (1986).

<sup>42</sup> The labor market imperfections can e.g. be the result of wages that are higher than the competitive equilibrium to guarantee sufficient caloric intake, i.e. efficiency wages (Leibenstein (1986)).

<sup>43</sup> de Janvry, Fafchamps, and Sadoulet (1991), Von Braun, Hotchkiss, and Inmink (1989), Taylor and Adelman (2002), Kurosaki and Fafchamps (2002), Rosenzweig and Wolpin (1993).

<sup>44</sup> Foster and Rosenzweig (1995), Conley and Udry (2004), Bandiera and Rasul (2006), Munshi (2004).

<sup>45</sup> Basu (2006b).

<sup>46</sup> Bourguignon and Chiappori (1994), Carter and Katz (1997), Basu (2006a).

Intrahousehold differences in control over assets and cash can thus affect cultivation and technology decisions, as well as a household's market orientation.<sup>47</sup>

3.31 More generally, imperfections in the credit market can lead to low liquidity at the beginning of the season, which can affect individual or household decisions to engage in the labor market to obtain cash.<sup>48</sup> Recent evidence from Kenya suggests that households might also have a savings commitment problem and therefore don't buy fertilizer for the next season, another explanation for the limited adoption of otherwise profitable practices.<sup>49</sup>

3.32 To the extent that these factors prevent households from maintaining soil fertility or otherwise adopting sustainable practices, they can have important repercussions for natural resource management. Unsustainable outcomes can also be the result of collective action problems, with the "tragedy of the commons" looming where household livelihoods depend on open access resources, as among pastoralist groups (chapter 8). Empirical evidence suggests, however, that cooperative resource management often emerges in such settings.<sup>50</sup>

***With market failures, household assets determine household well-being***

3.33 The asset endowments of individuals and households together with the context effectively condition participation in, and returns to, different income strategies, with implications for policies that target access to land, capital, or insurance (chapter 6). Land ownership can provide rural households with the collateral to circumvent credit market failures. With credit and input market failures, household ownership of work animals can affect the timing of cultivation practices. And human capital constraints can limit the possibilities for individuals to specialize in remunerative agricultural or nonagricultural activities. More generally, household choices between farm and nonfarm activities are determined by their asset endowments, with frequent early abandonment of agricultural and non-agricultural activities that have low profitability.

3.34 Lacking a minimum asset endowment can trap households in long-term poverty, and negative shocks can plunge them below the minimum asset threshold to pull themselves out.<sup>51</sup> Recent empirical studies provide evidence of poverty traps and the possible long-term negative consequences of shocks on households' asset accumulation patterns.<sup>52</sup> Such traps can result because of market imperfections that affect access to inputs or because profitable production requires a minimum scale. This suggests a role for policies to lift households above a minimum asset threshold and launch them on a pathway out of poverty—and to enhance household's ability to cope and prevent them from falling below this threshold when hit by a shock. Moreover, even without poverty traps, it can take a very long time for households to recover from a shock which further indicates the importance of enhancing risk coping and management strategies.

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<sup>47</sup> Udry (1996), McPeak and Doss (2006), Goldstein and Udry (2006).

<sup>48</sup> de Janvry and others (1992).

<sup>49</sup> Duflo, Kremer, and Robinson (2006).

<sup>50</sup> Ostrom (1990), Baland and Platteau (1996), Fafchamps, Udry, and Czukas (1998), McCarthy (2004),

<sup>51</sup> Dercon (2004), Carter and Barrett (2006), Carter (2006), Barrett and McPeak (2006).

<sup>52</sup> Lybbert and others (2004), Hoddinott (2006), Barrett and others (2006), among others.

3.35 Population density and access to markets, strongly correlated with transaction costs and asymmetric information, also determine household strategies. Rural household strategies are also conditioned by the agricultural potential and natural resources available in their environment (chapter 8). Recent work on the geography of poverty sheds light on how these factors relate to household strategies and rural poverty (see chapter 2, and the box on infrastructure in chapter 5).

3.36 Interventions can target access to assets, or the context that determines the returns to those assets by addressing market failures, increasing the productivity of assets, or helping manage vulnerability. The chapters in part II cover the policy options that can facilitate pathways out of poverty and prevent households from slipping into poverty. Discussed are several aspects of context that affect the return to rural households assets, such as price and trade policies (chapter 4), access to input and output markets (chapter 5), institutional innovations (chapter 6), technological options (chapter 7), natural resource management (chapter 8), and labor productivity and labor market returns (chapter 9). Exposure to risk is relevant across all these different themes.

***Risks are pervasive and responses to risk can be costly for household welfare***

3.37 Agriculture is one of the riskiest sectors of economic activity. Weather related and health shocks are often identified by rural households as their most important risk factors.<sup>53</sup> The immediate production and welfare losses associated with drought can be substantial. For example, in Kilimanjaro, Tanzania, farmers who reported rainfall patterns well below normal in the past year, experienced a 50 percent reduction in their gross agricultural revenues and a 10 percent reduction in their consumption.<sup>54</sup> Recent comparative panel studies in Africa, Asia, and Latin America suggest that health shocks contribute to more than half of all into chronic poverty by previously non-poor households.<sup>55</sup>

3.38 The lack of insurance markets makes agricultural producers particularly vulnerable. If, in addition, credit markets are imperfect, a smallholder household's consumption will be severely affected by shocks related to agricultural production. Households facing imperfect credit and insurance markets are thus likely to reduce their consumption risk by choosing low risk activities or technology, which might also have low average returns.<sup>56</sup> For example, farmers in riskier environments in South India choose asset portfolios that are less sensitive to rainfall variation but less profitable.<sup>57</sup> This is particularly so for poorer households. Portfolio choices associated with a one standard deviation change in the variability of the date of the onset of the monsoon lead to a 35 percent decline in the profitability of production for the poor but only a 4.5 percent average decline for all households.

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<sup>53</sup> Dercon, Hoddinott, and Woldehanna (2005), Christiaensen and Subbarao (2005), Christiaensen and Sarris (2007).

<sup>54</sup> Christiaensen and Sarris (2007).

<sup>55</sup> Krishna (2006b), Christiaensen and Subbarao (2005).

<sup>56</sup> Alderman and Paxson (1994), Fafchamps and Pender (1997), Dercon (2001).

<sup>57</sup> Binswanger and Rosenzweig (1993).

3.39 More generally, rural households face multiple risks that influence their livelihood strategies and asset accumulation pathways. Farmers need to be prepared both for shocks that affect their current earnings (including price shocks)<sup>58</sup> and shocks that reduce their future livelihood by degrading or destroying assets. In response to adverse income shocks, households typically liquidate assets or borrow to smooth current consumption. And in response to adverse asset shocks, such as the loss of livestock, households typically increase savings to replenish depleted asset stocks and preserve future income-earning capacity. When income and asset shocks coincide, households face conflicting pressures. Drought not only reduces crop income and milk production but also increases herd mortality rates, so herders in Burkina Faso and Kenya reduce consumption rather than liquidate livestock.<sup>59</sup>

3.40 The relationship between asset and income risk is acute for health shocks. Illnesses and injuries in a family simultaneously reduce income due to lost time working and from increased curative health treatment expenditures. In Indonesia income losses were found to be more important than direct medical expenditures, and they are seldom covered by insurance.<sup>60</sup> As fee waivers and many forms of insurance are commonly available for only fairly minor health expenditures, serious health shocks can impoverish a family—as can the death or permanent impairment of a household member.

3.41 In addition to coping with weather and price risks—as well as losses of income due to human health shocks—farmers often worry about abrupt changes in rules for land tenure or regulations for trade. In many low-income countries, property rights are vulnerable to seizure by government or local authorities, a risk that can reduce agricultural investment.<sup>61</sup> Similarly, sudden restrictions on grain movement or storage can discourage investments. For example, elimination of private grain trade in Zimbabwe contributed to the recent downward spiral in food security. Rural political violence and crime can also cause considerable farm productivity losses, as in Colombia.<sup>62</sup>

3.42 Shocks can be idiosyncratic, when one household's experience is weakly related, if at all, to that of neighboring households—or covariate, when households suffer similar shocks. Idiosyncratic shocks commonly arise from reduced crop yields associated with microclimatic variation, local wildlife damage or pest infestation, illness (especially chronic rather than infectious), and one-off property losses due to fire or theft. Such shocks can, in principle, be managed within a locale. Covariate shocks, by contrast, commonly arise from war, natural disasters, price instability, and financial crises, which almost everyone in a community experiences. Such shocks are difficult to insure locally and thus require some coordinated external response. The evidence suggests that idiosyncratic risk is often larger than expected in rural Africa and Asia, indicating the potential for significant gains from better local risk management and developing country agriculture.

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<sup>58</sup> Christiaensen and Sarris (2007), Dercon, Hoddinott, and Woldehanna (2005).

<sup>59</sup> Kazianga and Udry (2006), McPeak (2004), Fafchamps, Udry, and Czukas (1998).

<sup>60</sup> Gertler and Gruber (2002).

<sup>61</sup> World Bank (2006).

<sup>62</sup> González and Lopez (2007).

3.43 Are agricultural risks increasing? Recent empirical evidence suggests that the coefficient of variation of real agricultural output has been remarkably stable for the past 30 years or so.<sup>63</sup> Heightened volatility attributable to apparent increases in climate variability and associated episodes of drought, flooding, and other natural disasters<sup>64</sup> has been offset by reduced volatility thanks to the greater use of variability-reducing inputs in irrigation and livestock. Clearer than the trend in the number of adverse events is the rising cost per event—per meteorological or other natural disaster, reflecting the expansion of population and of cultivation into more vulnerable areas. Moreover, the economic costs of extreme weather events increase as production systems use more capital. Higher investments increase asset-risk exposure, which is one obstacle to expanding credit use by poor households. This also helps explain why many farmers who are not poor remain vulnerable to shocks in the absence of risk-mitigating measures.

3.44 Poor areas generally are also riskier. Prices tend to be more variable in more remote areas, often the poorest regions, which face greater price swings due to limited market access and greater costs of getting to market. Poor households also have fewer means to insure against bad weather and they face more weather-related disasters—aggravated by inequality in the coverage and effectiveness of infrastructure. People in low-income countries are four times more likely to die in natural disasters than those in OECD countries.<sup>65</sup>

#### ***Inability to insure can lead to asset depletion and to irreversible consequences***

3.45 The inability to protect a household from income and asset shocks can result in irreversible consequences across generations through reduced investments in health, nutrition, and schooling. For many households, accumulating assets is like the child's game of snakes and ladders, with laborious efforts to increase one's position being set back in one unlucky draw. With little insurance and often inadequate savings, households hit by a shock face the dilemma of either conserving productive assets for future consumption or stabilizing consumption by drawing down assets.

3.46 Drawing down assets becomes especially important if there are asset thresholds that trap a household in poverty. In many circumstances recovering from a shock is slow and often incomplete by the time the next shock occurs. And after an income shock the poor recover slower than the non-poor. Households in an isolated community in Zimbabwe lost 80 percent of their cattle in the 1992 drought. By 1997 the average herd size recovered to 50 percent of pre-drought levels, but there was little recovery for households that lost their entire breeding stock.<sup>66</sup>

3.47 Coping with shocks often comes at the expense of investments in the next generation. In addition to the higher infant mortality in drought years, survivors are often stunted. During droughts in Zimbabwe in the 1980s infants less than two years old—the

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<sup>63</sup> Santos (2006).

<sup>64</sup> Gaiha and Thapa (2006), Rasmussen (2004).

<sup>65</sup> Gaiha and Thapa (2006).

<sup>66</sup> Cavendish (1999).

age most vulnerable to malnutrition—show higher malnutrition after a weather shock.<sup>67</sup> Following these children to their young adult years also showed that their stunting led to fewer completed years of school, translating into a 14 percent reduction in lifetime earnings.<sup>68</sup> In many settings, rural households also respond to low rainfall or unemployment shocks by withdrawing children from school or decreasing their attendance so that they can help at home and on the farm.<sup>69</sup> Meeting current consumption after a shock can also degrade the environment at a cost of future livelihoods. Shocks can intensify pressures on common property, increase poaching and encroaching on protected areas, and augment conflicts between pastoral and farming communities.<sup>70</sup>

### **Rural income sources and livelihood strategies**

3.48 Agriculture remains a very important source of income for rural households in most countries. In the agriculture-based countries included in figure 3.1, farm crop and livestock income and agricultural wage generated between 47 and 75 percent of rural income. Even in the transforming and urbanized countries the share of rural income from on-farm and agricultural wages is always more than 25 percent, and often much higher.

#### ***The poor depend most on agricultural income***

3.49 For the poorest households, on-farm income and agricultural wages typically account for a larger share of household income, ranging from 79 percent in Ghana to 75 percent in Vietnam, 71 percent in Nepal, and 61 percent in Guatemala (figure 3.5). In Asia, Latin America and some countries in Africa (Malawi and Nigeria), agricultural wages are more important for low-income than for high-income households. On-farm income often declines across quintiles (Ghana, Guatemala, Indonesia, Vietnam) but is most important for households in the middle of the distribution of income in Nepal and Nicaragua.

3.50 Women's participation in agricultural self-employment differs across regions. In Africa, in Eastern Europe and Central Asia, and in some East Asian countries both men and women work equally in agricultural self-employment (figure 3.6). In Mozambique, Rwanda, and Uganda, but also in Egypt, women are in fact reported to work much more in agricultural self-employment. In contrast in Latin America and South Asia, women are reported to work less in agricultural self-employment.<sup>71</sup> Evidence for Burkina Faso, Malawi, and Zambia indicates that women are more likely to be engaged in subsistence farming and less likely to cultivate cash crops.<sup>72</sup> This sometimes reflects an inefficient

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<sup>67</sup> Similarly in Ethiopia, shocks were found to significantly reduce height growth among children between 6 and 24 months old (Yamano, Alderman, and Christiaensen (2006).

<sup>68</sup> Alderman, Hoddinott, and Kinsey (2006).

<sup>69</sup> Jensen (2000), Thomas and others (2004). de Janvry and others (2006).

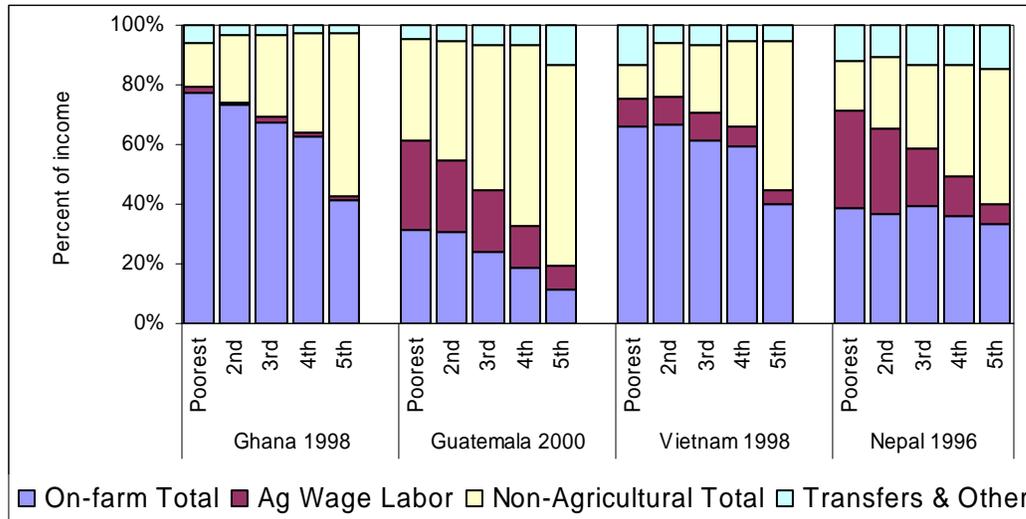
<sup>70</sup> Barrett (2006), Fafchamps (1998).

<sup>71</sup> Katz (2003). Note however that female self-employment in agriculture might often not be captured by the survey.

<sup>72</sup> World Bank (2005d), World Bank (2006b).

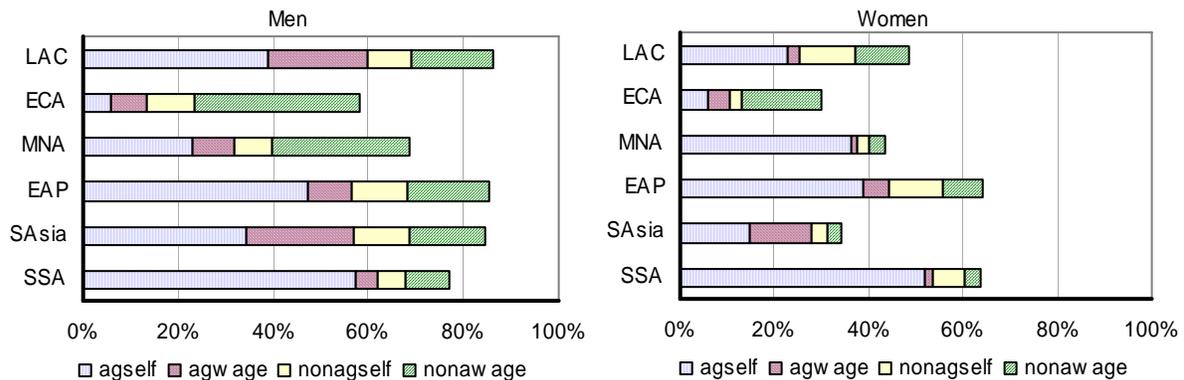
allocation of household resources because of diverging interests and unequal bargaining power across men and women.<sup>73</sup>

**Figure 3.5 Heterogeneity in income sources along expenditure quintiles**



Source: Davis and others (2007).

**Figure 3.6 Participation in economic activity, by principal activity and region (ages 15-64)**



Source: Regional averages based on available household surveys for 58 countries.<sup>74</sup> Omitted group includes individuals out of labor force and individuals whose economic activity is not defined.

3.51 Women in Africa, South Asia, and Latin America have broadened and deepened their involvement in agricultural production in recent decades.<sup>75</sup> Given that many development policies have wrongly assumed that farmers are men, the greater activity of women in agriculture in many parts of the world calls for much greater attention to gender-specific constraints, offering important win-win opportunities for efficiency and welfare.

3.52 Women have been employed in increasing numbers in the production and processing of nontraditional agricultural exports, such as fruits, flowers, and vegetables.

<sup>73</sup> Udry (1996).

<sup>74</sup> See footnote 10 for details.

<sup>75</sup> Lastarria-Cornhiel (2007). Ramachandran (2006).

Women are taking over more of the agricultural tasks once done only by men, such as land preparation, and they are investing more in cash crop production. Large-scale production of nontraditional agricultural exports (or high value agricultural exports) has sometimes increased women's wage work in fields, processing, and packing.<sup>76</sup> In China, by contrast, there is no feminization of either wage employment or self-employment in agriculture.<sup>77</sup>

### ***Challenges for smallholders are rising***

3.53 The vast majority of farmers in developing countries are smallholders, and 87 percent of them are farming less than two hectares.<sup>78</sup> To assess the potential of agriculture to contribute to growth, and poverty reduction, it is essential to know whether small farms are efficient. The literature linking household's asset endowments to agricultural productivity has long emphasized an inverse relationship between farm size and efficiency. Both theory and empirical evidence have indeed shown that such a relationship is common when imperfections in both land and labor markets are large.<sup>79</sup> The inverse relationship, where it exists, is a powerful motivation for land access policies that redistribute land toward smallholders which is good for both efficiency and equity.

3.54 Recent analyses suggest, however, that productivity may be higher on large farms in some countries.<sup>80</sup> For example, gains in staple food yields on small farms are lagging behind gains on larger farms in both Brazil and Chile (figure 3.7).<sup>81</sup> These results suggest additional market imperfections that can erase the competitive advantage of smallholders.

3.55 Imperfections in credit and insurance markets can prevent small farmers from adopting more productive capital-intensive techniques or higher value products.<sup>82</sup> Evidence from Brazil indicates market shifts favoring technologically more advanced producers who are better able to cope with price and yield variability and deal with the demands of agro-processing.<sup>83</sup> Imperfections in capital and insurance markets, combined with transaction costs, can also prevent land sales and rental markets from allocating land to the most efficient users.<sup>84</sup> Moreover, imperfect competition in the rental and sales markets and the insecurity of property rights might favor land concentration in larger farms.<sup>85</sup> These complexities indicate the need to jointly consider policies targeting land, capital, and risk (chapter 6).

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<sup>76</sup> Dolan and Sorby (2003), Deere (2005), Katz (2003).

<sup>77</sup> Zhang and others (2007).

<sup>78</sup> Von Braun (2003).

<sup>79</sup> E.g. Berry and Cline (1979) and Carter (1984). While some have argued that land quality differences or unobserved plot characteristics can help explain the inverse relationship (Benjamin (1995), Assuncao and Braido (2007)), others have shown that the inverse relationship persists even after controlling for land quality and other plot characteristics (Heltberg (1998), and Kimhi (2006)).

<sup>80</sup> Dorward (1999), Rios and Shively (2005), Mathijs and Swinnen (2001).

<sup>81</sup> Yields do not indicate efficiency, but just gross output.

<sup>82</sup> Feder (1985), Kevane (1996).

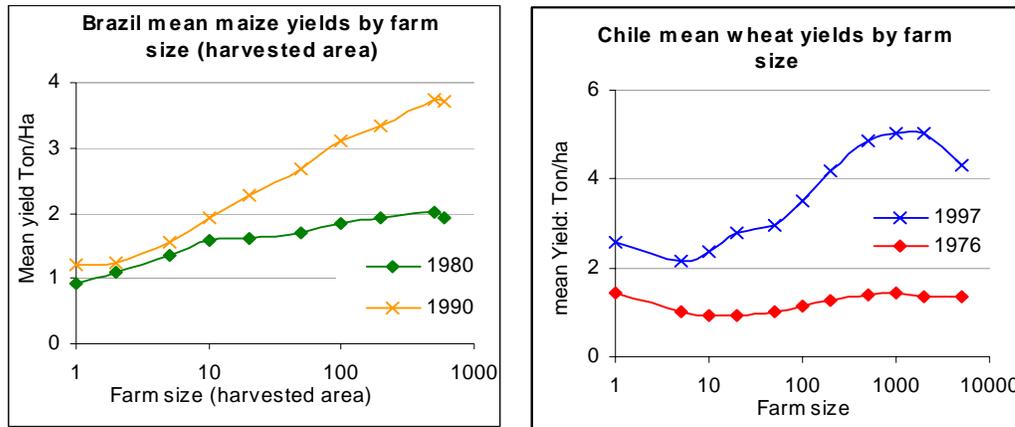
<sup>83</sup> World Bank (2003a).

<sup>84</sup> Zimmerman and Carter (2003), Carter and Chamorro (2001).

<sup>85</sup> Macours, de Janvry, and Sadoulet (2004).

3.56 While there may be constant returns to scale in production, economies of scope in the “new agriculture” often play a key role in obtaining inputs, technology, and information and in getting products to the market (chapter 5). As agriculture becomes more technology driven and access to consumers is mediated by agro-processors and supermarkets, such economies will become more important in both input and output markets.

**Figure 3.7 Small farms lag behind large farms in staples in Brazil and Chile**



Source: Anriquez and Bonomi (2007).

3.57 These different mechanisms can all reverse the small farm (yield) advantage, or make it irrelevant in the face of economies of scope. This can lead to a potential decline of the family farm (see box in chapter 10). The perceived “crisis” in smallholder agriculture is epitomized by the rash of suicides of heavily indebted farmers in India, the long-term stagnation of productivity of food crops in Africa, the role of poor (indigenous) farmers in the political instability in many Latin American countries, and the increasing rural-urban income disparities in South and East Asia.<sup>86</sup> Given this pessimism about smallholders, it is important to point out some promising and often ignored developments.

***Smallholder entrepreneurs and cooperation***

3.58 In most countries, there is a marked dualism in the smallholder sector, with entrepreneurial market-oriented farmers and smallholders engaged in subsistence farming. Smallholder entrepreneurs often focus on high-value products and are likely to respond when markets offer new opportunities. In Nepal farmers with strong market orientation do not necessarily have much higher land endowments, but they do have better access to irrigated land and markets, as well as higher human capital endowments.<sup>87</sup> This indicates a potential public role in facilitating the entrepreneurial smallholder pathway. The constraints on market participation are, however, likely to be different across settings. Evidence from Latin America suggests that market participation by smallholders in high-value crops depends on crop technology—and that it has been

<sup>86</sup> Vakulabharanam (2005), Jayne, Mather, and Mghenyi (2006), Otsuka (2007).

<sup>87</sup> Analysis based on 2003 NLSSII dataset. Using the 1996 NLSS data for Nepal, Fafchamps and Shilpi (2003) also find strong correlations between distance to markets and various measures of household strategies.

constrained by poor access to credit in some countries (Ecuador), but less so in others (in the Petrolina region in Brazil and Guatemala). Evidence for Mozambique suggests that market participation there is strongly related to household asset endowments.<sup>88</sup>

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### **Box 3.3 Are farms becoming “too small”?**

Population pressures are leading to rapid declines in farm sizes in many parts of Asia and Africa. In China and Bangladesh, average farm size is around 0.5-0.6 hectares, and in Ethiopia and Malawi it is around 0.8 hectares. This raises a question about whether many farms have become “too small”, and the associated farm-size debate is motivated by a number of concerns. First, some have argued that the inverse farm-size relationship might not hold at very small farm sizes, or that even if such farms are efficient, they might be too small for rural household to escape poverty based on the income of the farm alone. Others argue it results in more disguised unemployment. The importance of these arguments is likely to be context-specific, and depends in part on the alternative income sources that might be available to rural households, but also on the safety net value that small farms and land access often have.

A related question is whether decreasing farm sizes contribute to increasing rural-urban income gaps. Otsuka (2007) argues that as urban wages are increasing in many Asian countries, labor productivity in agriculture has to increase to avoid the widening of the rural-urban income gap. One way of achieving such productivity gains might be through farm consolidation and mechanization. Policies aimed at activating land rental and sales market can play a role in such consolidation. Vice versa, tenure insecurity can prevent land re-allocation through sales or rental markets, and hence prevent such allocative gains. In Japan, malfunction of land rental market due to government interventions is argued to be one of the major causes underlying the preservation of small-scale inefficient farms until today. These arguments have been used in places like China to advocate greater tenure security, as it would facilitate exit into the non-farm sector by many. Without such policy changes in China, the trend of declining farm sizes might continue. Otsuka hypothesizes that China may then become a major importer of food, like Japan, which will lead to raising world food prices.

In other places, targeted consolidation policies have been considered. The advantages of such policies are however not always clear, as consolidation of land in fewer farms, necessarily implies that some households will lose their land access.<sup>89</sup> Alternatively, mechanisms that increase the productivity of the existing small farms themselves, such as adoption of high-value crops, can help address the rural-urban income gaps.

*Sources:* Otsuka (2007), Otsuka (1992), Deininger and Jin (2003), Anriquez and Bonomi (2007).

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3.59 Smallholders can act collectively to overcome high transaction costs in factor and product markets, limited access to public services, and lack of voice in policy forums.<sup>90</sup> By forming producer organizations, smallholders can achieve economies of scale for input procurement and output marketing, improve their bargaining power in value chains, gain greater access to public services, and acquire voice in policy decisions that affect their livelihoods. Producer organizations can enable smallholders to improve their productivity, take advantage of emerging market opportunities, and diversify into higher

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<sup>88</sup> Boughton and others (2006), Damiani (2000), Barham, Carter, and Sigelko (1995).

<sup>89</sup> Similarly, important trade-offs might exist related to land consolidation policies aimed at reducing land fragmentation (i.e. the fragmentation of the land of one household into multiple small plots). While consolidation might decrease transaction costs, it can increase risk (for example, plots that are geographically separated are less likely to be hit by the same plague). Moreover, consolidation policies leave room for elite capture and fair and transparent mechanisms for re-allocating land across different households can be hard to design and implement. And policies that force a minimum plot size can reduce important distortions, and therefore come with a potential efficiency and equity cost.

<sup>90</sup> Jayne, Mather, and Mghenyi (2006).

value products, all of which can increase incomes for their members,<sup>91</sup> but they also face challenges in their operations and management (chapter 6).

3.60 Promoting activities that require cooperation between larger commercial farmers and smallholders is another possibility. Cooperatives for exporting high value crops in Brazil's San Francisco Valley are good examples of smallholder-large farmer cooperation managed by farmer organizations.<sup>92</sup> Smallholders can also benefit from economies of scale in input or output markets by engaging with the larger-scale agricultural organizations through the labor and land rental markets.<sup>93</sup> In Mexico whole ejidos are rented out to tomato-exporters, while ejidatarios receive a land rent and wage for work on their own farm.<sup>94</sup> But if the bargaining power of smallholders is low, they are unlikely to share in the benefits because of the market power of these larger organizations or because of imperfect property rights.<sup>95</sup>

3.61 The combination of smallholder subsistence farming with non-farm earnings or migration offers a viable strategy in many contexts. So, while market-oriented smallholders can be highly successful in the "new agriculture," for many others agriculture is a way of life that offers security and complements earnings in the labor market and from migration.

### ***Income diversification through wage employment and nonagricultural self-employment***

3.62 Households in prosperous agricultural regions may diversify into nonagricultural activities to take advantage of attractive opportunities, while those in less favored environments may shift into low-value nonagricultural activities to cope with the risks.<sup>96</sup> Households with the good asset endowments may seize remunerative opportunities in the nonfarm sector, while those lacking land or livestock may be driven into low-value nonfarm employment.<sup>97</sup> Labor market income may also be important where population pressures on limited land resources are high, or where seasonal income from farming is insufficient for survival in the off-season, possibly because of chronic rainfall deficits, prices, or disease.<sup>98</sup>

3.63 *Rural nonfarm income.* Both poor and rich households diversify their income sources. Rural nonfarm income increases across consumption quintiles, and

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<sup>91</sup> See Bebbington (1996), Uphoff and Wijayaratra (2000) discuss the related experiences from water user associations in Sri Lanka which suggest that collective action led to higher efficiency, changed cultivation practices and expansion of the area cultivated.

<sup>92</sup> Damiani (2006).

<sup>93</sup> Karp (2006).

<sup>94</sup> During Mexico's land reform collective titles to large plots of land were distributed to groups of beneficiaries, creating ejidos, with part of the land distributed for individual use and part for common pasture and forest.

<sup>95</sup> Swinnen and Vranken (2006), Vranken and others (2007).

<sup>96</sup> Reardon, Delgado, and Matlon (1992), Haggblade, Steven, Hazell, Peter, and Reardon, Thomas (Forthcoming), Bryceson (1997) finds that wealthy households in Africa mention profit-maximization as reason for income diversification, while lower income households emphasize risk minimization.

<sup>97</sup> Barrett and others (2005).

<sup>98</sup> Reardon and others (Forthcoming), Hayami (2006). Evidence for Bangladesh also shows the importance of non-farm income for areas with unfavourable rainfed conditions (Otsuka and Yamano (2006).

nonagricultural wage and self-employment income increases inequality in almost all countries analyzed in Davis and others (2007), except Pakistan.<sup>99</sup> Poverty is associated with agricultural wage employment in Panama, Pakistan, and Vietnam, and high welfare levels with nonagricultural wage earnings in Ecuador, Ghana, Panama, and Vietnam. In the nonagricultural sector the rich often dominate lucrative business niches. The poor, lacking access to capital, education, and infrastructure, are not the main beneficiaries of the more lucrative sources of non farm income.<sup>100</sup> This is due, in part, to high-value and low-value jobs (chapter 9).

3.64 *Age and education.* Participation in nonfarm activities is conditional on human capital, which differs substantially by age, education, and gender.<sup>101</sup> Illiterate adults are more likely to be working in agricultural self and wage employment, while literate adults are more likely to have nonagricultural wage jobs. Older cohorts are less likely to be working in nonagricultural wage employment than younger cohorts. But younger cohorts are more likely to work in agricultural wage jobs in many Latin American and some East Asian countries, which could indicate more limited access to land for the younger generations.

3.65 *Gender.* Rural women generally are less likely to work in nonagricultural wage jobs, but this difference is getting smaller in many countries. Women are somewhat more likely than men to work in nonagricultural self-employment in Africa, East Asia, and Latin America but not in South Asia, Middle East and North Africa, or Eastern Europe and Central Europe (figure 3.6). Nevertheless, in Bangladesh there have been large increases in the participation of rural females in the labor force, with part of the increase due to employment in the garment industry and part to self-employment, financed through microfinance institutions, including microfinance in livestock.<sup>102</sup>

3.66 *Ethnicity.* The activities of indigenous individuals differ substantially across countries. Indigenous groups in Bolivia and Guatemala are less active in wage employment and more active in nonagricultural self-employment, though the difference with the non-indigenous population is narrowing. Indigenous people in Guatemala are also much more likely to be self-employed in (subsistence) agriculture. In India scheduled castes and tribal groups are more likely than other groups to earn both agricultural and nonagricultural wages and work less in nonagricultural self-employment, and the difference is increasing. Across different ethnic groups within the same country, differences can be large in the gender division of activities: in Lao PDR, women in the Mon-Khmer groups do most of the agricultural cultivation, but this is not the case for other groups.<sup>103</sup>

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<sup>99</sup> Haggblade, Hazell, and Reardon (2005) find that the nonfarm sector is equity-increasing in Kenya and Pakistan, equity-neutral in Ethiopia and India, and equity-decreasing in Ecuador and Vietnam.

<sup>100</sup> World Bank (2005b).

<sup>101</sup> Evidence in this section is based on analysis of a large set of household surveys (see footnote 10 for explanation on the sources). See also Reardon and others (Forthcoming) for an overview of how household asset endowments relate to rural nonfarm employment.

<sup>102</sup> World Bank (2005b).

<sup>103</sup> World Bank (2006a).

### ***Exit, coping, and access to capital through migration***

3.67 Many rural households rely on seasonal migration to complement their incomes in the lean seasons. They also rely on temporary migration of some household members, who migrate to the cities or abroad, and send remittances to the remaining household members, providing crucial cash income for both consumption and investment. Such migration can be temporary or permanent, and those who migrate are often the young and better educated. And push or pull factors can induce entire households to migrate out of the rural areas.

3.68 Seasonal migration has long been important for income diversification and risk coping in many agriculture-based economies. Where access to nonagricultural employment is limited or where climate (or technology) prevents continual cultivation of agricultural land, seasonal migration can complement income, smooth consumption, and protect households' asset base during the lean season.<sup>104</sup> Laborers migrate seasonally to other regions in their own country, often attracted to the large export crop estates that provided income in the off-season or during emergencies.<sup>105</sup> They also migrate across borders, and an important part of South-South migration is seasonal.<sup>106</sup>

3.69 Where migration is (more) permanent, it can be driven by push and pull factors. In Chile the local unemployment rate is positively correlated with out-migration, but the expansion of agricultural employment and jobs in agro-processing slowed migration.<sup>107</sup> Cohort analyses with population censuses between 1990 and 2000 in Ecuador, Mexico, Panama, and Sri Lanka suggest that people move out of localities that are more remote, with less infrastructure and poorer living conditions.<sup>108</sup> Yet areas with high agricultural potential can have high out-migration, as in Guatemala.<sup>109</sup> In Brazil, where rural-to-urban migration has been going on for decades, current out-migration tends to be lower from locales with higher poverty rates and lower agricultural potential, suggesting that the cost of migration might limit further out-migration from the unfavorable areas.<sup>110</sup>

3.70 With intense migration, negative sorting is taking place. Those who leave are generally younger, better educated, and more skilled. Long-term panel analyses for Bangladesh, the Philippines, and Thailand show that permanent out-migrants have more education.<sup>111</sup> Similar patterns are found in Brazil and Mexico (box 3.4).<sup>112</sup> There are also clear gender differences in migration, but they differ across countries, even within

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<sup>104</sup> E.g. Macours and Vakis (2006) show the positive impact of seasonal migration on early childhood development; de Brauw and Harigaya (Forthcoming) find that households with seasonal migration were less likely to have stagnating consumption levels.

<sup>105</sup> See e.g. World Bank (2005a) and Rogaly and Rafique (2003) for discussions on seasonal migration in Central America, and India

<sup>106</sup> Ratha and Shah (2006). See Konseiga (2005) for an example from West Africa.

<sup>107</sup> Foster and Valdés (2006).

<sup>108</sup> Anriquez and Bonomi (2007). World Bank (2006c).

<sup>109</sup> World Bank (2005a).

<sup>110</sup> Buck and others (2007).

<sup>111</sup> Otsuka and Yamano (2006).

<sup>112</sup> In addition to changing the skill and age composition of those remaining behind, migration can change the ethnic composition of rural populations, with migration rates of indigenous populations often slower, both because they are attached to land as ancestral territories, and because they may be discriminated against in labor markets.

the same region. For example, men are more likely to leave rural areas in Mexico, while women are more likely to leave in Brazil. International migration out of rural areas is male-dominated in Ecuador but female-dominated in the Dominican Republic and the Philippines. In some middle-income countries the entry of women into the workforce has created a large demand for female migrant domestic workers from poorer countries. But a number of developing countries have policies to discourage or forbid women from emigrating.<sup>113</sup> Overall, the selective sorting triggered by migration can diminish entrepreneurship among the remaining population, while receiving areas (including other rural areas) can gain from the inflow of human capital.<sup>114</sup>

3.71 Those who migrate go abroad or to urban areas that offer better income opportunities. Interestingly, however, many migrate to urban areas that are relatively close by (box 3.4). Rural migrants also move to other rural areas, suggesting the pull of agricultural and rural nonagricultural opportunities.<sup>115</sup> Overall, however, large population transitions out of agriculture imply that rural-urban migration may or may not be successful due to individual asset endowments and characteristics. Given that migration costs often are high, capital constraints can prevent the poorest-of-the-poor from migrating.<sup>116</sup> As a result, private transfers often initially increase income inequality.<sup>117</sup>

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#### **Box 3.4 The young and educated leave rural areas in Brazil and Mexico**

Population movements between 1995 and 2000 in Brazil are documented in the 2000 census. Rural men and women aged 20-25 are most likely to migrate, and young women migrate more than men (box figure). Illiterate individuals are least likely to migrate and highly educated individuals move twice as much. People at all education levels move to both urban and rural areas, but the highly educated are much more likely to move to out-of-state urban centers.

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<sup>113</sup> Ratha and Shah (2006), McKenzie (2006).

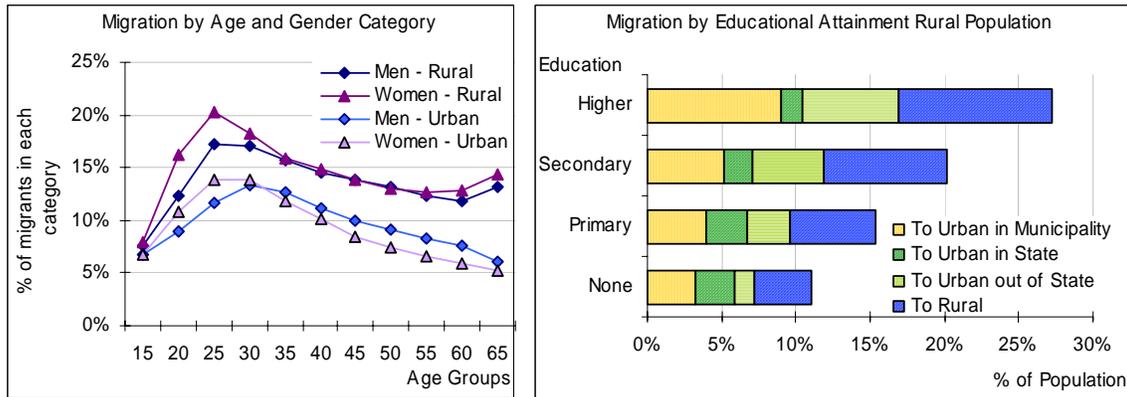
<sup>114</sup> Despite selection, the overall effect of migration on education levels might well be positive, both because of a positive incentive effect (see Stark, Helmenstein, and Prskawetz (1997) for a theoretical model and Boucher, Stark, and Taylor (2007) for empirical evidence from rural Mexico) and because of the use of remittances to cover the schooling costs of other household members.

<sup>115</sup> See Lohmar, Rozelle, and Zhao (2007) for evidence on China; box figure for evidence on Brazil.

<sup>116</sup> E.g. Du, Park, and Wang (2005) find an U-shaped relationship between assets and migration

<sup>117</sup> Davis and others (2007). The impact of remittances on inequality can change over time, with transfers initially increasing inequality, but afterwards (as migration becomes more common and more households participate) decreasing inequality (Stark, Taylor, and Yitzhaki (1998), Taylor (1992) and Docquier and Rapoport (2003).

**Box figure Young Brazilian women migrate more than young men; less educated migrate less**

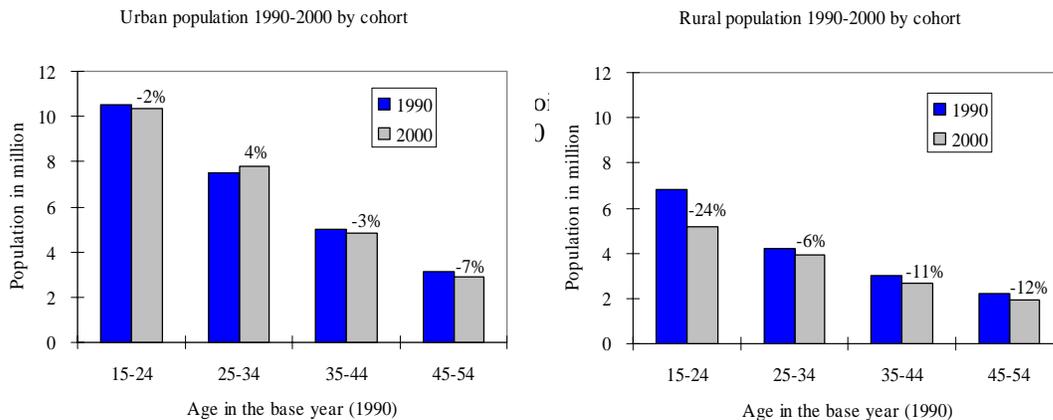


In Mexico rural emigration is much more common among men than women (27 vs. 21 percent) and among non-indigenous than indigenous (25 vs. 18 percent). Until 2000 women were relatively more prone to migrate to semi-urban and urban centers within the country, and men to the United States. Indigenous migration has its own dynamics, responding to seasonal agricultural cycles within Mexico, though international migration among indigenous groups steadily increased in the 1990s.

Current estimates indicate that up to 16 percent of the Mexican-born population lives in the United States. In the 1990s alone international migration from Mexico to the United States more than doubled over the previous decade, with 6.6 percent of the population leaving the country.

Net migration mainly affects rural areas. Almost a quarter of those 15-24 in 1990 had left rural Mexico by 2000, migrating to urban centers or abroad (box figure). Among the older cohorts, migration is also high, reaching 6-12 percent. Close to 15 percent of the rural households reported receiving remittances from abroad in 2004.

**Box figure Almost a quarter of the 15-24 cohort from 1990 had left rural Mexico by 2000**



Source: Censuses (10%). Population in 1990 is net of death during the decade

Source: Calculations based on Brazil census (2000), Mexico census (2000). Buck and others (2007).

3.72 Income from remittances by former household members (both national and international) increase the asset base of rural households that stayed behind, in the form of land, livestock, and human capital.<sup>118</sup> In the Philippines, remittances are more likely

<sup>118</sup> Yang (2007), Mansuri (2007a), Taylor and Mora (2006).

to be used for investment, rather than for direct expenditures, when the migrant is a child (as opposed to a sibling) of the receiving household.<sup>119</sup> Remittances are also important to offset weather or rural income shocks,<sup>120</sup> thereby protecting households' productive asset base. Evidence from the Oportunidades program in Mexico suggests that public transfers can similarly lead to (not necessarily intended) investments in productive activities and risk coping.<sup>121</sup>

3.73 Private and public transfers account for a surprisingly large share of rural income, particularly in transforming and urbanized economies. In some countries, there have been major increases in transfers, which coincided with declining farm incomes. In Bulgaria households became more dependent on public transfers as government spending on social protection rose to offset economic hardships. And in urbanized Brazil and Mexico public transfers (particularly conditional cash transfers) have become important for rural household income.

3.74 Urban-to-rural migration highlights agriculture's role as a safety net, showing that many urban residents are still part of a broader rural kinship network. During the Asian crisis in Indonesia and Thailand, and during the early transition years in the Caucasus and Central Asia, reverse migration helped people deal with economic shocks.<sup>122</sup> There is also evidence of return migration in parts of Africa, related to economic shocks and HIV/AIDS (see box on Zambia). Agriculture thus provides "farm-financed social welfare" when public welfare services are deficient or nonexistent.<sup>123</sup>

### **Three complementary pathways out of poverty**

3.75 Analyses of long-term panel data shed light on whether farm-, labor-, or migration-led strategies have resulted in pathways out of poverty.<sup>124</sup> This is particularly important because it is seldom clear whether income changes observed in short-term panels reflect transitory movements in and out of poverty, or long-term trends. Few studies shed light on the different pathways simultaneously, but those that do suggest that the different pathways often operate at the same time. Studies for Bangladesh and Tanzania discuss the success of the farm, nonfarm labor, and migration pathways, and evidence for Indonesia suggests the role of both farm and nonfarm pathways.<sup>125</sup> Similarly, diversification of income sources is correlated with moving out of poverty in 35 villages in Andhra Pradesh.<sup>126</sup> Careful studies using longitudinal data shed further light on the strong potential relationships between poverty reduction and each of the pathways.

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<sup>119</sup> Quisumbing and McNiven (2006).

<sup>120</sup> Yang and Choi (Forthcoming).

<sup>121</sup> Gertler, Martinez, and Rubio-Codina (2006), de Janvry and others (2006).

<sup>122</sup> Frankenberg, Smith, and Thomas (2003), Macours and Swinnen (2006).

<sup>123</sup> Owen (1966).

<sup>124</sup> While it is possible to document the success of the different pathways by correlating household income strategies with changes in poverty levels at different points in time, establishing causality is much more difficult.

<sup>125</sup> De Weerd (2006), Beegle, De Weerd, and Dercon (2006), Nargis and Hossain (2006), McCulloch, Weisbrod, and Timmer (2007).

<sup>126</sup> Krishna (2006a).

3.76 Success stories document how rural households exited poverty through the market-oriented farm pathway. In Tanzania those most successful in moving out of poverty were farmers who diversified their farming activities by growing a combination of food crops for own consumption, nontraditional cash crops (vegetables, fruit, vanilla) for sale, and keeping livestock. People who remained in poverty were those who stuck solely to the more traditional agricultural farming system.<sup>127</sup> In Uganda escaping from poverty was linked to improving land productivity and diversifying into commercial crops.<sup>128</sup> Anecdotal evidence for Niger shows how shifts to more sustainable cultivation practices by small farmers led to better soil conservation, increased income sources from tree crops, and lowered vulnerability.<sup>129</sup>

3.77 Some policy reforms have greatly enhanced the capability of smallholder entrepreneurs to lift themselves from poverty. This was clearly a key component in China's early agricultural success story (focus A). In Zimbabwe households that obtained land through resettlement programs experienced strong growth in crop income and asset accumulation between 1983 and 1996, with income gains the largest for the poorest households.<sup>130</sup> More recently in Malawi, reforms reducing protection to the large estates dramatically shifted the structure of agricultural production. Smallholders rapidly diversified into cash crops, and now produce 70 percent of burley tobacco, a major export crop.<sup>131</sup> The expansion helped many households move up the socioeconomic ladder, although others fell behind. Other farmers in the same area benefited from the expansion of trade in food crops.<sup>132</sup>

3.78 In Vietnam liberalizing agricultural markets induced many subsistence farmers to become more market oriented. Almost half the smallholders not selling to the market in 1992 were selling more than 25 percent of their production in 1998, and two-thirds of smallholders engaged in subsistence farming, who derive most of their income from agriculture in 1992, entered the market (table 3.3). Poverty rates among these producers fell drastically, and income almost doubled, while production of high value and industrial crops rose. Agricultural sales were more likely to increase for households with larger land endowments and those closer to markets or with non-farm industries in their communities. Households engaged in subsistence farming that did not enter the market were more likely to diversify their income sources, with poverty rates in those groups falling as well. Other households that continued to produce for self-consumption were those more engaged in nonagricultural activities both before and after the reforms. This suggests that both the farming pathway for smallholder entrepreneurs and the labor pathway for subsistence smallholders diversifying into nonagricultural activities were effective.

3.79 The labor pathway is further illustrated by long-term panel data analysis for India, that shows income from the nonfarm sector was an important driver of growth in rural areas. Nonfarm employment also had important indirect effects by increasing

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<sup>127</sup> De Weerd (2006).

<sup>128</sup> Krishna and others (2006).

<sup>129</sup> Kamber (2007).

<sup>130</sup> Gunning and others (2000).

<sup>131</sup> World Bank (2006b).

<sup>132</sup> Peters (2006).

agricultural wages.<sup>133</sup> In Indonesia agricultural households that shifted into the nonfarm economy were likely to have exited poverty, although agriculture did provide a pathway for others.<sup>134</sup> Business and trade provided an important pathway out of poverty in Tanzania, but only for those with networks in well connected communities.

3.80 Many studies have also established a positive correlation between migration and poverty reduction, though rigorous quantitative evidence of migration as a pathway out of poverty specifically for rural households is limited. The effects of exiting from rural areas are hard to measure because they require tracking down the households that leave. But a growing body of evidence shows how migration can be a pathway out of poverty for the household members who stay behind. Recent econometric evidence that controls for self-selection suggests the key role of both domestic and international migration for rural poverty reduction in diverse settings, such as rural China or Nepal.<sup>135</sup> Chapter 9 will return to policies that can further enhance migration's potential to reduce poverty.

**Table 3.3 Market participation among farming household in Vietnam**

Household characteristics	Subsistence farming		Market entrant		Market oriented	
	1992/3	1997/8	1992/3	1997/8	1992/3	1997/8
<b>Assets</b>						
Land owned (ha)	0.37	0.43	0.50	0.57	0.60	0.72
Land used (ha)	0.55	0.43	0.59	0.58	0.71	0.75
Education of household head (years)	4.6		6.3		6.3	
<b>Context</b>						
Market in community (%)	31		40		47	
Industrial/commercial enterprise in community (%)	34		43		42	
<b>Outcomes</b>						
Real income per capita (1998 Dong 1,000)	893	1,702	1,138	2,042	1,359	2,978
Share of agricultural income on total income (%)	80	62	83	66	83	73
Share below the poverty line	86	62	73	48	64	37
<b>Composition of gross incomes by crop type:</b>						
Rice (%)	60	59	62	53	54	49
Staple crops (%)	18	14	7	7	8	6
High valued crops (%)	7	8	6	13	18	24
Industrial crops (%)	6	5	15	18	12	15
Other crops (%)	8	14	10	8	8	7
Total (%)	100	100	100	100	100	100

*Note:* Subsistence farming households are defined here as selling less than 10 percent of their agricultural production in both years, market entrant as selling less than 10 percent in 1992/3 and more than 25 percent in 1997/8, and market-oriented as selling more than 25 percent in both years. These groups respectively represent 6, 13, and 28 percent of the rural farming households (i.e. households with more than 50 percent of income from agriculture).

*Source:* WDR team using VLSS 1992/93 and 1997/98.

<sup>133</sup> Foster and Rosenzweig (2004), Kijima and Lanjouw (2004) and Lanjouw (Forthcoming).

<sup>134</sup> McCulloch, Weisbrod, and Timmer (2007).

<sup>135</sup> Du, Park, and Wang (2005), Lokshin, Bontch-Osmolovski, and Glinskaya (2007).

### ***Pathways often enhance each other***

3.81 To the extent that there are complementarities between farm and nonfarm activities, farm households with better accessibility or in areas with high agricultural potential can earn more from agriculture, but also diversify more into nonagricultural activities. Empirical evidence from Bangladesh and Ecuador suggests the importance of such complementarities.<sup>136</sup> In Asia high rural savings rates from rising incomes during the Green Revolution made capital available for investment in nonfarm activities.<sup>137</sup> And diversification into such activities can relax credit and liquidity constraints—and the limits on own-farm agricultural production.<sup>138</sup>

3.82 Evidence from several countries also suggests the interplay among the farming, labor, and migration pathways. In the Philippines, land reform beneficiaries and large farmers benefited proportionally more from the Green Revolution, which allowed their children to attain high levels of education. These highly educated kids are now sending large remittances back to farm households.<sup>139</sup> Off-farm employment is consolidating the competitiveness of the family farm in the agricultural pathway. In Pakistan remittances from temporary migrants have a large impact on agricultural land purchases, and return migrants are more likely to set up a nonfarm business.<sup>140</sup> The relationship between migration and agricultural productivity is complex, however, because the (temporary) absence of household members reduces the agricultural labor supply, but remittances relax capital and risk constraints.<sup>141</sup> Agricultural productivity can therefore fall in the short run but rise in the long run<sup>142</sup> as households with migrants shift to less labor intensive, but possibly equally profitable, crops or livestock.<sup>143</sup>

### **Conclusions**

3.83 Three powerful and complementary pathways out of poverty are farming, off-farm labor, and migration. The following chapters discuss policies and programs that can enhance these pathways for the rural poor, by increasing their asset holdings and by improving the context that determines the level and volatility of the returns to assets. Given the heterogeneity in endowments and activities—across countries, regions within countries, households, and individuals within households—public policy responses need to address the different constraints that prevent, and the opportunities that can help, these different types of households and individuals to exit poverty.

3.84 The smallholder farming sector is characterized by dualism—there are both smallholders engaged in market-oriented and in subsistence farming activities. This dualism calls for differentiated agricultural policies that do not favor one over the other

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<sup>136</sup> Deichmann, Shilpi, and Vakis (2006), Davis and others (2007).

<sup>137</sup> Haggblade, Hazell, and Reardon (2005).

<sup>138</sup> Ngau and Evans (1991), Ellis and Freeman (2004).

<sup>139</sup> Estudillo and Otsuka (1999), Quisumbing, Estudillo, and Otsuka (2004), Otsuka and Yamano (2006).

<sup>140</sup> Mansuri (2007b) for Pakistan and Kilic and others (2007) for similar evidence on non-farm business in Albania.

<sup>141</sup> See Rozelle, Taylor, and de Brauw (1999) for evidence on China, Germenji and Swinnen (2004) for evidence on Albania.

<sup>142</sup> Lucas (1987) and Mansuri (2007b).

<sup>143</sup> McCarthy and others (2007), de Brauw and Harigaya (Forthcoming).

but instead serve the unique needs of all households while speeding the passage of subsistence farming to market-oriented farming. The variation and complementarity in income sources of rural households also indicates that policies can enhance returns to nonfarm labor and migration.

3.85 Recent changes in the global food market, in science and technology, and in a wide range of institutions that affect competitiveness are creating new challenges and exciting new opportunities for smallholder entrepreneurs. By addressing these challenges and seizing these opportunities, entrepreneurs can escape poverty through the farming pathway.

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## **Focus C Is there a link between agricultural production and food security?**

*Today the world has more than enough food to feed everyone but 850 million are food insecure. The problem is lack of economic access to food, at household and national levels, and hidden hunger—poor quality diets lacking the right vitamins and minerals. Agricultural productivity improvements not only increase household income and access to available food but ensure sufficient food supplies, at reasonable prices, for a growing population in the future. Focusing crop development on quality, such as biofortification, is an important component in the fight against hidden hunger.*

C.1 Food security emerged as a concept in the mid 1970s, as rapidly increasing prices caused a global food crisis. Attention focused first on food's availability, but moved to food access and food use. The commonly accepted definition of food security is:

when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

C.2 The chronically food insecure never have enough to eat. The seasonally food insecure fall below adequate consumption levels in the lean season. And the transitorily food insecure fall below the food consumption threshold as a result of an economic or natural shock—a drought, flood, or earthquake—but later return to food security.

C.3 Economic, natural and man made shocks exacerbate current food insecurity or drive people into food insecurity. Agricultural investments can reduce these risks. These investments can include irrigation systems, breeding drought tolerant crops, and weather based and commodity priced insurance instruments (chapter 6).

C.4 Global food security requires only sufficient global food production. And today the world is food-secure in this dimension. But without continuing attention to increased agricultural productivity to meet population and dietary shifts, this may not be true in the future (chapter 2). National food security requires both the production and the ability to import food from the global market. Household food security requires producing food or purchasing food in the local marketplace. Only at the individual level are availability, access, and use critical—the individual has access to sufficient food with the right blend of energy and micronutrients, prepared in safe conditions for a good nutritional outcome.

C.5 Malnutrition, from food insecurity, has significant economic consequences leading to individual productivity losses equivalent to 10 percent of lifetime earnings, and GDP losses of 2-3 percent in the worst-affected countries.<sup>1</sup>

C.6 Millennium Development Goal 1 recognizes that poverty and food insecurity are intimately connected by linking the outcome targets in one goal. Halving poverty,

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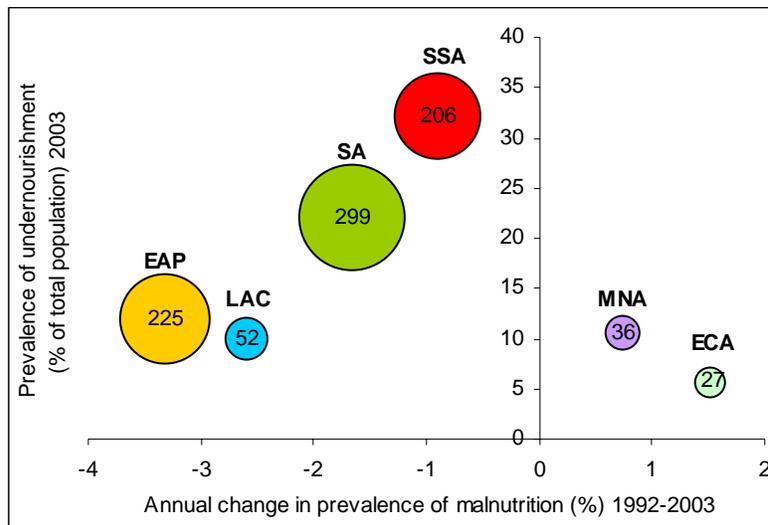
<sup>1</sup> Alderman (2005).

particularly the \$1 a day indicator, generally dominates discussions of MDG 1. But the other part of the goal, critical for sustainable poverty reduction, is halving hunger.

C.7 Undernourishment, as estimated by FAO, is one indicator of Millennium Development Goal 1, and captures an access-adjusted perspective of food insecurity. In today’s world, 850 million people are undernourished, despite global food availability, a stark revelation that poverty—not food availability—is the major driver of food insecurity.<sup>2</sup> The highest incidence of undernourishment is in Sub-Saharan Africa, where one in every three persons suffers from chronic hunger (figure C.1). The largest number of undernourished are in South Asia.

C.8 Failure to reduce undernourishment is a significant cause for concern. Just 3 million people were removed from the ranks of the undernourished in the decade from 1990-1992 to 2001-03. This marks a notable decline in decade performance given 100 million were removed from the ranks of the undernourished in the 1980s and 37 million in the 1970s.

**Figure C.1 Undernourishment is highest in Sub-Saharan Africa**



Note: The size of bubbles represents millions of undernourished people.

Source: FAO (2006a) and FAO (2006b).

C.9 FAO data suggest that about 60 countries fall below the internationally recognized daily caloric intake threshold of 2,350 calories. Two-thirds of them are in Sub-Saharan Africa, where per capita calorie availability has increased only 6 percent since 1961.

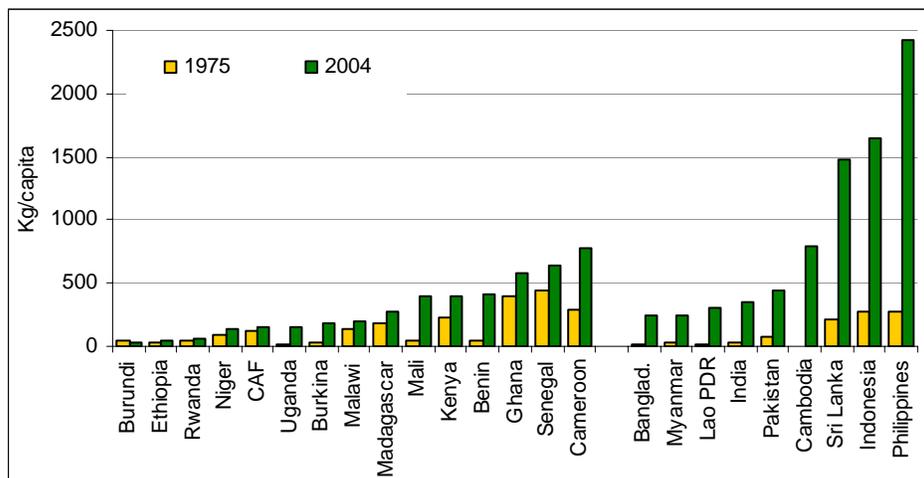
<sup>2</sup> FAO (2006b).

### Food availability—producing enough to eat

C.10 The price increases associated with the mid 1970s food security crisis were exacerbated by low foreign exchange reserves, limiting food imports in food deficit countries. This prompted some countries to look inward, striving for food self-sufficiency through domestic production. Cereal prices fell consistently through 2004. Many countries diversified their export base increasing the reliability of their foreign exchange earnings capacity, making food self-sufficiency expensive and redundant (figure C.2).

**Figure C.2 How much wheat can be purchased with export earnings?**

(1975-2004)



*Note:* Since prices were high in 1975, they provide a lower bound on import capacity.

*Source:* IMF International Financial Statistics.

C.11 For the least developed and, food-import-dependent, food insecurity has worsened. Many of the least developed countries, such as Ethiopia, Malawi, and Niger, are landlocked, adding high transport costs to the food import bill. These costs drive a wedge between import and export parity prices, resulting in neither imports nor exports. This leaves them largely dependent on domestic food supplies and external food assistance for their food security.

C.12 Dependency on own production is also true for households in remote areas with poor market access. Addressing the contemporary food security problem requires stimulating agricultural productivity in some poorer countries, especially in Africa, addressing ineffective and inequitable distribution driven by poverty and poor infrastructure development.

### **Food access—having enough to eat**

C.13 Nobel Laureate Amartya Sen famously wrote that “starvation is a matter of some people not *having* enough food to eat, and not a matter of there *being* not enough food to eat.”<sup>3</sup> The irony is that most of the food-insecure live in rural areas where food is produced, but are net food buyers rather than sellers. Poverty constrains their access to food in the marketplace. According to the UN Hunger Task Force, about half of the hungry are smallholder farmers, a fifth are landless, a tenth agro-pastoralists, fisherfolk, and forest users—and the remaining fifth live in urban areas.<sup>4</sup> Today agriculture’s role in income generation for the poor, particularly women, is more important for food security than its role in food production.

C.14 India has moved from food deficits to food surpluses, reducing poverty and having a per capita income higher than that in most parts of Sub-Saharan Africa. India remains home to 210 million undernourished people with 47 percent of children underweight—39 percent of the global total.<sup>5</sup> In Sub-Saharan Africa 26 percent of children are underweight. Bangladesh and Nepal, with India occupy three of the top four positions in the global ranking of underweight children. Only Ethiopia in Sub-Saharan Africa appears in the top four with the same incidence of underweight children as India, despite a much lower per capita income. Many believe that the inferior status of women in South Asia has reduced the food security impact of agriculture-led poverty reduction.

C.15 Women, more than men, spend their income on food. In Guatemala if the average yearly profits from nontraditional agricultural exports were controlled by women rather than their husbands, the amount spent on food would double.<sup>6</sup> In the Côte d’Ivoire increasing the proportion of income accruing to women in the household significantly improves the height of boys for their age relative to girls.<sup>7</sup>

C.16 Women’s significant engagement in agricultural production, particularly in Sub-Saharan Africa, makes women’s agricultural productivity important. Too often women do not own or control the plots they farm, and have less access to resources and services than men, resulting in lower yields on female-managed plots in the household. One study showed that if the same level of household resources were reallocated internally, ignoring gender norms, farm output would increase 10-20 percent.<sup>8</sup>

### **Food use—ending hidden hunger**

C.17 The food use pillar translates food security into nutrition security. Not only must enough food be available and accessible—it must be of the right quality and diversity, in terms of energy and micronutrients, safely prepared and consumed in a healthy environment. Nutritional security is distinct from food security in that it lies at the nexus

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<sup>3</sup> Sen (1981).

<sup>4</sup> Sanchez and others (2005).

<sup>5</sup> UNICEF (2007). FAO (2006b).

<sup>6</sup> Katz (1994).

<sup>7</sup> Hodinott and Haddad (1994).

<sup>8</sup> Udry (1996).

of health care, sanitation, safe water, and food, linking food security to the health and cognitive development of young children and ultimately to good nutrition outcomes.

C.18 Lack of dietary diversity leads to micronutrient malnutrition, or hidden hunger, even when energy intakes are sufficient. Hidden hunger can cause blindness, illness, and premature death and impair cognitive development. In the next 12 months it will kill 1 million children before the age of 5 and 50,000 women in childbirth.<sup>9</sup> Iron deficiency among female agricultural workers in Sierra Leone will cost the economy \$98.4 million in the next 5 years.<sup>10</sup>

C.19 Agriculture now has a relatively new and promising role in addressing hidden hunger. Traditionally the focus has been on home gardening, given the micronutrient content of vegetables. But often the high costs of home gardening and the low absorption of iron and vitamin A from vegetables make supplementation and food fortification more effective in addressing micronutrient deficiencies. Today, biofortification is enhancing staple crop varieties with higher levels of vitamins and minerals through plant breeding, using both conventional crop-breeding and biotechnology, improving diet quality.

C.20 The benefits of biofortified varieties of staple crops, such as cassava and maize, can be realized without changing existing diets and farming practices. The benefits are built into the seed, so little intervention or investment is needed once adopted. Biofortification can also produce healthier plants, with better pest and drought resistance and higher productivity.

C.21 A recent human field trial of an iron biofortified rice in the Philippines, where 32 percent of women are iron-deficient, indicated that it could raise the percentage of people meeting their estimated average requirement from 53 to 71 percent.<sup>11</sup> With iron deficiency and anemia affecting as many as 2.5 billion people, with consequent GDP losses of up to 2 percent, this is an important result.<sup>12</sup>

C.22 Biofortification of sweet potato can address Vitamin A deficiency. A recent study found that boiled orange-fleshed sweetpotato, as opposed to white-fleshed, contained more than 1,000 retinol activity equivalents per 125 grams. When fed to school aged children in South Africa, it provided 250 percent of their recommended daily allowance of Vitamin A. Transgenic techniques have also added beta carotene to rice, known as golden rice.

C.23 Biofortification is a cost effective solution according to Harvestplus. An \$80 million investment can develop 6 nutritionally enhanced staple food crops, including dissemination and nutrition evaluation in selected countries for consumption *year on year* by the world's population. The same investment in fortification of flour with iron would make a small temporary dent based on the overall need—more than 2 billion people are

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<sup>9</sup> Global Alliance for Improved Nutrition (GAIN) website, 2006.

<sup>10</sup> Darnton-Hill and others (2005).

<sup>11</sup> Haas and others (2005).

<sup>12</sup> World Bank (2006), UNICEF (2007).

anemic. It would reach just 48 million people for 2 years.<sup>13</sup> Food-based approaches are thus an important component in the fight against micronutrient deficiencies.

C.24 Agriculture thus assumes a new primacy in looking to the future. It can maintain and increase global food production, ensuring food availability. It can generate income for the poor, securing their access to food. And through new and improved crop varieties, it can improve diet quality and diversity and foster the link from food security to nutrition security.

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<sup>13</sup> Micronutrient Initiative (2006).

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## **Part II What to Do in Using Agriculture for Development?**

### **Chapter 4 Removing costly trade, price, and subsidy policies**

*Focus D Culture is changing in India's villages*

### **Chapter 5 Bringing agriculture to the market**

*Focus E The growth of global agribusiness (forthcoming)*

### **Chapter 6 Supporting smallholder competitiveness through institutional innovations**

### **Chapter 7 Innovating through science and technology**

*Focus F Capturing the benefits of GMOs for the poor*

### **Chapter 8 Making agricultural systems more environmentally sustainable**

*Focus G Using agriculture to mitigate climate change and adapting to it*

### **Chapter 9 Using labor markets pathways out of rural poverty**

*Focus H The two-way links between health and agriculture*

## Chapter 4 Removing costly trade, price, and subsidy policies

4.1 The economic and social costs of today's agricultural policies in world agriculture are large for the poor. Global agricultural trade policies cost developing countries, in forgone welfare gains, about 15 times more than they currently receive in overseas development assistance for the sector. Once-heavy agricultural taxation in developing countries has declined but not disappeared, imposing high costs on farmers—costs amplified by inefficiencies in agricultural public spending. Correcting these policy and investment failures can accelerate growth and reduce poverty, not easy, however, for it will require addressing the political economy to make difficult policy choices.

4.2 Agricultural policies vary significantly across countries. They have tended to shift from net taxation to subsidies with the low intrasectoral mobility of labor, rising rural-urban income gaps, and pressures from farm interest groups (chapter 1).<sup>1</sup> Heavily taxing farmers in agriculture-based countries while heavily subsidizing farmers in high-income countries creates a major policy bias against the poor in both domestic and international markets, a perverse redistribution from the poor to the rich within and between countries.<sup>2</sup>

4.3 Global agricultural trade policies suppress agricultural output growth in developing countries by about 0.4 percent a year on average.<sup>3</sup> They depress international commodity prices by about 5 percent on average, and erode the developing country share in global agricultural trade by about 9 percentage points. Public spending patterns further impede growth, particularly for countries with a high share of agricultural spending on subsidies. These costly policies, though reduced over the last two decades in both developed and developing countries, remain significant.

4.4 This chapter reviews the cost of current policies and expenditures, the recent policy shifts, the potential gainers and losers from trade and price policy reform, and the complementary public spending needed in agriculture to enhance growth and reduce poverty. The political economy framework from chapter 1 helps in understanding the determinants of policy choices for selected cases—and the ways to further improve trade and price incentives and the efficiency of public spending.

### **Global welfare costs of current agricultural policies remain high**

#### ***Agricultural trade policies impose larger welfare costs than policies in other sectors***

4.5 The global welfare costs of trade policies are large for both developed and developing countries. Recent estimates indicate that the cost of all trade tariffs on merchandise trade and agricultural subsidies would amount to nearly \$300 billion a year in forgone global welfare gains by 2015.<sup>4</sup> About 60 percent (\$180 billion) of the costs of

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<sup>1</sup> Hayami and Godo (2004).

<sup>2</sup> World Bank (1988).

<sup>3</sup> Anderson, Martin, and van der Mensbrugghe (2006).

<sup>4</sup> Anderson and Martin (2005).

current trade policies are due to agricultural tariffs and subsidies (the remainder to tariffs and subsidies in other sectors), much higher than agriculture and processed food's 6 percent share of global GDP and 9 percent share of international trade. Developing countries are estimated to bear close to a third of these welfare costs—which is equivalent to 0.8 percent of annual national income by 2015, compared with 0.6 percent in developed countries (table 4.1). While these costs are relatively small in absolute percentage terms, they equate to a much larger share of the historical global GDP growth rate. Other studies show a similar broad incidence of costs, although the magnitudes of the estimates have differed by study.<sup>5</sup>

**Table 4.1 Global welfare costs are largest for agricultural trade policies<sup>6</sup>**

Countries	Annual real income cost by 2015 (%)	Share of total cost caused by each sector trade policies (%)		
		Agriculture	Textiles and clothing	Other merchandise
Developing	0.8	63	25	12
Developed	0.6	63	8	29
World	0.7	63	14	23

Source: Anderson, Martin, and van der Mensbrugghe (2006).

### ***Trade share losses for developing countries are significant***

4.6 Developing countries lose nine percentage points in their share of global agricultural exports because of current global trade policies. With free trade in merchandise, the developing country share of trade for all agricultural products would rise to an estimated 65 percent, from its current share of 54 percent. Current agricultural policies depress international commodity prices by on average 5.5 percent for primary agricultural products and 1.3 percent for processed foods.<sup>7</sup> The largest price declines are estimated for cotton, oilseeds, and dairy products (figure 4.1) with significant costs to countries exporting these products (figure 4.2). The most significant trade share costs to developing countries are global oilseeds and cotton policies, which suppressed their share by 34 and 27 percentage points (from 83 to 49 percent and 82 to 55 percent respectively). The real value of West African cotton net incomes would be 36 percent greater, and that of their cotton exports would be 60 percent greater, in the absence of those policies.<sup>8</sup>

4.7 The costs of agricultural trade policies are now as high from restrictions to South-South trade as they are from restrictions to South-North trade.<sup>9</sup> South-South trade is an increasing share of overall trade for many developing countries, and improving access to developing country markets is especially important for other developing countries.

<sup>5</sup> Depending on base period used, and the model and its assumptions about market structure - see Bouët (2006).

<sup>6</sup> These estimates exclude services due to lack of data.

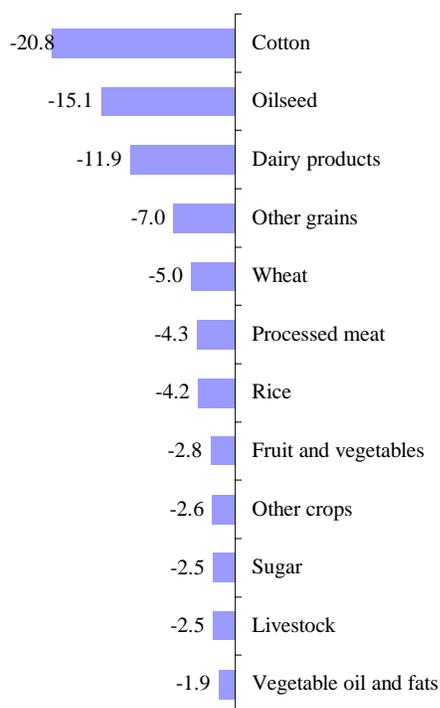
<sup>7</sup> Anderson, Martin, and van der Mensbrugghe (2006).

<sup>8</sup> Anderson and Valenzuela (2006).

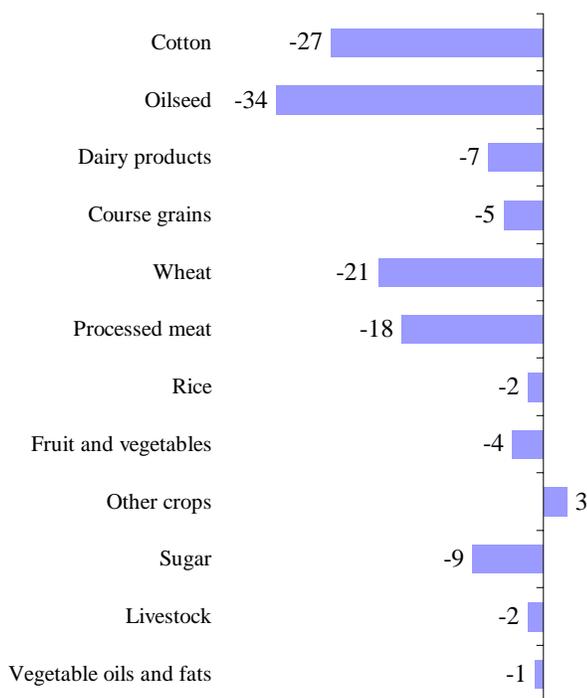
<sup>9</sup> Anderson, Martin, and van der Mensbrugghe (2006).

4.8 Simple averages of applied agricultural import tariffs have fallen considerably. From 1988-90 to 2001-03 the declines in low income countries were from 39 to 19 percent, in middle income from 25 to 16 percent, and in high income from 8 to 7 percent<sup>10</sup> (not including specific tariffs that dominate in high income countries). They have fallen less and remain higher for agriculture than nonagriculture. Agricultural tariffs remain in aggregate far more costly, in welfare losses, than domestic and export subsidies.<sup>11</sup> But this differs significantly by product (the reverse is true for cotton).<sup>12</sup>

**Figure 4.1 Real international commodity prices have been suppressed by current global trade policies (% of price)**



**Figure 4.2 Trade share losses to developing countries due to current global trade policies (% point loss to developing country trade shares)**



Source: Anderson, Martin, and van der Mensbrugge (2006).

***Agricultural growth is suppressed by current policies***

4.9 Agricultural output growth in developing countries is constrained by global trade policies by an estimated 0.4 percent a year, with the impact varying across developing regions (table 4.2). Latin America and Sub-Saharan Africa bear the largest losses, while South Asia and Europe and Central Asia on average benefit (table 4.2).

<sup>10</sup> UNCTAD TRAINS database at [http://r0.unctad.org/trains\\_new/index.shtm](http://r0.unctad.org/trains_new/index.shtm).

<sup>11</sup> Anderson, Martin, and Valenzuela (2006).

<sup>12</sup> Anderson and Valenzuela (2006).

**Table 4.2 Costs to agricultural output growth of current global trade policies are estimated to be largest for Latin America and Sub-Saharan Africa**

Regions	Annual agricultural output growth rate, %		
	2005 baseline annual growth (A)	2005-2015 annual growth following full trade liberalization (B)	Costs to growth of current policies (B-A)
East Asia and Pacific	4.0	4.0	0.0
South Asia	4.4	4.2	-0.2
Europe and Central Asia	3.0	2.9	-0.1
Sub-Saharan Africa	4.5	4.9	0.4
Latin America and the Caribbean	3.8	5.8	2.0
Developing countries	3.9	4.2	0.4
Developed countries	1.6	-0.1	-1.7

Source: Anderson, Martin, and van der Mensbrugge (2006).

### Agricultural protection in developed countries

4.10 Much attention has gone to the negative impacts of developed country policies as a major source of the global welfare costs—rightly so as they account for about half of these global costs<sup>13</sup>. The growing agricultural protectionism in developed countries spurred international efforts in the 1980s to reduce distorted prices in world markets. This was largely driven by concerns that rising protection created incentives for increased developed country agricultural exports, depressing world prices and the incomes of exporters of similar products in poorer developing countries. At the start of the Uruguay Round in 1986, agriculture-exporters formed the Cairns Group and ensured that members of the General Agreement on Tariffs and Trade put agricultural trade and subsidy reform high on the Uruguay Round agenda. Developing countries also formed the G-20 group at the time of the Cancun Ministerial in the Doha Round in 2003 to secure reductions in industrial country protection. Their efforts are having positive results, but much reform is still needed.

#### *Agricultural producer price support has declined*

4.11 OECD countries are reforming their agricultural policies, but progress is slow. The average agricultural producers support fell from 37 percent in 1986-88 (the beginning of the Uruguay Round of trade negotiations) to 30 percent in 2003-05.<sup>14</sup> While the percentage decline is significant, it still leaves an increase in dollars, euros and yen from \$242 billion a year to \$273 billion.

<sup>13</sup> Anderson, Martin, and van der Mensbrugge (2006).

<sup>14</sup> The producer support estimate measures the annual monetary value of gross transfers from consumers and taxpayers to support agricultural producers, measured at farmgate levels, arising from policy measures that support agriculture, regardless of their nature, objectives, or impacts on farm production or income (OECD).

4.12 Developed countries have also increased preferential access for some developing countries to their markets. The EU continues to provide extensive nonreciprocal preferential access to its markets for former colonies in Africa, the Caribbean and the Pacific under the Cotonou Agreement. Early in the 2000s it also provided UN-designated Least Developed Countries duty-free and quota-free access to its markets for ‘everything but arms,’ although it excluded services and delayed opening sensitive markets for bananas, rice, and sugar.

***Support is provided in less distorting forms***

4.13 More than a quarter of the producer support estimate is now somewhat decoupled<sup>15</sup> from production, up from less than a tenth in 1986-88. The move to decouple agricultural policies is a positive step in reducing trade distortions and increasing world prices for developing country exports, and they appear to have reallocated resources within agriculture. But to date the reform has not been sufficient for declines in total agricultural output and increases in world prices to be observed.

4.14 Decoupled payments are less distorting than output linked forms of support but can still influence production. They can reduce farmers’ aversion to risk (wealth effect), and reduce the variability in farm income (insurance effect). Banks often make loans to farmers that they otherwise would not, and this retains farmers in agriculture.<sup>16</sup> Most programs of decoupled payments have no time limit as in the European Union and Turkey. The United States had one with a time limit in the 1996 Farm Bill (not adhered to), and Mexico’s decoupled program initially had a time limit (now passed). Unless these programs have time limits with credible government commitments to stick to them, decoupled payments may be more distorting and costly than assumed.

***Progress varies significantly across countries and commodities***

4.15 While producer support has declined, and a larger share of it is being decoupled from production, progress varies significantly across countries. The EU, Japan, the United States, and Korea together provide more than 90 percent of the dollar value of agricultural support in OECD countries (the EU provides about half). In all four, producer support has declined as a share of the gross value of farm receipts since 1986-88 (figure 4.3).<sup>17</sup>

4.16 Progress on decoupling has also varied significantly by commodity, with most progress on grains and oilseed. Needed now is a shift to less distorting decoupled support for export products important to developing countries, such as cotton and sugar. There have been some recent changes to rice, sugar, and cotton policies in Japan, the EU, and the United States, all at an early stage of implementation.

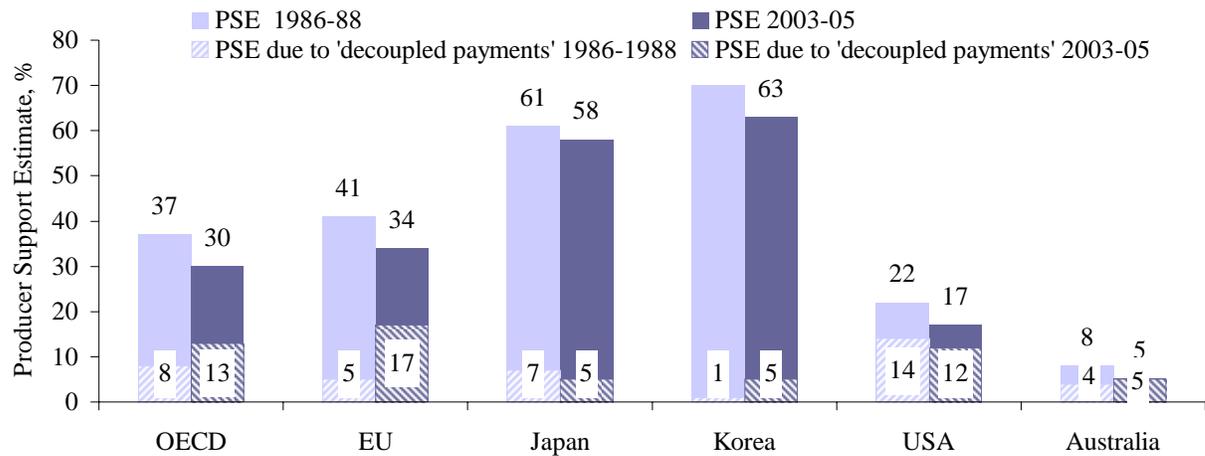
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<sup>15</sup> Not related to type, price, or volume of production decoupled payments have the objective of increasing income without distorting future or current production, including input use.

<sup>16</sup> Baffes and Gorter (2005).

<sup>17</sup> OECD (2006).

**Figure 4.3 Producer support as a share of the gross value of farm receipts has declined in the OECD with an increase in ‘decoupled’ payments**



Note: OECD countries include EU, Australia, Canada, Iceland, Japan, Korea, Mexico, New Zealand, Norway, Switzerland, Turkey, and United States.

Source: Producer support estimate, OECD Database 1986-2005.

### ***Political economy factors matter for further reform***

4.17 Political economy factors in each country have determined the pace and extent of reforms. Country cases of US cotton, EU sugar, and Japan rice policies indicate that the impact of the WTO in inducing reform is real and that media pressure can play a complementary role (box 4.1). The cases also indicate that bargained compromises and compensation schemes for the losers may be needed to get agreement on further reducing high levels of agricultural protection (as in the Japanese rice policy reforms and the EU sugar policy reforms).

#### **Box 4.1 Political economy of reforming developed country policies**

Agricultural subsidies and tariffs on rice and sugar, aggregated across all countries, respectively account for 20 and 18 percent of the global cost of all agricultural trade policies—the highest across all commodities. While the equivalent global cost of cotton subsidies and tariffs is much smaller, the absolute cost to developing countries is large, \$283 million a year. And to Sub-Saharan Africa these costs account for about 20 percent of the total cost of trade policies on all merchandise goods.

#### **Japan rice policy reform—bargained compromise to agree on decoupled support**

Japan protects rice producers, a traditional source of political support, through a 778 percent *ad valorem* tariff equivalent. In 2007 Japan introduced a less distorting direct payment to farmers linked to farm size, not production. The payment is expected to be bargained against a decline in tariff levels for rice—making payments to farmers larger than a certain size to target “principal” rather than “part-time” farmers. The new scheme is viewed as a less distorting alternative to border protection, and as a mechanism to induce larger scale production.

Why did politicians agree to the proposed scheme despite the apparent risk of undermining their political support from rural areas? Three factors. One is the ever-strengthening voices from nonfarm sections of the economy. A second is media pressure, fearing Japan’s increasing isolation in the global economic community on its rice policies. Third is the view that agriculture should be part of the broader economic reform.

The political change can be interpreted in terms of the framework presented in chapter 1 (figure 1.8). The system of protection of agriculture has been kept in place by a strong pro-agricultural coalition, “the iron triangle” of the Ministry of Agriculture, Forestry and Fisheries, the ruling Liberal Democratic Party, and the Japan Agricultural Cooperatives (see figure 1.8 in chapter 1). Japanese villages are characterized by strong community solidarity, a social capital that Japan Agricultural Cooperatives has converted into political capital. As the government’s agent, Japan Agricultural Cooperatives implements the farm subsidies. But the Ministry of Agriculture, Forestry and Fisheries has gradually shifted to more market-oriented policies. The ruling Liberal Democratic Party has shifted its balance of interest toward urban areas, due to the growth in its support from cities in the recent elections, an indication that nonagricultural groups are gaining political capital in this policy arena.

Opposition by Japan Agricultural Cooperatives led to a compromise in the coverage of the direct payment scheme. The program was expanded to include direct payments to small part-time farmers if they organized into a collective farming unit. Although viewed as weakening the efforts at structural change, it seemed necessary to get agreement to a reform program while not undermining, but perhaps slowing, the eventual shift to larger scale production. Larger scale farmers are already exiting the Japan Agricultural Cooperatives marketing system. Exits are expected to accelerate under the direct payments program, reducing the political capital of Japan Agricultural Cooperatives and further resistance to reform.

#### **EU sugar policy reform—compensation and restructuring support to complement reform**

EU domestic sugar prices—supported by high import tariffs—are three times higher than world market levels, increasing incentives to produce sugar in the EU and depressing the world market price of sugar at the expense of many developing country exporters.

The European Union agreed to reform its sugar regime on February 20, 2006, with reforms to begin on July 1, 2006, and extend for four years. If implemented, the reforms radically change the sugar regime, in place for almost 40 years. Four factors led to the initiation of reforms. First was discontent from the food processing industry, paying three times the world price for sugar. Second was the EU’s sugar export subsidy system, ruled noncompliant with agreed commitments under the WTO. Third was the campaign of an international NGO coalition, which emphasized the negative effects of the EU sugar policy for developing countries. Fourth was the EU’s “Everything but Arms Initiative,” introduced in 2001 to open the EU sugar market to duty-free and quota-free imports from the world’s 50 least developed countries from 2009 onwards. This was expected to lead to a surge in imports and the destabilization of the EU sugar regime unless the sugar price was reduced.

In the framework of figure 1.8, the coalition in favor of reform was able to build political capital both by lobbying and by influencing public opinion. Since the interest groups opposing the reform, most notably the sugar producers in the EU, also have political capital, measures were put in place to address their opposition. Compensation and a restructuring fund (financed by producers) to encourage uncompetitive producers to leave the industry were agreed to in February 2006. EU farmers are expected to receive an average of 62 percent of the price cut phased over four years.

Expected to be in place for four years, the restructuring fund has three main objectives: to encourage less competitive producers to leave the industry, to cope with the social and environmental impacts of factory closures, and to help the most affected regions develop new business in coherence with EU structural and rural development funds. Africa, Caribbean, and Pacific countries that received higher-than-world market prices for their quota of sugar produced for sale in to the EU market were eligible for an assistance plan worth €40 million for 2006.

#### **US cotton policy reform—WTO and local media pressure to offset industry lobby power**

The United States accounts for 40 percent of the world cotton exports and 20 percent of world cotton production. Subsidies account for a large, but variable share of US cotton producer revenues (box table). The added U.S. production due to these subsidies is estimated to reduce the world cotton price by about 10 percent at significant cost to developing countries.

**Box table US cotton subsidies versus the market value of production**

	2002	2003	2004	2005	2002-05
	<b>\$ millions</b>				
Government subsidy	3,508	1,805	4,455	3,583	3,338
Market value of production	3,497	5,266	4,540	5,204	4,627
Ratio of subsidy to market value	1.00	0.34	0.69	0.69	0.72

*Source:* USDA, President's budget update July 2006, and update figures and USDA Risk Management.

In the framework of figure 1.8, U.S. cotton policy is heavily influenced by a strong interest group coalition, the Cotton Council of America (representing the 20,000 cotton growers, as well as ginners, exporters, bankers, and suppliers). Using lobbying as their major strategy to build political capital, the Council is one of the most powerful U.S. commodity lobbies, winning disproportionately higher support than other sectors, particularly since the 1996 Farm Bill.

Brazil recently initiated a comprehensive case against the US for non-compliance with its WTO obligation on cotton subsidies. In March 2005 the WTO Dispute Settlement Body instructed the United States to bring the offending cotton subsidy measures into compliance with its WTO obligations. The United States made adjustments in response to the WTO decision, but in December 2006 Brazil formally expressed its dissatisfaction with the extent of U.S. policy changes and asked that the WTO panel find the United States out of compliance with the original ruling. The compliance phase of the case is now proceeding, with a decision expected in June 2007. While the reduction in US cotton subsidies was in response to the legal case at the WTO, the US media, representing taxpayers and reform-minded groups with less political capital than the cotton lobby, also pressured the U.S. Congress to reduce support.

*Source:* Honma, Hayami, Sumner, Mitchell, and Baffes, personal communication, 2007; Anderson, Martin, and van der Mensbrugge (2006), Anderson and Valenzuela (2006).

### **Agricultural taxation in developing countries**

4.18 Policies in developing countries also affect agricultural producer incentives. About half the costs to developing countries of global agricultural trade policies comes from their own tariff policies.<sup>18</sup>

4.19 Macroeconomic policies in developing countries historically taxed agriculture more than agricultural policies, but both were important in poorer countries. The indirect tax on agriculture, through overvalued exchange rates and industrial protection, was nearly three times the direct tax on the sector at the time of the last World Development Report on agriculture (1982). For example, in a study that included 16 of today's developing countries from the 1960s to mid-1980s, average direct and indirect taxation were estimated at 12 and 24 percent of agricultural producer prices respectively. High taxation of agriculture was associated with low growth in agriculture—and slower growth in the economy.<sup>19</sup> The poorest developing countries taxed agriculture the most (table 4.3).

<sup>18</sup> Anderson, Martin, and van der Mensbrugge (2006).

<sup>19</sup> Schiff and Valdés (1992).

**Table 4.3 Between 1960 and the early 1980s farmers were taxed more in today's agriculture-based countries than in today's transforming and urbanized economies**  
(period average percent of agricultural prices)

Country income group	Indirect tax	Direct tax	Total taxation
Agriculture-based	29	23	52
Transforming	21	15	36
Urbanized	24	4	30
16 developing countries	24	12	36

*Note:* Indirect tax estimates include the real exchange rate and industrial protection effects. Direct tax estimates include agricultural sector policy effects. The agriculture-based countries are Côte d'Ivoire, Ghana, and Zambia; the transforming countries, Egypt, Malaysia, Morocco, Pakistan, Sri Lanka, and Thailand; and the urbanized countries, Argentina, Brazil, Chile, Colombia, Dominican Republic, Philippines, and Turkey. Korea and Portugal, excluded from the table here, were included in Schiff and Valdés (1992).

*Source:* Schiff and Valdés (1992).

4.20 With reforms in the 1980s and 1990s to regain macroeconomic balance, improve resource allocation, and regain growth in many of the poorest countries, both direct and indirect taxes were reduced. The reduced overvaluation of currencies is reflected in the huge reduction in the black market premia for foreign currency in developing countries. For 59 developing countries, the trade-weighted average premium fell from more than 140 percent in the 1960s to around 80 percent in the 1970s and 1980s and to just 9 percent in the early 1990s, with wide variation across countries.<sup>20</sup>

### ***Less plundering of agriculture in agriculture-based economies***

4.21 Reforms in agriculture-based economies, particularly in Sub-Saharan Africa, halved the average net taxation of agriculture from 26 to 13 percent between 1980-84 and 2000-04. Seven of 10 countries included had lower net taxation in the second period (figure 4.4). Only Côte d'Ivoire, Nigeria, and Ethiopia had similar or higher net taxation between the two periods, with the highest net taxation of 40 percent in Côte d'Ivoire (-0.4 nominal rate of assistance,<sup>21</sup> see figure 4.4).

4.22 The aggregate national rates of assistance mask significant differences in taxation and protection between agricultural imports and exports and among products. A nominal rate of assistance close to zero simply indicates no net taxation, but it could be the result of large import tariffs offsetting large taxes on exports. For Uganda the estimated nominal rate of assistance on agricultural imports was 0.76 (equivalent to a 76 percent tariff) while on exports it was -0.24 (equivalent to a 24 percent tax), see figure 4.5. So while the net effect may be low taxation on agriculture, there remain significant efficiency gains through lowering import tariffs and export taxes. In Tanzania and

<sup>20</sup> Derived from Easterly (2006).

<sup>21</sup> Nominal rate of assistance (NRA) to farmers is the price of their product in the domestic market (plus any direct output subsidy) less its price at the border, expressed as a fraction of the border price (adjusting for transport costs, quality differences, etc.). Border prices are converted to domestic prices at the parallel exchange rate if one existed, otherwise at the official rate.

Zambia imports of agricultural products were effectively subsidized yielding negative nominal rates of assistance and adding to the net taxation (figure 4.5).

4.23 For the agriculture-based countries tobacco, groundnuts, and cocoa are still heavily taxed, on average by about 41 percent over 2000-05, slightly lower than the 44 percent in 1980-84. The net taxation of coffee declined from about 50 to 5 percent over the two periods, while sugar has shifted from being heavily taxed (0.4 nominal rate of assistance in 1980-84) to being heavily protected (0.9 in 2000-04) (table 4.4).

#### ***Shifts to protection in transforming and urbanized economies***

4.24 Net taxation in transforming economies has declined on average from 10 to 5 percent, but with significant variation across countries. Some countries shifted to protect the sector (Indonesia, Malaysia, Thailand and Vietnam) while others continued to tax it, though at lower levels than in the 1980s (China, Egypt). Zimbabwe is the only country of this group that had a higher net tax on the sector, mainly due to an overvalued exchange rate that lower the local price of food imports paid for by foreign exchange purchased at the official rate.

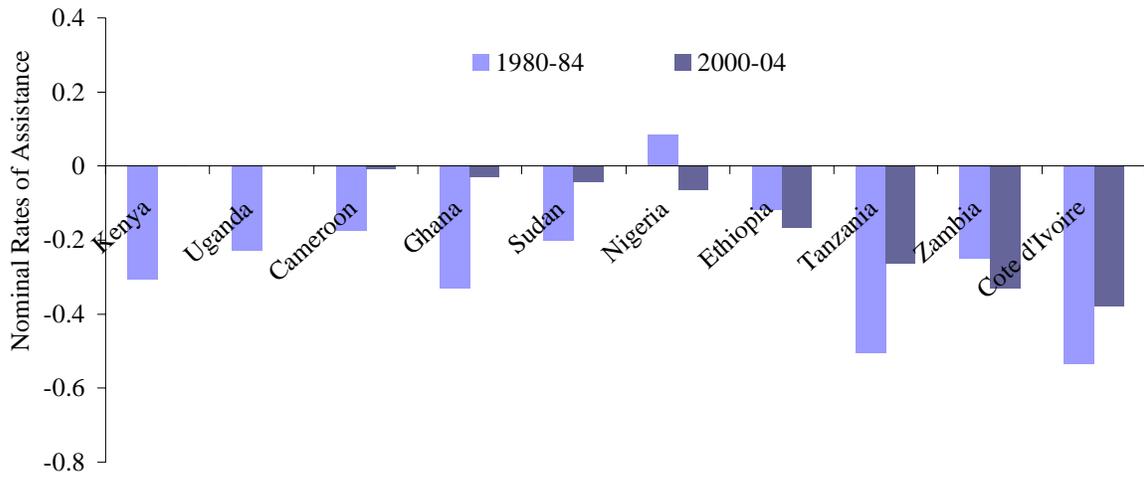
4.25 There are also differences across agricultural imports and exports. For example Pakistan had an overall nominal rate of assistance to agriculture of close to zero, but this masks both taxation of exports and some protection in imports (figure 4.5). Agricultural import protection was twice as high (0.4 nominal rate of assistance) in these countries (excluding Zimbabwe) as in the agriculture-based and urbanized countries (0.1 and 0.2 nominal rates of assistance on imports respectively). Sugar and maize tend to most highly protected, and tobacco, the most heavily taxed, driven by the high taxation in Zimbabwe (table 4.4).

4.26 In urbanized economies the net taxation shifted from 2 percent in 1980-84 to a net protection rate of 8 percent in 2000-04. Four of eight countries analyzed (Colombia, Ecuador, Mexico, and Philippines) had higher protection in 2000-04 than in 1980-84 (figure 4.4). In three of the countries (Colombia, Mexico, and Philippines), agricultural imports were protected (0.31 nominal assistance rate), and exports effectively subsidized (0.20 nominal assistance rate). Rice and sugar are the most highly protected products in the urbanized economies, more so than in the transforming and agriculture-based countries (table 4.4).

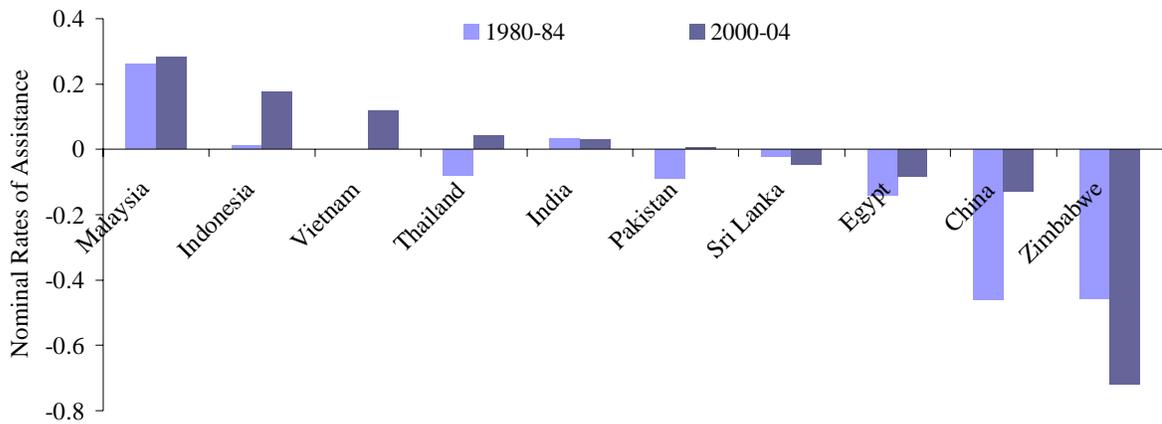
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**Figure 4.4 Shifting taxation and protection of agriculture by country**

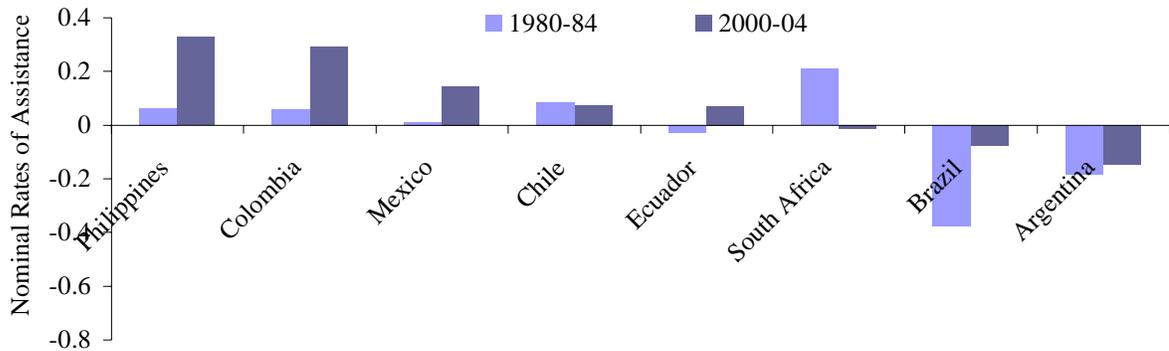
**Agriculture-based countries—lower net agricultural taxation in 7 of 10 countries**



**Transforming countries—some countries impose a net tax on agriculture while others protect it**



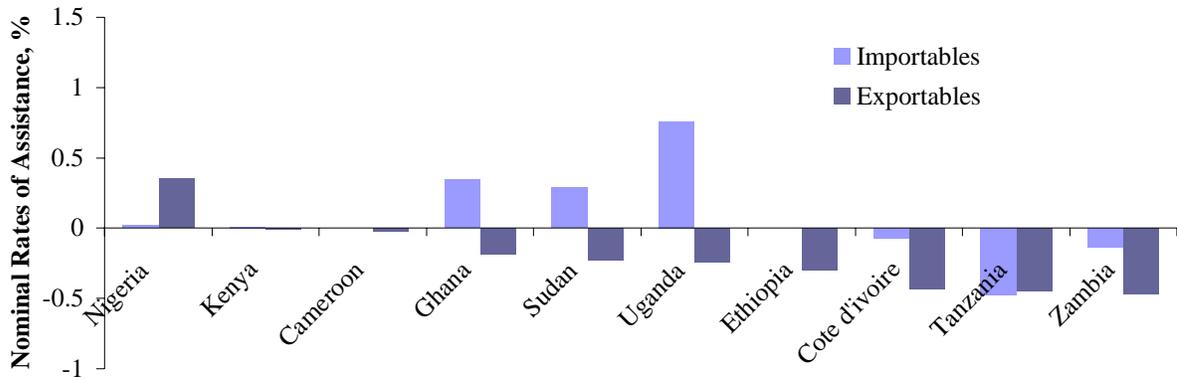
**Urbanized—higher agricultural protection in 6 of 8 countries**



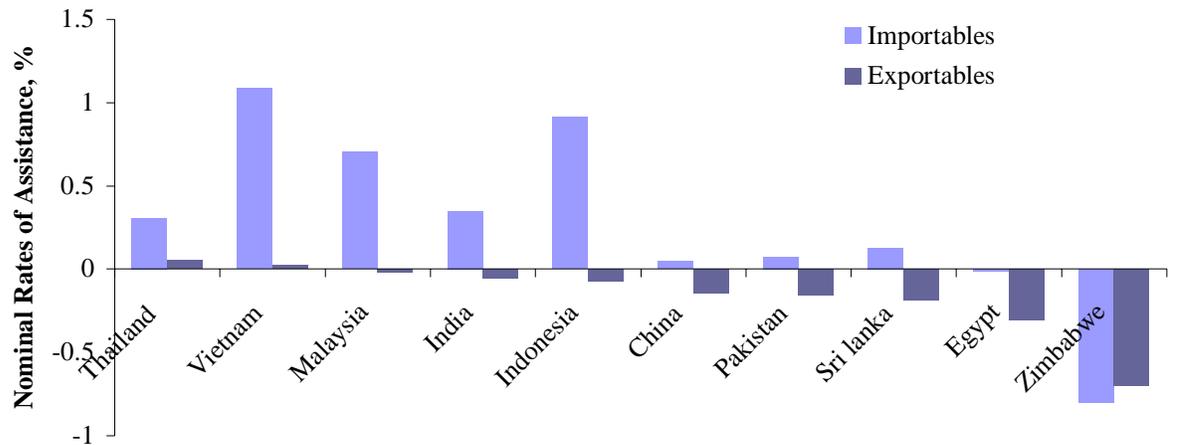
Source: Anderson (Forthcoming).

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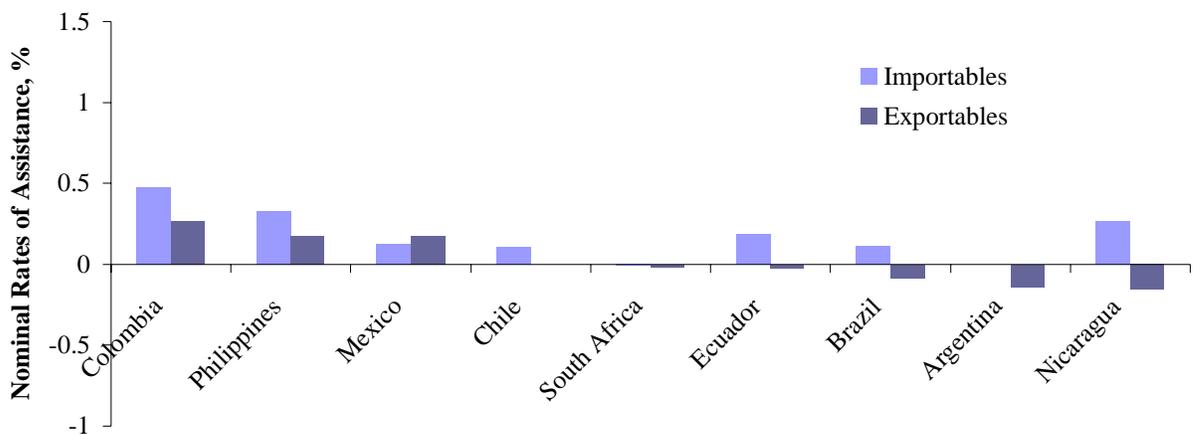
**Figure 4.5 Diverging assistance rates for agricultural imports and exports, 2000-04**  
**Agriculture-based countries—moderate to high taxation of agricultural exports and variable treatment of imports**



**Transforming countries—high protection of agricultural imports with some taxation of exports**



**Urbanized countries—high protection of agricultural imports and some subsidization of exports**



Source: Anderson (Forthcoming).

4.27 Urbanized economies in Eastern and Central Europe have on average reduced agricultural protection, but it remains high. Before the 1990s these countries subsidized agriculture at high levels. After a rapid decline in protection with the beginning of the transition from command to market economies, agriculture still remains mildly protected in most countries. Protection rates from price distortions on import-competing commodities in the region now range between 20 and 30 percent. Export products are protected in most Eastern European countries but taxed in Poland, Russia, Slovakia, and Ukraine.

**Table 4.4 Nominal rates of assistance by commodity<sup>22</sup>**

Product	Agriculture-based		Transforming		Urbanized	
	1980-84	2000-04	1980-84	2000-04	1980-84	2000-04
Sugar	-0.42	0.87	0.07	0.29	-0.63	0.35
Rice	-0.09	0.04	-0.36	-0.04	-0.02	0.45
Wheat	-0.02	0.02	0.08	0.02	0.09	0.03
Coffee	-0.50	-0.06	-0.18	-0.07	-0.44	0.06
Maize	-0.09	-0.06	-0.25	0.07	-0.10	-0.06
Cassava	0.00	-0.08	-0.07	-0.09	-	-
Cotton	-0.32	-0.17	-0.29	-0.08	-0.28	0.05
Cocoa	-0.50	-0.31	-0.02	0.00	-0.07	-0.08
Groundnuts	-0.33	-0.40	0.06	-0.02	-	-
Tobacco	-0.50	-0.53	-0.47	-0.68	-	-

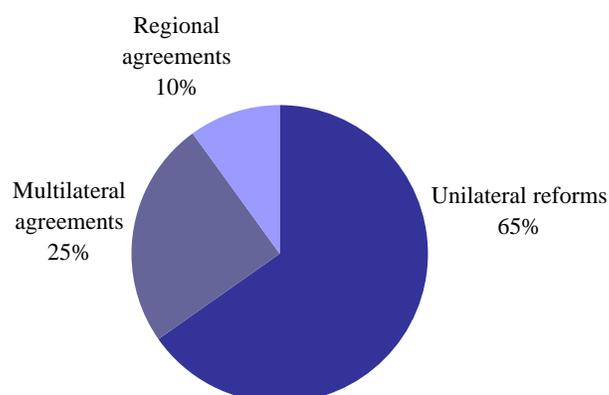
Source: Anderson (Forthcoming).

### *Significant gains still to be made*

4.28 While there is less domestic price and trade policy exploitation of farmers in developing countries than in the 1980s, it has not disappeared. Net taxation of agriculture remains high in many countries. Disaggregating net taxation by exportable and import-competing products shows that exports are still heavily taxed in many countries, while some imports are heavily protected (high protection on agricultural imports often offsets high taxation of exports to give low net taxation estimates). This suggests scope for further welfare gains. Most past policy reforms have come from unilateral reform efforts, but multilateral agreements and regional trade have helped. Each can advance further reforms. For example, unilateral reforms accounted for two-thirds of past tariff reductions in developing countries.

<sup>22</sup> The NRA is weighted by the value of production across countries in each the three country categories.

**Figure 4.6 Two-thirds of the past tariff reductions in developing countries on all merchandise goods from 1983-2003 has been from unilateral reforms, a quarter from multi-lateral agreements and the remaining 10 percent from regional agreements<sup>23</sup>**



Source: Martin and Ng (2004).

4.29 *Unilateral reforms.* Agricultural reforms in many of these countries, particularly those agriculture-based, followed the macroeconomic reforms of the 1980s. These reforms were heavily supported by external donors through policy advice and lending conditionality. Other important elements of reforms, reflecting the political economy in countries (box 4.2): Leadership and exploiting windows of opportunities (as in Uganda). Tying the fortunes of local leaders to the success of the local economy, paying attention to potential gainers and losers, building on local support, using WTO accession (as in China). And bargained complementary policies to support free trade as in Mexico.

4.30 Reducing heavy taxation and protectionist biases will require understanding of the political economy aspects of reform. The policy economy framework in chapter 1 (figure 1.8) provides a useful guide. The power of outside actors is real, as demonstrated by the impact of WTO accession on protection in urbanized and transforming countries—and by the impact of foreign assistance on taxation in agriculture-based countries, though it brought lasting change only with a strong domestic constituency. Helping the farm population organize to build coalitions for remaining policy changes in agriculture-based countries can help—particularly as political systems become more open and competitive (chapter 1).

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#### **Box 4.2 The political economy of reform in developing countries**

Three examples from each country category serve as illustration of the political economy of reform. In Uganda (agriculture-based) and China (transforming) net taxation of agriculture declined significantly between 1980-84 and 2000-04, while in Mexico (urbanized) there was a shift to protection over the same period.

##### **Uganda—leadership and a window of opportunity**

Uganda's agricultural reforms included disbanding the Coffee Marketing Board and the Lint Marketing Board monopolies in 1991 and the Produce Marketing Board in 1993—all had heavily taxed the agriculture

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<sup>23</sup> Martin and Ng (2004).

sector. The reforms significantly increased the share of the border price received by farmers. Cross-district product movement restrictions were also removed.

These reforms followed a broader set of macroeconomic reforms initiated in the late 1980s by the National Resistance Movement government that came to power in 1986. The macroeconomic reforms (by reducing overvalued exchange rates) had a greater impact on agricultural prices than the agricultural reforms, though both were significant. Following the armed struggle to power, popular legitimacy and military support formed the bedrock of the regime, enabling the president to pursue difficult and potentially unpopular reforms, including those in agriculture. Moreover, groups with vested interests in the marketing boards may have lost their political capital in the regime change.

### **China—tying the success of local leaders to the success of the local economy**

China launched a set of bold but gradual reforms in 1978 that first raised prices for agricultural commodities, then decollectivized agricultural production, making the farm household the residual claimant, and finally began to slowly but steadily dismantle the state-run procurement and input supply systems. The barriers between rural and urban areas were also slowly lifted. In response, the rural economy took off. Agriculture boomed. The rural economy was transformed. Productivity nearly doubled. The poverty headcount fell from more than 300 million to less than 50 million.

Why was China able to make these tough decisions when leaders in many other nations falter? The agricultural reforms were not only pro-farmer, they were also compatible with the interests of both local leaders and national officials. Moreover, the political frame mattered (see figure 1.8), particularly the combination of a decentralized system, a one-party political system with a long time horizon, and an egalitarian ideology.

Much of the pressure for reform came from the failed policies and poor performance of agriculture. But it also came from the *de facto* decentralized political system that relied on local leaders to implement policies and guide local economies. The rules of the political game in China tied the fortunes of local leaders significantly to the success of the local economy. Policy initiatives that tied local revenues, local investment spending and cadre salaries to the increases in agricultural output, marketing and the transformation of the economy towards rural industrialization had local support.

The fact that the reforms were introduced in a gradual process of local experimentation and learning reduced the political risks associated with the reform. Moreover, the grassroots pressure created in the process was an important source of political capital that helped the reformers at the top of the Communist Party to win the battle with conservative reform critics.

China's leaders were committed to restoring the nation to its previous status as a modern nation and be a secure and independent country. In recognition of their Communist ideology, there was also an imperative to worry about equity and provide its citizens with a minimum standard of living. Central planning was proving not to be effective. So, they turned to a new set of reforms that provided a lot of benefits and imposed few costs.

Breaking the large collectives into 200 million small units could have had costs in lost economies of scale and disrupted production processes. But the labor-intensive, relatively simple technology of Asian cropping systems required few inputs and little coordination between on-farm producers and off-farm processors. So, the reforms enhanced both the returns to land (pro-food security) and the returns to labor (pro-poor).

The key to making reforms succeed in China lay in finding a set of policies that were mostly compatible with the interests of farmers, local leaders, and national officials. Decentralization and policies that made the local economy grow naturally aligned the interests of rural citizens and local leaders. When policies that triggered growth and imposed few costs on farmers were implemented (or approved by top leaders if they arose spontaneously), local leaders were strong advocates. The central leadership was willing to invest in the reforms because they were mostly win-win and thus enhanced their legitimacy.

The case highlights a number of factors which are conducive for creating political capital in support of policy reform: paying attention to potential winners and losers, experimenting and learning, and building local support. Of course, some reforms can be abetted by idiosyncratic circumstances not replicable in

other places and periods. But there still are lessons for other nations to tap in their efforts to create reforms that lead to growth, structural transformation, and poverty alleviation.

**Mexico—delicate balance between complementary programs to facilitate agricultural policy reform versus subsidy and protection traps**

During the 1990s, following the North American Free Trade Agreement, which established the (gradual) elimination of tariff and nontariff barriers to agricultural imports by 2008, the Mexican government implemented wide-ranging agricultural market-oriented policy reforms in ways that avoided major political opposition from domestic agricultural producers with significant political power. The tradeoff has been that reforms maintained producer subsidies, and had less-than-expected impacts on efficiency and fiscal outlays.

The power of farmer organizations in Mexico was evident in 2002 when they used quite impressive strategies to create political capital, such as a violent, horse-ridden incursion into Mexico's congressional building. The message, reminiscent of the Mexican Revolution of 1910, paid off with a negotiated Acuerdo Nacional para el Campo (National Agreement for the Countryside), greatly increasing public resources funneled to the countryside.

The 1990s reforms eliminated state trading enterprises in agricultural products. They substituted market support to farmers, based on support prices, based on target incomes. They provided subsidies and market information for price risk management. They implemented decoupled, per-hectare payments to producers of basic grains and oilseeds, under a new program called PROCAMPO. And they strengthened land property rights in rural areas.

In addition to these reforms, major grant and subsidized credit-based programs were put in place to assist the sector in its transition toward greater efficiency and global competitiveness, through the Alianza Contigo (Alliance with You). Alianza Contigo encompasses a broad range of extension-like activities to promote technological innovation, farm capitalization, product value-chain integration, and capacity building (SAGARPA 2007). In 2004 roughly 80 percent of the Ministry of Agriculture's (SAGARPA) US \$ 3.7 billion budget was devoted to marketing support, Procampo, and Alianza Contigo, roughly a third of Mexico's public spending on rural sustainable development.

The elimination of state-trading enterprises and the substitution of price supports by indirect market interventions has not eliminated distortions in the allocation of production factors. Market interventions under the new policy regime have perpetuated or even exacerbated such distortions, hampering the adjustment toward more efficient use of private and public resources. And although interventions were initially established as temporary measures to ease adjustment to a market-based food sector, the vested economic interests created by these interventions and export subsidies in developed countries have made it politically infeasible for Mexican policymakers to justify an exit strategy.

The new policy regime promoting private market institutions—including those based on contracting and other systems of price risk management—has been thwarted by the way parallel interventions have been implemented. For example, uncertainty about when and who gets tariff-free import quotas has discouraged storage (increased its risk) and forward price markets. And marketing supports based on a target income have discouraged wider use of market-based price risk management instruments.

Because market interventions target production that is marketed, a small number of large, technologically advanced, and well organized producers still get the lion's share of transfer gains, while the greater number of small, marginal producers receive only a small proportion of the benefits. The regressive effects of market interventions have been partially neutralized by per-hectare income payments, such as those of PROCAMPO. Those payments have had an important income-smoothing element for marginal producers, while minimizing distortions in resource allocation. Producers have also used expected future payments as guarantees for credit and input suppliers—or decided to receive future payments in a lump sum and use them for investment projects.

*Source:* Opolot and Kuteesa (2006), Robinson (2005), Lin (1992), McMillan, Waley, and Zhu (1989), World Bank (2002), Yang (1996), Qian and Weingast (1996), Swinnen and Rozelle (2006), Huang, Rozelle, and Rosegrant (1999), Rozelle (1996), Yunez-Naude and Barceinas Paredas (2007), Avalos-Sartorio (2006), Rosenzweig (2003), Zahinser (2004).

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***Multilateral and regional trade agreements—content and implementation matter***

4.31 *Multilateral trade agreements.* Beyond domestic pressure, the Doha Development Round is important in taking forward the reform agenda through multilateral agreements. While having a less ambitious objective than full liberalization, with lower potential benefits to the poor, it is still vitally important to reduce the costs of global policies to the poor.

4.32 The heavy weight given to eliminating export subsidies (which raises import prices for food) rather than to reducing tariffs in both developed and developing countries makes the trade reform proposals under the current Doha round less poverty-friendly than full liberalization. As already highlighted, tariff removal is expected to have a far greater impact on global welfare and poverty reduction than the subsidy removal in developed countries, though both are important.<sup>24</sup> But there are exceptions (cotton) where reducing export subsidies is expected to have far larger impacts than reducing tariffs.<sup>25</sup>

4.33 The suspension of the Doha round of trade negotiations between July 2006 and January 2007—and the slow progress following resumption of talks raise important questions about the prospects for further reforms through multilateral agreements with three possible scenarios.

- *Resumption.* The best outcome would be a resumption of negotiations with agreement on further reforms. The impact would depend on the extent to which agreed tariff reduction levels are lower than actual levels. Currently applied or actual rates are lower than the upper bound rates agreed at the Uruguay Round of trade negotiations, and if the new agreed rates are not below the applied rates, there will be little impact. Reductions in applied rates would require substantial declines in the agreed upper bound tariff rates. It would also depend on the level of subsidy reduction for key export crops, such as cotton, on the treatment of sensitive and special farm products, which if not constrained can undercut reform impacts,<sup>26</sup> and on special and differential treatment of developing countries.
- *More bilateral and regional agreements.* There might be no further global reform but an increase in the number of bilateral and regional trade agreements, a less efficient and more costly outcome than the first, perhaps delaying and complicating further efforts at global reform.
- *Protection.* The worst outcome would be a spiraling back to protection, including in transforming and agriculture-based countries, reversing past efficiency gains and poverty reductions. OECD subsidies are already inducing some developing countries to call for increased protection rates on a range of agricultural products (as at the 2006 Food Security Summit for Sub-Saharan Africa).

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<sup>24</sup> Anderson, Martin, and Valenzuela (2006).

<sup>25</sup> Anderson and Valenzuela (2006).

<sup>26</sup> Ivanic and Martin (2006).

4.34 *Regional trade agreements.* South-South (including cross-border and regional) trade is a growing share of overall trade for many developing countries. And improving access of developing countries to developing country markets can have a significant effect given the current high level of protection on agricultural imports, particularly in transforming economies (figure 4.5).

4.35 More than a third of global trade is between countries that have some form of reciprocal regional trade agreement. These agreements have usually been easier than multilateral negotiations, with fewer participants and policymakers needed to reach agreement, and they usually extend beyond tariff reductions to reduce impediments associated with border crossings, regulations, and standards. Not all regional trade agreements create new trade and investment, instead fostering trade diversion (countries with high external border protection may actually reduce members' trade overall, even through trade within the group increases).

4.36 On average an African country has four agreements, and a Latin American country seven, adding to the complexity of negotiating. Regional trade agreements most likely to increase national incomes are those with low external 'most favored nation' tariffs, few sectoral and product exemptions, nonrestrictive rule of origin tests, measures to facilitate trade, rules governing investment and intellectual property that are appropriate to the development context, and schedules of implementation put in effect on time.<sup>27</sup> Implementation has proven difficult in many African countries: volumes of formal documents that legalize free movement of goods and people across borders (the Economic Community of West African States treaty) but implementation remains weak.

4.37 Efforts are needed to ensure policy harmonization, reduce nontariff barriers, reduce border formalities, address problems of currency transfers, and capitalize on scale economies in infrastructure. Greater regional integration and opening regional markets can help especially in regions with many small countries (Sub-Saharan Africa).<sup>28</sup>

### **Gainers and losers from further policy reform**

4.38 Further policy reforms will have gainers and losers. With further global trade liberalization net commodity exporters will likely gain, but some net food importing developing countries may lose. Because the poorest countries spend the largest portion of their incomes on cereal imports but also export agricultural products, they may lose from cereal price increases but gain from price increases in nonfood commodities (cotton).<sup>29</sup>

### ***Country and household net trade positions matter—but are not the whole story***

4.39 A recent study of 15 developing countries which links household data to a broader general equilibrium macroeconomic model finds that full agricultural trade liberalization in developed countries would lead to a terms-of-trade deterioration in about half the

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<sup>27</sup> World Bank (2004).

<sup>28</sup> World Bank (2004).

<sup>29</sup> Ashraf, Karlan, and Yin (2006).

developing countries (table 4.5).<sup>30</sup> Brazil—competitive in heavily protected agricultural products such as sugar, oilseeds, and beef—experiences significant terms of trade improvements. Mexico and Mozambique experience some erosion of existing trade preferences as a result of multilateral tariff cuts and thus some terms of trade losses. The terms of trade losses from full liberalization do not automatically translate into higher poverty levels, because they may be offset by gains in efficiency and reductions in the consumer price of domestically protected goods consumed by the poor. The 15 country study shows significant estimated total poverty declines from developed country agricultural trade reform in nine countries (table 4.5).<sup>31</sup>

**Table 4.5 There will be gainers and losers in developing countries from developed country agricultural trade reform**

Country	Change in terms of trade, %	Change in poverty headcount (at \$1/day level)		Change in poverty headcount of agricultural households (\$1/day) %	Change in poverty headcount of non-agricultural households (\$1/day) %
		%	1,000s		
Thailand	1.2	-7.1	-84	-22.0	4.4
Chile	0.7	-4.0	-12	-12.5	2.2
Brazil	5.5	-1.9	-431	-10.5	2.2
Indonesia	-0.2	-1.2	-177	-2.9	1.6
Malawi	2.7	-0.7	-31	-0.7	-0.2
Philippines	0.0	-0.7	-75	-3.5	1.7
Peru	3.5	-0.4	-19	-10.8	2.1
Colombia	1.3	-0.3	-12	-3.4	1.0
Bangladesh	-0.6	-0.1	-27	-1.3	0.8
Uganda	-0.5	0.0	7	0.1	0.1
Mozambique	-0.4	0.1	5	-0.2	0.6
Zambia	-0.2	0.1	8	0.0	0.3
Venezuela	-0.4	0.2	8	-0.6	0.5
Vietnam	0.3	0.3	4	-1.0	0.8
Mexico	-0.1	0.3	32	-7.8	2.4

Source: Hertel and others (2006).

4.40 Net trade positions of the poorest households vary widely (figure 4.7). Most poor households in rural areas tend to be net buyers of food,<sup>32</sup> and so they may lose from higher international food prices. But higher food prices will improve the welfare of many of the poor who are net sellers.

4.41 The transmission of international food price changes to rural households varies significantly by country. For example, a recent study of eight developing countries indicates low pass-through of prices in Colombia, Egypt, Ghana, Indonesia, and Madagascar, while Argentina, Chile, and Mexico had higher price pass-through to farmers (on average for these three countries, about 60 percent of domestic price

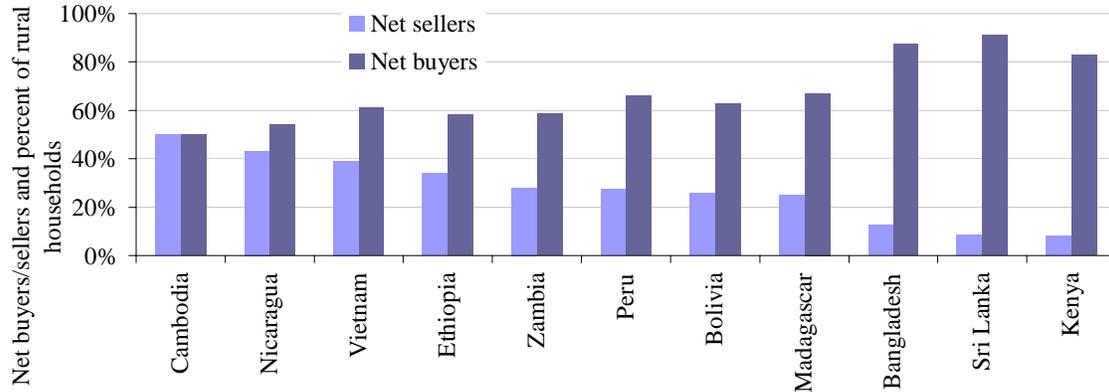
<sup>30</sup> Hertel and others (2006).

<sup>31</sup> Hertel and others (2006).

<sup>32</sup> Aksoy, Isik-Dikmelik, and Klytchnikova (Forthcoming), Christiaensen and Demery (2007), Seshan and Umali-Deiningar (Forthcoming).

variability can be explained by world price changes).<sup>33,34</sup> Price changes at the farm level will determine the magnitude of welfare impacts.

**Figure 4.7 A majority of the rural poor may lose from higher food prices**



Note: The poor are defined as households in the lowest quintile of total per capita expenditures.

Source: Aksoy, Isik-Dikmelik, and Klytchnikova (Forthcoming), Christiaensen and Demery (2007), and Seshan and Umali-Deininger (Forthcoming).

4.42 Beyond the initial price effects, trade liberalization affects poverty through several other channels: through creation and loss of markets, and through employment and wage effects induced by the price changes.<sup>35</sup>

4.43 The welfare impact of creation and loss of markets brought about by trade reforms often exceeds the gains and losses from a change in price, though it's difficult to measure.<sup>36</sup> New export opportunities may emerge with trade reforms, but markets for other products may disappear. For example, broad-ranging trade reforms in Vietnam during the *doi moi* program of the early 1990s increased rice prices, accompanied by lower fertilizer prices and new export opportunities. Contrary to the expectation that higher rice prices would hurt poor net consumers, poverty rates fell dramatically, thanks in part to the trade reforms.<sup>37</sup>

4.44 Rising or falling prices of staples can also induce changes in employment and wages of households engaged in their production and lead to additional welfare gains or losses. The direction and magnitude of this effect are case-specific and depends on labor market conditions. In countries with a large share of a landless rural population working in agriculture for wages, as in South Asia, labor market impacts can be significant.

<sup>33</sup> Baffes and Gardner (2003).

<sup>34</sup> The insulation of farm-gate prices is reflected in the earlier estimates of the welfare costs of global agricultural trade policies.

<sup>35</sup> Winters (2002), Winters (2006).

<sup>36</sup> Winters (2002).

<sup>37</sup> Niimi, Vasuveda-Dutta, and Winters (2006), Isik-Dikmelik (2006).

Decompositions of incomes in Vietnam, Bangladesh, and Uganda reveal that labor market effects are indeed important channels for trade reforms to affect welfare.<sup>38</sup>

### ***Policies and public spending to complement reforms***

4.45 Complementary policies and programs may be required to enhance the benefits of trade and price policy reform, facilitate the adjustments, and support the losers in developing countries. To design targeting mechanisms, it is necessary to recognize the heterogeneity in the groups adversely affected, examine their distinguishing demographic and geographic characteristics, and analyze the magnitude of the losses.

4.46 The poor are more likely to share in the gains from global trade when complementary programs:

- *Provide public services*, such as infrastructure to improve international price pass-throughs to rural producers, agricultural research and extension to take advantage of new market opportunities with trade reform, and support education and training to facilitate labor mobility between farm and nonfarm sectors, as in Colombia and India.<sup>39</sup>
- *Formulate complementary policies*, such as reforming domestic output marketing institutions and improving access to input markets to facilitate a supply response.
- *Strengthen technical assistance*, to support policy analysis and trade negotiations.
- *Provide cash transfers and social safety nets*, to sustain the extreme poor and to support needed adjustments, as in Mexico through the PROCAMPO program, although adjustment has been slow (box 4.2).<sup>40</sup> Cash transfers or targeted investments, such as infrastructure investments and extension services to improve productivity or education, are often more efficient mechanisms to protect the poor than tariffs on staple crops.<sup>41</sup>

4.47 All these complementary programs have implications for public spending. The challenge is to ensure an adequate balance among the complementary support and core public programs to spur agricultural growth and poverty reduction, and not to fall into a protection and subsidy trap. Governance problems which may limit the capacity to implement must also be addressed (chapter 11).

### ***Public spending efficiency in agriculture***

4.48 As the scope for policy reforms that directly affect relative prices across sectors declines, and the share of expenditures going to cash transfer and safety net programs rises, particularly in transforming economies, the level and efficiency of public spending

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<sup>38</sup> Isik-Dikmelik (2006), Klytchnikova and Diop (2006), Bussolo and others (2006).

<sup>39</sup> Harrison, Ann (Forthcoming).

<sup>40</sup> Ahgraf, McMillan, and Zwane (2005).

<sup>41</sup> Coady, Dorosh, and Minten (Forthcoming).

become key determinants of future agricultural growth and poverty reduction (see chapter 1 for levels of spending and chapter 11 for fiscal decentralization and transfers). Spending on agricultural subsidies in many developing countries is high, is usually economically inefficient, and often promotes wasteful use of resources (e.g. excessive water extractions, over-use of fertilizer and pollution—see chapter 8). And insufficient resources are allocated to operations and maintenance to ensure sustainability of public capital investments. Agricultural growth can be increased by reallocating resources to better uses.

4.49 Agricultural subsidies are defined here as payments from the public budget for essentially private goods such as agricultural inputs. Targeted subsidies can potentially play a useful role in helping to overcome temporary market failures (as part of a broader strategy), offset fixed costs of infrastructure, and reduce risk (chapter 6). But they have often not been used for these purposes, have benefited richer farmers, and are often difficult to remove once established—all leading to inefficient resource use.

4.50 Thus the quality of public spending—resource use efficiency—is often even more important than its level. For example, if the countries in the bottom half of a sample of 17 Latin American countries in rural spending were to raise their spending per capita to the average of those in the top half, their per capita agricultural GDP would go up by 19 percent. But if countries in the top half of the sample were to reallocate their spending so that the share of subsidies (65 percent) equals that of the countries in the bottom half (30 percent), their per capita agricultural GDP might increase by 40 percent.<sup>42</sup> According to these estimates, a reallocation of 10 percent of the subsidy expenditures to supplying public goods may cause an increase in per capita agriculture income of about 5 percent.

4.51 *Current spending is economically inefficient.* A large share of public spending has provided private goods (input and output subsidies) and services at high cost. Public expenditure reviews suggest that public budget allocations to agricultural private goods are high: 37 percent in Argentina (2003), 43 percent in Indonesia (2006), and 75 percent in Ukraine (2005). Transfers to parastatals and subsidies in Kenya in 2002/03 accounted for 26 percent of total government expenditure in agriculture, and in Zambia in 2003/04 85 percent of non-wage spending goes to subsidies for fertilizer and maize prices to farmers.

4.52 Allocations to subsidies often divert funds from high return investments in public goods. In Zambia only 15 percent of the 2003/04 budget was spent on research, extension services, and rural infrastructure—investments that have shown high payoffs (chapter 7). Reallocating spending on private subsidies to public goods can increase growth. While these investments are economically inefficient, they are often politically efficient. Improving the efficiency of resource use requires addressing the political economy pressures determining budget allocation (box 4.3).

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<sup>42</sup> López and Gallinato (Forthcoming).

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**Box 4.3 Zambia fertilizer subsidies**

About 5 percent of Zambia's national budget goes to agriculture. In fiscal 2005 more than half the agriculture budget was spent on the Fertilizer Support Program (37 percent), and crop marketing (for maize) under the Food Reserve Agency (15 percent). Only 3 percent of the budget went to irrigation development and other rural infrastructure, and 11 percent to operating costs, which included agricultural research and extension. Spending on agricultural research and development fell from about 1.2 percent of agricultural GDP in 1985 to about 0.5 percent by 2000.<sup>43</sup>

Why is spending on fertilizer subsidies so high? There are no powerful groups that benefit from the withdrawal of the government from input markets, despite it being an economically unproductive use of public resources.<sup>44</sup> This contrasts with early reforms in maize milling, where the private sector gained significantly from privatization and strongly supported the reform. Under the government fertilizer program, traders often benefit from government assumptions about distribution costs.

A 2002/03 household survey showed that only 29 percent of farmers acquired fertilizer, 59 percent through private dealers, and 36 percent through the government fertilizer support program. Both groups had higher income and wealth, were close to tarmac roads and district centers, and had higher education. The main difference was that those receiving fertilizer through the government program were predominantly civil service employees,<sup>45</sup> in a program intended to be targeted at the poor. Parliamentarians also benefited, sometimes informing groups of farmers that there was no need to repay loans on fertilizer received.

The economic costs of the program are high—both from lower spending in higher productivity areas such as agricultural research, extension, and infrastructure, and from lack of diversification away from maize production. These trade-offs need to be considered in the budget process.

*Source:* Beintema and others (2004), Pletcher (2000), Govereh and others (2006).

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4.53 In India, too, the trend is to move away from public good investments towards subsidies. Public expenditures on agriculture have remained at around 6.5 percent of agricultural GDP, but the share of subsidies for fertilizer and electricity (box 4.4) and for support prices for cereals, water, and credit has steadily risen at the expense of investments in public goods, such as R&D, irrigation, and rural roads. Subsidies now account for 75 percent of all agricultural spending (figure 4.8). Moreover, the returns to subsidies in India have declined to a point where each rupee spent on subsidies produces less than one rupee of agricultural GDP in the 1990s.<sup>46</sup> These findings and the results from a related study suggest significant welfare gains from reallocating public expenditures in agriculture in India.<sup>47</sup>

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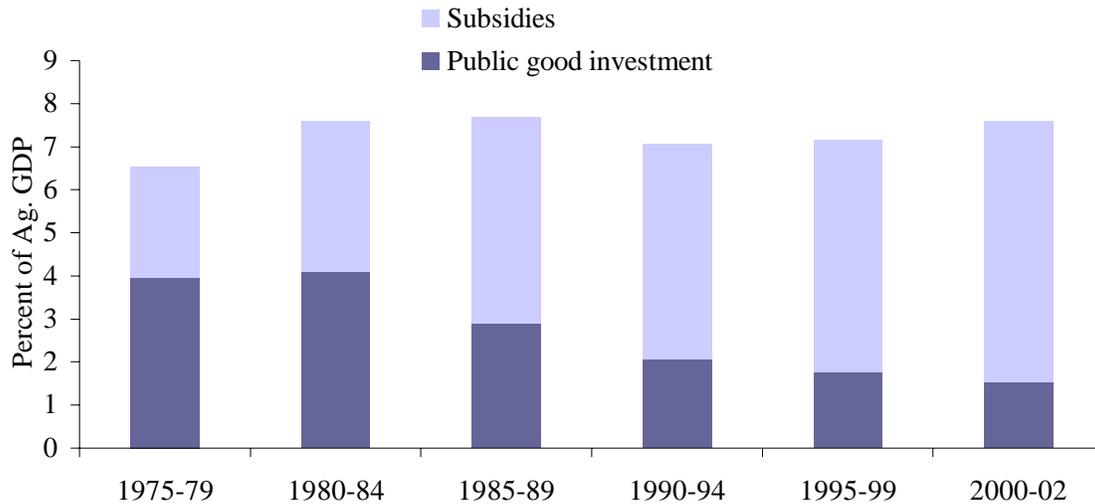
<sup>43</sup> Beintema and others (2004).

<sup>44</sup> Pletcher (2000).

<sup>45</sup> Govereh and others (2006).

<sup>46</sup> Fan, Sukhadeo, and Rao (2004).

<sup>47</sup> Chand and Kumar (2004).

**Figure 4.8 Subsidies have risen relative to public good investment in India**

Source: Chand and Kumar (2004).

#### Box 4.4 Electricity subsidies to agriculture in India

With 55-60 percent of India's irrigated land supplied by groundwater, electricity for tubewell pumps is an important input. Most state governments provide electricity to farmers at a subsidized flat rate—often for free. But the quality of service is poor due to erratic and limited supply and voltage fluctuations, which can result in crop losses from forgone irrigation and damaged pumping equipment. Despite free or near-free electricity, farmers suffer from the poor quality of electricity service.

The electricity subsidies to agriculture are also fiscally draining and damaging to the environment. In Punjab electricity subsidies to agriculture in 2002/03 were 7 percent of state expenditures. Together with other policies that promote water-intensive crops such as rice, the electricity subsidies contribute to the overexploitation of groundwater. About 60 percent of the state's groundwater resources are already overexploited, with extraction rates exceeding recharge rates—clearly not sustainable.

While increasing electricity prices and introducing metering are technically and economically sound, they are not politically feasible, so far. Although the central government has encouraged the states to reduce electricity subsidies, the number of states that provide electricity even free of charge has increased in recent years. Why? Larger farmers obviously benefit more from the subsidy, and they have political capital, but the political economy of India's electricity subsidies is more complicated than that.

One factor is path-dependency. Electricity metering has been abolished and electricity prices have been kept below costs since the 1980s, following massive farmer protests against electricity price increases at that time (a strategy to build political capital in terms of the framework displayed in figure 1.8).

Another important factor is the increasing income disparity between the agricultural and nonagricultural sector, caused by India's low agricultural growth rate. Politically, this has translated into a strong public discourse on "agrarian distress," in frequent reports on farmer suicides. This discourse constitutes an important source of political capital for those favoring electricity subsidies.

Making electricity free is also a politically "convenient" instrument to transfer income to the agricultural sector. Unlike other policy instruments, it does not require implementation by the—often ineffective—public administration. Farmers who buy water from pump owners—a considerable proportion of farmers in most states—potentially benefit from the subsidy, too, which increases the attractiveness of this policy instrument for politicians who want to win state elections.

Efforts to reform the electricity subsidy policy need to take these political factors into account. Policies that address low agricultural growth rates more generally and governance reforms that improve the

effectiveness of policy implementation will improve the frame for an electricity subsidy reform. Moreover, improving the quality of electricity supply is a key element of reforming the subsidy policy, because it reduces the costs incurred by farmers caused by unreliable electricity supply.

Due to widespread power theft and losses, states lack the credibility to deliver better service in exchange for higher prices. One option would be to decentralize energy supply to local governments or community groups, which allows for local accountability to improve electricity quality. Elite capture must still be prevented, but this community-oriented option holds the potential to break the political impasse.

Given the political capital of the opponents of reform—not only farmers, but also electricity employees and others who benefit from the current system—policymakers should assess gradually introducing reforms, enlisting political leaders, bundling unpopular and popular measures, building new coalitions, and engaging stakeholders in strategic bargaining or deliberative processes that involve social learning.

*Source:* Birner, Sharma, and Palaniswamy (2006), World Bank (2003).

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4.54 *Reforms to improve the efficiency of rural public spending.* Understanding why public rural expenditures are allocated to unproductive interventions requires understanding the political economy of government policies. Institutional, demographic, and economic variables jointly shape the size and quality of public spending. One factor affecting quality is information. The lack of a formal program of expenditure evaluations—combined with a lack of access to public information on expenditures and their beneficiaries—dilutes the effectiveness of any formal accountability mechanisms, which might be provided by political checks and balances, a free press, or well intentioned civil society organizations. With such information gaps, public debates about public policies tend to be manipulated by special interest groups (box 4.4). Rigorous evaluations, their wide dissemination, and increasing transparency should reduce this information gap.

4.55 Special interest groups also influence patterns of public spending. In Latin America the share of rural subsidies provided by governments seems statistically related to income inequality.<sup>48</sup> Economic sectors or groups of producers that control a large portion of national wealth also have the means to create political capital and influence public policies to their benefit. If the ineffectiveness of public expenditures is due to the influence of special interest groups, the solution might be to link budget implementation to participatory decisionmaking, in which poor rural households have a voice (chapter 11). This might work best for local expenditures where administrative decentralization accompanies political democratization, with proper decentralization of revenue-raising.<sup>49</sup> Still, the challenge is to avoid elite capture, and so far the evidence on the effect of decentralization on corruption is mixed.<sup>50</sup>

4.56 Improving the public expenditure management at central and local levels and coordination mechanisms for sector expenditures will improve coordination across layers of government. Regardless of the type or level of decentralization, improving coordination and information sharing is critical for the effective and efficient delivery of agricultural services at local levels, calling for better evaluation of effectiveness and impact (chapter 11).

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<sup>48</sup> Allcott, Lederman, and López (2006), Esteban and Ray (2006).

<sup>49</sup> See Bardhan (2002) for a discussion of the advantages and disadvantages of decentralization.

<sup>50</sup> Lederman, Loayza, and Soares (2006).

## **Conclusions**

4.57 Because trade and price policy biases and subsidies in agriculture impose significant costs on poor farmers in developing countries, policy reforms and better expenditure alignments offer great scope for further improvements in growth and poverty reduction, especially in low income countries.

4.58 OECD agricultural tariffs and subsidies have declined and shifted to less distorting forms. But progress varies by OECD country and product. Needed now is an acceleration of reductions in distortionary support for products that matter most to developing countries, such as cotton and sugar, where progress has been slowest. Progress in the Doha round of trade negotiations, international pressures, and local media attention can help. Complementary policies and programs may be needed to compensate losers and facilitate rapid and equitable adjustment to emerging comparative advantages.

4.59 Net taxation has on average declined sharply across agriculture-based, transforming, and urbanized countries. But some of the net effect is due to rising protection of agricultural imports with remaining high taxation of exports in many countries. Relatively high protection in transforming countries is imposing additional costs on South-South trade. Building on local support to strengthen coalitions for reform, and ensuring that complementary programs facilitate sector adjustment to new sources of income while avoiding drifts to protection and subsidy traps, particularly in transforming countries, can produce further efficiency gains.

4.60 Public investments in agriculture, too often squandered on regressive subsidies, should focus on high-payoff investments in rural public goods and human capital. Great scope remains for improving the efficiency of public resources to increase investments on high-priority public goods. Needed are actions to increase information, accountability, and commitment. Information gaps in public knowledge of budget allocations and impacts of public spending on agriculture have to be closed through greater publicity and transparency of budget allocation and evaluation. And accountability mechanisms at both national and local government levels have to be improved through strengthening the voice and influence of rural producers and other stakeholders in allocation decisions.

4.61 Political economy will determine the pace and extent of reform and have to be addressed in both developed and developing countries. Building the political capital of coalitions supporting reforms can help. The WTO has induced reform, and local media have played complementary role (as in US cotton). In some cases bargained compromises and compensation schemes for the losers may be needed—as in the new Japan rice policy reforms, the EU sugar reforms, and Mexico's 1990s reforms. And linking domestic agricultural reforms to a broader set of economywide reforms can strengthen the political capital of reform coalitions, and increase the likelihood of successful reform, as in many developing countries in the 1980s and 1990s.

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## **Focus D Culture is changing in India's villages**

*Sharp changes in the technologies of consumption, production and governance have fundamentally altered the culture of village life in India. This should lead us to rethink the opportunities and risks faced by rural residents. The common tropes of rainfall risk and restrictive inequality traps<sup>1</sup> need to be supplemented with a better grasp of how they interact with uncertain global processes. Access to information and capital may come to matter more than access to land in determining inequality, and that would fundamentally alter the culture of Indian agriculture.*

D.1 It is commonly believed that social and cultural change in rural India has been slow. Some scholars have even blamed an unchanging, caste-centered, “Hindu equilibrium” for placing an atavistic hold on human innovation and entrepreneurial ability.<sup>2</sup> More reasonably, a rich body of work by anthropologists and economists argues that social relationships—whether family and kinship networks, or inter-linkages between landlords and tenants—create particular asymmetries that result in poverty traps.<sup>3</sup> In particular, much of the development economics literature in the last two decades has studied how peasant households are subject to such pervasive risk that they devote their lives to mitigating that risk by nurturing social networks that crowd out social mobility.<sup>4</sup> Other work has examined how history’s long arm fundamentally affects institutions that have a bearing on agricultural productivity.<sup>5</sup>

D.2 While this literature has contributed substantially to our understanding of the institutional determinants of agricultural development, it would be incorrect to infer that culture is a constraint, that it is static, or that history is destiny. Historians have shown that rural Indian society and the structure of caste have seen considerable periods of change over the centuries.<sup>6</sup> These changes have been induced by external invasions, political shifts, and technological change—particularly with the green revolution. And in the last decade, a radical shift in technology has sharply increased the link between villages and globalizing processes of consumption, production, and governance. These have transformed rural life by gradually delinking it from traditional economic and social structures.

### **Technologies of consumption**

D.3 Perhaps the most important change in the technology of consumption, starting in the early 1990s, is the sharp expansion of rural access to television and communications, thanks to marked reduction in cost. This has increased the market penetration of advertising in India and many other rural areas of the world. Rural viewers now have their preferences shaped by the same forces as urban consumers.

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<sup>1</sup> World Bank (2005).

<sup>2</sup> Lal (1989).

<sup>3</sup> Dasgupta (1993).

<sup>4</sup> Munshi and Rosenzweig (2005).

<sup>5</sup> Banerjee and Iyer (2005).

<sup>6</sup> Bayly (1999).

D.4 Inequalities in wealth and status are signaled and expressed through the new consumption patterns, and human aspirations are shaped by life on the screen more than any time before. This has implications for a variety of different things—most obviously the demand for consumer goods. Aware of this potential, multi-national firms are adapting their wares for rural markets<sup>7</sup>, and rural India has seen a huge surge in the demand for consumer durables.<sup>8</sup>

### **Technologies of production**

D.5 In addition to innovations in agricultural technology, changes in trade regimes and interconnectivity because of improved communication and transportation have transformed the landscape of agricultural markets. Ubiquitous cell phones and the internet give farmers direct access to information on commodity prices and globally linked markets (<http://www.echoupal.com>). Global climate change has increased uncertainties about water use. And villagers depend less on agriculture for their livelihoods—partly because urban migration has become an important source of rural income, and partly because of the nonfarm sector has sharply increased options outside agriculture.<sup>9</sup>

### ***Higher consumer aspirations***

D.6 The reduced rural isolation has raised consumer aspirations, while vastly expanding the options for mobility and risk diversification. Strategies for mobility are increasingly centered on breaking out of rural areas, or on taking greater risks by adopting new agricultural technologies such as genetically modified seeds.

D.7 This can have a positive impact—with an increase in entrepreneurial initiative and the potential for raised incomes. But it also results in what can be called an aspirations gap—people tend to have ambitions that exceed their capabilities. This can lead to poorly thought out investments in new businesses or new technologies.

D.8 Similarly the increase in educational aspirations can have the healthy effect of raising the demand for schooling for both boys and girls. But it can also lead to a disequilibrium between demand and supply—smallholders make large sacrifices to get their children a higher education only to see them join the ranks of the unemployed, and to return to live with them. Pathologies such as depression and alcoholism are often the result.

D.9 Globalization, in other words, has opened opportunities, but it has also left rural residents with risks that are not well understood and that are thus more uncertain. Opening access to global markets leaves farmers more vulnerable to downturns in international markets, and more subject to the strategic manipulation of multinational enterprises in accessing new technologies. This uncertainty can churn the social structure: individuals and groups better able to comprehend global opportunities will

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<sup>7</sup> Prahalad (2006).

<sup>8</sup> Rao and Natarajan (1996).

<sup>9</sup> Lanjouw and Shariff (2004).

compete better than those more insular. And the differential access to global knowledge does not necessarily correlate with traditional social hierarchies. The geographic reach of low caste networks can, for instance, be greater than those of high-caste networks.<sup>10</sup> Technologies of globalization thus have the potential to break traditional inequality traps—but also to replace them with new ones.

### **Technologies of governance**

D.10 Policies to improve governance are also, in their way, technologies.<sup>11</sup> They are tools devised by people who claim expert knowledge applied within a real-world context to improve the quality of life. Driven by external donors, the technology of rural governance has changed radically over the last decade with externally driven attempts to empower local actors. In many countries this has involved greater decentralization in power and finance to local governments.<sup>12</sup> Another important effort has been the greater emphasis on participatory and community-based approaches to development, which purport to give communities greater voice over policies that affect their lives but often do not deliver as promised.<sup>13</sup>

D.11 These approaches to development have several important implications for rural societies. They can localize politics and create the space for marginal groups to gain power. They can generate an enhanced “capacity to engage” with dominant elites,<sup>14</sup> while inculcating the “capacity to aspire”—the capability of envisioning a collective path out of destitution.<sup>15</sup> But they can also strengthen the hands of elites by putting resources under the control of local big-men without downward accountability.<sup>16</sup>

D.12 Note that administrative and policy interventions aiming to improve the quality of life anywhere are never culturally neutral. This was famously demonstrated for India in British attempts to introduce a decennial census, essentially creating the modern caste system by hardening categories that earlier were much more fluid.<sup>17</sup> Recent work has shown that similar processes have continued in the post-independence period.<sup>18</sup> Policies can have profound, unintended consequences for cultural change. For instance, the overuse of participatory approaches can create imaginary constructs of “community” that emerge simply to engage in rent-seeking from donors.<sup>19</sup> Even abstract constructions, such as nationalism, can act as “symbolic public goods” facilitating the coordination of collective action by changing social preferences, creating the space for deliberative dialogue, and changing the incentives for democratic participation.<sup>20</sup>

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<sup>10</sup> Luke and Munshi (2005).

<sup>11</sup> Agrawal (2005).

<sup>12</sup> Bardhan and Mookherjee (2006).

<sup>13</sup> Mansuri and Rao (2004).

<sup>14</sup> Gibson and Woolcock (2005).

<sup>15</sup> Appadurai (2004).

<sup>16</sup> Abraham and Platteau (2004).

<sup>17</sup> Dirks (2002).

<sup>18</sup> Rao and Ban (2006).

<sup>19</sup> Cooke and Kothari (2001).

<sup>20</sup> Rao (2007).

D.13 In India, the most pervasive change in the technology of rural governance has been shaped by nationalist priorities and a constitutional mandate. This is the shift to panchayat governance, which requires the devolution of finance and power to a three-tier system of democratically elected councils at the village, county and district levels. Social inequalities are explicitly countered by requiring that a third of seats in the councils, and in their presidencies, be reserved for women. In addition, the proportion of seats reserved for discriminated castes are required to reflect their proportion in the population.

D.14 Caste reservations in panchayats have raised the likelihood of greater benefits for discriminated groups.<sup>21</sup> Women's reservations have brought greater authority to women in the north,<sup>22</sup> which has more acute gender discrimination, than in the south, where women and men have more common desires and goals.<sup>23</sup> The impact of panchayat reform has been most advanced in the Kerala State, where a deep history of social mobilization by the left aided a "People's Campaign" that sharply increased the accountability and oversight of village governments, while devolving 40 percent of the state's budget to them.<sup>24</sup> All this has sharply localized politics, giving marginal but numerically large castes considerable political clout, and shifted the structures of traditional authority.<sup>25</sup>

***Traditional inequalities less salient, but...***

D.15 While agriculture growth has not always kept up with the galloping pace of the rest of the Indian economy, changes in economic, political, and social life have tended to level the playing field in rural areas. Traditional inequalities have by no means disappeared, but they are becoming less salient. For instance, it is now just as likely to see an upper caste man working as a wage laborer in rural India as it is to see a lower caste woman as the president of a village council. The social life of agriculture in many parts of India today is thus less about the reproduction of inequality—with a particular caste endowed with a particular occupation, and status largely determined by land ownership—and more about the expansion of occupational choices and the energizing but risky encounters with global connectivity.

D.16 While the vulnerability of poor households has not diminished, risk now has a global dimension and old techniques of risk management are less likely to work. Rural institutions in India are rapidly changing, reacting to public and private interventions that affect the technologies of consumption, production, and governance. With similar changes occurring in almost every other part of the world—the view of culture's role in agriculture and development needs revision.

***What should policy do?***

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<sup>21</sup> Besley and others (2004).

<sup>22</sup> Chattopadhyay and Duflo (2004).

<sup>23</sup> Ban and Rao (2006).

<sup>24</sup> Chaudhuri and Heller (2003).

<sup>25</sup> Krishna (2002).

D.17 What should policy do in this dynamic environment? First is to create stable institutions that help equalize access to new opportunities while protecting those who could be hurt by rapid change. Eliminating illiteracy is fundamental. Nothing matters more in accessing information, and globalization is likely to sharply increase the correlation between illiteracy and inequality. Second, investment hubs located close to rural markets would equalize access to information and capital so that talented individuals from all social groups can benefit from global opportunities. Third, local governance needs to be improved by freeing access to village budgets and records, while ensuring that public deliberation holds village governments more accountable for its actions. Fourth, villages need better access to formal mechanisms of dispute resolution to ensure that contract enforcement is reliable and equitable. Fifth, a subsistence level of employment should be guaranteed to ensure that the most vulnerable are protected from livelihood shocks. Variants of all these policies are being implemented by the government of India, with their quality affected by the local geography and political economy.

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## **Chapter 5 Bringing agriculture to the market**

5.1 Far-reaching changes in domestic and global markets are creating big opportunities for farmers and agribusiness entrepreneurs. The demand for high-value primary and processed products is rapidly increasing, driven by rising incomes, faster urbanization, liberalized trade, foreign investment, and technological advance. These developments are expanding market opportunities, important for faster agricultural and non-farm growth and for greater employment and rural incomes.

5.2 For many low income agriculture-based and transforming economies, food staples are still a mainstay for a major share of households, many of them poor. But food staple markets are often hampered by poor infrastructure, inadequate support services, and weak institutions, pushing up transaction costs and price volatility. How markets for food staples function thus affects livelihoods, welfare, and food security, especially for poor households. So, improving the performance of those markets can promote faster rural growth while benefiting the poor—win-win.

5.3 Well functioning markets are critical because they link consumers and farmers. They encompass physical assembly, handling, storage, transport, processing, wholesaling, and retailing. They also encompass services directly supporting these activities, such as providing market information, establishing grades and standards, financing marketing activities, and managing risk.

5.4 Strengthening farm-to-market linkages has improved the livelihoods, incomes and food securities of rural and urban households, especially in developing countries. But the nature and pace of market development has varied across food staples (cereals), traditional bulk export commodities (coffee, cocoa, tea, cotton), and higher value products for domestic and export markets (dairy, meat, fruits, vegetables). Given the importance of each of these commodity groups, this chapter examines the new opportunities and challenges for smallholders in competing in the corresponding markets.

### **Food staples improving commodity trading and risk management**

5.5 Food staples remain by far the most important market in many agriculture-based and transforming economies, because they take up a major share of total household expenditure. Growing populations sustain direct demand, now supplemented by the rapidly growing demand for livestock feed in middle-income countries. Inhibiting food staple market development, however, are high transaction costs, product wastage and losses, wide marketing margins, weak market integration, limited access to trade finance, and weak institutions. These marketing constraints have broad implications for agricultural growth because they also influence agricultural diversification. Well functioning markets are equally needed for high value products. They build confidence among farmers on the reliability of food staple markets to ensure food security, as they diversify production to other products.

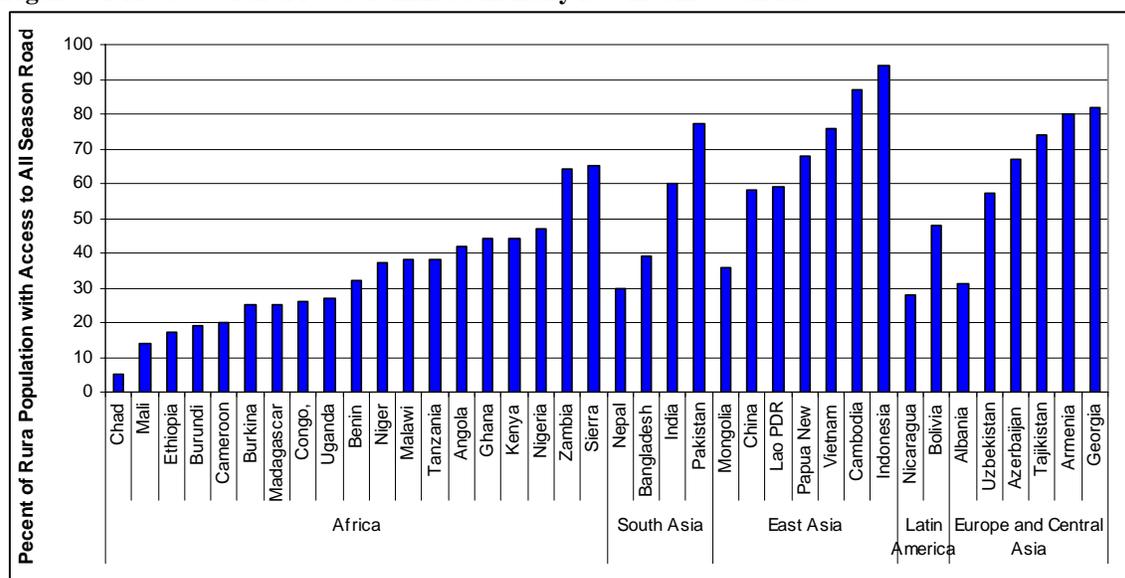
5.6 In agriculture-based and transforming economies, small and medium size traders and multiple layers of intermediaries are common features in the marketing of food

staples and other agricultural commodities. Often one-person businesses dealing in several commodities, they are mainly self-funded because of limited access to credit, maximizing the returns to their working capital by the rapid turnover of small quantities, with little storage. Quality grades are rarely standardized, nor are weights and measures, making personal inspection of products by buyers essential. This requires that traders travel extensively between markets and in limited geographical areas, increasing the transactions cost.

**Weak infrastructure increase marketing costs**

5.7 Also adding to the marketing costs are the inadequate availability and quality of infrastructure, undermining international export competitiveness particularly in African countries (figure 5.1). Market facilities in developing countries are often limited and congested, raising the costs of marketing. A recent study in Tamil Nadu, India, finds that wealthier farmers tend to capture a disproportionate share of the benefits of facilities in congested wholesale markets.<sup>1</sup> But investments in market facilities would be pro-poor because the sales of the poorer farmers would increase proportionally more than those of the wealthy farmers.

**Figure 5.1 Access to rural roads is limited in many low-income countries**



Note: Access to an all-season road measures the number of rural people who live within 2 km (typically equivalent to a 20-minute walk) of an all-season road as a proportion of the total rural population. An "all-season road" is a road that is motorable all year.

Source: World Bank Transport Database.

5.8 Trader surveys in Benin, Madagascar, and Malawi find that transport costs accounted for 50 to 60 percent of total marketing costs.<sup>2</sup> In the Democratic Republic of Congo transport costs on bad roads were twice those on paved roads, reducing the

<sup>1</sup> Shilpi and Umali-Deininger (2006).

<sup>2</sup> The traders in the sample marketed a range of commodities, including food staples, fruits and vegetables (Fafchamps, Minten, and Gabre-Madhin (2005)).

producer share of the market price.<sup>3</sup> So road improvements can have significant benefits to farmers. Transport costs for Sub-Saharan Africa have been estimated to be 136 percent higher and trade volumes 6 percent lower than those for non-Sub-Saharan African countries.<sup>4</sup> Weaknesses in infrastructure account for nearly half the transport penalty borne by intra-regional Sub-Saharan Africa trade. In many African countries, inadequate access to roads and transport services hurt women, who frequently have to carry goods as headloads over long distances.<sup>5</sup>

5.9 Improving the availability and quality of road infrastructure can develop markets and improve market efficiency. While methodological issues complicate the evaluation of the benefits of road investments,<sup>6</sup> some recent studies point to their broad contributions. In Vietnam road rehabilitation encouraged market development, increased the variety of goods that households sold in the market—primarily fruits, vegetables and meat—and encouraged greater household participation in trade and services.<sup>7</sup> In Georgia the construction and rehabilitation of roads increased the opportunities for off-farm and female employment.<sup>8</sup> In Madagascar simulations of reducing transport costs suggest that a 50 percent reduction in travel time per kilometer on roads would increase rice production by 1 percent.<sup>9</sup>

5.10 Improving and modernizing the marketing system can increase market efficiency, improve competitiveness with imports, and reduce losses and risks. Market modernization, beyond improving basic transport, takes different forms in different countries, including marketing information systems, commodity exchanges, and price risk management.

### *Market information systems*

5.11 Market information keeps farmers and traders attuned to the demands and changing preferences of consumers, guiding farming, marketing, and investing. It encompasses much: timely and accurate prices, buyer contacts, distribution channels, buyer and producer trends, import regulations, competitor profiles, grade and standards specifications, variety specifications, seed sources, production guidance, post-harvest handling advice, and storage and transport recommendations.<sup>10</sup>

5.12 Public market information systems have often been disappointing, with information disseminated too slowly, in the wrong form, or too infrequently to be of real

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<sup>3</sup> Minten and Kyle (1999).

<sup>4</sup> Limao and Venables (2001).

<sup>5</sup> Barwell (1996) in a survey of villages in Burkina Faso, Uganda and Zambia, estimates that shifting from headloads of 20 kg units to transporting goods by donkey-cart which can carry 250 kgs a trip can reduce the number of required trips by 92 percent.

<sup>6</sup> The close interaction of road infrastructure with other social and physical infrastructure and geographical, community and household characteristics increase the complexity of estimating the benefits from road investments (Van der Walle (2007)).

<sup>7</sup> Van der Walle (2007).

<sup>8</sup> Lokshin and Yemtsov (2005).

<sup>9</sup> Stifel, Minten, and Dorosh (2003).

<sup>10</sup> Kohls and Uhl (1985).

use to market participants.<sup>11</sup> But several innovative approaches are being piloted in different parts of the world, building on advances in communications technology (radio, cell phone, television, internet) and the liberalization of telecommunications and broadcasting. In India the Ministry of Agriculture operates AgMark Net, which collects price information from wholesale markets nationwide and disseminates it through the internet.<sup>12</sup> The private sector in India is also capitalizing on information technology by setting up internet-linked rural kiosks to provide market information, extension, and other services (box 5.1) and linking rural areas to commodity exchanges (MCX's Gramin Suvidha Kendra pilot).

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#### **Box 5.1 Rural kiosks: The e-Choupal initiative**

The agribusiness group of Indian Tobacco Co. (ITC) established 6,400 internet kiosks, e-Choupals, in nine Indian states between 2000 and 2006, reaching about 36,000 villages and 3.5 million farmers. By 2015 it aims to install a further 20,000 e-Choupals to give a total network coverage of over 100,000 villages, a sixth of rural India and covering more than 10 million e-farmers in 15 states.

Here's how it works. ITC establishes an internet facility in a village and appoints and trains an operator (*Sanchalak*) from among the farmers in the village. The *Sanchalak* then operates the computer on behalf of farmers, allowing them to get information on local and global prices, weather, farming practices, to buy a range of consumer and agricultural goods and services (sourced from other companies), and to sell wheat, soya, coffee, or shrimps to ITC. Sales to ITC are handled by the *Sanchalak*, acting as a commission agent to receive and pay for produce in the village and manage its delivery to ITC.

Compared with the traditional wholesale marketing system, this channel cuts marketing costs for both farmers and ITC. It improves transparency and allows better grading of produce and thus better prices. And it puts competitive pressure on traditional markets. Goyal (2006) estimates that e-Choupals in Madhya Pradesh have increased soybean prices in general agricultural markets in the same districts by 5 to 10 percent.

*Source:* Manohar (2005), DeMaagd and Moore (2006), and Goyal (2006).

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5.13 Market information systems have been developed to disseminate information in Kenya, Mozambique, and Senegal using a mix of internet, SMS, voicemail, radio, and market chalkboards.<sup>13</sup> Local FM radio broadcasts market information in Mali and Uganda.<sup>14</sup> It is still early to judge the long-term viability and impact, but anecdotal evidence points to the interest of farmers (with rising use of SMS) and the willingness of mobile phone companies to invest in these systems, supported by initial donor funding. The new systems have the potential to significantly reduce transaction costs, especially transport costs, and warrant continued investment and investigation.

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<sup>11</sup> Shepherd (1997).

<sup>12</sup> World Bank (2007).

<sup>13</sup> These are being implemented by the Kenyan and Malawi Agricultural Commodity Exchanges, the Mozambique Agricultural Marketing Information System (SIMA) and by Manobi, which is currently expanding these activities to Burkina Faso, Ghana, Mali, Tanzania, Uganda, and Zambia (see <http://www.manobi.sn/sites/?M=6&SM=20&IDPresse=22>).

<sup>14</sup> Kleih, Okoboi, and Janowski (2004), Temu and Msuya (2004), Fafchamps, Minten, and Gabre-Madhin (2005).

### ***Commodity exchanges***

5.14 Commodity exchanges offer a fast and low-cost mechanism for discovering prices, for trading, and for resolving contractual disputes. A physical exchange is often a first step to more sophisticated trading contracts, initially contracts for forward delivery and perhaps later futures, options, and swaps. China, India, South Africa and Thailand have developed agricultural futures exchanges, which facilitate a wider range of financing and risk management transactions.<sup>15</sup> Notably, these successes have been in countries which benefit from large domestic production and relatively well-developed financial sectors.

5.15 In India, there has been a rapid expansion in the number of commodity futures exchanges after the government eliminated the ban on their operations.<sup>16</sup> Currently, three national electronic and 21 regional futures exchanges operate, covering a range of products (cereal, sugar, cotton, potatoes, oilseeds, spices).<sup>17</sup> The fortnightly turnover in trading a number of agricultural commodities<sup>18</sup> in the three national exchanges totaled \$8.7 billion in September 2005. The South Africa Futures Exchange (SAFEX) offers futures contracts on white and yellow maize, wheat, sunflower, and soybeans. The exchange traded over 1.9 million contracts in 2006. Traders throughout the region use SAFEX as a benchmark for pricing physical trades. In 2006, the government of Malawi used a SAFEX-based call option to protect itself from the risk of price increases during food shortages<sup>19</sup>

5.16 Success in developing futures trading requires good financial and legal structures and supportive government policies. The benefits diminish if the markets for smallholders are separated from the exchange by high transport and transaction costs or quality deficiencies. Establishing exchanges in Africa is challenging because of continuing government intervention in grain markets, weak institutions, and lack of warehouses and warehouse receipt systems, and grades and standards.

### ***Price risk management***

5.17 Managing food price risk continues to be debated. Because of the vulnerability of poor producers and consumers to price shocks, governments often seek to stabilize prices, which run counter to efforts towards greater market liberalization. The variability in world grain prices remains significant, with coefficients of variation around 20 to 30 percent for rice, wheat, and white maize. Domestic price instability tends to be higher in Africa, especially in land-locked countries, where the wedge between export and import parity is high because of high transport costs and poor market infrastructure. This large

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<sup>15</sup> Gabre-Madhin and Goggin (2005), UNCTAD (2006).

<sup>16</sup> Trading in forward and futures contracts in India were limited to a few commodities (such as oilseeds, sugar, and cotton) after broader futures trading was banned in 1952 (World Bank (2005c)).

<sup>17</sup> World Bank (1996), Sahadevan (2005), Narender (2006).

<sup>18</sup> These include the fortnightly turnover of futures trading for guar seed, chick peas, black legumes, soybean oil, cane sugar, guar gum and lentils (Narender (2006)).

<sup>19</sup> Dorward, Kydd, and Poulton (2006), Dana, Gilbert, and Shim (2006), Dana, Gravelet-Blondin, and Sturgess (2007).

wedge, combined with high domestic production variability, increases the impact of domestic shocks (Ethiopia, Zambia).<sup>20</sup>

5.18 There are three dominant views on the appropriateness of government price stabilization interventions. Opponents note that price stabilization interventions often lead to economically inefficient production decisions and discourage incentives to search for cost-reducing technical and institutional innovations. Most often, the government agencies implementing them are subject to significant inefficiencies, corruption, and influence by vested interests, resulting in huge fiscal costs.<sup>21</sup> Proponents, by contrast, show that the net welfare effects of food price instability on economic growth and on household food and nutrition security can be significant.<sup>22</sup> They suggest that food price fluctuations and political instability retard investments and slow macroeconomic growth.

5.19 Another view is that the nature and extent of price stabilization interventions will depend on the country's stage of development.<sup>23</sup> Food price stabilization is more relevant to the subset of economies with a large proportion of rural poor engaged in smallholder agriculture and for whom credit and risk markets are not available. Where a high proportion of the poor have little or no stake in the production of staple foods—either because of extensive urbanization or because the agricultural economy is dominated by larger commercial farms producing specialized crops—policy can be more single-minded, focusing on sustainable means of ensuring cheap food, perhaps best achieved by liberal internal and external trade.

5.20 Lessons over several decades suggest that the design of policy reforms to manage food price instability within acceptable levels needs to be country-specific.<sup>24</sup> Food price risk interventions should be part of a holistic strategy for broad-based growth, poverty reduction, and food security. This strategy gives emphasis to measures that raise the overall productivity of food staples and reduce domestic shocks over the longer term—say, through investments in irrigation and roads. Measures to improve the efficiency of markets (infrastructure, market information, grades and standards, warehouse receipts) and minimize the impact of price shock (weather-based insurance, and safety nets) (chapter 6) are critical. Liberalizing trade, especially by promoting regional trade, can be a source of “quick wins” for reducing price volatility, especially in small and medium-sized countries (box 5.2).

5.21 If implemented, food price stabilization policy should be consistent, predictable, and transparent, with clearly outlined “rules of the game.” Many developing countries establish food reserve agencies to maintain publicly owned strategic reserves—that can reduce price instability, but instead destabilize prices.<sup>25</sup> Safeguards are needed to prevent

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<sup>20</sup> Mitchell and Le Vallee (2005), Hazell, Sheilds, and Sheilds (2005), Avalos-Sartorio (2006).

<sup>21</sup> Umali-Deininger and Deininger (2001), Cummings, Rashid, and Gulati (2006), Dorward, Kydd, and Poulton (2006).

<sup>22</sup> Myers (2006), Timmer (2002), and Dawe (2001).

<sup>23</sup> Dorward, Kydd, and Poulton (2006).

<sup>24</sup> Byerlee, Jayne, and Myers (2006)

<sup>25</sup> Malawi, despite having these reserves, disrupted domestic trade by imposing an export ban, which undercut the other price stabilization measures.

this from happening. These include arm's length "central bank" type autonomy, highly professional management and analytical capacity, strict rule-based market operations to meet a narrowly defined objective, and tendering some operations, including storage, to the private sector.<sup>26</sup>

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### **Box 5.2 Price stabilization through international trade—Bangladesh**

To stabilize domestic prices and the availability of food, many countries have accumulated large national stocks as emergency reserves. But market development and trade liberalization provide another option, potentially less costly and more effective, as evidenced by Bangladesh after massive floods in 1998.

As floods spread across much of Bangladesh in mid-1998, rice prices rose to import parity levels (the export price of rice in the exporting country plus transport and normal marketing costs). This induced massive imports of rice by hundreds of small traders. Private sector rice imports, estimated at 2.42 million tons, were 6.1 times larger than government rice distributions. If the government of Bangladesh had imported this grain, the added cost of the imported rice delivered to local delivery points would have been \$50-100 million. And if the government had subsidized this rice by selling it at the price used for limited government sales in urban centers, the total fiscal cost would have been \$160-210 million.

The liberalized trade policy helped the government stabilize prices without large government stocks. In 1988/89, at the time of another major flood, public stocks averaged 1.2 million tons from August to November (10.9 kilograms per person). These stocks, combined with public sector imports, enabled the government to use public distribution channels to stabilize markets. Average public stocks in August-November 1998, however, were only half the per capita levels of 10 years earlier. Even so, private imports rather than public distribution provided the main source of additional market supplies to compensate for the 2.04 million ton crop loss.

Other factors were also important. The large expansion in the winter season *boro* rice and wheat harvests over more than two decades helped reduce the relative importance of the monsoon rice crop in total domestic production and minimize the time between major domestic harvests. Moreover, large-scale imports would not have been possible without market infrastructure (particularly, roads and bridges) and pro-market policies including no limits on private stocks, no movement restrictions, sufficient access to foreign exchange—all made possible by the expansion of Bangladesh's exports and by the availability of grain in world markets.

*Sources:* Del Ninno and others (2001), Dorosh (2001).

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## **Traditional bulk export commodities: maintaining international competitiveness**

5.22 Maintaining international competitiveness in bulk agricultural commodity exports is a major challenge for many low income countries, especially in Africa. Although exports of these commodities, such as coffee, cocoa, tea, and cotton, account for only a small share of global agricultural trade, they are critical to many low income countries because they are their main source of foreign exchange. In Benin, Burkina Faso, Burundi and Mali, one of these commodities account for more than 50 percent of the value of total exports.

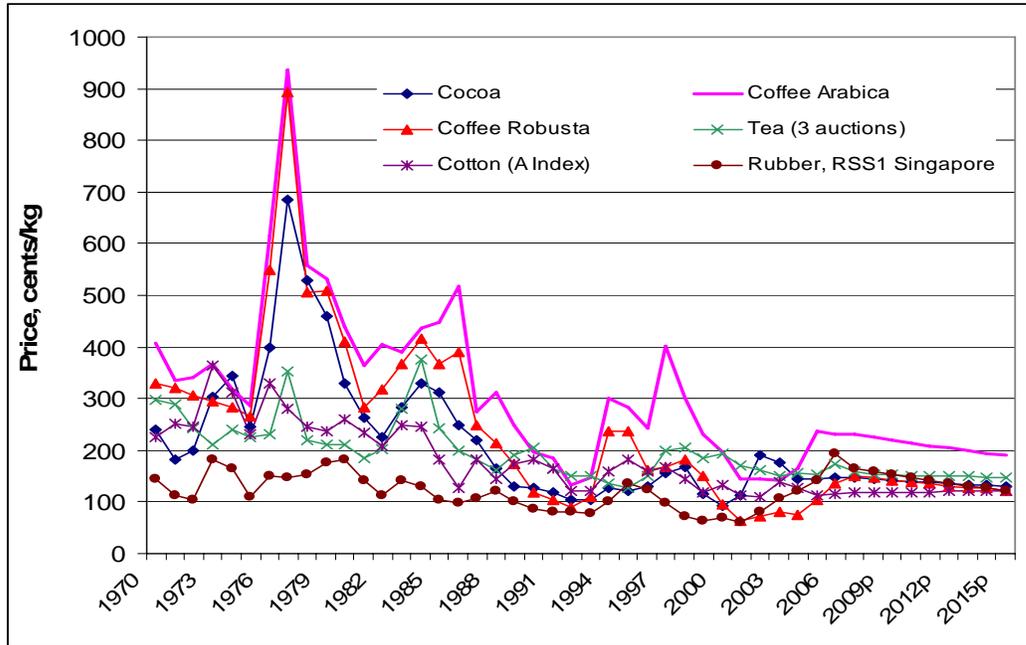
5.23 Producers of these commodities, however, face a long-term downward trend in prices as global supply outpaces demand (figure 5.2). Global output grew as productivity increased among traditional producers and exporters and the entry of new players, such as

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<sup>26</sup> World Bank (2006a).

Vietnam in coffee and tea, further expanded supply.<sup>27</sup> Efforts to increase productivity to cope with declining prices helped some countries in the short term, but added to the long-term downward pressure on world prices. This occurred as consumption stagnated in the major markets (western countries), with limited growth in the “new” markets (Middle East, Eastern Europe, and former Soviet Union).<sup>28</sup> Cotton subsidies in OECD countries further depressed prices (chapter 4). Projections for coffee, cocoa, and tea indicate continuing price declines till 2015.<sup>29</sup>

**Figure 5.2 Declining trend in world prices for traditional bulk exports shows no recovery in the next decade.**



Note: Prices are in constant 1990 dollars. Prices from 2007 onwards are projected.

Source: World Bank Data Group.

5.24 Another major challenge is the declining global demand for higher priced premium grades of cocoa, coffee, and tea, as demand shifts to lower quality products. Technological advances in processing technology and bulk transportation permit international cocoa grinders to use, and cost-effectively compensate for, lower quality cocoa beans.<sup>30</sup> Technological advances in roasting lower quality robusta coffee allow its substitution for higher quality arabica. Changing consumer preferences, such as the consumption shift toward instant and flavored coffees and convenience teas, further shift demand toward lower quality products. Cotton is the exception, where the importance attached to lint quality has risen in recent years. The widespread use of large, high-speed

<sup>27</sup> In the case of cotton, the widespread adoption of GM cotton varieties in major producing countries, such as China, US and Australia, was a major contributor to the significant increases in productivity and global output (Poulton (2007)).

<sup>28</sup> Poulton (2007).

<sup>29</sup> Mayer and Fajarnes (2005).

<sup>30</sup> In Cameroon, this led to the “homogenization” of exported cocoa beans, with most cocoa being exported as “fair fermented” quality rather than the high quality “good fermented” cocoa, and a fall in the price premium paid on high quality beans (Tollens and Gilbert (2003)).

spinning machines increased the quality requirements for lint, such as uniformity, the absence of foreign matter and stickiness, and the conventional attributes of staple length, strength, and color.

5.25 Specialty markets for coffee, cocoa, tea, and cotton (organic, gourmet, fair trade) offer an alternative higher priced market, but they account for a small share of the global market (see section on specialty markets). Currently, the specialty coffee sector accounts for only about 6 to 8 percent of global consumption.<sup>31</sup> Many low income countries, such as Tanzania and its Kilimanjaro specialty coffee or “KILLICAFE” initiative,<sup>32</sup> are targeting these markets to expand export markets and increase revenues.

### *Different ways to liberalize domestic markets*

5.26 Bulk export commodity markets in Africa were traditionally controlled by parastatal agencies, which often had monopoly powers in domestic marketing, in exports, and in providing inputs to farmers (seeds, fertilizer, credit, extension services). Using such methods as price stabilization funds, the parastatals also aimed to stabilize prices received by farmers. The vertical coordination arrangements in production and marketing enabled farmers to overcome market failures in the input, credit and insurance markets. They also ensured a steady supply of products of assured quality for export to the parastatal agency. But due to poor management and interference by vested interests, the financial and economic performance of parastatals deteriorated. They were widely criticized for significant inefficiencies, lowering the prices paid to farmers and raising the fiscal costs to government.<sup>33</sup> To redress these failures, commodity markets in many countries in Africa were liberalized in the 1980s and 1990s, and many parastatal agencies were abolished or restructured.

5.27 African countries that restructured their bulk commodity markets followed different courses, ranging from restructuring the parastatal ownership to include the private sector and farmers (cotton in Burkina Faso), to market zoning (cotton in Ghana), to full market liberalization (cotton in Uganda, cocoa and coffee in Cameroon and Côte Ivoire).<sup>34</sup> Overall the liberalization of the bulk commodity markets generated immediate benefits, with the influx of private capital, management, and marketing expertise and with market competition reducing transaction costs, increasing prices received by farmers, and typically leading to prompter payment for crops purchased.<sup>35</sup> One study found that 85 percent of coffee producers in Tanzania were better off as the gains from higher producer prices more than offset the loss from reduced access to credit.<sup>36</sup>

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<sup>31</sup> Tollens and Gilbert (2003), Baffes, Lewin, and Varangis (2005).

<sup>32</sup> KILLICAFE, a farmer owned company, facilitates marketing and provides technical assistance to members to improve productivity and quality. Its export sales of specialty coffee exceeds \$500,000 annually. The quality improvement enabled farmers to receive a 70 percent price premium ([www.technoserve.org/news/TZCoffeeSectorBrief.pdf](http://www.technoserve.org/news/TZCoffeeSectorBrief.pdf)).

<sup>33</sup> Akiyama, Baffes, and Varangis (2001).

<sup>34</sup> Poulton (2007), Bonjean, Combes, and Sturgess (2003).

<sup>35</sup> Shepherd and Farolfi (1999), Akiyama, Baffes, and Varangis (2001).

<sup>36</sup> Winter-Nelson and Temu (2002).

### ***After liberalizing—addressing second-generation problems***

5.28 In many countries, the restructuring of the market brought second-generation problems, aptly illustrated by cotton in major producing countries in Africa. The absence of a clear legal and regulatory framework to guide private sector/farmer behavior in the context of free market competition or weak enforcement created confusion and allowed some malpractices to persist (box 5.3). In Ghana the government initially adopted open competition. Early players supplied free inputs to farmers, to be repaid on the delivery and sale of produce. But stagnating output prices led to extensive side selling by farmers to other traders to evade payment for the inputs. So the government instituted zoning to stem the widespread payment evasion by farmers in the open market system, maintain a degree of market contestability, and retain the benefits of vertical coordination within the zone.<sup>37</sup> But weak standards, ill-defined zones, and uncontrolled entry by new players undermined the new structure. By contrast, Côte d’Ivoire and Zambia adopted similar zoning arrangements for cotton marketing under a more regulated environment and fared better.<sup>38</sup>

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#### **Box 5.3 Zambia and Burkina Faso—contrasting experiences in liberalizing domestic cotton markets**

**Zambia—production triples, after some fixes.** Zambia’s cotton sector continues to evolve after market liberalization, with significant impacts on productivity and quality. In 1995 the government sold the Lint Company of Zambia, the government parastatal, to two private companies, Clark Cotton and Lornho, later acquired by Dunavant. To ensure access by participating farmers to extension services and inputs (on loan), the two companies implemented outgrower schemes. The costs of the inputs were to be paid by farmers on sale of their seed cotton. But the rapid entry of other buyers created overcapacity in ginning and fierce buyer competition. The outgrower schemes began to fail due to rampant side-selling by farmers to other traders offering high prices without grading and non-repayment of input loans. As the rate of loan defaults increased, the cost of credit increased, which led to greater farmer loan defaults or exits from the outgrower program. Production in 2000 was less than half the level in 1998.

After 2000 many agents and buyers exited the industry leaving two dominant companies. Dunavant adopted the Distributor System to improve credit repayment rates among farmers. Distributors were responsible for identifying farmers, providing inputs and technical advice, and collecting produce on behalf of Dunavant. The distributor’s remuneration was directly tied to the amount of credit recovered, on an increasing scale. Dunavant established inspection points in all buying stations to enforce quality standards. National production tripled between 2000 and 2003, and credit repayment improved from about 65 percent to over 90 percent.

**Burkina Faso—losses of \$128 million.** The government tried to reduce inefficiencies by changing the structure of ownership of SOFITEX, the cotton parastatal, in 1999. It allowed producers, represented by the *Union Nationale des Producteurs de Coton Bukinabe*, to take up 30 percent ownership, empowering farmers to oversee the management of SOFITEX and ensure professional management. But the institutional changes at SOFITEX did not improve its financial position. Supporting and stabilizing domestic cotton prices as world prices declined produced financial losses of \$128 million from 2004/05 to 2006/07.

*Source:* Tschirley, Zulu, and Shaffer (2004), Food Security Research Project (2000), Bonjean, Combes, and Sturgess (2003), Christopher Gilbert (personal communication).

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<sup>37</sup> The main expected advantage of awarding concessions is allowing indirect competition through benchmarking. The “yardstick” competition procedure is used for regulatory purposes of extracting monetary rent from public utilities where the monopoly situation has a technological legitimacy Littlechild (1986), Bonjean, Combes, and Sturgess (2003).

<sup>38</sup> Bonjean, Combes, and Sturgess (2003), Tschirley, Zulu, and Shaffer (2004), Poulton (2007).

5.29 The competition from new buyers in some countries broke down quality enforcement. In Zimbabwe the number of cotton buying firms increased from two to five in 2000/01 and to 14 in 2005/06, creating overcapacity in ginning. To ensure supply and keep plant capacity use up, firms ignored quality standards in buying cotton. In 2003/04 most seed cotton in Zimbabwe was purchased at a flat rate without grading. Flat rate pricing could undermine the longer term competitiveness of Zimbabwe cotton, with indications of a declining quality premia in its cotton exports. Tanzania faces a similar weakening of quality enforcement.<sup>39</sup>

5.30 While market deregulation addressed some of the critical economic and institutional failures associated with the public monopolistic marketing structure, second-generation problems can come in its aftermath. In countries that liberalized their cotton markets, public regulatory mechanisms are still needed to counter the opportunistic behavior of farmers and buyers. Public intervention in grades and standards, and in contract enforcement is essential to make sure that private markets work. Liberalization also exposed the underdevelopment of rural financial systems, this is a problem which also needs to be addressed (Chapter 6).

5.31 What contributed to second-generation failures? The weaknesses and lack of credibility of public institutions to enforce appropriate rules of behavior for the private sector. The African experience also highlights the seeming tradeoffs between more concentrated and vertically coordinated marketing structures and more open marketing systems, which can promote greater competition but at the expense of uncompetitive behavior (side-selling, market poaching) and quality deterioration. These experiences also demonstrate the potential for associations and professional organizations (farmer groups Burkina Faso and Tanzania), to overcome the short-sightedness of individual farmers and buyers.<sup>40</sup>

### **Higher value urban markets: linking producers to modern supply chains**

5.32 Rising incomes, urbanization, greater female participation in the workforce, wider media penetration—all are driving the demand for higher value products, semi-processed and processed products, and convenience foods (figure 5.3). They are also increasing consumer attention to food quality and safety.<sup>41</sup> Diets are also globalizing, with local consumer preferences influenced by international tastes.<sup>42</sup> These trends open new markets for a wide range of high value agricultural products and propel the evolution of the structure of the marketing system in many developing countries, with the entry and rapid growth of supermarket chains and the food processing and food service industries, all aiming to satisfy the changing consumer needs.

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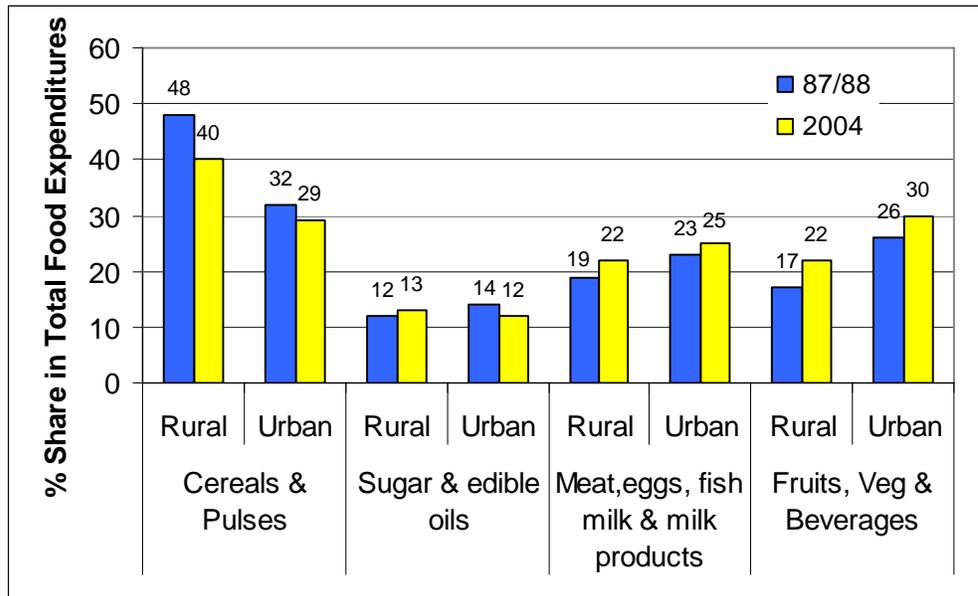
<sup>39</sup> Poulton (2007).

<sup>40</sup> Bonjean, Combes, and Sturgess (2003).

<sup>41</sup> Reardon and Berdegue (2006), Henson (2006)

<sup>42</sup> Pingali and Khwaja (2004)

**Figure 5.3 Food consumption in India is shifting from cereals to higher value foods**



Source: National Sample Survey Organization, India (1996 and 2006).

5.33 For many developing countries the supermarket revolution began in the early to mid-1990s. By the early 2000 food retail sales in supermarkets exceeded 50 percent of total retail sales in many countries in East Asia and Latin America and in major urban centers in others (figure 5.4). Accelerating the expansion: significant foreign direct investment by multinational supermarket chains in developing countries, either directly or through joint ventures with local firms.

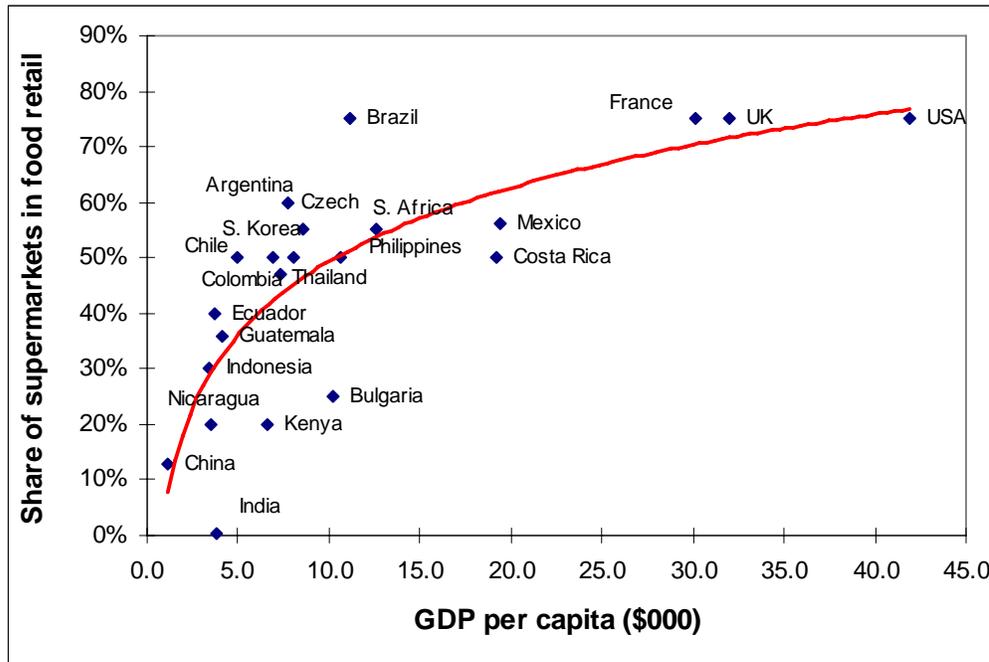
5.34 Supermarket growth in most countries followed similar diffusion patterns across space, consumer segments, and product categories.<sup>43</sup> From a base in large cities, supermarkets initially spread to intermediate cities and towns, and later to small towns in rural areas—in response to market competition and saturation. They often first target the upper income consumer (national and expatriate), followed by the middle class and later the urban lower income households.

5.35 Dominating the supermarket’s product selection in the early stages are processed foods (canned, dry and packaged food items), motivated by economies of scale in procurement and direct relations with processed food manufacturers. Product selection gradually expands to semi-processed foods (dairy, meat and fruit products). Generally, the last category to be added is fresh fruits and vegetables, as consumer preference for fresh produce and the proximity and convenience of small produce shops and wet markets offer a competitive alternative. International experience indicates that fresh fruits and vegetables generally account for the lowest share in supermarket sales.<sup>44</sup> So small shops and wet markets will likely remain important marketing channels for these products for years to come.

<sup>43</sup> Reardon and Berdegue (2006).

<sup>44</sup> ANTAD (2005), Reardon, Pingali, and Stamoulis (2006), Goldman and Vanhonacker (2006).

**Figure 5.4 Rising per capita incomes are important drivers of supermarket growth**



Source: Reardon and Berdegue (2006) and World Bank World Development Indicators.

5.36 Changing consumer demand is also driving the growth of the food processing and food service industries. Processed foods accounted for about 80 percent of global food sales, estimated at \$3.2 trillion in 2002.<sup>45</sup> Food service sales are also growing rapidly, totaling \$1.8 trillion in 2002.<sup>46</sup> “Eating out” is becoming popular in many developing countries. For example, spending on food services now accounts for 22 percent of food budgets in Brazil and 15 percent of urban food spending in China.

**Modern procurement systems**

5.37 Competition in highly contested markets is driving supermarkets, food processors, and food service providers to adopt supply chain strategies to reduce costs and to enhance quality. The chains have profoundly changed the structure for production and wholesale marketing in developing countries. A key element is modernizing procurement arrangements to boost efficiency, capture economies of scale, reduce coordination costs, and increase food safety. Recent studies show that procurement systems change earliest

<sup>45</sup> Although the per capita spending on processed foods in developing countries is still low in lower middle income countries (\$143 per capita per year) and in low income countries (\$63 per capita per year), it is growing fastest in these countries—28 percent a year in lower middle income countries and 13 percent a year in low income countries. (Regmi and Gehlar (2005)).

<sup>46</sup> These include fast food and full service restaurants, food stalls, schools, hospitals, etc. Minot and Roy (2006).

in processed foods, meat, and dairy products and eventually are partially applied to fresh fruits and vegetables.<sup>47</sup>

5.38 Modern procurement takes many forms, varying by supermarket chain, product, and country.<sup>48</sup> It can involve centralized procurement, shifting from fragmented per-store purchases to operating a distribution center catering to a district (China), the whole country (Mexico), or whole region (Central America).<sup>49</sup> It can also involve shifting from relying on traditional spot wholesale markets for sourcing produce to outsourcing to specialized wholesalers and logistics firms—to cut transaction, coordination, and search costs and enforce private standards and contracts with suppliers (Central America and East Asia).<sup>50</sup>

5.39 Modern procurement can involve contracting with processors and farmers or using preferred supplier lists. Supermarket chains and their specialized wholesalers move from spot markets to preferred supplier lists to hold down transaction costs and meet the need for greater control over quality and consistency. This is often done where farmers or processors are grouped or are individually large (Philippines, Russia, Thailand).<sup>51</sup> The contracts are incentives for suppliers to stay with the buyer and invest in assets specific to the retailer's specifications for products. The arrangements may include direct or indirect assistance for farmers to invest in human capital, management, input quality, and basic equipment.

5.40 Modern procurement can also involve private standards and their enforcement—standards that serve two main functions.<sup>52</sup> They help coordinate supply chains by standardizing product requirements for suppliers over many regions or countries, enhancing efficiency and lowering transaction costs. They help ensure that public food safety standards are met in all markets served by the retail chain or food processing firm, distinguishing one's products from competitors through signaling.<sup>53</sup>

### ***Impact on small farmers and retailers***

5.41 The modernization of procurement systems affects farmers differently across countries and products. While the analysis of its impact is limited, the available evidence provides a mixed picture. Some recent studies of selected commodities find that the

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<sup>47</sup> See Reardon and Berdegúe (2002) for Latin America; Berdegúe and others (2005) for Central America, Dries, Reardon, and Swinnen (2004) for Central and Eastern Europe, Schwentesius and Gómez (2002) for Mexico, Reardon and Farina (2002) for Brazil, and Weatherspoon and Reardon (2003).

<sup>48</sup> Reardon and Berdegúe (2006).

<sup>49</sup> China Resources Enterprise estimates that it is saving 40 percent in distribution costs by combining modern logistics with centralized distribution in its two large new distribution centers in southern China. Similar figures have been obtained in Costa Rica and Brazil (Reardon and Berdegúe (2006)).

<sup>50</sup> Boselie, Henson, and Weatherspoon (2003), Digal and Concepcion (2004), Natawidjaja and others (2006), Berdegúe and others (2005).

<sup>51</sup> Boselie, Henson, and Weatherspoon (2003), Manalili (2005), Dries and Reardon (2005).

<sup>52</sup> Reardon and others (2001), Reardon and Berdegúe (2006).

<sup>53</sup> Modern retailers in Vietnam signaled to consumers their supply chain food safety assurance procedures during and after the avian flu crisis, which won many consumers away from wet markets and into supermarkets in Ho Chi Minh Ci (Phan and Reardon (2006)).

modern procurement systems exclude asset-poor farmers. Supermarket buying agents prefer first to source from large and medium-sized farmers if they can, as for bananas in Central America, tomatoes in Mexico, and potatoes in Indonesia. Where large and medium-size farmers have sufficient quantities, small growers were not included.<sup>54</sup> In other developing countries, supermarkets source their produce from small farmers because the existing farm structure obliges them to do so. For these small farmers, land is often not the most important determinant of participation, rather it is the individual capital/labor ratios and access to infrastructure that are more important drivers of participation.<sup>55</sup>

5.42 Participating farmers tend to be more asset-rich. In Guatemala, relative to non-participating farmers, participating lettuce farmers have twice the farm size (2 hectares vs 1) and 40 percent more education—and are nearly twice as likely to have irrigation, four times as likely to have a truck, and twice as likely to be close to paved roads and be in a small farmers organization. Participating farmers use much more labor-intensive practices due to requirements for field practices, sorting, and packing. Because they are more likely to double-crop over the year, they hire 2.5 times more labor (typically from local asset-poor households). Thus while small farmers may not participate directly, they benefit through farm employment. Studies of tomato growers in Indonesia and kale growers in Kenya find similar results. Participation can increase farmer income by 10 to 100 percent (Guatemala, Indonesia, Kenya)<sup>56</sup>

5.43 When supplies from large or medium scale farmers is inadequate or not available, supermarkets contract with small farmers<sup>57</sup> They use a variety of procurement methods in sourcing from small farmers (box 5.4). They may enter into direct contracts with farmers or farmer groups or contract with wholesalers, which then purchase from or subcontract with small farmers and producer organizations. Or they may ask farmers (large and small) to deliver their produce to collection centers, where it is graded, washed, packaged, labeled, and priced. Recent studies of contract farmers show that they have significantly higher incomes than other farmers.<sup>58</sup>

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**Box 5.4 Linking small farmers to high-value chains****China: Farmer marketing through a cooperative**

Supported by local government, a group of small-scale growers registered the brand “Yulin” for their watermelons. Their production is standardized through coordinated planting, quality inspection and packaging. They formed the Ruoheng watermelon cooperative to ensure their proprietary techniques and expand their marketing network. The cooperative sells directly to wholesalers (40 percent), supermarkets (25 percent) and retailers (35 percent). These buyers source supply from the cooperative because it can deliver large volumes on a regular and timely basis and ensures food safety and quality standards. As the

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<sup>54</sup> These studies looked at tomatoes in Guatemala (Hernández, Reardon, and Berdegué (Forthcoming)), Indonesia (Natawidjaja and others (2006)) and Nicaragua (Balsevich, Berdegué, and Reardon (2006)), kale in Kenya (Neven, Odera, and Reardon (2006)), lettuce in Guatemala (Flores, Reardon, and Hernandez (2006)), guavas in Mexico (Berdegué and others (2006)), and produce in China (Wang and others (2006)).

<sup>55</sup> Reardon and Timmer (2006).

<sup>56</sup> Flores, Reardon, and Hernandez (2006).

<sup>57</sup> Berdegué and others (2003), Dries, Reardon, and Swinnen (2004)

<sup>58</sup> See for example for peanuts in Senegal (Warning and Key (2002)), poultry in India (Ramaswami, Birthal, and Joshi (2006)), and maize in Indonesia (Simmons, Winters, and Patrick (2005)).

“Yulin” watermelon developed a high quality brand image, it received a higher price than other watermelons (3.0 yuan/kg versus 1.2 yuan/kg), significantly increasing the income of the cooperative’s farmer members. With its marketing success, the cooperative’s membership increased from 29 to 152, its farmed area increased from 0.2 hectare in 1992 to thousands of hectares in 2005, with total capitalization reaching RMB 21 million in 2005.

**Philippines: A farmer leader and small farmers clusters**

NorminVeggies is a multi-stakeholder association supplying vegetables to the fast-food industry, supermarkets and vegetable processors in the Philippines. In December 2003 NorminVeggies started Normincorp, a marketing company/facilitator that links the farmer directly to the buyer, in exchange for a 6 percent facilitation fee. The farmer is liable for the product and retains ownership over it all along the chain. Normincorp forms production clusters: a group of 10 small farmers allied with a commercial lead farmer who helps to jumpstart quality production. The clusters commit to undertake a common production/marketing plan for a particular product for an identified market. The lead farmer coordinates the production processes of the cluster farmers and is responsible for training them in to ensure the quality specified by the market. Normincorp has become preferred supplier for several clients due to its ability to respond to changes in market requirements. Normincorp doubled its sales from 30 to 40 tons/month of assorted vegetables to 80 tons in July 2006.

*Sources:* Berdegué and others (2003), Zuhui, Qiao, and Yu (2006), Concepcion (2006).

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5.44 Recent experience with modern procurement in developing countries suggest some basic trends. Land size or land tenure is often not the most important determinant of smallholder participation in these systems. Assets other than land appear to play a much bigger role, particularly education, access to irrigation, transport, and roads, and such other physical assets as wells, cold chains, greenhouses, good quality irrigation water (because of contaminants), vehicles, and packing sheds. A very good farmer organization—another major asset—can help small farmers sell directly to the supermarket. Producer organizations can also reduce the cost of transacting with small farmers (chapter 6). Most farmers lacking these assets are excluded.<sup>59</sup> Because participating farmers tend to reap substantial benefits, the payoff to assisting farmers to make these "threshold investments" can be substantial.

5.45 Some studies find that smaller processing firms are left out of the supply chain, with medium-sized and large processors preferred for long-term contracts.<sup>60</sup> The number of small retail stores often declined with rising market share for supermarkets—with implications for employment.<sup>61</sup> And competition is driving small retail stores and processors to grow and upgrade their services to stay competitive (India).<sup>62</sup>

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<sup>59</sup> Reardon and Timmer (2006), Reardon and Berdegué (2002).

<sup>60</sup> Hu and others (2004), Dries and Reardon (2005), Balsevich, Berdegué, and Reardon (2006).

<sup>61</sup> In urban Chile between 1991 and 1995, there 15,777 small shops closed, mainly in Santiago (Faiguenbaum, Berdegué, and Reardon (2002)). In urban Argentina, Gutman and others (1997) notes that from 1984 to 1993, in the most intense period of supermarket takeoff, the number of small food shops declined from 209,000 to 145,000. Rodriguez and others (2002) note that while general-line small shops folded quickly, those in a specialized niches, in particular bakeries, fresh fish, meat, and fruit and vegetable shops, were better able to compete.

<sup>62</sup> Mukherjee and Patel (2005).

**Helping small-scale farmers keep up with the requirements**

5.46 The government and the private sector can help farmers expand and upgrade their range of assets to meet the new requirements of supermarkets and other coordinated supply chains (table 5.1). The options include public investments increasing farmers’ productivity and connectivity to markets, policy changes to facilitate trade and market development, and public-private efforts to promote collective action and build the technical capacity of farmers to meet the new standards.

**Table 5.1 Public and private options for strengthening farmer linkages to the market**

Issue	Public sector		Private sector
	Public investments	Policy environment	
Lack of access to markets	<ul style="list-style-type: none"> <li>Investment in education, rural infrastructure (roads, markets, electricity, irrigation); support formation of farmer organizations</li> </ul>	<ul style="list-style-type: none"> <li>Liberalize domestic trade; foster development of input and credit markets</li> </ul>	Assist farmers in forming farmer organizations
Weak technical capacity	<ul style="list-style-type: none"> <li>Support market oriented extension</li> </ul>	<ul style="list-style-type: none"> <li>Foster environment for private extension participation</li> </ul>	<ul style="list-style-type: none"> <li>Provide extension and key inputs to farmers</li> </ul>
Meeting quality standards	<ul style="list-style-type: none"> <li>Support farmer training on good agricultural practices for quality enhancement and food safety</li> </ul>	<ul style="list-style-type: none"> <li>Establish grades and standards</li> </ul>	<ul style="list-style-type: none"> <li>Supply inputs and train farmers on quality management and food safety</li> </ul>
Meeting contract conditions	<ul style="list-style-type: none"> <li>Train firms in contract design and management; train farmers on their rights and obligations</li> </ul>	<ul style="list-style-type: none"> <li>Foster institutions for dispute resolution; strengthen producer organizations</li> </ul>	<ul style="list-style-type: none"> <li>Foster trust; develop contracts that are self-enforcing</li> </ul>
Farmer exposure risk	<ul style="list-style-type: none"> <li>Foster development of commodity and futures exchanges; train firms on use of market instruments to hedge risk.</li> </ul>	<ul style="list-style-type: none"> <li>Create enabling environment for insurance market</li> </ul>	<ul style="list-style-type: none"> <li>Use contracts which share risk equally among parties, assist farmers to access insurance</li> </ul>

Source: Adapted from World Bank (2007).

5.47 Some supermarkets or their agents help farmers overcome their asset constraints by providing technical assistance, in some instances through public-private partnerships.<sup>63</sup> Examples of such partnerships include joint extension by supermarket field staff and government extension officers, technical assistance to improve product quality and safety and accredit and assess the supply potential of small producers.<sup>64</sup>

5.48 Other supermarkets enter into production contracts, which sometimes include the supply of inputs, credit, and extension services. For many small farmers these contracts are the only means to acquire inputs and use support services.<sup>65</sup> Contracting firms, in supplying inputs and providing an assured market and price share the production and

<sup>63</sup> Some examples are Xincheng and SanLu in China (Hu and others (2004)), Homegrown in Kenya (Boselie, Henson, and Weatherspoon (2003)), Konzum in Croatia (Dries, Reardon, and Swinnen (2004)), and Hortifruti in Central America (Berdegué and others (2003)).

<sup>64</sup> Boselie, Henson, and Weatherspoon (2003)

<sup>65</sup> Reardon and Swinnen (2004), Berdegué and others (2005), Boselie, Henson, and Weatherspoon (2003)

marketing risks with farmers. Reducing these risks helps stabilize farmers' incomes, critical in the absence of insurance markets. The technical assistance to farmers also generates indirect benefits, as farmers apply the improved farm practices for the contract crops to other crops, increasing their productivity.<sup>66</sup>

### **Higher value exports—meeting the product standards in the market**

5.49 Agricultural exports diversified significantly in the last two decades, particularly into high value fresh and processed products, fueled by changing consumer tastes and advances in production, transport, and other supply-chain technologies (chapter 2). Comparatively low and declining tariff barriers and price pressures from year-round supplies also increased the competitiveness of developing country exports.<sup>67</sup> Fresh and processed fruits and vegetables, fish and fish products, meat, nuts, spices, and floriculture now account for more than 50 percent of agro-food exports from developing countries, about \$106 billion dollars in 2003/04.

#### ***Meeting standards***

5.50 For agro-food products, sanitary and phytosanitary standards govern international trade to manage the food safety and agricultural health risks associated with pests (fruit flies), food-borne and zoonotic diseases (mad cow disease and foot and mouth), and microbial pathogens and other contaminants (mycotoxins, pesticides).<sup>68</sup> But the rapid growth in such exports highlights how greatly the standards for food safety and animal and plant health diverge across countries—and the different capacities of public authorities and commercial supply chains to manage them.

5.51 In reaction to the periodic “food scares” in industrial countries, coupled with improved scientific knowledge and increased public concern about these various risks, many countries tightened their sanitary and phytosanitary standards or extended their coverage to new areas. Public standards were also introduced to ensure fair competition, reduce information costs to consumers (organic foods), and promote competition based on quality.<sup>69</sup> In parallel, the private sector developed standards and supplier protocols to ensure compliance with official regulations, fill perceived gaps in such regulations, differentiate their brands in a competitive market place, and otherwise better manage their commercial and reputational risks.<sup>70</sup> The standards tend to blend food safety and quality management concerns—or to have protocols that combine food safety, environmental, and social parameters (child labor, labor conditions, and animal welfare).<sup>71</sup>

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<sup>66</sup> Swinnen and Maertens (2005), Minten, Randrianarison, and Swinnen (2006).

<sup>67</sup> World Bank (2005b).

<sup>68</sup> Unnevehr and International Food Policy Research Institute (2003), World Bank (2005b).

<sup>69</sup> Buzby, Frenzen, and Rasco (2001), Henson (2006).

<sup>70</sup> Unnevehr (2003).

<sup>71</sup> One example is the trans-national Euro-retailer Produce Working Group for Good Agricultural Practices (EUREP-GAP) fresh produce protocol, with requirements covering soil and site management, fertilization, pest management and irrigation practices, and waste and pollution management. Currently 30 major food retailers in 12 European countries participate in EUREP (Henson (2006)).

5.52 A major concern for developing countries is the proliferation and stringency of food safety and health measures. Many fear that the emerging standards will be discriminatory and protectionist—and that they will result in market exclusion because of the lack of in-country administrative and technical capacities to comply with these requirements or that the costs of compliance will erode their competitive advantage. The standards would further marginalize weaker economic players, including smaller countries, enterprises, and farmers. Both anecdotal cases and broader research lend evidence to support this “standards as barriers” perspective.<sup>72</sup>

5.53 An alternative view highlights the potential opportunities in the evolving standards environment and the scope for capitalizing on them.<sup>73</sup> The emerging public and private standards can be a “common language” across international markets, potentially reducing transaction costs. Standards can also provide incentives for modernizing developing country supply chains and clarify the necessary and appropriate risk management functions of government. The greater attention to “good practices” in agriculture and food processing may not only improve export competitiveness but also generate spillover benefits to domestic consumers. So, rather than undercutting the comparative advantage of developing countries, the enhanced capacity to meet stricter standards could create new forms of competitive advantage. Although there will inevitably be winners and losers, this view suggests that standards compliance can provide the basis for more sustainable and profitable agro-food exports in the long term.

5.54 There is general agreement that sanitary and phytosanitary standards affect agro-food trade, but there is no consensus on the relative importance of individual measures in relation to other trade-distorting measures, or on the aggregate net effects of those measures. The lack of consensus is not surprising, because estimating the impact of such standards presents enormous empirical difficulties.<sup>74</sup> Several studies based on econometric models have estimated very large potential losses in trade.<sup>75</sup> In contrast, most industry case studies identify an array of competitive factors affecting trade (standards are only one) and typically point to both “winners” and “losers,” not to absolute declines in trade. When the Guatemalan raspberry industry faced official and private market access problems following an outbreak of food-borne illness in the United States many leading operators shifted their production base across the border into Mexico. While the Guatemalan industry has never recovered, exports from Mexico and Chile have served an expanding market.<sup>76</sup>

### ***Meeting the costs of compliance***

5.55 There is worry that sanitary and phytosanitary standards and the cost of compliance will disadvantage developing countries.<sup>77</sup> Empirical studies examining “compliance costs” in the high-value food trade of developing countries highlight the

<sup>72</sup> Henson and Caswell (1999), Jha (2002), OECD (2003a), Wilson and Abiola (2003).

<sup>73</sup> Jaffee and Henson (2004), World Bank (2005b).

<sup>74</sup> See OECD (2003b), OECD (2003a) and Jaffee (2006).

<sup>75</sup> Otsuki, Wilson, and Sewadeh (2001) is widely referenced.

<sup>76</sup> Calvin, Flores, and Foster (2003).

<sup>77</sup> Brenton and Machin (2002), Unnevehr (2000), Augier, Gaziorek, and Lai Tong (2005).

difficulties of making broad generalizations, especially when the costs are influenced by the starting position of the industry or firm, the firm size, the available technical and advisory services, and the approach to achieve compliance.<sup>78</sup> Recent studies find that compliance costs tend to be small relative to the scale of most export industries. Fixed, non-recurrent costs are generally 0.5 to 5.0 percent of multi-year exports, while recurrent costs tend to be 1 to 3 percent of annual exports. The focus on compliance costs can distract countries from the benefits, many of them long term and intangible. Productivity gains, reduced wastage, worker safety, environmental benefits, and the value of continuing market access can be underestimated or not counted. They can also generate spillover benefits to domestic consumers from greater awareness of food safety risks and access to safer products.<sup>79</sup>

5.56 Empirical work on the impact of more stringent standards on smallholder participation in higher-value supply chains show a mixed picture. In theory, there are economies of scale in product traceability, certification, and testing. These factors tend to provide a competitive advantage to larger production units. Yet there are examples from many countries where, due to limits on land acquisition or other features of the agrarian structure, smallholders remain the dominant suppliers for firms. So institutional arrangements have been developed to manage the attendant risks and transaction costs of sourcing raw materials with exacting standards from smallholders.<sup>80</sup>

5.57 It is also important to recognize the large increase in off-farm work opportunities with expanded agri-food exports. In Senegal despite tight export standards that led to the shift from smallholder contract farming to large scale integrated estate production, the higher horticulture exports increased incomes and reduced regional poverty by about 12 percentage points and extreme poverty by half.<sup>81</sup> Poor households benefited through labor markets rather than product markets (box 5.5).

### *Looking at the benefits and choices*

5.58 Developing country suppliers rarely face all-or-nothing choices when determining the changes and investments to conform to emerging standards. They have a range of choices. One is compliance—adopting measures to meet the standards. Another is voice—seeking to influence the rules of the game. A third is redirection—seeking other markets and countries or changing the mix of products.<sup>82</sup> Suppliers need to weigh the costs and advantages for different products and market segments. In some cases, there may be larger and more profitable opportunities to serve the domestic market, regional

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<sup>78</sup> ‘Compliance costs’ are the additional costs necessarily incurred by government and private players in meeting the requirements to comply with a given standard in a given external market and may include upgrades to official surveillance or inspectorate systems, investments in laboratory testing capacities, changes in production or manufacturing processes or technologies, upgrades of farm/factory infrastructure and certification and testing costs.

<sup>79</sup> World Bank (2005a), Umali-Deininger and Sur (2006).

<sup>80</sup> See Jaffee (2005) for Indian spices, Minten, Randrianarison, and Swinnen (2006) for Madagascar vegetables, Manarungsan, Naewbanij, and Rerngjakrabhet (2005) for Thai vegetables, and Dries, Reardon, and Swinnen (2004) for various examples in Eastern Europe.

<sup>81</sup> Maertens and Swinnen (2006).

<sup>82</sup> World Bank (2005c).

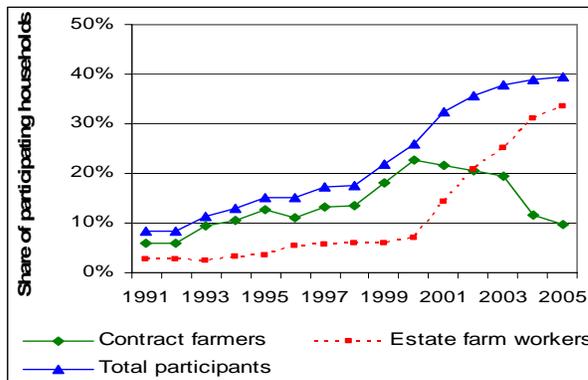
market, or industrial country segments that impose less stringent standards or allow more time to implement them.

**Box 5.5 French bean exports boosted employment and reduced poverty in rural Senegal**

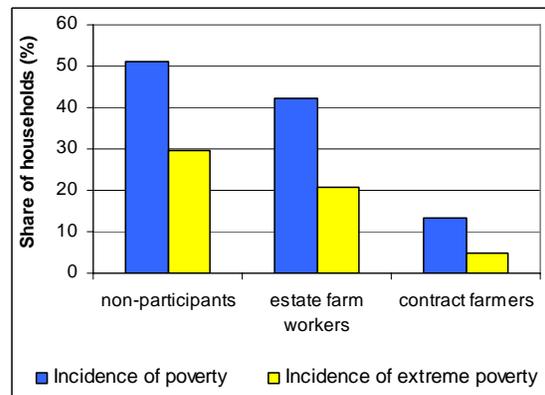
Fresh fruit and vegetable exports from Senegal to the European Union increased significantly in the last 15 years, despite the tightening of sanitary and phytosanitary standards. Senegal’s main export is French beans, which account for 42 percent of fresh fruits and vegetables exports, more than doubling from 3,000 metric tons in 1991 to 7,000 metric tons in 2005. Changing EU sanitary and phytosanitary standards put pressure on exporters to invest more to meet these standards and to increase vertical coordination with downstream buyers (to ensure markets) and upstream suppliers (to guarantee food safety and quality and timing of production). Increased vertical coordination led to the shift from contract farming with smallholder farmers to large scale estate production in agro-industrial farms.

The incidence of contract farming declined (from 23 to 10 percent of households), but employment in estate farms increased (from 10 to 34 percent of households). While contract farming tended to be biased toward larger farmers, poorer households participated as farm workers. Participation in fresh fruits and vegetables export production, whether as a worker or contract farmer, raised household incomes. Estate farm workers had incomes 1.2 to 2.3 million CFA francs higher than non-participating households, while contract farmers had incomes between 2.4 and 4.1 million CFA francs higher.

*Household participation in French bean export production in Senegal*



*Incidence of poverty and extreme poverty among participating households*



Source: Maertens and Swinnen (2006).

5.59 Addressing the export challenges of sanitary and phytosanitary standards requires joint public and private efforts in policy (food safety legislation), in research (risk assessment, good practices), and in management (disease surveillance) (table 5.2). The private sector should take the lead in awareness-building, training, and complying with food safety and agricultural health requirements, either individually or collectively through trade associations. There is growing evidence that countries staying abreast of technical and commercial requirements and anticipating future changes have repositioned themselves in more remunerative market segments.<sup>83</sup>

<sup>83</sup> Jaffee and Henson (2004), World Bank (2005b), Maertens and Swinnen (2006).

**Table 5.2 Public and private sector roles to enhance trade-related sanitary and phytosanitary and quality management capacity**

Public sector	Private sector
<p><b>Policy and regulatory environment</b></p> <ul style="list-style-type: none"> <li>• Pursue international dialogue; adopt domestic food safety legislation and standards consistent with local conditions and preferences, WTO and other trade obligations.</li> </ul> <p><b>Risk assessment and management</b></p> <ul style="list-style-type: none"> <li>• Strengthen national or sub-national systems for pest, animal disease and market surveillance; support research on food safety and agricultural health concerns</li> </ul> <p><b>Awareness building and promoting good practices</b></p> <ul style="list-style-type: none"> <li>• Support consumer awareness campaigns on food safety; promote good agricultural, hygiene, and manufacturing practices, integrate into extension programs; invest in appropriate laboratory infrastructure; accredit private laboratories</li> </ul> <p><b>Infrastructure investments</b></p> <ul style="list-style-type: none"> <li>• Improve water supply and sanitation and marketing facilities</li> </ul>	<p><b>Good management practices</b></p> <ul style="list-style-type: none"> <li>• Implement appropriate management practices (HACCP, ‘good’ agricultural practices); obtain formal certification where viable</li> </ul> <p><b>Traceability</b></p> <ul style="list-style-type: none"> <li>• Develop systems and procedures to enable the traceability of raw materials and intermediate and final products</li> </ul> <p><b>Develop training, advisory, and conformity assessment services</b></p> <ul style="list-style-type: none"> <li>• Strengthen human capital, physical infrastructure and management systems to supply support services to agriculture, industry, and government related to quality and food safety management</li> </ul> <p><b>Collective action and self-regulation</b></p> <ul style="list-style-type: none"> <li>• Self-regulation through adoption and oversight of industry ‘codes of practice’; alert government to emerging issues, advocate for effective government services.</li> </ul>

*Source:* Adapted from World Bank (2007).

### ***Decommodification in specialty markets***

5.60 New specialty markets have developed with the decommodification of agricultural products. These open alternative markets for traditional and higher value products from developing countries. Geographic indications (Blue Mountain coffee from Jamaica), which capitalizes on local know-how and special agro-ecological conditions to establish brand identity, are one example. Organic, fair trade, and rainforest-alliance-certified products are other examples. Organic products are grown without the use of conventional pesticides, artificial fertilizers or sewage sludge—and processed without ionizing radiation or food additives.<sup>84</sup> Fair trade seeks greater equity in international trade and aims to contribute to sustainable development by offering better trading conditions and securing the rights of marginal producers and workers.<sup>85</sup> Rainforest-alliance-certified products meet stringent environmental and social standards for production.<sup>86</sup>

5.61 Retail sales, mainly to meet the growing demand in OECD countries, and area planted under these products have expanded significantly. The area planted to organic

<sup>84</sup> For animals it means they were reared without the routine use of antibiotics and without the use of growth hormones. And at all levels organic food is produced without the use of genetically modified organisms.

<sup>85</sup> Farnsworth and Goodman (2007).

<sup>86</sup> David Dudenhofer, personal communication.

crops reached 31 million hectares in 2005, with retail sales reaching \$23.9 billion in the EU, Canada, United States and Asia in 2006.<sup>87</sup> The biggest producers of organic products are China and middle-income Latin American countries. Sub-Saharan countries account for a large proportion of organic cotton production, while Asia and Latin America dominate production of organic coffee and cocoa. Retail sales of certified fair trade products in OECD countries reached \$1.4 billion in 2005. The most traded products of fair trade: bananas and coffee.<sup>88</sup>

### *Two sides to fair trade*

5.62 Most case studies highlight the positive impact of fair trade on producer prices, incomes, and well-being. Some benefits of fair trade include building capacity (support services, improved market information and awareness), empowering local actors, the mitigation of gender imbalances, and providing clear environmental benefits.<sup>89</sup> There are concerns, however, about the sustainability of fair trade. Producers in some countries face problems of rationing, as fair trade prices are set above market clearing levels and potential supply is exceeding demand. There are also concerns about long-term effects on investment and productivity, and the efficiency of fair trade channels. But few evaluations of this have been carried out.

5.63 Recent studies show that the costs and margins for coffee sold through fair trade are high, and that intermediaries, not farmers, receive the larger share of the price premium. One estimate is that growers receive only 43 percent of the price premium paid by the consumer for fair-trade-roasted coffee, and 42 percent for soluble coffee.<sup>90</sup> The higher cost is partly explained by the diseconomies of scale related to the small volumes and high associated costs: certification of supply chain actors, membership fees, advertising and campaigning.<sup>91</sup>

5.64 Fair trade is also raising concerns.<sup>92</sup> As it expands, the prices in the conventional markets could fall, with serious consequences on non-certified producers. If fair trade is mainstreamed, how can fair trade products be differentiated from other similarly produced products? There will be a need for agreement on a common standard and improved coordination among the organizations promoting these standards. If fair trade remains a niche market, the high prices but limited markets will necessitate some form of quantitative rationing at the global level, raising equity considerations.

### *Market saturation—more production at lower prices?*

5.65 There is also concern about export market saturation, as developing countries jump into the same export “bandwagon,” often referred to as the “adding up” or “fallacy

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<sup>87</sup> IFOAM (2006), Dimitri and Oberholtzer (2006).

<sup>88</sup> Henson (2006), Farnsworth and Goodman (2007).

<sup>89</sup> Utting-Chamorro (2005), Becchetti and Costantino (2006), Murray, Reynolds, and Taylor (2006).

<sup>90</sup> Zehner (2002), Mendoza and Bastiaensen (2003).

<sup>91</sup> Lernoud and Fonseca (2004).

<sup>92</sup> Daviron and Vagneron (2007).

of composition” problem.<sup>93</sup> It highlights how export market demand for one small exporting country acting in isolation may not be viable for a group of exporting countries acting together.

5.66 If all countries, and especially large countries, try to substantially increase their exports of a product, there is a risk that they will encounter rising protection from industrial countries—or that the terms of trade will decline so much that the benefits of any increased export volume are more than offset by losses from lower export prices. While there is some evidence that developing countries face protectionist tendencies from industrial (and also some developing) countries when exports pass a threshold, the rules defined by the WTO reduce this risk. The risk of protection is lowest for tropical products with limited developed country domestic competition and highest for in-season temperate products.<sup>94</sup>

5.67 An expansion of developing country nontraditional exports could also reduce prices, perhaps so much that export revenues decline. Generally, the adding-up problem is greater when the exporter’s market share is small, the world market price elasticity of demand is small, and the elasticity of supply of the rest of the world is high. The potential for this is greatest in unprocessed commodity markets.<sup>95</sup> The potential competition posed by efficient large producers—such as Brazil and China—can be large.<sup>96</sup> FAO estimates that an increase in China’s exports of green beans is likely to reduce world market prices with adverse effects on the export revenues of other developing countries.<sup>97</sup> So under certain circumstances there is the possibility for the expansion of agricultural exports by some market participants to curtail market potential.

5.68 A close eye thus needs to be kept on export products dominated by one or two countries—or where smaller countries simultaneously expand their export market shares. This is particularly so for fresh or semiprocessed products for which the own-price elasticity is likely to be lower and the fixed costs of production are greatest.<sup>98</sup> This emphasizes the need for export promotion agencies in developing countries to build stronger capacities in market intelligence.

## **Conclusion**

5.69 Linking farmers and rural households to markets increases employment and incomes in rural areas, and boosts agricultural and non-farm growth. But this requires well functioning markets, which can transmit price incentives, ensure competitiveness, and regulate the quality and safety of food products.

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<sup>93</sup> Akiyama and Larson (1994), Schiff (1995), Mayer (2003).

<sup>94</sup> Cline (1984), Henson (2006).

<sup>95</sup> Akiyama and Larson (1994), Food and Agriculture Organization (2004).

<sup>96</sup> China’s high value agricultural exports nearly doubled from \$4.2 billion in 1994 to \$8 billion in 2004, while its processed food exports more than tripled from \$2.6 billion to \$8 billion.

<sup>97</sup> Food and Agriculture Organization (2004).

<sup>98</sup> Henson (2006).

5.70 Improving food staple markets in agriculture and transforming economies can be a win-win strategy for promoting faster growth while benefiting the poor. In many countries, particularly in Africa, expanding access to rural infrastructure will be critical. Innovations reducing transactions costs and risks also show promise. They include commodity exchanges, information technologies, and market-based risk management tools.

5.71 Many governments intervene in food staple markets because of food security concerns. Price risk interventions for food need to be integrated into a holistic strategy for broad-based growth, poverty reduction and food security. They should emphasize measures to raise overall productivity of food staples and reduce domestic shocks. Many developing countries still keep public food reserves to reduce price instability, often with mixed success. Safeguards are needed to ensure that the operations of the public food reserve agencies do not destabilize the market—among them, arm’s length “central bank” type autonomy, highly professional management, strict rule-based market operations, and where possible tendering operations to the private sector.

5.72 The long-term downward trend in world market prices for bulk export commodities (except cotton) threatens the livelihoods of producers in these countries. Mechanisms to maintain or enhance quality will be critical to remaining competitive and increasing export revenues.

5.73 High value product markets are often the fastest growing in many developing countries. Ensuring that smallholders ride this new wave of prosperity, whose participation is neither automatic nor universal, will be a challenge for policymakers. Asset-rich farmers are best able to participate in these new supply chains. Enhancing smallholder participation requires strengthening market infrastructure, upgrading farmer technical capacity, fostering development of risk management instruments, and collective action through producer organizations.

5.74 Significant investments are needed to build country capacity to meet sanitary and phytosanitary standards. While the public sector can provide support, the private sector has to take the lead in meeting these standards.

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**Focus E The growth of global agribusiness**

*(Forthcoming)*

## **Chapter 6 Supporting smallholder competitiveness through institutional innovations**

6.1 Structural adjustment in the 1980s dismantled the elaborate system of parastatal agencies providing farmers with access to land, credit, insurance, inputs, and cooperative organizations. This descaling of the state in agriculture was motivated by the high cost, low quality, and regressive bias in these services. The expectation was that removing the state would free the market for private actors to take over these functions. Too often, that didn't happen. In some places the state's withdrawal was tentative at best. Elsewhere, the private sector emerged only slowly and partially mainly serving commercial farmers but leaving many smallholders exposed to extensive market failures, high transaction costs, and service gaps.

6.2 The last 10 years have, however, seen a broad effervescence in institutional innovations to fill the deficits in land markets, financial services, input markets, and producer organizations. The reconstruction is still incomplete, especially for smallholders and more marginal areas, dependent in many cases on direct state intervention to put into place the preconditions for private actors to enter. Incomplete markets and institutional gaps impose huge costs in forgone growth and welfare losses on smallholders, threatening their competitiveness and in many cases their survival. New forms of producer organizations are an important part of the institutional reconstruction, using collective action to complement the state and private sector responses, and increasing the voice of smallholders in the policy process.

6.3 Institutional innovations to construct a market-driven agriculture, combined with technological innovations and new actors in integrated supply chains, have often revolutionized the practice of agriculture. Institutions frequently combine the advantages of traditional agrarian society with the forces of globalization and modernity. New mechanisms are increasing the security of property rights and facilitating land reallocation as rural households adjust their livelihood strategies or leave for the city. Innovations in finance are providing smallholders with greater access to credit, savings facilities, and insurance. Incentives (and sometimes subsidies) can promote more efficient input markets. And new forms of collective action representing producers' interests are emerging.

### **Innovations in land policies and administration**

6.4 Institutions governing land rights and ownership affect the efficiency of land use. If those who farm lack secure rights to land, they have less incentive to exert effort to use it productively and sustainably or to carry out land-related investment. And if women—who cultivate much of the land in Africa—have few vested rights, households tend to produce less than their asset base could otherwise provide. Secure and unambiguous property rights also allow markets to transfer land to more productive uses and users, providing a basis for expanding the non-agricultural economy. Cost-effective systems of land administration facilitate non-agricultural investment and can lead to lower-cost credit by increasing the use of land as collateral and thus reducing risk for financial institutions.

6.5 Institutions governing land have evolved over a long history of adaptation to social, natural, and economic factors. Their diversity reflects land's value not only as a factor of production but also as a source of status, cultural identity, and political power. Land policies were often adopted less to maximize overall efficiency than to further the interests of dominant groups, making land issues politically charged. This section addresses how recent institutional and technological innovations can help deal with such legacies, increase security of tenure, and provide broad-based access to land to maximize its contribution to agricultural competitiveness and overall economic development.

### *Opportunities to enhance tenure security*

6.6 Providing land owners or users with security against eviction enhances their competitiveness by encouraging land-related investment, as shown by numerous studies.<sup>1</sup> While earlier interventions to improve tenure security focused almost exclusively on individual titling, this can leave out or weaken communal, secondary, or women's rights. And because completely eliminating asymmetries of informational is very difficult, titling risks land-grabbing by local elites and bureaucrats. So, although individual titling is still appropriate in many cases, it needs to be complemented by new approaches to securing tenure.

6.7 *By recognizing customary tenure.* In many countries vast expanses of land held under customary tenure do not enjoy legal protection, and traditional rights are often at odds with legislation inherited from colonial times. For example, many African jurisdictions considered most land to be "state land." Those who had cultivated such land for generations received only precarious tenure rights and could lose their land—say, to make room for "strategic" investments—with little or no compensation. Over the last decade a large number of African countries have adopted a wave of new land legislation to recognize customary tenure, make lesser (oral) forms of evidence admissible, strengthen women's land rights, and establish decentralized land institutions.<sup>2</sup> Evidence from Uganda suggests that, with greater knowledge of such laws, land-related investments and productivity increase. With less than a third of households informed about the law, further efforts to disseminate information could have a significant impact.<sup>3</sup>

6.8 Communal lands and common property resources are a special case of customary tenure. In addition to their productive value, they are often important as safety nets for the poor. But they are vulnerable to degradation and appropriation by powerful chiefs, outsiders, or bureaucrats.<sup>4</sup> Increasing the productivity of such resources requires:

- Delineating legally valid boundaries, identifying existing (possibly overlapping) rights, and registering them as appropriate.
- Vesting day-to-day management decisions in an accountable body that functions transparently—say, as a legally incorporated user group.

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<sup>1</sup> Place and Otsuka (2002), Ayalew, Dercon, and Gautam (2005), and Deininger and Jin (2006b).

<sup>2</sup> Alden-Wily (2003).

<sup>3</sup> Deininger, Ayalew, and Yamano (2006).

<sup>4</sup> Chauveau and others (2006).

- Making evolution to more formal types of tenure possible through a well-defined and transparent process. In Mexico certified individual land plots in *ejido* communities can be transformed into fully alienable freehold land based on a qualified vote by the assembly. But the fact that fewer than 15 percent of *ejidos* chose to go this route illustrates that many users see the benefits from maintaining communal relations to be greater than those from full individualization of rights.

6.9 *By documenting land rights.* While legal recognition of existing rights is an indispensable first step, there is often demand to demarcate plots and issue certificates to reduce boundary disputes and facilitate land transactions. High survey standards and the associated costs under traditional technology—between \$20 and 60 per parcel<sup>5</sup>—has been a major obstacle to broader implementation. But recent advances in technology—particularly the widespread availability of satellite imagery and handheld GPS devices, together with institutional arrangements that put local actors in charge of systematic adjudication—can significantly reduce the cost of issuing certificates for boundaries with reasonable accuracy. Experience points toward considerable demand for these land certification programs, as in Ethiopia (box 61.).

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#### **Box 6.1 Benefits from community-driven land certification in Ethiopia**

Based on promising results from issuing land use certificates to about 632,000 households in Tigray in 1998/99, other Ethiopian regions have embarked on a large-scale certification effort, issuing land use certificates to about 6 million households (18 million plots) in 2003-05. The process starts with local awareness campaigns, often with the distribution of written material, followed by elections of land use committees in each village. After a period of training, these committees, if necessary with assistance from elders, systematically resolve existing conflicts, referring cases that cannot be settled amicably to the courts. This is followed by demarcation and surveys of undisputed plots in the presence of neighbors with subsequent issuance of land use certificates which, for married couples, include names and pictures of both spouses<sup>6</sup> but no sketch map or corner coordinates.

As land remains state owned with strong restrictions on transfers, certificates document only heritable use rights. These limits notwithstanding, more than 80 percent of respondents in a nation-wide survey indicated that certification reduced conflicts, encouraged them to plant trees and rent out land, and improved women's situation—and that having a certificate would increase the possibility of getting compensation in case of land taking. Many (76 percent and 66 percent) expect demarcation of communal land to reduce encroachment and increase soil conservation. Comparing court files from before and after certification in Tigray points toward a reduction of conflict after certification but suggests that, without mechanisms to keep records current, this effect may be short. Estimates for Amhara suggest that such mechanisms should be possible at about (\$0.65) per transaction.

Demand for certificates is illustrated by the fact that 95 percent of households outside the program would like to acquire one and that 99 percent of those with a certificate would be willing to pay an average of B12 (\$1.50) to replace it if lost, and 90 percent (most of them willing to pay) would like to add a sketch map.

A rough estimate puts the cost at \$1 per plot, largely because all local inputs to conflict resolution and surveying are voluntarily provided by local land use committees. Adding differential handheld GPS with an accuracy of less than one meter to record corner coordinates would increase these costs by about 60 percent. The certification shows that, with modern technology making low-cost approaches more feasible, systematic certification could help implement new land legislation in Africa and beyond.

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<sup>5</sup> Burns (2006).

<sup>6</sup> In case of polygamy, wives beyond the first receive their own individual certificate.

In Ethiopia's case, certificate could be considered a first step toward reform of land policy which does not permit sales or mortgaging of land and restricts land rental.

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6.10 The nature of women's land rights affects productivity and investment where they have a main role in cultivation.<sup>7</sup> In addition, with land as a key asset, rights are critical for women's bargaining power within the household, their broader economic opportunities, and their long-term security in case of divorce or death of family members. Recognition of the adverse consequences of discrimination against women in this area has led to changes in constitutional provisions and more specific legislation to require general equality of men and women, mandate issuance of joint titles, modify inheritance legislation, and ensure female representation on land administration institutions. Where implemented, such measures have a positive impact. But legal reforms that clash with traditional power arrangements may be indifferently enforced. To minimize such clashes, a mix of mediation and awareness-raising can complement other programs to ensure rights. For example, Mexico's ejido system now includes mediation to protect the property rights of women. And in Nicaragua a program to title land rights in the names of both spouses included a consultation process with the indigenous population to clarify both communal and collective rights.

6.11 *By expanding options for conflict resolution.* In many developing countries a large share of court cases originates in land-related disputes. Apart from clogging up the courts and stifling investment, unresolved conflicts can depress the productivity of land use. For example, in Uganda the productivity on plots under dispute is less than a third that on unaffected plots.<sup>8</sup> Traditional institutions can resolve some forms of localized disputes. But they are not well equipped to resolve disputes that cut across groups belonging to different communities (between nomads and sedentary agriculturalists), across ethnic boundaries, or between individuals and the state. They also tend to be under the control of, and function for, males in disputes with women, e.g., over inheritance rights.<sup>9</sup> Expanding the range of options to resolve land conflicts in a systematic way and out of court can have large benefits, especially for the poor and for women and widows who otherwise are often unable to enforce their legal rights.

6.12 *By modernizing land administration.* In many countries land administration is one of the most corrupt public services. Irregularities and outright fraud are frequent in allocating and managing of public lands. The sums can be large. In India bribes paid annually by users of land administration services are estimated at \$700 million,<sup>10</sup> three-quarters of the public spending on science, technology, and environment. In Kenya "land grabbing" by public officials reached systemic proportions during 1980-2005 and was identified as "one of the most pronounced manifestations of corruption and moral decadence in our society."<sup>11</sup> Modern technology and partnerships with the private sector can yield quick benefits. To give only one example, computerizing records in the Indian state of Karnataka under a PPP model is estimated to have saved users \$16 million in

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<sup>7</sup> Goldstein and Udry (2006), Udry (1996).

<sup>8</sup> Deininger and Castagnini (2006).

<sup>9</sup> Khandiagala

<sup>10</sup> Transparency International India (2005).

<sup>11</sup> Government of Kenya (2004), p. 192.

bribes.<sup>12</sup> Automating registration and the associated land valuation allowed outsourcing to the private sector which significantly improved access and resulted in cuts in stamp duty from 14 percent to 8 percent while quadrupling tax revenue from \$120 to \$480 million.

6.13 Land administration institutions will be viable in the long term and independent from political pressure only if they can sustain their operations financially, without charging more than users are willing to pay. Although the reforms required to make them more efficient are well known and their effectiveness has been repeatedly demonstrated (box 6.2), implementation has often faced strong resistance from vested interests who benefit from the status quo.

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**Box 6.2 Improving the efficiency of land administration services in Georgia**

Georgia established a single national land administration agency, made all information publicly available on the internet, put licensed private surveyors in charge of conducting surveys, and drastically cut staff (from 2,100 to 600) while increasing salaries (eightfold). To keep the registry financially independent, the registry law was revised, free legal consultation service established, and the fee structure adjusted.

The time for property registration came down from 39 to 9 days, and the associated cost from 2.4 percent to 0.6 percent of property value, with attendant benefits for land users—evidenced by greater (rental and sales) market activity, and more mortgages and credits by private and agricultural lenders.

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***Access to land can be improved***

6.14 Getting land markets to work is fundamental where new options emerge for households to diversify livelihoods and eventually leave agriculture. This can be done through rental or sale. Although land rental is a widespread means to access to land, it has often been viewed as second best to purchase. This view is motivated by concerns about equity—having to pay rent to a landlord reduces the benefits to tenants and productivity as the widespread practice of sharecropping was viewed as being less efficient than other contractual forms. However, several studies show that the efficiency disadvantages of share tenancy are small and that the arrangement provides opportunities for tenants to overcome credit and risk obstacles. Even though renters do not enjoy all the benefits of ownership, they can thus still derive considerable advantages. By allowing users to gain experience, renting can provide a stepping stone toward full ownership. Moreover, landlords taking non-agricultural activities are more likely to rent out than to sell because of the lower transaction cost and greater flexibility of the former, implying that supply will be much higher in rental than in sales markets.

6.15 *By enabling land rental markets.* In developed countries about 50 percent of farmland is rented, often under sophisticated contractual forms. In most developing countries, by contrast, land rental markets are atrophied. But land rentals are increasing in places where they had not been practiced extensively earlier—as in Eastern Europe,<sup>13</sup> in Vietnam where rental participation quadrupled to 16 percent in five years,<sup>14</sup> and in

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<sup>12</sup> Lobo and Balakrishnan (2002).

<sup>13</sup> Swinnen and Vranken (2006).

<sup>14</sup> Deininger and Jin (2003).

China where they allow rural communities to respond to large scale out-migration (box 6.3).

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**Box 6.3 How land rentals can increase productivity and equity in China**

Land rental markets can contribute much to rural diversification and income growth in a rapidly growing economy. Look at China. After the introduction of the household responsibility system in 1978, land use rights were allocated on a per capita basis, leading to an egalitarian land “ownership” structure, with land also functioning as a social safety net. Although households held 15-year land use contracts, administrative reallocation—in clear breach of contractual obligations—was regularly practiced in response to population growth or to make land available for nonagricultural purposes without being contested.<sup>15</sup> But with rural-urban migration tripling from 5 percent in 1988 to 17 percent (125 million migrants) in 2000, the limits of exclusive reliance on administrative means became obvious for productive inefficiency<sup>16</sup> and preventing abuses of power and corruption.<sup>17</sup>

Decentralized land rentals, which complemented and eventually replaced administrative reallocations, address some of these concerns. Indeed, they have been just as equitable but significantly more productive.<sup>18</sup> A national sample with information on the two parties for land transactions highlights the significant impact of land rentals on occupational structures, land productivity, and welfare.<sup>19</sup>

- Land rentals transformed the occupational structure. While almost 60 percent of those renting out relied on agriculture as their main source of income before entering rental markets, only 17 percent continued to do so—while 55 percent engaged in migration (up from 20 percent before) and 29 percent in local nonfarm activity (up from 23 percent).
- Land rentals also led to considerable productivity gains. Net revenue on rented plots increased by about 60 percent, supporting the notion that, by transferring land from those with low ability or little interest in agricultural cultivation to better farmers, rental markets can improve rural welfare. Renters—who generally had less land, more family labor, and lower levels of assets and education—received about two-thirds of the gains, with the rest going to landlords in rent.
- Net income for both renters and landlords increased—respectively by 25 percent and by 45 percent (partly due to migration income), in a way that was very equitably distributed. Not surprising, in view of the larger pie and the fact that renters are relatively poor.

This illustrates the importance of well functioning land markets in a context of strong nonagricultural growth and migration. But many producers still feel constrained by insecure property rights. To allow land markets to better respond to the needs of a changing economy, recent initiatives, especially the 2003 rural land contracting law, aim to strengthen farmers’ property rights and reduce the scope for discretionary intervention by officials.

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6.16 Productivity-enhancing rental transactions will not fully materialize if tenure is insecure or restrictions constrain land leasing. Studies in the Dominican Republic, Nicaragua, and Vietnam show that insecure land ownership reduced the propensity to rent and limited transactions to pre-existing social networks, despite the associated inefficiency. Fear of losing the land, together with explicit rental restrictions, was the

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<sup>15</sup> Kung and Liu (1997).

<sup>16</sup> Benjamin and Brandt (2002).

<sup>17</sup> Cai (2003), Brandt, Rozelle, and Turner (2004).

<sup>18</sup> Deininger and Jin (2005).

<sup>19</sup> Deininger and Jin (2006a).

main reason for suboptimal performance of rental markets in Ethiopia.<sup>20</sup> Tenancy restrictions in India reduce productivity and equity (box 6.4). Replacing them with policies that facilitate renting will improve access to land by those remaining in the rural sector as large population movements induced by overall economic growth accelerate.

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#### **Box 6.4 Rental markets and the impact of restrictions in India**

Where tenants have few alternatives, landlords will use land rentals to extract as much surplus as possible. This led Indian policymakers to impose rent ceilings and tenant protection, and to prohibit tenancy in many states. Partly as a result, reported land rental activity in India declined sharply, from 26 percent in 1971 to less than 12 percent in 2001, contrary to trends in other countries. Still, renting continues to be an important means of accessing land; even in 2001, more households rented land than had benefited from land reform throughout the country's independent existence.

A national survey that allows comparisons over time suggests that the assumptions underlying interventions in land rental markets may no longer hold. Instead of causing reverse tenancy, rental markets help land-scarce and labor-abundant households with little education but agricultural skills—37 percent of them landless—to rent land from land-abundant and wealthy households who take up nonagricultural employment. Higher village incomes increase the propensity to rent, because wealthier households are more likely to move out of agriculture and supply land to the rental market.

The equity impact of rental restrictions is evidenced by comparing the marginal product of one day of labor in agricultural self-cultivation (Rs. 150 for males and females) with daily wages in the casual labor market (Rs. 46 for males and Rs. 34 for females). The statistically significant difference implies that, even after subtracting payments to the landlord, renting can improve household welfare considerably. Gender discrimination in casual labor markets would make renting particularly attractive for women, consistent with anecdotal evidence of rural women's use of self-help groups to rent land, often in contravention of existing laws. At least in "modern" areas, eliminating land rental restrictions could, by increasing rental market activity, boost the non-agricultural sector.

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6.17 *By strengthening land sales markets.* Compared with land rentals, sales markets for acquiring ownership increase investment incentives and provide a basis for using land as collateral in credit markets. But imperfections in other markets, and expectations of future land price increases, affect the functioning of land sales markets more than that of rentals, implying that they would not necessarily transfer land to the most productive producers. Thus, historically, most land sales were due to distress that required defaulting landowners to cede control of their land to moneylenders, who amassed huge amounts of lands.<sup>21</sup>

6.18 Data on land sales over 20 years in India illustrate some of the peculiar features of land sales markets:

- They did transfer land to better cultivators and from land-abundant to land-scarce households, allowing the land-scarce to significantly improve their welfare<sup>22</sup>

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<sup>20</sup> Deininger, Ayalew, and Alemu (2006).

<sup>21</sup> Cain (1981), Kranton and Swamy (1999), and World Bank (2003).

<sup>22</sup> Although their initial level of income and assets was not significantly different from the average, their level of assets and income in 1999 was more than 50 percent above the mean while their level of consumption was about 20 percent above the average.

without making sellers worse off. But sales markets are thinner, more affected by life-cycle events, and less redistributive than those for rentals.

- Climate shocks increased the probability of land sales, but this was mitigated by local safety nets (employment guarantees) and access to credit from banks.<sup>23</sup>
- Although land ownership ceilings may have played a role, land sales and purchases did more than land reform to equalize India's land ownership.<sup>24</sup>

6.19 This implies that often there is little justification for policy measures to restrict land sales, especially since they tend to drive land sales underground and undermine access to formal credit without addressing the underlying problems of asymmetries in power, access to insurance, and information. Safety nets and other measures, including ways of redistributing land, are more appropriate to deal with these problems and prevent distress sales than constraints on sales. And land taxes can curb speculative demand and encourage better land use, while providing revenue for local governments to fulfill their functions.<sup>25</sup>

6.20 *By making land reform more effective.* Land markets are not a panacea for addressing structural inequalities in countries with highly unequal land ownership that reduce the productivity of land use and hold back development.<sup>26</sup> To overcome the legacy of such inequality, ways of redistributing assets such as land reform will be needed. The postwar experiences of Japan, Korea, and Taiwan, China show that, in such situations, land reform can improve equity and economic performance. But there are many other cases where land reform could not be fully implemented or even had negative consequences. Evictions of tenants or changes of land use in anticipation of legislation that would have given greater security to tenants or allowed expropriation of "underused" land often made prospective beneficiaries worse off or prompted land owners to resort to even less efficient techniques.<sup>27</sup> If land is transferred through redistributive land reform, improvements in access to technology, credit, and markets are essential for the new owners to become competitive. Similarly, some tenancy reforms have proved highly effective<sup>28</sup> but measures to clarify ownership rights are needed to avoid disincentives for investments. Experience suggests that land reform will need to be one of several avenues to improve access to assets. Land reform must be integrated in a broader rural development strategy, using transparent rules, offering clear and unconditional property rights, and improving incentives to maximize productivity gains. In short, land reform can enhance access to land for the rural poor, but it requires a commitment by government to go beyond providing access by ensuring the competitiveness and sustainability of beneficiaries as market-oriented smallholders.

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<sup>23</sup> Nagarajan, Deininger, and Jin (Forthcoming).

<sup>24</sup> Bardhan and Mookherjee (2006).

<sup>25</sup> Bird (2004).

<sup>26</sup> Banerjee and Iyer (2005), Nugent and Robinson (2002).

<sup>27</sup> Appu (1996), Deininger (1999), Lutz, Heath, and Binswanger (1996).

<sup>28</sup> Banerjee, Gertler, and Ghatak (2002).

### **Financial services to enhance the competitiveness of smallholders**

6.21 Access to financial services—savings products for safeguarding seasonal earnings, credit products acquiring assets, or money transfer services for remittances—expands the opportunities for efficient technology adoption, resource allocation, and exchange. The ability of agricultural enterprises and rural households to invest for the long term and take calculated decisions for risky and time-patterned income flows is shaped by the set of financial services in the economy. But financial constraints abound in agriculture, and their impacts on households and the economy can be costly and inequitable. For instance, a study of smallholder participants in an agro-export boom sector in Guatemala found that those who failed to fully adopt highly profitable opportunities due to credit constraints were, in effect, paying implicit insurance premiums equivalent to 50 percent of their income.<sup>29</sup>

6.22 Financial services are delivered to rural populations by organizations that exist along a continuum from informal to formal. The boundaries between these categories are often blurred, but in general formal financial institutions are licensed banks or non-bank financial institutions supervised by a central authority, including public and private commercial banks, state-owned agricultural or rural development banks, cooperative banks, microfinance banks, and special purpose institutions such as leasing and housing and consumer finance companies. Informal providers of financial services include rotating savings and credit associations (ROSCA), money lenders, pawnshops, businesses that provide financing to their customers, and friends and relatives. In between stand non-governmental organizations and small financial cooperatives.<sup>30</sup>

#### ***Financial constraints, pervasive in rural areas, reinforce poverty***

6.23 Financial constraints are more pervasive in rural than urban areas. Financial contracts in rural areas tend to involve higher and more variable transaction costs due to the greater spatial dispersion of production, lower population densities, the generally lower quality of infrastructure, and the seasonality and often high covariance of rural production activities. These factors make gathering information and enforcing contracts more difficult and expensive. Banks and other traditional for-profit financial intermediaries tend to limit their activities to urban areas and to more densely populated, more affluent, more commercial areas of the rural economy. In such areas operating costs are lower, loan sizes sufficiently large to cover fixed transaction costs, and legal contracts more easily enforced.

6.24 The rural reality: the majority of households and small firms cannot fill their demand for credit and other financial services. Informal financial arrangements serve rural communities, but they tend to fragment along lines of household location, asset ownership, or membership in kin- or ethnic-based networks, all affecting the transaction costs of contracting, the size of the possible transactions, and the rate of interest charged.<sup>31</sup> In short, there is tremendous need for financial innovations that can place

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<sup>29</sup> Von Braun, Hotchkiss, and Immink (1989).

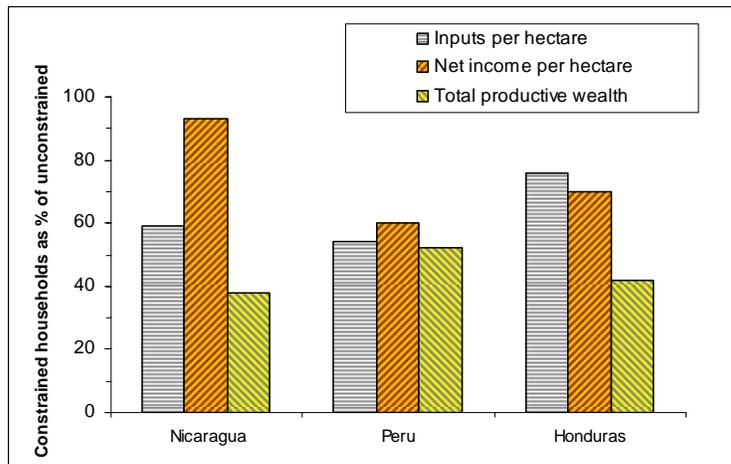
<sup>30</sup> World Bank (2005a).

<sup>31</sup> Zeller (2003).

smallholders on a ladder of ascending financial market access as well as those that complement and crowd-in market and social arrangements by managing the systemic risks that undercut financial efficiency.

6.25 The cost of financial constraints on smallholders is huge in forgone opportunities and exposure to risk. In rural Honduras, Nicaragua, and Peru the constrained constitute some 40 percent of all agricultural producers, using on average only 50 percent to 75 percent of the purchased inputs of unconstrained producers and earning net incomes (returns to land and family labor) between 60 percent and 90 percent of the unconstrained (figure 6.1).<sup>32</sup> In Peru agricultural output would be 25 percent higher in the area studied if credit constraints were eliminated. In Central and Eastern Europe, where reforms resulted in dual agrarian structures in which the large farm remnants of prior state and collective farms coexist with numerous smallholders, nearly 50 percent of smallholders in five countries report financial constraints to be the major barrier to the growth and expansion of their enterprises.<sup>33</sup>

**Figure 6.1 Credit-constrained households use less inputs and have lower incomes**



Source: Boucher, Carter and Guirkinger (2006).

6.26 Low wealth households are more likely to face financial constraints. The root of the problem is that lenders tend to offer only a limited menu of contracts, mainly with heavy collateral requirements. Wealthier farmers can obtain larger loans at lower cost from formal lenders because they can credibly pledge assets or future cash flows. Asset-poor households, by contrast, may be limited to considerably smaller loans at much higher rates because they have to rely on lenders who must substitute costly monitoring for collateral. Poor farmers may also turn down contracts they qualify for because they are unwilling to bear the risk of losing collateral, termed “risk rationing.”<sup>34</sup> In the studies of Honduras, Nicaragua, and Peru, 20, 40, and 50 percent of credit-constrained borrowers are, respectively, risk rationing. Access to credit and insurance are thus closely tied both conceptually and empirically.

<sup>32</sup> Boucher, Carter, and Guirkinger (2006).

<sup>33</sup> Sarris (2004).

<sup>34</sup> Boucher, Carter, and Guirkinger (2006).

6.27 This skewed pattern of capital access can create an exclusionary dynamic that blunts employment and makes the income distribution less favorable than otherwise. Land market policies become less effective in the presence of wealth-biased financial market constraints. Economic growth and the associated structural transformation will inevitably lead many smallholders and their families to exit from agriculture. But they are more likely to be prematurely pushed out when they are not competitive due to financial constraints, than pulled out by improved urban income opportunities.

***The microfinance revolution has made slow progress in reaching smallholders***

6.28 The inadequacies of rural financial markets reflect real problems and real transaction costs that cannot simply be wished, or legislated, away. Innovations are required to permit more flexible forms of lending while still guaranteeing that borrowers repay loans.

6.29 One approach to resolve these problems follows from the pioneering efforts of the Grameen Bank. Microfinance institutions (MFIs) open the menu of available contracts with new arrangements that substitute for collateral wealth. They often have guidelines to favor groups—particularly women—that tend to be excluded from borrowing. Some of them lend to local groups whose members select each other and share liability for loan repayment. In this case, local social capital substitutes for wealth as collateral in accessing credit.

6.30 This shared liability creates powerful incentives for rigorous peer selection and borrower monitoring, and it can work well when loans are used for a diversity of (quick turnaround) activities. But it works less well for crop activities, where all producers are subject to a common set of weather risks (when one cannot pay, often no one can pay) and where project gestation periods are long. Weather risk also undermines the financial stability of locally based MFIs. Some MFIs that lend for agriculture explicitly limit the share of lending to reduce their exposure to this sector. Moreover, many microfinance organizations have targeting criteria for land ownership that indirectly restrict their lending on agricultural activities.

6.31 In moving to meet this underserved agricultural market, MFIs have begun to innovate.<sup>35</sup> FUNDEA in Guatemala has offered individual loans to agricultural producers of short-cycle tomatoes and other vegetable crops. It has adopted the principles of value chain financing to inputs and outputs, using standing crops as collateral. *Caja de los Andes* in Bolivia began to accept non-standard collateral assets and lend to farmers well diversified across a range of agricultural and nonagricultural activities.<sup>36</sup> Agricultural loans now constitute 10 percent of its portfolio.

6.32 In short, there are hopeful signs that innovation will permit the microfinance movement to partially fill the agricultural void, at least for producers with small enterprises engaged in high value activities. There is a strong case for public policy support to the search for, and pilot-testing of, technological and institutional innovations

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<sup>35</sup> Peck Christen and Pearce (2005).

<sup>36</sup> CGAP (2005).

that reduce the costs and risks of doing business. Many of the newly developed innovations may have the character of a public good, because innovations by one lender may be quickly adopted by another. This justifies public support for promising start-ups and pilot experiments to enable them to reach scale and become financially viable within reasonable time periods. Some interventions may build up local equity or intermediary capital to help crowd in the private sector.

6.33 Financial sector regulations, if reformed, coupled with an enabling financial sector infrastructure, could also substantially boost access to financial services in many countries. Forty developing and transition economies still have interest rate ceilings that make it difficult for MFIs to survive without resorting to the use of nontransparent fees.<sup>37</sup> Other regulations make it nearly impossible for MFIs to mobilize savings and accept deposits. For example, Indian legislation requires a deposit-taking institution to have start-up capital of \$445,000, well beyond the reach of many MFIs. While protection of small saver deposits is of high concern and this regulation is meant to address this issue, other ways to achieve this goal need to be explored, such as well structured deposit insurance schemes.

***Institutional innovations are reshaping financial services for smallholders and the rural non-farm economy***

6.34 MFIs, however, cannot provide the mainstay of rural finance. Promoting, improving, or even creating rural institutions to support a wide range of rural financial transactions is one of the fundamental challenges facing developing country governments. The range of alternatives for this is broad. Government-sponsored agricultural lending institutions have been successful in many now-developed countries such as Korea and Taiwan, China. But in developing countries government efforts to improve rural financial markets have a record of doing more harm than good, heavily distorting market prices, repressing and crowding out private financial activities, and creating centralized, inefficient, and frequently overstaffed bureaucracies captured by politics.<sup>38</sup> Unsurprisingly, public agricultural and development banks came under heavy criticism in the 1980s.<sup>39</sup> Bolivia and Peru simply closed their traditional agricultural banks, while The Gambia and many of the former Soviet Republics sold off and privatized all or part of their state banking programs.<sup>40</sup>

6.35 *Public agricultural banks can be reformed.* Despite the failed state interventions in developing country financial markets, the importance of public and state banks in many now-developed countries raises the question whether the blanket anti-state bank conventional wisdom needs reconsideration. Banrural in Guatemala shows how hard budget constraints and appropriate governance mechanisms can create public-private institutions that meet the needs of rural and agricultural finance (box 6.5). Other reforms

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<sup>37</sup> Consultative Group on International Agricultural Research (CGIAR) (2004).

<sup>38</sup> Adams, Graham, and Von Pischke (1984).

<sup>39</sup> The 1989 World Development Report on Financial Systems offered a sharp critique of these programs. By the end of the decade most donors and governments were lifting financially repressive policies and sharply scaling back on state-led agricultural credit programs (World Bank (1989)).

<sup>40</sup> **FAO (1998).**

of state-sponsored lenders have similarly produced some of the most successful agriculturally oriented finance programs, including Bank Rakyat Indonesia and BAAC Thailand.

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**Box 6.5 Banrural SA: From ill-performing agrarian bank to profitable public-private financial institution**

The Banrural SA in Guatemala shows that financial and development goals can be combined and that a large bank can remain highly profitable while offering financial services to poor, rural, and agricultural clients. Banrural was created in 1997, when Guatemala closed its poorly performing public agricultural bank, Bandesa. With 200,000 credit clients, and 1 million savings accounts, it facilitates the transfer of more than \$1.3 billion in remittances, and has a default rate on loans of less than 1.5 percent. It works mainly outside Guatemala City. Half of its clients are women and it provides biometric and multilingual devices to serve illiterate and indigenous clients.

*An innovative governance model.* Banrural is controlled by private shareholders. The public sector owns less than 30 percent of the equity and provides no direct subsidies. The remaining 70 percent is divided among five types of stock, each represented on the board of directors. The 10 board seats are divided among the public sector (3), unions (mostly agricultural producer unions, not credit unions) (2), Mayan organizations (2), NGOs (1), small and micro enterprises (including microfinance organizations) (1), and the general public and former BANDESA employees (1). Each group elects its own directors and can sell stock only to other members of that group. This unusual governance model has empowered the private stakeholders. Decision making is by consensus, as a majority requires agreement by at least three groups. Goals of profitability and rural development are balanced. And the governance model is sustainable because the board and equity makeup cannot be altered significantly over time.

*A focus on rural areas and poor clients.* Banrural's profits come from a high volume of small transactions mostly in rural areas. It learned the lesson of the microfinance revolution. It adapts financial technologies to its clientele—loan officers visit all clients, decisions based on an evaluation of business and household income flows, use of traditional collateral is limited—without losing its definition as a bank. Its lending portfolio to agriculture has more than doubled since it was privatized. To increase its reach to smallholders and rural microenterprises, Banrural functions as a second-tier bank, providing credit lines to more than 150 institutions, such as credit unions and NGOs. And to build strong community bonds, it provides health care, scholarships, and community-based activities.

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6.36 Building on existing (but perhaps failed) public banks offers the opportunity of using their branch networks to establish a branch presence and take advantage of scale and spatial dispersion to reduce costs. The successful restructuring and subsequent privatization of the former Agricultural Bank of Mongolia (renamed KhanBank in 2006), and that of NMB in Tanzania, demonstrate the potential of using existing branch bank infrastructure, innovative and independent management and oversight, and strong barriers to political interference to transform financial institutions. But it may be hard to transform the institutional culture of a public institution, and state banks remain vulnerable to political capture. Key elements of reform include professionalization and clear pecuniary incentives for management and staff that tie rewards to the financial performance of branches.

6.37 *Self-help groups and financial cooperatives provide access to financial services.* In several Indian states a separate movement has emerged, based on village-level women self-help groups and their federations at the village, mandal, and district levels. These groups collect savings from their members and either deposit them in rural banks or lend

them out to members. After demonstrating their capacity to collect on loans over a six-month time period, rural banks will typically leverage a group's savings amounts by a factor of four, providing additional capital that is mostly used for agricultural purposes. In these circumstances it is often easier for self-help groups to obtain loans than it is for individual farmers, who have proven to be poor customers for rural banks in India. And with the self-help groups responsible for all screening, processing, and collection activities, the transaction costs on loans are also greatly reduced.

6.38 Financial cooperatives and their networks are re-emerging as promising institutions in rural finance in many countries, combining the traditional with the modern.<sup>41,42,43</sup> Locally based, their transaction costs are typically lower than those of other financial institutions. But because they are members of a larger network, they can offer the variety and volume of financial services that rural customers require. For example, innovations in achieving deeper rural outreach are being pioneered in Burkina Faso. RCPB, the largest network of financial cooperatives there, is establishing rural service points and very small village-based credit unions, managed and supervised by financial cooperatives in larger villages.<sup>44</sup>

6.39 *Innovative approaches expand the reach of rural finance.* Emerging information technologies are seen as major new avenues to extending financial services to rural areas.<sup>45</sup> The use of mobile phones (m-banking) is being pioneered by companies such as Wizzit (South Africa) and G-xchange (Philippines). Phones can be used to pay for purchases in stores and to transfer funds, reducing transaction costs tremendously. While enabling legal frameworks often need to be established, this could be one of the major breakthroughs in extending outreach to poor customers.<sup>46</sup> Branchless banking—using stores, gas stations, and input providers—is another quite successful approach to reaching rural customers at low cost. Institutions in Brazil, India, Kenya, the Philippines, and South Africa demonstrate the financial viability of such an approach, though, again, there are issues in regulating such endeavors.<sup>47</sup>

6.40 Rural leasing is an additional financing option for rural entrepreneurs, in both the rural non-farm economy and agriculture. A study of commercial providers in Mexico, Pakistan, and Uganda shows that leasing can be an effective means to finance the acquisition of productive assets.<sup>48</sup> The providers run profitable enterprises, but they benefited from access to government and donor funds to jumpstart their operations.

6.41 *Financial intermediation occurs through interlinked agents.* Another way to resolve inadequate agricultural access to capital is to have financial intermediation through interlinked agents (input suppliers or output processors). Those agents are either

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<sup>41</sup> Cuevas and Fischer (2006).

<sup>42</sup> World Bank (2007).

<sup>43</sup> Nair and Kloppinger-Todd (2007).

<sup>44</sup> Aeshliman (2007).

<sup>45</sup> World Bank (2005c).

<sup>46</sup> Consultative Group on International Agricultural Research (CGIAR) (2006b).

<sup>47</sup> Consultative Group on International Agricultural Research (CGIAR) (2006a).

<sup>48</sup> Nair and Kloppinger-Todd (2006).

in a position to cost-effectively monitor on-farm behavior (eliminating information asymmetries) or to accept non-standard forms of wealth as collateral, such as standing crops or, in warehouse receipt financing, harvested crops. These innovations have been shown to work in some settings, but there appear to be limits to the types of crops and marketing channels.<sup>49</sup>

6.42 Further work is also needed to answer whether these (often spatially monopolistic) practices offer finance at competitive rates and whether transaction costs continue to bias them against smallholders. As mentioned, some MFIs and cooperatives have themselves begun to adopt this form of secured lending. But their success has in many instances been cut short by inadequate legal frameworks, which often prevent less conventional assets (an MFI's loan portfolio or an input supplier's standing crop guarantees) from being collateralized.<sup>50</sup> Further undercutting collateralized lending are legal systems that fail to provide clear rules for priority claims on assets in the event of default and prompt redress.

6.43 *Reputational collateral can be created through microcredit reporting bureaus.* Innovations establishing individual reputations can help small farmers use their reputation as an asset. Credit ladders can be established as individuals first signal their capacity to manage a payment obligation. Once that is established, the individual can then leverage reputation into a loan. The key is a mechanism for credit and saving histories and credibly signaling them to the next level of the financial market.

6.44 This same idea of creating and signaling one's creditworthiness can be applied to the next tier in the credit market through microcredit reporting bureaus that link the microfinance and conventional banking sectors. A smallholder begins by establishing a credit history in the MFI sector, often using credit for nonagricultural purposes. In some instances, savings records are being accepted as proof of good financial behavior. The credit bureau next establishes a reliable, portable signal of the borrower's reputation. Armed with this signal, a borrower should then be able to climb a lending ladder, moving from the more restricted purposes and term structures of MFI credit, to standard loan contracts from institutions able to bear the portfolio risk and term structures required for agricultural loans.

6.45 For a lending ladder to work, two things must happen. First, the information in a credit report must both help lenders select clients and induce clients to repay loans to enhance reputation. Recent research that exploits the quasi-experimental rollout of an MFI credit bureau in Guatemala shows that both can happen.<sup>51</sup> Second, given that MFI credit bureaus establish effective incentives and reputational capital, an access ladder from rural MFIs to conventional, agricultural loan contracts could become available. Using a client's credit history does address risks related to borrowers' financial behavior—but it does not, and cannot, address business risks related to weather and price in agriculture.

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<sup>49</sup> Conning (2005).

<sup>50</sup> Fleisig and de la Peña (2003).

<sup>51</sup> De Janvry, Sadoulet, and McIntosh (2006).

### **New approaches for risk management and insurance**

6.46 Risk in agriculture is exceptionally high, and risk-reduction mechanisms are still insufficient, especially for smallholders. Risk distorts investments and puts assets in jeopardy. Insurance can assist farmers in taking more risks in production and prevent shocks from depleting assets. Insurance that addresses covariant risks that cannot be insured locally is particularly important. By opening space for new financial institutions, insurance can also reduce interest rates needed to offset the risk of default and increase the amounts available for agricultural credit by making traders and other intermediaries more willing to put more of their assets into an agricultural loan portfolio.<sup>52</sup> In addition to enhancing the supply of agricultural credit, it can make potential borrowers more willing to bear the risk of conventional collateralized loans. But as always, there is a trade-off. Insurance coverage is costly and might lead to higher overall costs when added on to a loan.

#### ***The cost of risk layering can be reduced by insuring systemic risk***

6.47 While there is much that individuals and local networks can do to manage risk, such strategies often flounder on systemic risk, which is beyond the capacity of the individual and community to manage. New innovations to address systemic risk complement existing local capacity to manage idiosyncratic risks. By doing so, the expectation is that they will underwrite a more productive and sustainable pattern of agricultural and human capital investment.

6.48 *Individual and community responses to risk are insufficient.* One element of any strategy to address the cost of risk is to expand a household's risk management opportunities. Households generally seek a mix of coping *ex post* and *ex ante* with economic shocks—in a strategy termed *risk layering*. A farmer might forgo some potential income by choosing a less risky portfolio. He or she may also share risk across the community and, less typically, transfer some risk to commercial providers. This market insurance layer may not, however, be available or may be too costly unless low-probability, high-cost events can be covered through reinsurance.

6.49 The unavailability of commercial insurance induces farmers to hold a large share of unproductive liquid assets to cover contingencies, at a cost. Savings and borrowing assist in this, even in the absence of advanced banking systems, in effect, by spreading risks over time. But for most poor households savings provide a limited cushion. For example, households that can maintain consumption when crops fail a first time may find that they have difficulty coping with successive shocks, as observed in both Burkina Faso and Ethiopia, exhausting coping mechanisms that functioned during the earlier shocks.<sup>53</sup>

6.50 Communities have developed informal systems to respond to shocks based on traditional norms<sup>54</sup> and local information. But these tend to fail poor families, for several reasons. One is the inherent limitation of insuring for covariate shocks: one's neighbors

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<sup>52</sup> Hess (2003), Skees and Barnett (2007).

<sup>53</sup> Reardon and Webb (1992).

<sup>54</sup> Just (2006)

cannot provide assistance if they are also under stress. Another is the fact that such systems entail transaction costs of searching for partners and coordinating activities and monitoring reciprocal arrangements. As these costs increase, the optimal size of a mutual support network is reduced, also reducing risk-sharing. Moreover, similar individuals tend to form networks with each other, with caste, ethnicity, and gender as well as the asset base influencing the nature of the association. For example, pastoralists in Kenya provide cattle to neighbors who have lost a portion of their herds based in part on assistance received in the past and to create future obligations.<sup>55</sup> For these reasons, mutual insurance, though useful, tends to fall short when it is most needed.

6.51 *Microfinance institutions can be a source of risk management tools.* As discussed, the absence of insurance limits access to credit. Conversely, accessible credit can assist a household smooth consumption and avoid distress sales. But shouldn't households save in anticipation of future needs and use their savings to self-insure? Households do, of course, save grain and cash but less than might be expected. Hence, the puzzle: savings are assumed to be open to all; in fact, they are not.<sup>56</sup> Just as there are credit constraints, households have limits to saving due to low (or even negative) real interest rates, security concerns, and the inaccessibility of banks. In addition, intrafamily obligations and gender roles hinder the accumulation of cash. On the supply side, many banks find that transactions and regulatory costs make small deposits unprofitable. MFIs partially address this. In addition to their well known effort to extend credit to households with limited collateral, many MFIs offer secure and convenient ways of saving small amounts, in fact often requiring a savings history before granting a first loan.

6.52 MFIs can serve an additional role in risk management; they can reduce the marketing and monitoring costs of insurance by being intermediaries for insurance to their clients. MFIs often require insurance on the assets purchased when a loan is taken out—for example, to insure against the loss of a cow. They may also require that clients insure against external factors that interfere with the ability to repay on schedule or offer loan protection insurance to ensure that debts are not passed on to survivors. Furthermore, MFIs can serve as intermediaries for other types of insurance, taking advantage of their ability to collect small amounts regularly and in keeping with the transformation of some MFIs from lending institutions to providers of a broader range of financial services, including savings accounts. That is, the marginal costs for collecting payments when staff networks are already in place may be reduced for life as well as health and crop insurance. Indeed, the lives of more than 1.6 million Africans were insured in 2004 through a profit-making product marketed through 26 NGO-managed MFIs, 24 of which were in Uganda<sup>57</sup>.

6.53 *The promise of weather indexed insurance is still incomplete.* Although MFIs can address the limitation imposed by the costs of providing small contracts to potential insurance customers, they do not necessarily address the issues of moral hazard or

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<sup>55</sup> McPeak (2006).

<sup>56</sup> Armendariz de Aghion and Morduch (2005).

<sup>57</sup> McCord, Michael, Felipe Botero, and Janet McCord. 2005. Good and Bad Prices in Microinsurance. CGAP Good and Bad Practices in Microinsurance, Case Study #9.

adverse selection, two major obstacles to the provision of insurance. One innovation that might do so is insurance indexed to an objective indicator of weather, such as rainfall or temperature. Since weather is not affected by individual behavior, index insurance can address both monitoring costs and moral hazard. The choice of indicator depends both on the type of coverage and on the cost and availability of data for estimating the probability of a payout. Cumulative rainfall or the date of the start of a rainy season is often proposed as an indicator; the number of days with temperatures below or above a cutoff is also in common use.

6.54 One concern is basis risk—the correspondence of the indicator and the actual losses incurred by policyholder. The more specific the indicator, the lower the basis risk and more responsive it will be to farmers' needs. But a diverse range of products—including separate rainfall contracts for planting, vegetative growth, and harvesting stages—would make marketing more difficult as individuals often find it hard to assess the probabilities of an event. And addressing individual variation shocks increases monitoring costs. So, index-based insurance may have its greatest potential in addressing covariant shocks with other layers of a risk strategy addressing idiosyncratic risks.

6.55 Several approaches are being tried to adapt index insurance to diverse conditions. But because they are still in pilot stages, no definitive statement about their sustainability or their impact on credit rationing, input use, and portfolio choice is yet available. Mexico determines the timing of assistance to small farmers after weather related shocks on the basis of a weather index. But the payment amount is based on proxies for chronic poverty. In 2006, 28 percent of the non-irrigated cultivated area was covered through an insurance contract with the federal and state governments, with the main limitation being the availability of weather stations. Mongolia, by contrast, promotes private livestock insurance, with the government addressing reinsurance to share risks among herders, the insurance companies, and the government (box 6.6). In Malawi weather-based index insurance covers the loans necessary to finance the planting of certified seeds with payments going directly to banks to settle the farmers' loans. In India, an MFI, BASIX, has served as an intermediary between insurance companies and its clients. The entry of new private investors and the number of repeat customers for unsubsidized weather insurance indicates market potential.

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**Box 6.6 Mongolia's index-based livestock insurance**

Mongolia has piloted index-based livestock insurance to share risks among herders, insurance companies, and the government since 2005. The project combines self-insurance, market-based insurance, and social insurance. Herders retain small losses that do not affect the viability of their business (self-insurance), while larger losses are transferred to the private insurance industry (market insurance through a base insurance product). This is not a purely commercial program, however. The final layer of catastrophic losses is borne by the government (social insurance through a disaster response product).

Herders pay a market premium rate for the base insurance product, which pays out to individual herders whenever the livestock mortality rate in a local region exceeds a threshold. Since excess mortality reflects a combination of dry, windy summers and cold, high-snowfall winters, the insurance index is linked not to a weather event but to historical livestock mortality data. Insurance payments are thus not directly linked to individual herders' livestock losses, and payments are instead based on local mortality. This should avoid or reduce moral hazard and adverse selection—and reduce costs.

A key to the approach is good data to develop the livestock mortality index. Mongolia has a 33-year time series on adult animal mortality for all regions and for the four major species of animals (cattle and yak, horse, sheep, and goat). The mortality index provides the basis for determining the specific mortality rates that would trigger indemnity payments.

*Source:* World Bank (2005b).

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6.56 *Do governments have a role in agricultural insurance?* The track record of agricultural insurance directly supplied by governments is not encouraging. In Brazil costs exceeded revenues by more than 300 percent.<sup>58</sup> Even so, in some settings such as Tanzania, latent demand for insurance can remain below the actuarial fair cost of provision, particularly for low-income farmers.<sup>59</sup> Indeed, the tendency for wealthier households to purchase more insurance is a general pattern, with potential consequences for income distribution.<sup>60</sup> In some cases targeted subsidies may be warranted for variable costs and prove less costly than *ex post* assistance. Occasionally, subsidies can offset the fixed costs of establishing a market. In other cases, as with Turkey's earthquake insurance, the government's main role is to establish a regulatory framework that facilitates risk pooling.

6.57 Governments can also improve *ex post* risk mitigation by improving the data necessary for privately provided market insurance. For example, insurers may be unable to estimate the costs of rare events: a one-in-100 event is hard to distinguish from a one-in-80 event. Similarly, risks are hard to quantify in a changing climatic or economic environment. Thus, insurers may require higher premiums to accommodate such ambiguity risk. When governments assemble information that can be employed in index-based insurance, they provide a public good that can improve the efficiency of markets and reduce costs.

### **Institutional innovations in agricultural input markets**

6.58 Agricultural productivity has grown rapidly where modern varieties and fertilizer have been adopted widely, but not where adoption has lagged (chapter 2). In much of Asia and parts of Latin America, promoting seed and fertilizer use was accompanied by complementary investments in irrigation, rural roads, marketing infrastructure, financial services, and other factors that made using seed and fertilizer profitable and paved the way for dynamic commercial input markets. But throughout most of Africa these complementary investments have mostly been lacking, and private input markets have yet to emerge on a large scale. Recent initiatives to build seed and fertilizer markets provide lessons that can inform future policy design.

#### ***Seed and fertilizer markets have distinctive features that discourage investment***

6.59 Why are efficient markets for seed and fertilizer so difficult to develop? To begin with, demand for both inputs is highly variable in time and space. In developing

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<sup>58</sup> Hazell (1992).

<sup>59</sup> Sarris, Karfakis, and Christiaensen (2006).

<sup>60</sup> Gine, Townsend, and Vickery (2006).

countries the demand for seed is strongest when farmers are growing hybrids, whose seed must be replaced regularly. And it is weakest when farmers are growing varieties, whose seed can be saved from the harvest and replanted for several cropping seasons. In addition, the quality of seed found in the market may be unknown, a common problem because seed quality cannot be determined through visual inspection.

6.60 Similarly demand for fertilizer used on non-commercial crops is generally weak and unstable, for many of the same reasons: lack of knowledge, information asymmetries, liquidity constraints, risk and uncertainty, and high opportunity costs.<sup>61</sup> Profitability tends to weigh heavily in farmers' decisions, because the cost of fertilizer often represents a large share of production costs.<sup>62</sup> When cost factors and risk factors act in tandem, as they do in most rainfed environments, the impact on fertilizer demand can be significant.<sup>63</sup>

6.61 How do the distinctive features of demand for seed and fertilizer affect supply? The incentives for private firms to invest in producing and distributing seed depend on the potential profitability of these activities. In industrial countries, where economic incentives (and the expanding use of intellectual property rights) make it more likely that farmers will regularly purchase seed, plant breeding is done mainly by seed companies. But in smallholder agriculture in developing countries, seed companies depend on public research programs to provide varieties. This makes the pipeline for new products uncertain, with successful varieties perhaps shared with competitors. Private seed companies usually have incentives to serve the needs of business-oriented farmers when the predominant seed technology is hybrid, when on-farm seed production is difficult, or when output markets demand a uniform product that depends on genetically uniform, high-quality seed.<sup>64</sup> But when these conditions are absent, as is often the case in smallholder farming systems, the incentives for private seed companies are low.

6.62 In the case of fertilizer, seasonally variable and geographically dispersed demand discourages potential suppliers, because markets are small. And when markets are small, low-cost procurement becomes difficult. Producing, importing, and transporting fertilizer all feature major economies of scale.<sup>65</sup> Importing fertilizer, for example, is most cost-effective in lots of 25,000 tons, considerably above the annual demand in most Sub-Saharan countries. Transport costs are particularly high in Africa due to generally poor road and rail infrastructure, and because of domestic transport costs, fertilizer use is higher in coastal African countries than in landlocked countries.<sup>66,67</sup> In Malawi, Nigeria, and Zambia international and domestic transport costs make up two-thirds to three-quarters of the farm-gate price, compared with only about one-third in the United States (figure 6.2).

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<sup>61</sup> Factors affecting demand for fertilizer are discussed in Kelly (2006).

<sup>62</sup> Yanggen and others (1998).

<sup>63</sup> For a discussion of how risk affects fertilizer use decisions, see Anderson and Hardaker (2003).

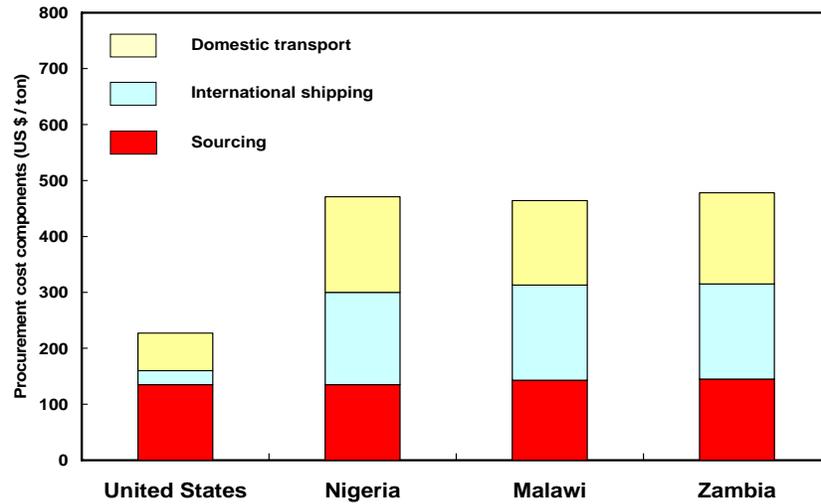
<sup>64</sup> Morris (1998).

<sup>65</sup> For a discussion of the logistical challenges facing fertilizer distributors, see Gregory and Bumb (2006).

<sup>66</sup> Kherallah and others (2002).

<sup>67</sup> Jayne and others (2003).

**Figure 6.2 Transport costs can make up two-thirds or more of the farmgate price of fertilizer in Africa countries, 2005**



Source: Gregory and Bumb (2006).

6.63 Adding to high logistics costs are high financing costs. The reason? Fertilizer purchases typically involve large volumes, and a year or more can elapse between the time when an advance payment is made to a supplier and the time proceeds are received from retail sales. Just as producers face risk, so do input suppliers. If rains fail early in the season, sales of fertilizer can plummet as farmers scale back their planting, and if rains fail late in the season, credit recovery can become difficult as farmers experience crop failures and are unable to repay their loans.

### *Promoting seed and fertilizer in Africa hasn't worked well so far*

6.64 Given the market failures that lead to socially suboptimal use of these two inputs governments frequently step in to distribute seed and fertilizer directly. But past efforts to jumpstart agricultural input markets have had mixed results. Government-led distribution programs have often increased input use, but the fiscal and administrative cost has usually been high and performance erratic.<sup>68,69</sup> And many public distribution programs have crowded out private markets. But the withdrawal of governments has its own risks. Recent cutbacks in public seed multiplication schemes and public seed distribution have saved money for governments, but private companies have not always stepped in to fill the gap, leaving many smallholders with no reliable access to seed.<sup>70</sup>

6.65 Initiatives to promote fertilizer use have usually encouraged cost-effective importing. Few developing countries have access to the raw materials to manufacture fertilizer, and even fewer have a domestic market big enough to support an efficient manufacturing facility. These initiatives have often sought to make fertilizer more

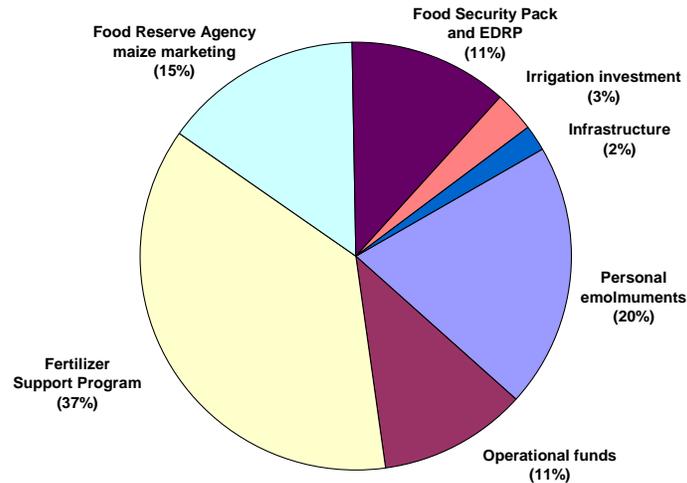
<sup>68</sup> For a review of initiatives to promote seed in Sub-Saharan Africa, see Minot and others (2006).

<sup>69</sup> For a review of initiatives to promote fertilizer in Sub-Saharan Africa, see Morris and others (2007).

<sup>70</sup> Tripp (2006).

affordable at the farm level,<sup>71</sup> commonly through subsidies, which are enjoying new popularity.<sup>72</sup> The subsidies remain controversial, however, in part because of their high cost. To cite a possibly extreme example, in Zambia 37 percent of the public budget for agriculture in 2005 was devoted to fertilizer subsidies (figure 6.3). Subsidies may also heighten inequality by benefiting mainly the larger farmers.<sup>73</sup>

**Figure 6.3 More than a third of Zambia's 2004/05 public budget for agriculture went to fertilizer subsidies**



Source: Jayne and others (2006).

6.66 There may be situations where fertilizer should be subsidized, but they need to be carefully identified (box 6.7). When used as part of a broader strategy that addresses binding constraints on supply and demand, well designed fertilizer subsidies can potentially play a useful role in helping to overcome temporary market failures. When used for this purpose, fertilizer subsidies should be “market smart,” contributing to the emergence of viable private sector-led input markets.<sup>74</sup> Market-smart subsidies should be carefully targeted to poor farmers to encourage incremental use of fertilizer by those who would otherwise not have used it. They should bring the market price of fertilizer closer to the true economic price to encourage more efficient use. They should stimulate new demand for fertilizer without displacing existing commercial sales. They should encourage competition in fertilizer distribution channels. And they should be time-bound, introduced for a limited period, with a clear schedule for phasing out when they’ve achieved their purpose. Use of market-smart fertilizer subsidies is sometimes justifiable, but the conditions for using them efficiently are demanding. Fertilizer subsidies used as a safety net measure in marginal production environments are rarely justifiable, because other instruments for providing income support or ensuring food security will almost always be more cost-effective.

<sup>71</sup> FAO (2005).

<sup>72</sup> IFDC (2003).

<sup>73</sup> Crawford, Jayne, and Kelly (2006).

<sup>74</sup> Borlang and Doveswell, 2007.

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**Box 6.7 When should fertilizer be subsidized?**

Fertilizer subsidy programs have tried to remedy low fertilizer use by small-scale farmers in Africa. Various benefits are cited in justifying the subsidies—economic (real productivity increases), environmental (reductions in land degradation), and social (poverty alleviation or emergency relief). Despite having some obvious drawbacks—high cost, difficult targeting, and crowding out commercial sales—fertilizer subsidies continue to have strong support from farmers and from politicians who view farmers as an important constituency.

Two questions should be addressed in considering whether subsidies are appropriate for promoting increased fertilizer use. First, can fertilizer subsidies bring economic benefits that exceed their costs? Second, are there circumstances when subsidies are justified to achieve social rather than economic goals?

**For efficiency**

Fertilizer subsidies can bring economic benefits to society in several ways:

- They can kickstart fertilizer markets by offsetting high initial distribution costs until the market expands, economies of scale are realized, and prices decline.
- They can stimulate adoption by encouraging farmers to use fertilizer and learn about its benefits, creating positive externalities for others.<sup>75,76</sup>
- They can overcome missing or imperfect credit or insurance markets for farmers that cause farmers to use suboptimal amounts of fertilizer.
- They can offset taxes or output price controls that make fertilizer financially unprofitable, as a second-best alternative to removal of taxes or price controls when this is not feasible.
- They can generate positive externalities associated with higher soil fertility—avoiding soil erosion, deforestation, and increased carbon emissions into the atmosphere.

In practice, it has been difficult to implement subsidies and avoid undesirable market and distributional effects. Still, the potential for net economic gains provides a rationale for their use, assuming also that the benefits from subsidies exceed the benefits that could potentially be generated through alternative public investments, such as those in rural roads, irrigation, or agricultural research and extension.

**For welfare**

Suppose that fertilizer subsidies do not meet the economic efficiency test—that is, it would not be economic to use fertilizer, even if input, output, finance, and risk markets were working well. Is there a rationale for using subsidies to achieve non-economic or social safety-net objectives, such as food security or emergency income support? This would require that fertilizer subsidies be the most cost-effective available option for achieving the desired social objective, compared with such alternatives as food aid, food for work, and cash transfers. This second test recognizes the importance of non-economic objectives, but it retains an emphasis on cost-effectiveness as a standard for selecting the means of achieving them.<sup>77</sup>

Consider a program to distribute free fertilizer to food-deficit farmers, with the goal of boosting their food production sufficiently to cover family consumption requirements. Such a program may not be

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<sup>75</sup> Foster and Rosenzweig (1995).

<sup>76</sup> Conley and Udry (2001).

<sup>77</sup> This principle or evaluation criterion, which reflects the case of potential acceptability, is discussed in Morris and others (2007), Chapter 7 and was advocated earlier by Gramlich (1990).

economically efficient, but as a “fertilizer aid” program it may under certain conditions offer a cheaper way to achieve household food sufficiency than direct distribution of food aid. Whether fertilizer aid is cheaper than food aid would depend on the relative costs for government of acquiring fertilizer and food and of delivering them to food-deficit households; the additional food crop output likely to be generated per dollar of fertilizer distributed to and applied by farmers, and other cost savings associated with fertilizer aid, such as avoiding of farm-to-market transport and handling costs incurred when farmers must sell a portion of their crop to repay fertilizer loans.<sup>78</sup>

As a means of addressing anticipated food shortages, the suitability of a fertilizer aid program relative to food aid or cash transfers also depends on how well food markets are working.<sup>79</sup> Food aid or fertilizer aid would be appropriate if food markets are working poorly. But cash transfers to enable household purchases of food may be more appropriate if food markets are working well, especially in marginal areas where food production payoffs to fertilizer use are risky and fertilizer aid may not be a good safety net.

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### ***What shows promise?***

6.67 Because public interventions in seed and fertilizer markets have so often failed, attention is turning to new approaches to establish sustainable private-sector-led input distribution systems. What can be done to overcome the weak demand and inadequate supply for seed and fertilizer?

6.68 On the demand side, efforts to encourage greater use of seed and fertilizer have often focused on strengthening the ability of farmers to acquire inputs. To stimulate market development, vouchers have been distributed rather than the inputs themselves. In Malawi, under a scheme known as “Inputs for Assets,” vouchers were distributed only to those who had participated in a public works project, providing some self-targeting since wealthier farmers are less likely to participate in building roads. Vouchers were redeemable with local agro-dealers, which strengthened effective demand for inputs and increased sales—and profits—of private distributors.<sup>80</sup> In an experimental pilot scheme in Kenya, fertilizer vouchers were sold to farmers at harvest time as a commitment device to ensure that funds were reserved for fertilizer rather than drawn away to meet other demands—with good results.<sup>81</sup> In Mali and Nigeria, matching grants were provided to producer organizations during an initial period for use in testing and learning about new technologies.<sup>82</sup>

6.69 On the supply side, the international research centers of CGIAR have promoted partnerships in eastern and southern Africa between public plant breeding programs and private seed producers. In West Africa Sasakawa Global 2000 has supported small-scale private seed producers by providing technical training, business advisory services, and access to credit. In Kenya, Malawi, and Uganda the Rockefeller Foundation has teamed with local NGOs to build networks of rural agro-dealers who sell seed and fertilizer and offer extension advice (box 6.8).<sup>83</sup> In Angola, Mozambique, and other countries where

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<sup>78</sup> Sachs (2003).

<sup>79</sup> Morris and others (2007).

<sup>80</sup> Kelly, Adesina, and Gordon (2003).

<sup>81</sup> Duflo, Kremer, and Robinson (2006).

<sup>82</sup> Van der Meer and Noordam (2004).

<sup>83</sup> Other initiatives to support entrepreneurial input distributors in Africa include Seeds of Development (<http://www.sodp.org/>) and African Agricultural Capital (<http://www.aac.co.ke/>).

farmers lost their seed stocks during civil conflicts, NGOs such as Seeds of Hope have sponsored seed fairs and seed exchanges to supplement emergency seed distribution.<sup>84</sup>

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**Box 6.8 Thriving rural input supply retailers as agro-dealers in Africa**

The Rockefeller Foundation has led the development of agricultural input supply pipelines in rural Kenya, Malawi, and Uganda. Working with global partners such as the International Fertilizer Development Center (IFDC) and local organizations, it has piloted:

- Training rural retailers to develop their technical, product, and business management skills. After being trained, the retailers become certified as agro-dealers.
- Linking certified agro-dealers to major agricultural input supply firms using partial credit guarantees that cover 50 percent of the default risk.
- Repackaging seed and fertilizer into small packs (as small as 1 kilogram for seeds and 2 kilograms for fertilizer) to increase the affordability for farmers.
- Organizing agro-dealers into “purchasing groups” to facilitate bulk purchasing from suppliers (the group members provide joint collateral to guarantee repayment).

These efforts to strengthen rural distribution networks are beginning to bear fruit. In Malawi a recent survey of rural markets showed that the majority of farmers now buy their inputs from local agro-dealers, not from the government-owned Agricultural Development and Marketing Corporation or from large commercial distributors in urban areas.

As the number of agro-dealers has expanded, the distances traveled by smallholder farmers in search of inputs have been drastically reduced in many districts. The range, volume, quality, and price of agricultural inputs supplied into rural areas have also improved significantly.

Meanwhile, the default rate on the credit guarantees was less than 1 percent in the first three years of the program. The low default rate is attributed to the high quality of the technical and business management training for the agro-dealers—and their use of collective action to ensure repayment. As a result of greater involvement in seed and fertilizer sales, agro-dealers have become important extension nodes, and several seed, fertilizer, and agro-chemical companies now use the agro-dealers to conduct demonstrations of new technologies.

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6.70 Another avenue for improving input supply systems is to strengthen the capacity of producer organizations to take responsibility for the final stages of distribution. For smallholders, purchasing inputs in bulk and organizing distribution through their own organizations is a way to compensate for inadequate private sector delivery. For input suppliers, dealing with producer organizations presents considerable advantages over dealing with geographically dispersed farmers who individually purchase only very small quantities of inputs. The success of producer organizations in Ethiopia taking over retail fertilizer distribution from government and parastatal companies shows how innovative institutional arrangements can improve performance.<sup>85</sup>

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<sup>84</sup> Bramel and Remington (2007).

<sup>85</sup> Byerlee and others (2006).

6.71 These and other innovative efforts to stimulate greater use of improved seed and fertilizer provide lessons about state and donor support to private-sector-led agricultural input markets. Progress in improving seed and fertilizer distribution systems will not be sustainable, however, unless there is strong effective demand for both inputs, assured only as long as investment in seed and fertilizer is profitable for farmers. That will be the case only if they have access to reliable markets for selling their products at remunerative prices. Building input markets must go hand in hand with building output markets and linking farmers to those markets.

### **Producer organizations for smallholder competitiveness**

6.72 Smallholders typically face high transaction costs and low bargaining power in factor and product markets. They have limited access to public services, and do not get their voices easily heard in policy forums. Yet, in a world increasingly dictated by the rules of globalization, competitiveness is the condition for survival. To overcome these constraints, smallholders increasingly engage in collective action by forming various types of producer organizations (chapter 3). These organizations have expanded rapidly in developing countries, and there are marked successes on these three fronts—markets, public services, and voice. But the world smallholders have to compete in has changed dramatically, putting new demands on their organizations.

#### ***Producer organizations are more prevalent***

6.73 Producer organizations mediate between producers and economic, institutional, and political actors outside the farming community.<sup>86</sup> They take on various legal forms according to national legislation, such as cooperatives, associations, and societies.<sup>87</sup> Their functions can be grouped in three categories:

- Commodity-specific organizations focusing on economic services and defending their members' interests in a particular commodity, such as cocoa, coffee, or cotton.
- Advocacy organizations to represent producers' interests, such as national producers' unions.
- Multipurpose organizations that respond to the diverse economic and social needs of their members, often in the absence of local governments or effective public services.

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<sup>86</sup> Mercoiret and Berthomé (1997).

<sup>87</sup> An association is a non-profit organization that enables members to collaborate for services, the exchange of information, and representation. A cooperative can engage in collective commercial activities such as buying inputs or selling members' products. Benefits are distributed to each member proportionately to his/her volume of transactions with the cooperative. Cooperatives benefit from a specific fiscal regime, distinct from that of enterprises, and are often tax-exempt.

6.74 Producer organizations are extraordinarily important in industrial country agriculture, which still largely relies on the family farm. In the European Union there are some 30,000 cooperatives with 9 million members, accounting for 50 percent of the market for inputs and 60 percent of that for agricultural produce.<sup>88</sup> In France 9 of 10 producers belong to at least one organization, with market shares of 60 percent for inputs, 57 percent for products, and 35 percent for processing.<sup>89</sup>

6.75 Taking stock of the role played by cooperatives in industrialized countries, many developing country governments initiated cooperative development programs in the 1960s, often to promote cash crop production and distribute subsidized credit and inputs. The cooperatives were largely government-controlled and staffed. So farmers considered them as an extended arm of public institutions to acquire inputs and credit, not as institutions owned by them. Political interference and elite capture resulted in poor performance and finally in the discredit of much of the cooperative movement.

6.76 This situation changed radically with political liberalization and structural adjustment in the 1980s. The first opened opportunities for producers to become active players through organizations of their own. The second led to disengagement of the state from many productive functions and services, leaving farmers exposed to extensive market failures without the security offered by price control systems. Contrary to expectation, the dismantling of parastatal agencies led to only limited entry of private providers, mostly in high potential areas. Smallholders thus turned to producer organizations to compensate for the withdrawal of state services and the lack of private alternatives.

6.77 As seen in chapter 3, producer organizations have spread rapidly. Between 1982 and 2002 the number of villages with producer organizations rose from 8 to 65 percent in Senegal and from 21 to 91 percent in Burkina Faso.<sup>90</sup> In Ecuador there were nearly 3,000 grassroots organizations in 1993, but by 2003, FENOCIN (Federación Nacional de Organizaciones Campesinas, Indígenas y Negras) alone claimed 1,300 grassroots member organizations bringing together 200,000 families dispersed over 18 provinces.<sup>91</sup>

6.78 Producers have also begun organizing at the subregional levels, accompanying the emergence of subregional economic entities. In West Africa, national federations of producer organizations have set up the Network of Producer Organizations of West Africa (ROPPA) to interface with UEMOA.<sup>92</sup> In Latin America, subregional organizations are also emerging, such as COPROFAM (Coordinadora de las

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<sup>88</sup> In the Netherlands in 2002, cooperatives supplied farmers with 54 percent of the animal feed and 80 percent of the livestock genetic resources they used. In the same year Dutch cooperatives marketed 85 percent of dairy, 100 percent of starch potatoes, and 51 percent of fruits and vegetables produced (Netherlands National Cooperative Council (2002)).

<sup>89</sup> Mauget and Koulytchizky (2003).

<sup>90</sup> Bernard and others (2006).

<sup>91</sup> Santana (1997).

<sup>92</sup> Mercoiret (2006).

Organizaciones de Productores del MERCOSUR) to interact with MERCOSUR.<sup>93</sup> The International Federation of Agricultural Producers recently opened its membership to producer organizations from developing countries (box 6.9). International representation allows organizations to participate to consultations with international bodies.

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**Box 6.9 Producer organizations with international membership**

The International Federation of Agricultural Producers (IFAP) was founded in 1946. In 2000 its Millennium Development Cooperation Initiative opened membership to producer organizations from developing countries, setting up a farmer to farmer capacity-building program under which producer organizations in industrial countries strengthen the organizations of their colleagues in developing countries. In 2006 IFAP represents 115 national organizations from 80 countries with 500 million members, and developing countries now form the majority of IFAP membership. IFAP is the only world forum for farmers from industrialized and developing countries to exchange concerns and set common priorities. It has general consultative status with the Economic and Social Council of the United Nations and the CGIAR (<http://www.ifap.org>).

Via Campesina, an international network of 92 federations or unions, was created in 1992 to coordinate organizations of small and middle sized producers, agricultural workers, rural women producers, and indigenous communities from Asia, America, Africa, and Europe. Via Campesina aims at influencing decision-making by governments and multilateral organizations in order to guide the economic and agricultural policies that affect small and medium-scale producers, strengthen women's participation, and formulate proposals in key areas such as agrarian reform, food sovereignty, trade, research, genetic resources, biodiversity, the environment, and gender. (<http://www.viacampesina.org>)

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***Producer organizations can contribute to smallholder competitiveness, but they must address new challenges***

6.79 Producer organizations, as elements of smallholders' social capital, engage in a broad array of activities in support of competitiveness and welfare. They negotiate trade and domestic agricultural policy (chapter 4), improve access to output markets (chapter 5) and input markets (above), support the financing and adopting of technological innovations (chapter 7), and manage common property resources (chapter 8). Services of efficient producer organizations have enabled smallholders to improve their productivity, take advantage of emerging market opportunities, and diversify into higher value products—all increasing incomes for their members. A remarkable example is the Indian Dairy Cooperatives Network, which in 2005, with 1.1 million village cooperatives and 12.3 million members, accounted for 22 percent of the milk produced in India. Sixty percent of the cooperative members are landless, very small holders, or women (25 percent of the members). However, many cooperative dairy federations are not commercially viable and only survive because of state government subsidies (e.g., in Maharashtra and Andhra Pradesh).

6.80 Producer organizations, though expanding rapidly in number and function, face a rapidly changing world, with new demands on managerial capacity, rising conflicts

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<sup>93</sup> Other sub-regional federations are the Southern African Confederation of Agricultural Unions (SACAU), the Regional Platform of Central African Producer Organizations (PROPAC), the Eastern African Farmer Federation (EAFF), and the Association of African Cotton Producers (APROCA).

between solidarity and competitiveness, more diverse constituencies, and greater distance between global negotiations and local representation.

6.81 Globalization and integrated supply chains challenge the capacity of producer organizations in providing market access to their members. Managers of producer organizations must deal with more sophisticated national and international supply chains, with stringent and changing requirements (chapter 5). They must orchestrate members' supplies to meet the demands of these value chains—achieving scale and timing in delivery, satisfying sanitary and phytosanitary standards, meeting the specifications demanded by agro-processors and supermarkets, using the services of qualified professionals, and much more. As case studies have shown, producer organizations must become highly effective professional organizations to succeed in these fiercely competitive markets.<sup>94</sup>

6.82 Many producer organizations operate under traditional rural societies' norms and values of social inclusion and solidarity, which may be incompatible with the requirements of professional, business-oriented organizations. In the name of solidarity, they may subsidize the under-performance of some members at the expense of others, thereby failing to reward efficiency and innovation. And they have difficulty in excluding a member who does not comply with agreements and obligations, nor can they apply strict selection criteria for entering members. This cultural clash jeopardizes the performance of producer organizations operating in high-value chains with stringent efficiency requirements (Chapter 5). An analysis of 410 producer organizations in Chile shows that those that succeed have developed a system of rules that: (i) allocate costs and benefits to each member on the basis of his or her farming performance and market conditions; (ii) enforce agreements between the organization and the individual; and (iii) reduce the transaction costs of negotiating, monitoring, and enforcing agreements between the organization and its members.<sup>95</sup> Another problem that POs face on their way to becoming business-oriented professional organizations is government interference in their internal decision-making processes, especially in the case of cooperatives.

6.83 As seen in chapter 3, producers are becoming increasingly differentiated and heterogeneous under the pressure of market competition. This creates a third challenge for producer organizations: how to represent the interests of a diverse membership, not only those of their leaders who tend to be older males and larger scale farmers. Yet, as constituencies change, organizations have to ensure that the interests of smallholders, women, and young producers are fairly represented, and their needs adequately served.

6.84 Producer organizations are now more present at the negotiating table where global issues are discussed. But for organization leaders to have their voices heard in these forums presents a fourth challenge. Participating in high-level technical discussions, such as global trade negotiations, requires that organization leaders be assisted by professional resource persons with both technical and communication skills.<sup>96</sup> At the

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<sup>94</sup> Stockbridge (2003), Berdegúe (2001).

<sup>95</sup> Berdegúe (2001).

<sup>96</sup> Brook and McGee (2004).

same time, international federations or networks of organizations have to remain true to national and local members' interests. A key instrument for this is sustaining consultations at the local, regional, and national levels. But participation in high level discussions and maintaining open channels of communication with their membership requires resources that organizations may not have.

***What can the state and donors do to support producer organizations as instruments for agricultural development?***

6.85 Governments and donors recognize the importance of investing in social capital as a complement to investing in other forms of capital.<sup>97,98</sup> To help smallholders benefit from opportunities and mitigate the threats of globalization, donors<sup>99</sup> have been supporting producer organizations, often through specialized NGOs.<sup>100</sup> Producer organizations in industrialized countries have sometimes provided support to organizations in developing countries through a service NGO of their own financed by a production levy.<sup>101</sup>

*Building capacity and reforming cooperatives.* Donors are supporting capacity-building of producer organizations in a wide variety of areas that range from all aspects of management, to market intelligence, technical aspects of production and resource conservation, input procurement and distribution, sanitary and phytosanitary standards, and policy analysis, dialogue, and negotiations. Donors have also been involved in the reforms of the cooperatives, through strengthening leaders' managerial capacities, putting in place transparent financial management systems, and promoting a change in the legal and regulatory environment that would allow cooperatives' autonomy. This is a difficult process that requires confronting powerful vested individual and political interests in the current leadership structure.<sup>102</sup>

*Empowering the more marginal members.* Donors also help producer organizations put in place more transparent decision making mechanisms as well as information and communication systems, using various media and information technology instruments to reach isolated and marginal members. Training funds are earmarked for all members, especially women, and not for leaders' only.

*Enhancing participation in consultative processes.* Governments need to organize consultative policy processes with the many stakeholders in agriculture (including

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<sup>97</sup> Cernea (1987).

<sup>98</sup> The value of social capital has been well documented in the case of water management projects in India and Sri Lanka, which had invested in water user associations. Project outcomes directly attributable to collective action included increasing the efficiency of water management, changing cultivation decisions and extending the area cultivated (Uphoff and Wijayaratra (2000)). The authors estimate that half of the increase in productivity is attributable to farmer collective action while the projects invested only 5 to 10 percent in supporting water user associations.

<sup>99</sup> Among others, USAID, AFD, GTZ, DANIDA, and DFID have been involved in supporting RPOs.

<sup>100</sup> ACDI-VOCA and CARE for example in the case of USAID.

<sup>101</sup> For example, CLUSA for the American cooperatives, AGRITERRA for the Dutch cooperatives, or AFDI and FERT in France.

<sup>102</sup> Hussi and others (1993). The USAID financed and ACDI\_VOCA implemented Agricultural Cooperative Ethiopia project is a good example of such support.

producers) to negotiate agricultural policy design and implementation. Governments and donors can enhance the effectiveness of producer organizations' participation in these consultations by helping them gain equal access to information and providing them with funds to recruit expertise to prepare their inputs into the policy dialogue and seek professional advice.

6.86 *Most perplexing is "how" to provide support.* Investing in social capital is not easy. Organization-strengthening is "more an organic than a mechanical process ... (that) is not predictable, takes time, and does not obviously move money in large amounts."<sup>103</sup> To be effective, support should be committed for the long term but with a clear phasing-out strategy to prevent dependency. Indeed, donor and government support may be a double-edged sword, creating dependency or empowering. But there is no blue print for doing it. One approach that has proven effective is the use of demand-driven funds with producer organizations in the driver's seat for activity selection (box 6.10).

### **Capitalizing on synergies between tradition and modernity**

6.87 Informal markets for finance and factors of production, and traditional organizations in support of smallholders, are built on trust and community norms. Replacing them with more formal structures allows for the scale and scope that a growing sector and competitiveness in a globalized economy require. But this entails some loss of flexibility and incurs costs of enforcement and sharing of information.<sup>104</sup> Using innovative approaches to credit and insurance can promote market development that merges the advantages of informal systems with a wider more integrated market. Building a modern legal system of land legislation that accepts the information embodied in traditional systems can encourage investments while ensuring equity. And, using modern management principles allows producer organizations to be more effective in supporting the competitiveness of their members and in representing their interests. Capitalizing on the best that tradition and modernity have to offer in constructing new agrarian institutions for a market-driven agriculture is a promising road ahead for smallholder competitiveness.

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#### **Box 6.10 Producer empowerment at the regional and grassroots levels in Senegal**

The objective of the Agricultural Services and Producer Organizations Project was to establish decentralized services responsive and accountable to producers, and to empower producer organizations. Producer organizations were full partners for project elaboration, negotiation, and implementation, at national, regional, and local levels.

The design of producer organization support was crafted so as to empower members. With support from the project, the Conseil National de Concertation et de Coopération des Ruraux (CNCR) established rural consultative forums made up of producer organization representatives at the communal and regional levels, representing some 50,000 producers. The project enabled the CNCR to set up a demand-driven capacity building fund that allocates resources to capacity-building micro-projects, prepared by grassroots organizations. The micro-projects are selected by the rural consultative forum according to a manual of procedures designed with them that sets the criteria and methodology for selecting the micro-projects. Thus producer organizations define which activities to finance, determine the timing and pace of

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<sup>103</sup> Esman and Uphoff (1984).

<sup>104</sup> Fafchamps (2006).

implementation, and select their service providers from a registry of regularly audited professionals. According to a beneficiary assessment undertaken in 2004, more than 80 percent of producer organizations' individual members were satisfied with services delivered and activities undertaken with funding from the capacity building fund.

*Source:* World Bank (2006).

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## **Chapter 7 Innovating through science and technology**

7.1 Today's challenges to technological innovation are probably even more daunting than those before the Green Revolution. The land frontier is closing. The scarcity of water is acute. And demands on the new agriculture, including biofuels, are growing. All point to technological innovation as the main source of growth.

7.2 The demands on innovation are thus changing. With globalization and new supply chains, farmers and countries need to innovate to maintain their competitiveness. And with climate change, they will have to gradually adapt. And all regions, especially the risky rainfed systems of Sub-Saharan Africa, want more sustainable technologies that increase not only productivity but the stability, resilience, and equitability of production systems.<sup>1</sup>

7.3 Science is also changing rapidly. Revolutionary advances in the biological and information sciences have the potential to enhance the competitiveness of market-oriented smallholders and overcome drought and disease in production systems important to the poor. Consider the win-win-win of transgenic disease-resistant cotton: it has reduced yield losses, increased farmer profits, and greatly reduced pesticide use. But with investments in biotechnology driven by large private multinationals interested in commercial agriculture, the challenge is to safely harness technology for the needs of the poor.

7.4 The institutional setting for technological innovation is also changing rapidly as well, now more institutionally complex, involving plural systems and multiple sources of innovation. The new world of agriculture is opening space for a wider range of actors in innovation, including farmers, civil society, and the private sector. Linking technological progress with institutional innovations to engage this diverse set of actors is at the heart of future productivity growth.

7.5 All these changes focus attention on emerging innovation systems. With the development of markets, innovation becomes less driven by science (supply) and more by markets and users (demand). New demand-driven approaches stress the power of users, especially farmers and increasingly consumers and interests outside of conventional agriculture, in setting the research agenda—and the organization of research in a value chain from “farm to plate.” It has long been recognized that innovation is not a linear process, and that the feedback linkages between farmers and agricultural research, extension and education institutions matter. However, innovation for the new agriculture requires feedback linkages, learning and collective action among a much broader set of actors from the public sector, the private sector and civil society.

7.6 This chapter looks at the recent record of science and technological innovation through three perspectives.

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<sup>1</sup> Conway (1999).

- The recent impacts and emerging challenges of biological and management technologies.
- The investments in R&D to generate new technologies, paying particular attention to a growing divide between industrial and developing countries, and within developing countries.
- The institutional innovations that make investments in innovation more efficient and effective through collective action and farmers' involvement.

7.7 Its main conclusion: Investments in agricultural R&D have accelerated growth and reduced poverty in much of the developing world. But global and national market failures have led to serious underinvestment in R&D and in related systems to use technologies better, especially in the agriculture-based economies of Africa. Increasing public and private investment in R&D and strengthening institutions and partnerships with the private sector, farmers, and civil society are now essential to bridge the “knowledge divides,” strengthen user demand for R&D, increase competitiveness, and ensure that the poor participate and benefit. These investments will be even more important in the future, with rapidly changing markets, growing resource scarcity, and greater uncertainty from multiple threats.

### **Biological technologies have been enormously successful—but not everywhere**

7.8 Agriculture is a biological process—so technical change in agriculture is different from that in other sectors. The 1950s and 1960s showed that biological technologies, such as crop and animal breeds, did not travel well from the temperate North to the tropical South. Global and national research has had its highest payoffs and pro-poor impacts in breeding improved varieties adapted to subtropical and tropical conditions. Rapid advances in the biological and informational sciences promise even greater impacts that have yet to be tapped for the benefit of the poor.

### ***Slow magic; the continuing spread of modern varieties***

7.9 Since the 1960s scientific plant breeding that developed modern varieties suited for smallholders in sub-tropical and tropical areas—the Green Revolution—has been one of the major agricultural success stories of development (figure 7.1).<sup>2</sup> Initially spearheaded by semi-dwarf varieties of rice and wheat, and improved varieties of maize from international agricultural research centers of the Consultative Group on International Agricultural Research (CGIAR), public breeding programs in developing countries have released over 8,000 improved crop varieties over the past 40 years.<sup>3</sup> Private seed companies have also become significant sources of improved hybrid varieties for smallholders for some crops, especially maize.

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<sup>2</sup> Pardey and Beintema (2001).

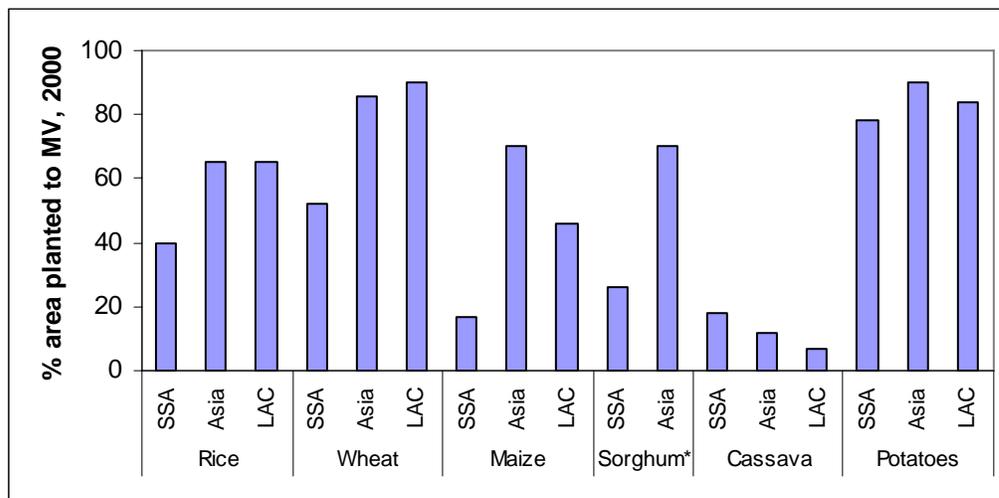
<sup>3</sup> Evenson and Gollin (2003).

7.10 The contribution of modern varieties to yield growth has been greater in the past two decades than in the early Green Revolution decades. In the 1980s and 1990s their spread is estimated to have accounted for 50 percent of yield growth, compared with 21 percent in the preceding two decades.<sup>4</sup> Poor consumers have been the main beneficiaries. Without those gains cereal prices would have been 18 to 21 percent higher in 2000, caloric availability per capita in developing countries would have been between 4-7 percent lower, and 13-15 million more children would have been classified as malnourished.<sup>5</sup>

7.11 Steady genetic improvement in newer generations of varieties and their spread beyond irrigated areas and rainfed areas with good water control have contributed to continued yield gains. For example, modern varieties are now planted on 80 percent of the cereal area in India, only about half of it irrigated.<sup>6</sup> Newer generations of modern wheat varieties have provided an annual increase in yields of 1 percent, and globally the area planted in them has more than doubled since 1981, largely in rainfed areas.<sup>7</sup>

7.12 Not all farmers have been touched by this “slow magic.” Sub-Saharan Africa has seen very incomplete adoption, with many countries having almost no area under modern varieties. Why the limited scope of the Green Revolution in Sub-Saharan Africa? The broader mix of crops grown in the region, the agro-ecological complexities and heterogeneity of the region, the lack of an enabling environment in infrastructure, markets, and supporting institutions, and the gender differences in labor responsibility and access to assets—all have contributed (chapter 2).<sup>8</sup>

**Figure 7.1 The green revolution—areas planted to modern varieties, 2000, by region**



Note: SSA is Sub-Saharan Africa, LAC is Latin America and the Caribbean.

<sup>4</sup> Evenson and Gollin (2003). Other components of yield growth have been fertilizer, irrigation and other management practices.

<sup>5</sup> Evenson and Rosegrant (2003).

<sup>6</sup> See website at <http://www.indiastat.com>.

<sup>7</sup> Byerlee (1996), Heisey, Lantican, and Dubin (2002), Reynolds and Borlaug (2006).

<sup>8</sup> InterAcademy Council (2004), Quisumbing (1996)

Source: Evenson (2003).

7.13 Recent experience is more promising. After a late start, modern varieties are finally making an impact on some food staples in Sub-Saharan African, largely using products from the CGIAR (figure 7.1).

- *Maize*. Improved maize varieties and hybrids were widely adopted by smallholders in many African countries in the 1980s, reaching almost universal coverage in a few countries, such as Zimbabwe. But much of this was underwritten by heavy subsidies for inputs and prices, subsidies that were unsustainable.<sup>9</sup> Still, a substantial share of the maize area is planted to improved varieties and hybrids in Kenya (80%), Malawi (30%), Tanzania (92%), Zambia (49%) and Zimbabwe (73%).<sup>10</sup>
- *Cassava*. Improved disease-resistant strains of cassava have been widely adopted, reaching more than half the cassava area in Nigeria, the world's largest producer. Cassava has been the fastest growing food staple in Africa, and since it is a staple of the poor, the impacts are especially pro-poor.<sup>11</sup>
- *Rice*. The New Rice for Africa—combining the resistance of African rice to weeds, pests, diseases, and water stress with the high-yielding potential of Asian rice—was released to farmers in 1996. Increasing yields under low input conditions, it is cultivated on about 200,000 hectares in Africa.<sup>12</sup> But adoption rates are still modest due to insufficient dissemination, training, and extension.<sup>13</sup>
- *Beans*. In Eastern, Central, and Southern Africa nearly 10 million farmers, mostly women, are reportedly growing and consuming new bean varieties (*Phaseolus vulgaris*), many with multiple stress resistance.<sup>14</sup>

7.14 Another promising development in low and uncertain rainfall regions of marginal production potential is the use of participatory varietal selection and breeding approaches that involve farmers in the early stages of plant breeding. Decentralized and participatory approaches allow farmers to select, adapt, and adopt technologies to local soil and rainfall patterns and to social and economic conditions, using indigenous knowledge as well. For example, between 1997 and 2004, the Barley Research Program of the International Center for Agricultural Research in Dry Areas in Syria transformed its operation from 8,000 plots planted and evaluated on the research station to 8,000 plots planted in farmers' fields and evaluated by farmers.<sup>15</sup> Participatory plant breeding speeds varietal

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<sup>9</sup> Byerlee and Eicher (1997).

<sup>10</sup> CIMMYT, pers. com.

<sup>11</sup> Falusi and Afolami (2000), Nweke, Spencer, and Lynman (2002)

<sup>12</sup> Kijima, Sserunkuuma, and Otsuka (2006), WARDA, pers. com.

<sup>13</sup> Africa Rice Center (2004).

<sup>14</sup> International Center for Tropical Agriculture (CIAT) (2006).

<sup>15</sup> Joshi and others (1996).

development and dissemination to 5-7 years, half the 10-15 years in a conventional plant breeding program.<sup>16</sup>

7.15 In very poor rainfed rice-growing areas of South Asia that the Green Revolution passed by, participatory plant breeding is now paying off with strong early adoption of farmer-selected varieties that provide 40 percent higher yields in farmers' fields.<sup>17</sup> The approach needs to be more widely tested in the heterogeneous rainfed environments of Africa, where involving farmers, especially women farmers, in selecting varieties on research stations has shown early successes for beans, maize, and rice.<sup>18</sup> The cost-effectiveness of the approach for wider use also needs to be evaluated, and legislation for seed and plant varietal rights has to be adapted to accommodate the non-uniformity of varieties developed by the approach.<sup>19</sup>

7.16 But modern varieties alone will not produce a Green Revolution in less favored areas, since low soil fertility and lack of water control are major constraints that are difficult to overcome via genetic enhancement alone. In the language of crop scientists, both the G (genotype) and the E (crop environment) have to change to exploit the type of positive G x E interactions that characterize a Green Revolution (below).

### ***Yield risk and the Red Queen***

7.17 Yield stability is important for all farmers, especially for semi-subsistence farmers whose food security and livelihood are vulnerable to outbreaks of pests and diseases and to droughts and other stresses. And modern varieties can make yields more stable. A recent study concluded that the variability of cereal yields as measured by the coefficient of variation around trend over the past 40 years has declined in developing countries, a decline that is statistically associated with the spread of modern varieties even after controlling for more irrigation and other inputs.<sup>20</sup> The annual benefits from better yield stability in maize and wheat alone are estimated at about \$300 million.

7.18 Yield stability of modern varieties largely reflects long-standing efforts in breeding for disease and pest resistance. Even when modern varieties are bred to resist a disease, they must be periodically replaced to insure against disease outbreaks from new pathogens. This "maintenance research" is best described by the Red Queen in Alice in Wonderland: "*Now here, you see, it takes all the running you can do to keep in the same place.*"<sup>21</sup> A third to a half of R&D investments in crop breeding may be for maintenance.<sup>22,23</sup>

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<sup>16</sup> Walker (2007).

<sup>17</sup> Joshi and others (1996), Walker (2007).

<sup>18</sup> Sperling, Loevinsohn, and Ntabomvura (1993), Walker (2007).

<sup>19</sup> Almekinder and Hardon (2007)

<sup>20</sup> Gollin (2006)

<sup>21</sup> Dalrymple (2004), Blackeslee (1987).

<sup>22</sup> Byerlee (1996), Townsend and Thirtle (2001).

<sup>23</sup> Maintenance research is also essential for the productivity of livestock. In South Africa, cattle diseases losses are closely related to expenditures on livestock health. Previous studies that ignored this maintenance

7.19 Underinvesting in maintenance research can lead to devastating losses that threaten local food supplies and sometimes have global significance. Consider the dramatic recent emergence of Ug99, a new race of stem rust (*Puccinia graminis tritici*) in wheat, the world's second most important food staple. Stem rust is catastrophic because of its ability to cause an almost complete loss of crops over wide areas. Ug99, after first appearing in 1999 in Uganda, is now widespread in wheat-growing areas of Kenya and Ethiopia, and in 2007 it was found in Yemen. Based on previous experience it is expected to be carried by the wind through the Middle East to wheat-growing areas of South Asia and possibly to Europe and the Americas, with potential devastating losses in some of the world's breadbaskets.<sup>24</sup> Its last major outbreak in the United States in 1953 and 1954 caused \$3 billion in losses in today's dollars.<sup>25</sup> Through a new international effort, plant breeders and pathologists should be able to avoid a global epidemic by screening for resistant genotypes and getting them into farmers' fields.

7.20 Farmers who use traditional varieties are also vulnerable to random outbreaks of disease, as with the recent outbreak of bacterial wilt (Banana *Xanthomonas* wilt) in East Africa. The disease threatens the livelihoods of millions of people who depend on bananas in the Great Lakes Region—an area that boasts the world's highest per capita consumption of banana.<sup>26</sup> In Uganda, where bananas are the staple, the potential national loss is estimated at \$360 million a year.<sup>27</sup> A genetically engineered variety with resistance to the disease is a breakthrough, but applying it depends on Uganda's putting biosafety regulations in place (focus F).<sup>28</sup> These recurring crises are a wake-up call to the need to develop appropriate maintenance research strategies together with global coordination and financing.<sup>29,30</sup>

7.21 Progress in developing varieties that perform well under drought, heat, and salinity stresses has been slower than for disease and pest resistance. CIMMYT, for example, after more than 30 years of research to produce drought-tolerant maize hybrids is now seeing results in Eastern and Southern Africa. Evaluated against other hybrids, they have yielded 20 percent more on average under drought conditions.<sup>31</sup> New varieties of rice that survive flooding have also recently been identified.<sup>32</sup> Advances in drought and flood tolerance will be especially important to adapt to climate change.

7.22 But large areas of major food crops are now planted each year in relatively few modern varieties, and genetic uniformity can make crops vulnerable to major yield losses from changes in pests, diseases, and climate. There is some evidence that genetic

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effect found low returns to livestock improvement in South Africa. But when maintenance effects are accounted for, the returns on livestock research are about 40 percent.

<sup>24</sup> Stokstad (2007).

<sup>25</sup> Long and Hughes (2001).

<sup>26</sup> See <http://www.promusa.org>.

<sup>27</sup> Kamuze (2004).

<sup>28</sup> Karamura and others (2006), Edmeades (personal communication).

<sup>29</sup> Expert Panel on the Stem Rust Outbreak in Eastern Africa (EPSROEA) (2005), Singh and others (2005).

<sup>30</sup> Townsend and Thirtle (2001).

<sup>31</sup> International Maize and Wheat Improvement Center (CIMMYT) (2006).

<sup>32</sup> Xu and others (2006).

uniformity increases yield risk, even though it can also produce higher yields.<sup>33</sup> In recent decades the world has largely avoided major disasters from genetic uniformity, in part due to frequent turnover of varieties that bring new sources of resistance. Even so, wider conservation and use of genetic resources is needed (chapter 10).

### ***Beyond crops—genetic improvement of livestock and fish***

7.23 Advances in animal and fish genetics combined with improved animal health and feeding have been the basis of the livestock revolution in developing countries (chapter 2). Improved pig and poultry breeds have spilled over through private direct transfers from the North..<sup>34</sup> These gains show up in livestock productivity. Over 1980-2005 in the developing world, the annual off-take from a flock of chickens with a total live weight of 1,000 kilograms increased from 1,290 kilograms to 1,990 kilograms—and that of pigs from 140 to 330 kilograms live weight.<sup>35</sup>

7.24 The cross-breeding of dairy cows with exotic breeds has improved the livelihoods of smallholder farmers in high potential areas in the tropics. About 100 million cattle and pigs are bred annually in the developing world using artificial insemination.<sup>36</sup> Thanks largely to artificial insemination, about 1.8 million small-scale farmers in the highlands of East Africa draw a significant part of their livelihood from genetically improved dairy cattle.<sup>37</sup> Gains in milk yields have been significant in many countries.

7.25 Similarly for fish culture, genetically improved Tilapia is changing aquaculture into one of the fastest growing sectors in Asian agriculture. In 2003 improved strains from a single project—genetic improvement of farmed tilapia (GIFT)—accounted for 68 percent of the total tilapia “seed” produced in the Philippines, 46 percent in Thailand, and 17 percent in Vietnam. Lower production costs per kilogram of fish, high survival rates, higher average weight per fish, and yields 9 to 54 percent higher than existing strains explain the fast uptake of GIFT-derived strains.<sup>38</sup>

7.26 Even so, genetic improvement in animals and fish has been constrained by delivery systems. Livestock breeding services in much of the developing world are still generally subsidized, crowding out the private sector. More research to reduce the costs of these technologies, and policy and institutional reforms to ensure efficient delivery, will enable the developing world to capture the full benefits of these promising technologies.

### ***A biotechnology revolution in the making?***

7.27 Agricultural biotechnology has the potential for huge impacts on many facets of agriculture—crop and animal productivity, yield stability, environmental sustainability,

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<sup>33</sup> Smale and Drucker (Forthcoming).

<sup>34</sup> Narrod and Pray (2001).

<sup>35</sup> Steinfeld and others (2006).

<sup>36</sup> Thibier and Wagner (2002).

<sup>37</sup> Leksmono and others (2006).

<sup>38</sup> Dey and others (2000), Asian Development Bank (2005).

and consumer traits important to the poor. The first-generation biotechnologies include plant tissue culture for micropropagation and production of virus-free planting materials, molecular diagnostics of crop and livestock diseases, and embryo transfer in livestock. Fairly cheap and easily applied, they have already been adopted in many developing countries. For instance, micropropagation of disease-free banana has been adopted in Kenya,<sup>39</sup> and advanced biotechnology-based diagnostic tests helped eradicate rinderpest virus in cattle (chapter 10).<sup>40</sup>

7.28 The second generation of biotechnologies based on molecular biology uses new information technologies to provide genomic information on genes important for a particular trait. This allows the development of molecular markers to help select improved lines in conventional breeding (called marker-assisted selection).<sup>41</sup> Such markers are “speeding the breeding,” leading to downy mildew-resistant millet in India,<sup>42</sup> cattle with tolerance to African sleeping sickness,<sup>43</sup> and bacterial leaf blight resistant rice in the Philippines.<sup>44,45</sup> As the costs of marker-assisted selection continues to fall, it is likely to become a standard part of the plant breeder’s toolkit, substantially improving the efficiency of conventional breeding.

7.29 The most controversial of the modern biotechnologies are the transgenics, or genetically modified organisms, commonly known as GMOs (see focus F). Transgenic technology is a tool for “precision breeding,” transferring a gene or set of genes conveying specific traits within or across species. In the developing world, about 9 million farmers mainly in China and India, have already adopted transgenic Bt cotton for insect resistance. It has already reduced yield losses due to insects, increased farmer’s profits, and significantly reduced pesticide use (see focus F). Transgenic technology remains controversial, however, owing to its perceived and potential environmental and health risks.

7.30 Biotechnology thus has great promise, but current investments are concentrated largely in the private sector, driven by commercial interests and are not focused on the needs of the poor. That is why it is so urgent to increase *public* investments in pro-poor traits and crops at international and national levels—and to improve the capacity and transparency to regulate these technologies. Unless the benefits of biotechnology for development are demonstrated and articulated forcefully, and separated from the political polarization in developed country markets, there is a great risk that the opportunity will be missed to apply these technologies to benefit the poor in developing countries (focus F).

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<sup>39</sup> FAO (2004).

<sup>40</sup> FAO (2004).

<sup>41</sup> Dwivedi and others (2007).

<sup>42</sup> McGaw, Witcombe, and Hash (1997).

<sup>43</sup> Gibson (2002).

<sup>44</sup> Pablico (2006).

<sup>45</sup> Africa Rice Center (2006).

### **Management and systems technologies are needed to complement genetic improvement**

7.31 Much R&D is focused on improving the management of crop, livestock, and natural resource management systems. The Consultative Group on International Agricultural Research now invests about 35 percent of its resources on sustainable production systems, twice the 18 percent on genetic improvement.<sup>46</sup> Much of this work has focused on soil and water management and agro-ecological systems that exploit biological and ecological processes to minimize the use of non-renewable inputs, especially agricultural chemicals.<sup>47</sup> Examples include conservation tillage, improved fallows, green manure cover crops, soil conservation technologies, improvements in soil organic matter, and pest control using biodiversity more than pesticides.<sup>48</sup>

7.32 One of the most dramatic technological revolutions in the developing world over the past two decades has been conservation or zero-tillage, which minimizes or eliminates tillage and maintains crop residues as ground cover. Conservation tillage, has many advantages over conventional tillage, increasing profitability from savings in labor and energy, conserving soil, and increasing tolerance to drought. However, it makes control of weeds, pests and diseases more complex, and usually requires use of herbicides.

7.33 In Latin America's Southern Cone (Argentina, Bolivia, Brazil, Paraguay and Uruguay), conservation tillage is used on more than 41 million hectares (about 43% of the arable land area).<sup>49</sup> Originally adopted by large and mid-sized farmers, there has been later adaptation and wide adoption by small farmers in southern Brazil. Networks of researchers, input suppliers, chemical companies, and farmers have used innovative research methods (participatory research) and formal and informal interactions to integrate various parts of the technology (rotations, seeds, chemicals, and machinery) and adapt them to local conditions. The approach has also been adopted by an estimated 100,000 smallholders in Ghana in the past decade. And in irrigated systems it is now estimated to be used on over 800,000 hectares on wheat-rice systems of the Indo-Gangetic Plain (box 7.1).

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#### **Box 7.1 When zero means plenty: the benefits of zero-tillage in South Asia's rice-wheat systems**

South Asia's rice-wheat systems, the bedrock of food security, are in trouble. Long-term experiments show that crop yields are stagnating and that soil and water quality are in decline. In response, the Rice-Wheat Consortium of the Indo-Gangetic Plains of South Asia—a network of international scientists, national scientists, extension, private machinery manufacturers, and NGOs—has developed and promoted zero-tillage farming.

Although zero-tillage is part of a much broader farm management system that involves many agricultural practices, a key part of the system promoted by the Consortium is planting wheat immediately after the rice without tillage so that the wheat seedlings germinate using the residual moisture from the previous rice

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<sup>46</sup> World Bank (2004)

<sup>47</sup> Pretty (2006)

<sup>48</sup> Pretty (2006)

<sup>49</sup> See <http://www.rolf-derpsch.com/siembradirecta.htm>.

crop. A notable aspect of the approach has been to work with local machinery manufacturers and farmers to adapt drills to local conditions.

Zero-tillage farming increases wheat yields and reduces production costs by up to 10 percent. It reduces water use by about 1 million liters per hectare (a saving of 20–35 percent). It improves soil structure, fertility, and biological properties and reduces the incidence of weeds and some other pests. Zero-tillage with wheat succeeding rice is now the most widely adopted resource-conserving technology in the Indo-Gangetic Plains, especially in India with some 0.8 million ha planted using the method. Research on zero-tillage on rice-wheat systems in India is estimated to have a rate of return of 57 percent, based on an investment of \$3.5m.<sup>50</sup>

Further work must consider the fact that women contribute more than half the labor in the rice-wheat system, especially for livestock management. This has important implications for involving women in seed selection and fodder management practices for the system.

Source: Malik, Yadav, and Singh (2005), Paris (2003)

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7.34 *Legumes*. Another input-saving and resource-conserving technology is introducing or improving legumes in farming systems to provide multiple benefits, most notably the fixing of nitrogen and reducing the need for chemical fertilizer, especially if the legume is inoculated with nitrogen-fixing *Rhizobium*. Much of the yield gain in Australian cereal production over the past 60 years comes from rotation systems that include legumes. In Sub-Saharan Africa fast-growing “fertilizer” trees such as *Gliricidia*, *Sesbania* and *Tephrosia* have improved soil fertility, soil aggregation, water infiltration, and holding capacity. Other benefits include reduced soil erosion and the production of fuelwood and livestock fodder (box 7.2).<sup>51</sup>

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#### **Box 7.2 Using legumes to improve soil fertility**

Low fertility of soils in much of Africa and the low (and sometimes declining) use of mineral fertilizers have increased farmer interest in agroforestry-based soil fertility systems. The main methods are a rotational fallow or a permanent intercrop of nitrogen-fixing trees. The systems have spread mainly in the southern African sub-humid region, where they have more than doubled maize yields and increased net returns to land and labor. In Zambia’s Eastern Province nearly 80,000 farmers practicing improved fallows earned net returns of \$2.25 million in 2006. The technologies often work best in combination with judicious doses of mineral fertilizer.

With 12 million smallholder maize farmers in Eastern and Southern Africa, rotational fallows and permanent intercropping offer considerable long-term opportunities for integrated soil fertility management to keep African soils productive and healthy.

Source: ICRAF, pers. comm.

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7.35 *Pest management*. At the other end of the spectrum, research that reduces use of dangerous pesticides can have win-win-win benefits for profitability, the environment, and human health in intensive systems. Integrated pest management uses a combination of practices, especially improved information on pest populations and predators to estimate pest losses and adjust pesticide doses accordingly. Despite notable examples of integrated pest management, the scale of adoption has often been limited (focus H).

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<sup>50</sup> Consultative Group on International Agricultural Research (CGIAR) (2006).

<sup>51</sup> CGIAR (2006c).

7.36 *Combinations.* The greatest impact on productivity is obtained through systems that combine improved varieties and several management technologies to exploit their synergistic effects. For example, conservation tillage is combined with improved legume-based fallows and maize varieties in Ghana.<sup>52</sup> In Eastern Africa low-input integrated pest management has been developed planting *Desmodium* (a nitrogen-fixing leguminous plant that can be used for livestock fodder) between the rows of maize to suppress *Striga*, an especially serious parasitic weed.<sup>53</sup> A similar integrated approach involving modern varieties, biological nitrogen fixation, cover crops, and zero-tillage has been vital to the global competitiveness of Brazilian soybeans.<sup>54</sup>

7.37 *More suitable technologies still badly needed.* While R&D on production and resource management has huge potential, success has been mixed, with zero-tillage as the outstanding success. Suitable technologies are still badly needed to conserve and efficiently use scarce water, control erosion, and restore soil fertility for smallholders in less favored areas. Such complex technologies are often labor- or land-intensive and may be unattractive to farmers where labor costs are high, where land is scarce, or discount rates on future returns are very high or the returns risky.<sup>55</sup> These concerns are especially important to women farmers who have poor access to assets and services, and specific seasonal labor patterns.

7.38 Management and systems technologies can require considerable institutional support to be widely adopted (chapter 8). Many of them require the interaction of several actors, such as collective action among neighboring farmers—as well as considerable learning, farmer-to-farmer interaction, and knowledge-sharing, as with conservation tillage in Brazil. In addition, many have positive impacts on the environment that are not captured in the private benefits of adopting farmers (chapter 8).

7.39 The integrative nature of management and agro-ecological approaches also affects the way R&D is carried out. Because of location-specificity, farmer and community participation in R&D characterizes the major success stories of these technologies. Location specificity also reduces the potential for spillins of technologies—so despite substantial investment by the CGIAR, the evidence of impacts is limited.<sup>56</sup>

7.40 Scaling up management and system technologies will not be easy. Networks of scientists, farmers, private firms, and NGOs take time to develop and become inclusive and effective. Advances in geographic information systems and remote sensing by satellites are opening new ways to synthesize complex and diverse spatial data sets, creating new opportunities for collaboration among scientists and decision makers at all levels.

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<sup>52</sup> Agricultural Research for Developing Countries (CIRAD) (2006)

<sup>53</sup> See website at <http://www.icipe.org>.

<sup>54</sup> World Bank (2006b)

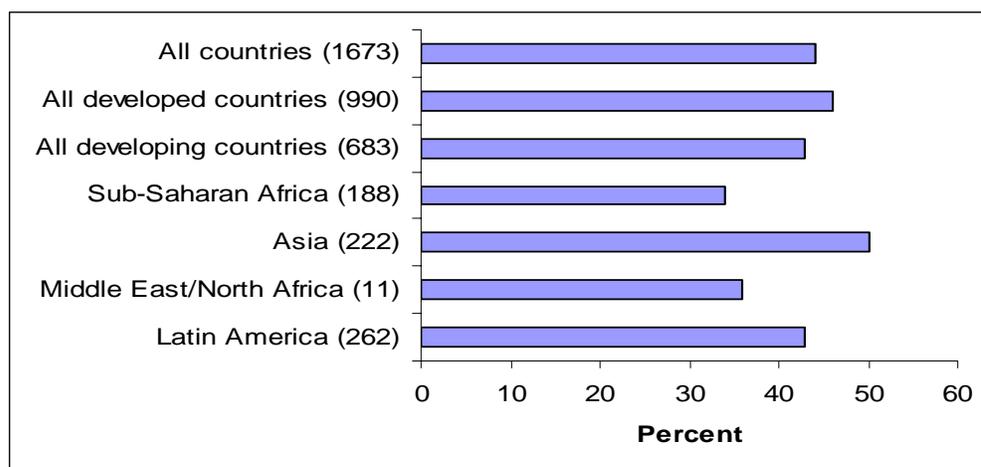
<sup>55</sup> Kelley and Gregersen (2004), Pender and Hazell (2000).

<sup>56</sup> Barrett (2006)

### Investing more in R&D<sup>57</sup>

7.41 Agricultural productivity improvements have been closely linked to investments in agricultural research and development (R&D) (chapter 2). Published estimates of nearly 700 rates of return on R&D and extension investments in the developing world average 43 percent a year.<sup>58</sup> Returns are high in all regions, including Sub-Saharan Africa (figure 7.2). Even discounting for selection bias in evaluation studies and other methodological issues,<sup>59</sup> there is little doubt that investing in R&D has been a resounding success. The high payoffs also indicate that agricultural science is grossly underfunded.

**Figure 7.2 Estimated returns to agricultural R&D are high in all regions<sup>a</sup>—averaging 43 percent!**



<sup>a</sup>Based on studies carried out from 1953 to 1997. Number of observations in parentheses.  
 Source: Alston and others (2000).

### *Why agricultural R&D is underfunded*

7.42 Public investment is especially important for funding agricultural R&D where markets fail because of the difficulty of appropriating the benefits. Seeds of many improved varieties can be reused by farmers and sold or shared with neighboring farmers (non-excludable, in the terms of economists). Information on improved management practices can be freely exchanged (non-rival). Intellectual property rights have partially overcome these market failures in industrial countries. But few technologies of importance to poor farmers can be cost-effectively protected by IPRs (box 7.3). A major exception has been private sector investment in hybrid seed of few crops where intellectual property can be protected by trade secrets and where farmers must purchase seed annually to maintain yields, providing a steady market for private seed companies to serve smallholders.

<sup>57</sup> Based largely on Pardey and others (2007).

<sup>58</sup> Alston and others (2000).

<sup>59</sup> Many of these studies do not consider technological spillovers from other countries (Maredia and Byerlee (2000)).

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**Box 7.3 Stronger IPRs in developing countries: How will they affect small farmers?**

Under the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), member countries are required to implement intellectual property rights, including on plant varieties and biotechnology inventions. The most common type of protection is through plant variety rights; a few developing countries also provide for patent protection.

Several developing countries have elected to follow the model developed in 1978 by the Convention on the Protection of New Varieties of Plants (normally known by the implementing agency the International Union for the Protection of New Varieties of Plants (UPOV)), which established harmonized conditions and norms for protecting new varieties while giving farmers the right to save and exchange seed. Other countries (e.g. India, Thailand) explicitly include in the same regulatory framework farmers' rights to saving and exchanging seed (derived from the FAO-International Treaty, 2004) and the sharing of benefits arising from the use of farmers' genetic resources and indigenous knowledge (based on the Convention on Biological Diversity, 1993). North-South bilateral and regional trade agreements often put pressure on developing countries to adopt even stronger levels of protection, for example, based on the 1991 Convention of UPOV, which makes selling and exchange of seed of protected varieties illegal, or provide patent protection on plant varieties (and biotechnology inventions) which generally does not allow saving of seed by farmers.

**Little impact so far**

A recent review of the impacts of stronger IPRs on the seed industries of China, Colombia, India, Kenya, and Uganda found relatively little impact to date, mainly because such IPRs are still under development in most countries. Although limitation on the reuse and exchange of farmer-saved seed appears a significant obstacle to smallholder farmers, there are yet no indications that such rules have been enforced. Indeed it is generally not cost effective to enforce such rules for staple crops grown by smallholders. Also the potential advantages of IPRs should not be overrated in most developing countries. IPRs do not seem critical in the initial development of a private seed sector but could help to support a maturing commercial seed industry.

Nonetheless, countries could do more to adapt IPR legislation to their specific needs within the guidelines of current international treaties.<sup>60</sup> For example, a country with both semi-subsistence and high-value agriculture could provide strong protection for the latter sector as an incentive for private investment while excluding or providing weaker protection to crops important to semi-subsistence farmers where seed saving and exchange are integral to farming practices. Only a few developing countries with large commercial sectors or potential in private biotechnology R&D should consider strong IPRs such as UPOV 1991. Plant variety rights also need to fit into other regulatory systems, such as seed certification laws, biosafety laws and other IPRs such as trademarks and trade secrets. In any event, increased capacity by the public sector, private firms and farmers is needed to design and build credible and cost-effective IPR systems that fit a country's needs.

Sources: Tripp, Louwaars, and Eaton (2007); Oxfam International (2007); World Bank (2006a).

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7.43 For these reasons, 94 percent of the agricultural R&D in the developing world is conducted by the public sector.<sup>61</sup> But growth in public spending on R&D, after rapidly increasing in the 1960s and 1970s, has slowed sharply in most regions in the past decade or more, opening a knowledge divide between poor countries and rich countries and in the developing world between a handful of "star performers" and most of the others.

7.44 Developing countries as a group invested 0.56 percent of their agricultural GDP in agricultural R&D in 2000, only about one-ninth of the 5.16 percent that developed countries invest. Part of this disparity is due to private investment, which makes up just

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<sup>60</sup> World Bank (2006a).

<sup>61</sup> Pardey and others (2007).

over half of R&D spending in industrial countries but only 6 percent in the developing world.<sup>62</sup> Still the intensity of public investment is five times higher in industrial countries.

7.45 A few developing countries—Brazil, China, and India—show signs of converging on the higher levels of investment in agricultural R&D typical in rich countries. Their shares in developing country public spending in agricultural R&D increased from a third in 1981 to almost half in 2000. The private sector also has a growing presence in Brazil and India, where expanding agricultural input markets provide incentives to invest. Meanwhile, many agriculture-based countries are stalling or slipping in the amount spent, in the intensity of investment, or in both. In the 1990s public R&D spending in Sub-Saharan Africa fell in nearly half of the 27 countries with data.<sup>63</sup>

**Table 7.1 Total public agricultural R&D expenditures by region, 1981 and 2000**

	Public agricultural R&D spending		Public agricultural R&D intensity	
	1981	2000	1981	2000
	(million 2000 international dollars)		(percent)	
Asia & Pacific	3,047	7,523	0.36	0.41
China	1,049	3,150	0.41	0.40
India	533	1,858	0.18	0.34
Latin America & Caribbean	1,897	2,454	0.88	1.15
Brazil	690	1,020	1.15	1.85
Sub-Saharan Africa	1,196	1,461	0.84	0.72
West Asia & North Africa	764	1,382	0.61	0.66
Developing countries	6,904	12,819	0.52	0.53
Japan	1,832	1,658	1.45	3.62
USA	2,533	3,828	1.31	2.65
High-income countries	8,293	10,191	1.41	2.36
<b>Total</b>	<b>15,197</b>	<b>23,010</b>	<b>0.79</b>	<b>0.80</b>

*Note:* These estimates exclude Eastern Europe and former Soviet Union countries where data are not available. The intensity ratios measure total public agricultural R&D spending as a percentage of agricultural GDP.

*Source:* See <http://www.asti.cgiar.org>; Pardey and others, 1997..

7.46 Why does this underinvestment in R&D continue, given the well documented high rate of return to investment? First, the political economy of public expenditure decisions tends to emphasize short-term payoffs and subsidies that are “politically visible” (chapter 4), while agricultural R&D investments are both long-term (10 years or more) and risky. Second, trade subsidies and national policies that reduce incentives to

<sup>62</sup> Pardey and others (2007).

<sup>63</sup> Beintema and Stads (2006).

farmers in developing countries are a disincentive to public and private investment in R&D (chapter 4).<sup>64</sup>

7.47 In addition, because the benefits of much public R&D spill over to other countries, it might not make much economic sense for small countries to spend their scarce resources on agricultural science, on their own behalf—and many nations have been free-riding on the efforts of a few others. The international agricultural research centers of the CGIAR have provided spillovers in many areas of technology, especially germplasm.<sup>65</sup> About half of all benefits of R&D are generated by such spillovers.<sup>66</sup> But future reliance on spillovers carries risks.<sup>67</sup> Privatization of R&D restricts access to proprietary technologies and sharing of scientific knowledge (see below). Traditional sources of spillovers—the public R&D systems in developed countries and to some extent also the CGIAR—have also shifted priorities away from productivity-enhancing research to research on the environment and food safety and quality.<sup>68</sup> And in some regions, especially Sub-Saharan Africa, there is less potential to capture spillovers because of the relative uniqueness of their agro-climatic conditions and crops (box 7.4).

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#### **Box 7.4 Sub-Saharan Africa's agricultural R&D challenge**

In addition to stagnant R&D spending, Sub-Saharan Africa faces specific challenges that add urgency to increasing spending on agricultural R&D, extension, and associated services.

- The potential to capture spillovers of technology from outside the region is less in Sub-Saharan Africa than for other regions. This is in part due to the nature of the crops grown in Sub-Saharan Africa, which are more diverse, with many so-called orphan crops (cassava, yams, millet, plantain, teff)—and in part to “agro-ecological distance.” Using an index of agro-ecological distance of zero to represent no potential for spillovers from high-income countries where most R&D is conducted, to 1 for perfect spillover potential, Pardey and others (2007) estimate that the average index for African countries is 0.05, compared with 0.27 for all developing countries.
- There is considerable heterogeneity within countries due to rainfed production systems, and the spillover potential among countries in the region is quite low.<sup>69</sup>
- Due to small country size, agricultural research systems in Sub-Saharan Africa are fragmented into nearly 400 distinct research agencies, nearly four times the number in India and eight times that in the United States (see box table). This prevents realizing economies of scale in research.
- Funding per scientist is especially low in Sub-Saharan Africa. Although it has nearly 50 percent more scientists than India, and about a third more than the United States, all of Sub-Saharan Africa spends only about half of what India spends, and less than a quarter of the United States. Only a quarter of African scientists have a PhD, compared with all or most scientists in India and the United States.
- Complex technological challenges in Sub-Saharan Africa must combine genetic improvement with emphasis on pest, diseases, and drought, with improvements in soil and water management, and with labor saving technologies in areas of low population density or serious HIV/AIDS.

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<sup>64</sup> Alston and Pardey (1993), Sunding and Zilberman (2001), Hayami, Kikuchi, and Morooka (1989).

<sup>65</sup> Maredia and Byerlee (2000), and Byerlee and Traxler (2001).

<sup>66</sup> Alston and others (2000).

<sup>67</sup> Pardey and others (2007).

<sup>68</sup> Gardner and Lesser (2003), Pardey and others (2007).

<sup>69</sup> Pardey and others (2007).

These problems are surmountable. First, Australia is another dryland continent technologically distant from other regions. But with one of the highest intensities of public R&D investment in the world (more than 4 percent of agricultural GDP), it has a productive and competitive agricultural sector. Second, spillovers can be more targeted—for example, East African highland countries such as Ethiopia and Kenya, have product mixes and agro-ecological conditions similar to Mexico. Third, the rise of regional research organizations in Africa should help achieve economies of size and scope.

**Box table 1 Comparison of research systems in Sub-Saharan Africa, India and USA around 2000**

	<b>Sub-Saharan Africa</b>	<b>India</b>	<b>USA</b>
Arable land (million ha)	147	160	175
Number of public agricultural research agencies	390	120	51
Number of full-time equivalent scientists	12,224	8,100	9,368
- percent with PhD	25	63	100
Annual spending on agric R&D (mil. 1999 international dollars)	1,085	1,860	3,465
Spending per scientist (thous. 1999 international dollars)	89	230	370

*Source:* Pardey and others (2007), Pal and Byerlee (2006), FAO (2005).

### ***Ways to increase investment***

7.48 Increasing the priority to R&D in public funding will rest on greater political support to agriculture, particularly to financing public goods. Forming coalitions of producer interests around particular commodities or value chains may be the most effective way to lobby for more public funding and for producers to co-finance R&D. In addition, institutional reforms, discussed in the next section, will be needed to make investing in public R&D organizations more attractive—and to make funding more transparent and open to a wider range of research providers in universities, civil society, and the private sector.

7.49 Another way to reduce underinvestment is to provide incentives or remove barriers that would stimulate the private sector to invest more. One constraint to private R&D investments is a weak investment climate for private investors generally (chapter 9). Another is weak demand from smallholders for improved technologies due to credit constraints and risks (chapter 6), and poor access to information. A third is that production systems and technologies in much of the developing world make it difficult to enforce IPRs. Added to these are restrictions on private sector imports of technologies and high regulatory barriers to the release of new technologies, such as the varieties developed by the private sector.<sup>70</sup>

7.50 More could be done to stimulate private investment in R&D by improving the environment for private innovation—say, through stronger IPRs for inventions for

<sup>70</sup> Gisselquist, Nash, and Pray (2002)

commercial crops (box 7.3) and lower barriers to the import and testing of technologies. Another approach is to make public funding for R&D contestable, and open to private firms to implement the research, usually with private co-financing. Competitive funding has become common, especially in Latin America, and some funds have the specific objective of funding private innovation (FONTEC in Chile).<sup>71</sup> Yet another is to establish a “purchase fund” or prize to reward developers of specific technologies, such as varieties resistant to a particular disease.<sup>72</sup> Prizes were used historically to promote inventions, such as an accurate measure of longitude.<sup>73</sup> The reward can also be tied to the economic benefits actually generated.<sup>74</sup>

### **Institutional arrangements to increase the efficiency and effectiveness of R&D systems<sup>75</sup>**

7.51 Although public research organization dominate in most developing countries, their efficiency and effectiveness in today’s changing world are in question. Institutional reforms to public R&D were addressed in the 2002 World Development Report. They include creating autonomous bodies or public corporations with good governance, such as EMBRAPA in Brazil, improving the effectiveness to assess and respond to farmer demands, and increasing the contestability of funding through competitive funding mechanisms. To succeed, these reforms have to be accompanied by a long-term commitment to build capacity, which has paid off in the now-strong public research systems in Brazil, China, and India. A particular challenge for public research systems in Africa is attracting and maintaining scientists who operate in a global marketplace, especially women scientists who make up only 21 percent of the total, as of 2000 (box 7.5).<sup>76</sup>

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#### **Box 7.5 Long-term capacity development pays off in Ghana**

The Ghana Grains Development Project is one of the few African success stories of long-term donor support to strengthen national capacity for research and extension for food production at a national level. Ghana is also one of the few countries with sustained increases in per capita food production. The project focused primarily on increasing the output of maize and cowpeas through the development of well adapted varieties and management practices for each of Ghana’s agro-ecological zones. Annual maize production increased from 380,000 tons in 1979, when the project was initiated, to more than 1 million tons by the project’s end in 1998. Maize yields increased by 40 percent during this period from 1.1 to 1.5 tons per hectare (FAOSTAT). A special feature was the graduate-level training of about 50 scientists, nearly all of whom returned to the project.

The project developed an effective bottom-up approach that integrated farmers in all stages of research and included socio-economic assessment of the technology. Complemented by large-scale extension programs supported by the NGO Sasakawa Global 2000 (SG2000), more than half of all maize farmers in Ghana adopted improved varieties, fertilizer and planting methods by 1998 (although use of fertilizer dropped to a quarter after after removal of fertilizer subsidies). But adoption by women farmers (39 percent) was

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<sup>71</sup> Katz (2006), World Bank (2006a).

<sup>72</sup> Kremer and Zwane (2005).

<sup>73</sup> Sobel (1996)

<sup>74</sup> Masters (2005).

<sup>75</sup> Based largely on Pardey and others (2007).

<sup>76</sup> Eicher, Maredia, and Sithole-Niang (2006).

significantly lower than for men (59 percent), reflecting differences in access to assets and services, especially biases in extension.

Source: Morris, Tripp, and Dankyi (1999), Canadian International Development Agency.

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7.52 Universities are also underused for publicly supported science, and competitive funds have increased their role of universities in agricultural R&D. For example, 30-50 percent of competitive grants for agricultural R&D in Brazil, Chile, Ecuador, and Mexico have been channeled to universities.<sup>77</sup> And universities everywhere prepare the next generation of scientists. A comprehensive agricultural science policy must address their weaknesses.<sup>78</sup>

7.53 While public investment in public R&D organizations remains important, the public sector can no longer do it alone. Science-driven linear research-extension-farmer approaches—in which public research systems generate technologies that are then disseminated through largely public extension systems to farmers—have worked well in some critical contexts (the Green Revolution). But they work less well in meeting today's rapidly changing market demands, especially for high-value and high-value-added products. Nor are they suited to more heterogeneous contexts, as in rainfed areas of Sub-Saharan Africa.

7.54 To improve the efficiency and effectiveness of R&D, collective action involving arrangements among a variety of actors in an innovation systems framework is emerging as important. The framework recognizes multiple sources of innovation, and multiple actors as developers and users of technologies, in a two-way (non-linear) interaction. Such collective action can pool complementary assets (intellectual property, genetic resources, research tools), reap economies of scale and scope, facilitate technology transfers through arrangements with private input distributors, and foster mechanisms for farmers and other clients to express their demands for technology.

7.55 Collective action can be global, national, and local. The global example of collective action is the system of international agricultural research centers under the CGIAR. Given the rise of value chains and private-sector development, public-private partnerships are becoming common. And farmers are doing more in the R&D process, especially through partnerships between R&D organizations and producer organizations. Ensuring participation of women at all levels can make these initiatives more inclusive and effective.

### ***Global and regional partnerships to achieve economies of scale***

7.56 The high fixed costs of much of today's research lead to increasing economies of scale in R&D, which puts small and medium-sized countries and research organizations at a disadvantage for some kinds of research.<sup>79</sup> Many developing countries may be too small to achieve efficient scale in much of the relevant elements of their agricultural

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<sup>77</sup> World Bank (2006) (LAC report).

<sup>78</sup> Eicher (2006).

<sup>79</sup> Byerlee and Traxler (2001).

R&D interests, except in adaptive research. A particular challenge for global efficiency in agricultural science, and for many smaller countries, is to develop effective institutions for financing and organizing research on a multinational basis.<sup>80</sup>

7.57 The CGIAR was created especially to facilitate such spillovers by producing international public goods that benefit the poor. This collective action, now consisting of 64 funders and 15 international centers, has been one of the major global success stories of agriculture. The CGIAR system is especially critical for small, agriculture-based countries to underwrite the cost of R&D, but even industrial countries benefit substantially. Future success of the CGIAR as a system depends on increasing its core funding and sharply focusing its priorities (chapter 11).

7.58 International cooperation in R&D goes well beyond the CGIAR. Growing capacities in the large countries with dynamic R&D systems, such as Brazil, China, and India, represent an underused resource for South-South cooperation that small developing countries can tap, with modest levels of funding. New collaborative arrangements among developing countries are making this possible. FONTAGRO, the Regional Fund for Agricultural Technology for Latin America and the Caribbean, is a key example. A consortium of 13 countries, created in 1998, it allocates grants competitively to regional organizations, aiming to achieve economies of scale and scope on a set of pre-established research priorities.<sup>81</sup> Similar approaches are being implemented in Africa through the Forum for Agricultural Research in Africa and several subregional associations. A related model is the Latin American Fund for Irrigated Rice, which includes members from public and private sectors and from producer organizations in 13 countries to finance rice improvement research.

### ***Public-private partnerships***

7.59 Given the dominance of public systems for R&D in developing countries, and the global role of the private sector in R&D and in value chain development, public-private partnerships (PPPs) offer much potential and are proliferating.

7.60 One type of PPP aims to make the products of biotechnology available to smallholders in the developing world, in areas where the private sector has little commercial interest. Biotechnology partnerships can link both global and local actors through complex agreements that reflect the asset positions of the different actors—the CGIAR has 14 such partnerships (table 7.2).<sup>82</sup> Some partnerships also reflect the rise of the new philanthropists, such as the Gates Foundation or foundations associated with private biotechnology companies that provide both new sources of private funding—as well as access to research tools and technologies (Syngenta Foundation).

7.61 Despite the promise, PPPs of this type have been slow to deliver results on the ground because of high transaction costs in negotiating intellectual property agreements

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<sup>80</sup> Jin and others (2005)

<sup>81</sup> See website at <http://www.fontagro.org>.

<sup>82</sup> Spielman, Hartwich, and von Grebmer (2006).

(box 7.6), asymmetric information on asset positions and bargaining chips, clashes of public and private cultures, and a lack of mutual trust.<sup>83</sup>

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**Box 7.6 IPR options to provide the poor access to modern science**

The increasing share of tools and technologies protected as intellectual property in the developed world—by both the public and private sectors—poses a major challenge to harnessing them for the benefit of poor people.

For many countries, the fact that a particular gene or tool is protected in rich countries may not be a problem, since IPRs are relevant only in the country awarding the patent or plant variety right (unless a product derived from the gene or tool is exported to a country holding the IPR). Since many small countries and the least developed countries are not attractive commercial markets for private companies, few patents are taken out in these countries, and they may unilaterally decide to use a particular gene or tool if they can physically obtain them (by obtaining seed with a desired gene).

But for the rapidly emerging and larger countries, patent protection is more common. And for all countries, timely access to new tools and technologies, as well as the tacit knowledge often required to effectively use them, increases the value of a formal agreement to obtain access.

Innovative approaches have recently been put in place to acquire proprietary science or at least reduce the transaction cost of doing so for the benefit of small farmers in the developing world.

- *Market segmentation and humanitarian licenses* recognize that many technologies may benefit poor farmers who are not an attractive market for private firms. Golden Rice is an example: patents have been negotiated for humanitarian use for farmers in the developing world with incomes below \$10,000 a year.
- *Public Intellectual Property Resource for Agriculture (PIPRA)* is a consortium of public R&D organizations based at the University of California to encourage intellectual property sharing in the public sector and provide licenses for humanitarian use in the developing world.
- *Biological Information for Open Society (BIOS)* fosters collaborative “open source” development of sets of key enabling technologies, such as tools of genetic transformation that will be made freely available to developing countries. It also is a clearing house for databases from IPR offices to reduce transaction costs in acquiring intellectual property.
- *African Agricultural Technology Foundation (AATF)* brokers the acquisition of intellectual property for smallholders in Africa, case by case, on a humanitarian basis. The foundation brokered the partnership of CIMMYT, the Kenya Agricultural Research Institute, BASF (a private producer of agro-chemicals), the Forum for Organic Resource Management and Agricultural Technologies seed companies, and NGOs to make the *Striga*-killing maize-herbicide technology available to small holders in Kenya.

Source: Wright and Pardey (2006a), Wright and Pardey (2006b), African Agricultural Technology Foundation (AATF) (2004).

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7.62 A second type of partnership is being stimulated by new markets for high-value products and supply chains. In supply chains for higher value products, innovation may be less dependent on local R&D since the technology for many high-value products is less location-specific than for traditional staples (horticulture in greenhouses and stall-fed dairy farming). A dynamic system of innovation comprises private business, farmers, processors, regulatory bodies, and public R&D organizations operating in partnerships, networks, or consortia.

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<sup>83</sup> Spielman and von Grebmer (2004), Byerlee and Fischer (2002), Pardey and others (2007).

7.63 Public policy can facilitate these types of PPPs by providing incentives for innovation through competitive funds that co-finance both R&D and the pilot testing of innovations, usually in partnership with private actors, whether farmers, processors, or other agri-businesses. India’s National Agricultural Innovation Project will support about 15 value chains, at roughly \$5 million apiece, through this approach. Coordination can also be facilitated along the value chain, by formalizing coordinating bodies or consortia for a specific value chain.

**Table 7.2 Assets of public and private sectors in agri-biotechnology research**

Institution/firm	Scientific and knowledge assets	Other assets
Multinational research firms (life-science firms)	<ul style="list-style-type: none"> <li>• Genes, gene constructs, tools, related information resources</li> <li>• Biotechnology research capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Access to international markets and marketing networks</li> <li>• Access to international capital markets</li> <li>• Economies of market size</li> <li>• IPR skills</li> </ul>
International agricultural research centers (CGIAR)	<ul style="list-style-type: none"> <li>• Germplasm collections and informational resources</li> <li>• Conventional breeding programs and infrastructure</li> <li>• Applied/adaptive research capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Access to regional/global research networks</li> <li>• Access to bilateral/multilateral donor funding</li> <li>• Generally strong reputational integrity</li> </ul>
National agricultural research institutes in medium-size countries	<ul style="list-style-type: none"> <li>• Local/national knowledge and materials</li> <li>• Conventional breeding programs and infrastructure</li> <li>• Applied/adaptive research capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Seed delivery and dissemination programs and infrastructure</li> <li>• Generally strong reputational integrity</li> </ul>
Local firms	<ul style="list-style-type: none"> <li>• Local/national knowledge and materials</li> <li>• Applied/adaptive research capacity</li> </ul>	<ul style="list-style-type: none"> <li>• Seed distribution and marketing infrastructure</li> </ul>

*Source:* Adapted from Byerlee and Fischer (2002), Spielman and von Grebmer (2004). For simplicity, advanced research institutes and other players in the global research system are excluded from this table.

***Putting farmers in the drivers’ seat for R&D***

7.64 Formal R&D partnerships with farmers’ organizations aim to enhance the demand for innovation by bringing farmers’ voices into decisionmaking. Collective action of this type can better identify constraints, pool indigenous knowledge, and aggregate “technological demands.” These partnerships help scale up adaptive research, testing, and dissemination—and facilitate access to inputs, markets, and finance for the new technologies.

7.65 Farmer organizations (chapter 6) have demonstrated strong interest in such partnerships. One approach empowers farmers by formally including them in governing

councils of research organizations. This generally produces results only when the system is decentralized and farmers have a controlling interest in resource allocation—giving farmer organizations the power to approve research projects and programs, as in Mexico (box 7.7).

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**Box 7.7 Mexican farmers lead research through PRODUCE foundations**

PRODUCE foundations,<sup>84</sup> farmer-led NGOs, were created in Mexico in 1996 to leverage additional funding for the seriously cash-strapped National Agricultural Research Institute and to give producers a role in the funding and focus of agricultural R&D. They participate in priority-setting and approve and co-finance research projects in each state.

In 1998 the 32 foundations (one for each state) created a national coordinating office to help them become key players in Mexico's agricultural innovation system. They are now a successful lobbying instrument for agricultural R&D.

The foundations have formal links with research and educational institutions, as well as the National Council for Science and Technology (CONACYT). They also manage a trust fund, which has a mechanism for matching funds between the governments and producers.

The foundations are, however, the turf of commercial farmers. Attempts to integrate small farmers through social networks have failed because of high transaction costs in dealing with individual farmers and the difficulties in identifying small producers who might integrate themselves with commercial agriculture.

*Source:* Ekboir and others (2006), Paredes and Moncada (2000).

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7.66 The influence of farmers is even more effective where they finance a significant share of R&D. The best known examples of this approach use levies on commercial crops, such as cotton or coffee, governed by commodity-based producer organizations (for tea research in Tanzania and coffee research in Colombia). Widely adopted in industrial countries, such levies have been underused in developing countries, despite their potential to resolve underinvestment and improve the demand orientation and effectiveness of research.<sup>85</sup> In most cases, the levies are 0.5 percent or less of the value of commodity output. If matched by public funding, as in Australia and Uruguay,<sup>86</sup> they would allow a significant increase in research intensity in developing countries. And even where levies are not feasible due to the nature of the value chain,<sup>87</sup> donors and governments could still channel more funding through farmer organizations, especially for adaptive research—as in Mali, where Regional User Commissions receive funds for adaptive research.

7.67 The most successful partnerships combine the involvement of farmer organizations with the advantages of value chain integration and PPPs (box 7.8). Funds are becoming more available to co-finance these partnerships. In Senegal, for example, farmer organizations have strong decision powers in a successful competitive fund that

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<sup>84</sup> In Spanish the name Produce means “farmer, go farm!”

<sup>85</sup> Kangasniemi (2002). When used, there has been little accountability of the funded scientists to farmers.

<sup>86</sup> Uruguay, with commercialized agriculture, has by law implemented a levy for all agricultural research, matched by public funding to the level of 0.4 percent (see Allegri (2002)).

<sup>87</sup> Levies are feasible for products that pass through a narrow processing or marketing chain or where the producers are concentrated and well organized. They are not applicable to traditional staples, such as rice and cassava.

has financed a 30 research projects, many of them outside the traditional public research organization.

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**Box 7.8 Adding value to a poor farmers' crop—cassava in Colombia and Ghana**

Cassava, traditionally viewed as a subsistence crop of the poor, is emerging as a strategic link in industrial value chains in Colombia and Ghana. Private-public-farmer partnerships facilitated this transformation through greater coordination along the value chain—and through R&D within a broader context of developing new products and markets and increasing competitiveness.

In Ghana the Sustainable Uptake of Cassava as an Industrial Commodity Project established systems linking farmers to new markets for cassava products, such as flour, baking products, and plywood adhesives. The local Food Research Institute and industrial users collaborated to organize more than 100 stakeholders into a value chain of cassava production and drying in rural areas, grinding and milling in centralized facilities, and distribution to industrial processors.

In Colombia the International Center for Tropical Agriculture structured its early cassava research around the production of dried cassava chips for the animal feed industry. The identification of varieties with low cyanogenic glucosides permitted the use of natural drying methods and the commercialization of cassava. Between 1980 and 1993, 101 cooperative and 37 private processing plants were built. By 1993 these facilities produced 35,000 tons of dried cassava, with an estimated value of \$6.2 million. In 2004 the Ministry of Agricultural and Rural Development explicitly included cassava in its competitive call for R&D projects to stimulate further innovation in the industry and to maintain competitiveness.

*Source:* World Bank (2006a).

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7.68 A major challenge for integrating farmer organizations into technological innovation is that their leaders are at an educational and social disadvantage in dealing with scientists and technical advisors. This gap is even more pronounced for poor and marginalized groups and for women (box 7.8), and targeted programs and financing is usually required to ensure that farmer leaders articulate their interests.

**Better use of available technology through skills and information**

7.69 There is general agreement on the considerable productivity and profitability gaps in most smallholder farming systems.<sup>88</sup> The lack of access to inputs and credit and the inability to bear risks explain part of the gap (chapter 6). But one major reason is an information and skills gap that constrains the adoption of available technologies and management practices or reduces the technical efficiency of their use when adopted. Hence the recent emphasis on new approaches to demand-led extension and to the application of new information and communications technologies (ICTs).

***New demand-led approaches to extension***

7.70 The role of agricultural extension is to help farmers learn how to augment their productivity, raise their incomes, and collaborate with one another and with partners in agribusiness and agricultural research. Accordingly, extension programs are shifting from prescribing (a *delivery model*), to focusing more on building capacity among rural people to identify and take advantage of available opportunities, both technical and

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<sup>88</sup> Christiaensen, Demery, and Kuhl (2006)

economic (an *empowerment model*). To perform such a wide-ranging role, extensionists must be trained in areas beyond technical agriculture to build skills in mobilizing farmers, in accessing market intelligence, and in managing farm and non-farm businesses (focus).

7.71 Public services have dominated extension. Indeed, public spending for extension usually exceeds that for agricultural research in most developing countries. But public financing and provision faces profound problems of incentives of civil servants for accountability to their clients, weak political commitments to extension and agriculture more generally, keeping extension workers abreast of relevant emerging technological and other developments, and a severe lack of fiscal sustainability in many countries.

7.72 One of the most influential efforts to "fix" public extension in the past two decades was the training and visit (T&V) model of organizing extension, promoted by the World Bank from 1975 to 1995 in more than 70 countries. The T&V approach aimed to improve performance of extension by strengthening management and formulating specific regular extension messages. But the T&V system exacerbated other weaknesses, especially fiscal sustainability and a lack of real accountability. The result: widespread collapse of the structures introduced.<sup>89</sup>

7.73 In the 1990s many governments moved away from centralized systems and transferred to local governments, the responsibility for delivering extension and in some cases financing it, in line with wider efforts to decentralize government (chapter 11). The expected advantage is to improve accountability and incentives, as agents report to local stakeholders or become employees of local government, which—if democratically elected—would be keen on receiving positive feedback on the service from the clientele-electorate. Although these are good reasons to decentralize extension, difficulties in broader decentralization efforts, as well as misguided local political capture, have in some cases compromised desired progress in more effective delivery of advisory services.<sup>90</sup>

7.74 A promising additional element increasingly adopted, is to involve farmers in decentralized governance. Since around 2000 both the Agricultural Technology Management Agencies (ATMAs) in India and the National Agricultural and Livestock Program in Kenya have set up stakeholder fora from national to district and sub-district levels to undertake planning and set priorities for extension activities. Both promote farmer interest groups around specific crop and livestock activities, farmer-to-farmer learning and knowledge sharing, and marketing partnerships with the private sector. Based on favorable evaluations of the first phase (including an estimated 25 percent increase in farmer incomes in most ATMA districts, far more than the 5 percent in most neighboring districts), the two programs are being scaled up to the national level, and similar initiatives are under way in many other countries, such as Tanzania.<sup>91</sup>

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<sup>89</sup> Anderson, Feder, and Ganguly (2006).

<sup>90</sup> Anderson (2007), Asuming-Brempong, Sarpong, and Asante (2006), Qamar (2002), World Bank (2006a).

<sup>91</sup> Cuellar and others (2006), Heemskerk and Wennink (2005), Singh (2007), and Sulaiman V. (2003).

7.75 Other new approaches recognize the significant private-good attributes of many extension services, such as technical advice delivered by processors and wholesalers to farmers producing high-value crop and livestock products under contract (chapter 5). Mixed public-private systems involve farmer organizations and nongovernmental organizations and public agencies contracting-out extension services. The various approaches are now often found alongside each other, in a shift from a “best practice” or “one-size-fits-all” to a “best fit” approach to particular social and market conditions (table 7.3).<sup>92</sup> In all these efforts to make agricultural innovation systems more demand-driven (say, by giving farmers’ voice), there is a need to pay attention to ways women’s demands can be represented, accommodating their time constraints (in, say, farmer organizations) and employing them in advisory services to increase effectiveness of service delivery.<sup>93</sup>

7.76 As in research, building demand is an important ingredient of successful extension. Extension functions may become the responsibility of farmer or agribusiness organizations rather than local governments. Extension can still be publicly funded, but funds can flow through farmer organizations that have a controlling interest in fund allocation (figure 7.3).<sup>94</sup> Farmer organizations, in turn, may contract out extension services to private providers and NGOs, as in Uganda’s National Agricultural Advisory Services, seen by farmers to be working well.<sup>95</sup> Another approach is to have a private company and the state extension system jointly finance and provide advisory services, especially for agro-chemical inputs, as in Madhya Pradesh, India.<sup>96</sup>

7.77 Extension methods have also become more diverse, including farmer-to-farmer extension. Informal networks among farmers have always been powerful channels for exchange of information and seeds. Several programs are formalizing and linking such networks for knowledge-sharing and learning. The Programa Campesino a Campesino in Nicaragua and the Mwiwata network in Tanzania provide national coverage through farmer-to-farmer approaches.<sup>97</sup>

7.78 A related approach is the Farmer Field School, originally designed as a way to introduce integrated pest management to irrigated rice farmers in Asia. The schools have been introduced, often on a pilot basis, in some 80 developing countries, and their scope broadened to other types of technology.<sup>98</sup> Evaluations, although limited, have not demonstrated the cost-effectiveness hoped for in service delivery.<sup>99</sup> This is in part because complex management information, such as that for integrated pest management,

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<sup>92</sup> Anderson and Feder (2004), Anderson and Feder (Forthcoming), Birner and others (2006).

<sup>93</sup> Doss and Morris (2001), Moore, Hamilton, and Thiongane (2001), Gladwin (2002), Blackden and others (2006).

<sup>94</sup> Chipeta (2006).

<sup>95</sup> Ekwamu and Brown (2005), Ellis and others (2006).

<sup>96</sup> Sulaiman V. and Hall (2002).

<sup>97</sup> Cuéllar and Kandel (2006), Uliwa and Fischer (2004).

<sup>98</sup> van den Berg and Jiggins (Forthcoming).

<sup>99</sup> Feder, Murgai, and Quizon (2004a), Feder, Murgai, and Quizon (2004b), Godtland and others (2004), and Tripp, Wijeratne, and Piyadasa (2005).

does not travel as easily from farmer to farmer as in the case of seed of improved varieties.

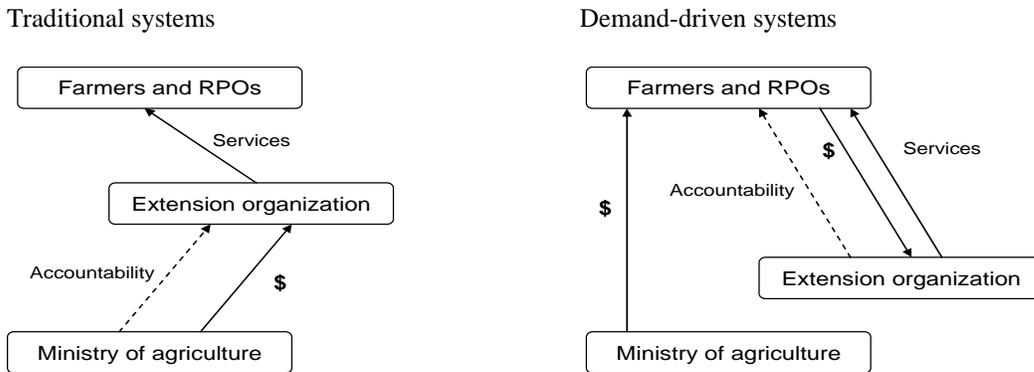
7.79 Agricultural extension services, after a period of neglect, are now back on the development agenda, with a sense of excitement about many of the emerging institutional innovations. Clearly there still is much to do in bringing needed extension services to smallholders around the world, especially the poorest groups. Understanding what works well in the diverse circumstances of the developing world remains a challenge of course. More evaluation, learning, and knowledge sharing are required to capitalize on this renewed momentum.

**Table 7.3 Providing and financing pluralistic agricultural advisory services**

Provider of the service	Source of finance for the service				
	Public sector	Farmers	Private firms	NGOs	Farmer organizations
<b>Public sector</b>	Public sector advisory services with decentralization	Fee-based services		NGOs contract staff from public extension services	Contract staff from public extension services
<b>Private firms</b>	Publicly funded contracts to service providers	Fee-based advisory services or input dealers	Firms provide information with input sales or marketing of products		Contract staff from private service providers
<b>NGOs</b>	Publicly funded contracts to service providers	Fee-based services		NGOs hire staff and provide services	
<b>Farmer organizations</b>	Publicly funds managed by farmer organizations				Its extension staff to provide services free to members

Source: Birner and others (2006), adapted from Rivera (1996), and Anderson and Feder (2004).

**Figure 7.3 Financing for extension services—the traditional approach and the new**



Source: Chipeta (2006).

### *New ICT tools at the farm level*

7.80 The declining costs of information and communication technologies (ICTs) are giving farmers and rural people in developing countries much greater access to information. In China 83 percent of villages now have fixed phones, and 56 percent mobile coverage—in India 77 percent, and 19 percent. Mobile phone coverage in India is expanding at breakneck speed—on one day in 2006, Nokia alone sold more than 400,000 new mobile phone handsets, and new subscriptions are averaging six million a month, many in rural areas.<sup>100</sup>

7.81 In Africa about 9 percent of the population has a mobile phone, in networks that could reach 60 percent of the population. In Uganda, 80 percent of communities have mobile phone coverage and 5 percent of households possess mobile phones.<sup>101</sup> The broader coverage, more than the possession of individual mobile phones, induces market participation by reducing transaction costs in crop marketing and increasing prices, especially for perishable goods.<sup>102</sup> The Kenya Agricultural Commodity Exchange (KACE) and Safaricom Limited collect and disseminate current and reliable commodity price information to Kenyan farmers through a low cost Short Message Service (SMS) provider.<sup>103</sup>

7.82 Farmers can also use ICTs for extension advice from a range of sources, but it takes time to develop demand-driven services. Private operators and an NGO in India reach tens of thousands of farmers and are being rapidly scaled up (box 7.9). Computers are now being linked through mobile phone networks to greatly expand the scope for information. And the soon-to-be-launched “\$100 laptop,” developed at MIT, could herald an even greater role for ICTs.<sup>104</sup>

7.83 Policies to improve access to ICT in rural areas need to focus as much on content and education as on infrastructure. Education is one of the key factors affecting the returns to ICT in agricultural production, along with electricity, roads, and appropriate business models.<sup>105</sup> Local content creation needs to be linked to institutional innovations to provide farmer-responsive extension services.

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#### **Box 7.9 Private agribusiness and NGOs lead ICT provision to farmers in India**

Indian private companies and NGOs are global leaders in providing information to farmers, as a spin-off from India’s meteoric rise as a world leader in ICTs. The e-Choupals (chapter 5) now provide information on the weather and farming techniques in local languages, in addition to that on market prices.

The M. S. Swaminathan Research Foundation established Knowledge Centers in Pondicherry, India in 1997. Centers in each village are connected by satellite to a hub at Villianur, with the support of the Indian Space Research Organization. The centers are managed by women’s self-help groups, which receive

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<sup>100</sup> Srivastava (2006).

<sup>101</sup> International Telecommunication Union (2006).

<sup>102</sup> Muto (2006).

<sup>103</sup> <http://www.kacekenya.com>

<sup>104</sup> Sullivan (2005).

<sup>105</sup> Lio and Liu (2006).

micro-credit loans and training to start small businesses such as mushroom or biopesticide production. The self-help groups use the centers' computers to manage their business accounts and coordinate their activities, using video-links with the other villages.

Farmers can use the centers to access databases of technical information, developed by the hub, with the help of experts from local agricultural institutions, in their local language. Dairy farmers, for example, have received training in some centers using touch-screen computer applications developed by the local veterinary college. An alliance of more than 80 partner organizations extends the concept throughout India.

*Sources:* Goyal (2006), M.S.Swaminathan Research Foundation (MSSRF) (2005), Arunachalam (2002), Tongia, Subrahmanian, and Arunachalam (2004).

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### **Moving forward**

7.84 Science and technological innovation are critical for the agriculture-for-development agenda to succeed on four fronts. First, at a global level, science will become even more important to overcome looming resource constraints. Second, in all countries, science and innovation are central for maintaining competitiveness in global markets. Third, the potential of science to address poverty in many less-favored regions has yet to be tapped. And fourth, science will be critical for adaptation to and mitigation of climate change.

7.85 With current R&D policies likely to leave many developing countries as agricultural technology orphans in the decades ahead, the need to raise funding for agricultural R&D throughout the developing world cannot be overstated. Without more investment many countries may lose ground both in competitiveness and the ability to adapt. The greatest urgency is to reverse the stagnant funding of agricultural R&D and broader knowledge systems in Sub-Saharan Africa. This reversal must be driven by national leadership and funding, but it will require substantially increased support from regional and international organizations.

7.86 Continuing progress, especially in extending benefits of R&D to less-favored regions, depends critically on improvements in soil, water, and livestock management and on the development of more sustainable and resilient agricultural systems. These technological innovations, often-location specific, must be combined with institutional innovations to ensure that financial services, farmer organizations, and input markets are in place for broad-based productivity growth.

7.87 But low spending is only part of the problem. Many public research organizations face serious institutional constraints that inhibit their effectiveness and thus their ability to attract funds. The rise of higher-value markets is creating new opportunities in the private sector to foster innovation along the value chain, often involving collective action by the public sector, private sector, farmers, and civil society. What is needed now is to understand what works well in what context and to adapt that understanding to ensure wider participation of poor farmers.

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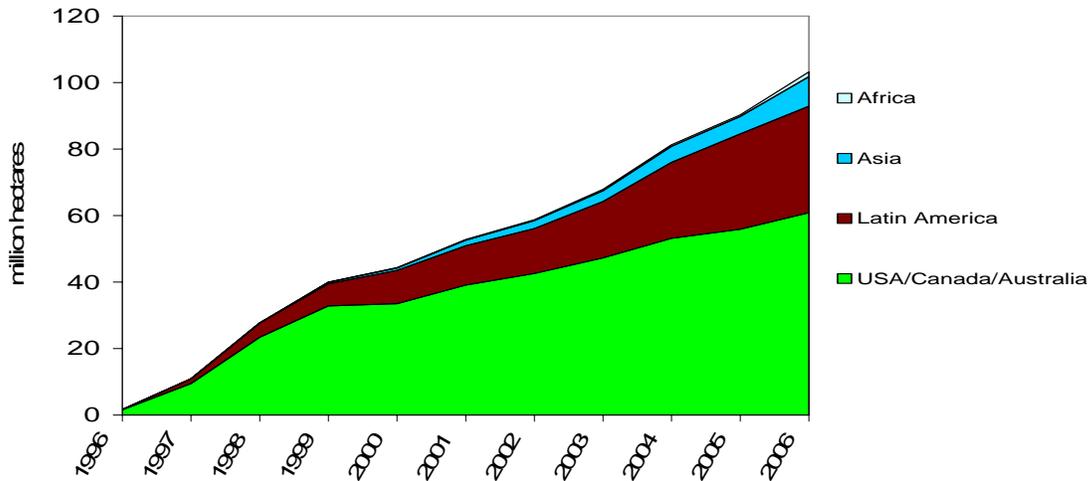
## Focus F Capturing the benefits of GMOs for the poor<sup>1</sup>

In 2006 farmers in 22 countries planted transgenic seeds on about 100 million hectares, about 8 percent of the global crop area (figure F.1).<sup>2</sup> Transgenics, or genetically modified organisms (GMOs), use genetic engineering to transfer one or more genes, usually from a wild species to a crop plant of a different species or genus. While most transgenics have been developed by the private sector for commercial interests, the techniques have considerable potential for improving the productivity of smallholder farming systems and providing more nutritious foods to poor consumers. Blunting the promise of this biotechnology are controversies over possible environmental and health risks as well as political factors.

### Adoption of Bt cotton has been impressive

F.1 Developing countries have been adopting transgenics since 1996, largely based on spillovers from private R&D investments in the industrial countries. But their use has been limited to certain crops (soybean and maize for animal feed, and cotton), traits (insect resistance and herbicide tolerance), and countries with commercial farming (Argentina and Brazil). The only wide adoption of transgenics by smallholders has been Bt cotton for insect resistance. An estimated 9.2 million farmers mostly in China and India planted Bt cotton on 7.3 million hectares in 2006.<sup>3</sup>

Figure F.1 Adoption of transgenics is on the rise in most regions, but not in Africa and Europe<sup>a</sup>



Note: <sup>a</sup> The area planted to transgenics in Europe is about 100,000 hectares, mostly in Romania.

Source: James (1996-2003), James (2004), James (2005), James (2005).

<sup>1</sup> Pehu and Ragasa (2007).

<sup>2</sup> James (2005).

<sup>3</sup> James (2005).

F.2 The economic and environmental benefits to Bt cotton can be substantial, but the impacts vary across years, institutional settings, and agro-ecological zones.<sup>4</sup> Farmers in China recorded a \$470 per hectare increase in net income (340 percent), thanks largely to a two-thirds reduction in pesticide applications (table F.1) that also provided significant environmental and health benefits.<sup>5,6</sup> In India farmers growing Bt-cotton also used less insecticide and gained significant yield increases,<sup>7</sup> with an additional advantage of improved yield stability.<sup>8</sup>

F.3 The institutional and social context for introducing the technology often determines the direction and magnitude of impacts, more so than the effectiveness of any particular trait.<sup>9</sup> Supporting the quick and extensive adoption of Bt cotton in China was its low cost thanks to publicly developed Bt cotton varieties, decentralized breeding to adapt them to local needs, and competitive seed markets.<sup>10</sup>

**Table F.1 Estimated economic and environmental benefits from Bt cotton**

	Argentina <sup>a</sup>	China <sup>a</sup>	India <sup>b</sup>	Mexico <sup>a</sup>	South Africa <sup>c</sup>
Added yield (%)	33	19	26	11	65
Added profit (%)	31	340	47	12	198
Reduced chemical sprays (number)	2.4	n.a.	2.7	2.2	n.a.
Reduced pest management costs (%)	47	67	73	77	58

*Note:* n.a.—not available.

*Source:* (a) Adapted from FAO (2004); (b) Qaim and others (2006). Other recent studies include Gandhi and Namboodiri (2006), who reported similar trends except for a much higher increase in profits (88 percent); (c) Bennett, Morse, and Ismael (2006).

F.4 In Africa, only South Africa has released Bt cotton, and most cotton-growing Sub-Saharan countries, especially in the west, are only at the early stage of testing Bt varieties, if at all. Countries and farmers that are slow to adopt them will lose their competitiveness as global commodity prices fall with broader adoption in large exporting countries.<sup>11</sup>

<sup>4</sup> Smale and others (2006), FAO (2004).

<sup>5</sup> Huang and others (2002), Qaim (2005).

<sup>6</sup> According to Huang and others (2002), the two thirds reduction in pesticide applications translated into 80 percent fewer kilograms of active ingredient applied.

<sup>7</sup> Gandhi and Namboodiri (2006).

<sup>8</sup> An observed reduction in the coefficient of variation of yields in on-farm field trials in India from 0.69 for conventional cotton to 0.57 (Qaim (2003)).

<sup>9</sup> Sakiko (2007), Smale and others (2006), FAO (2004).

<sup>10</sup> Sakiko (2007), Smale and others (2006), Pray and others (2002).

<sup>11</sup> Gruere and Bouët (2006), Nielson and Anderson (2007).

### **Slow progress in foods**

F.5 Transgenic food crops have yet to be adopted by smallholders in the developing world. The Philippines has approved a transgenic crop, Bt maize (mostly for feed), and China allows cultivation and use of publicly developed transgenic vegetables (in addition to Bt cotton). Transgenic rice, eggplant, mustard, cassava, banana, sweet potato, lentil, and lupin have been approved for field-testing in one or more countries. And, many transgenic crops are in the public research pipeline in developing countries.<sup>12</sup> There are also numerous research and development efforts under way for livestock and fish, especially for better disease resistance.<sup>13</sup>

F.6 Many of these technologies promise substantial benefits to poor producers and consumers. Most notable are traits for rice, the world's major food staple, such as insect resistance, vitamin A-enhanced (Golden Rice), and salt and flood tolerance. Advanced field testing of Bt rice in China shows higher yields and an 80 percent reduction in pesticide use.<sup>14</sup> The estimated health benefits of Golden Rice are large, since rice is the staple of many of the world's poor suffering from vitamin A deficiency. In India alone up to 1.4 million life-years could be saved each year through widespread consumption of Golden Rice—more cost-effective than current supplementary programs for vitamin A.<sup>15</sup> Despite the promise, there has been a significant delay from the 1990s projections that transgenic varieties of major food staples would be available to farmers by 2000.<sup>16</sup>

F.7 Africa suffers from the greatest lag in developing transgenic crops, especially for important food security crops, such as sorghum, and cassava.<sup>17</sup> Transgenics could reduce the impacts of several of Africa's intractable problems, such as animal diseases, drought, and Striga (a devastating parasitic weed), which cannot be eliminated by conventional breeding. A recent study showed that disease-resistant transgenic bananas would likely be adopted by the poorest farmers.<sup>18</sup> Transgenic lines of streak virus-resistant maize<sup>19</sup> and drought and salinity resistant crops<sup>20</sup> have already been generated in Kenya, South Africa, and Zimbabwe. But weak regulatory capacity will delay their field testing.<sup>21</sup>

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<sup>12</sup> In an IFPRI study of 15 developing countries, the public research pipeline for transgenic food crops included 201 genetic transformation events<sup>12</sup> in 45 different crops (Cohen (2005)). In addition, the Grand Challenges in Global Health Initiative, a public-private partnership, has ongoing research projects on staple crops such as banana, rice, sorghum, and cassava for increased levels of key micronutrients

<sup>13</sup> FAO (2004).

<sup>14</sup> Huang and others (2005).

<sup>15</sup> Stein, Sachdev, and Qaim (2006).

<sup>16</sup> Byerlee (1996).

<sup>17</sup> Eicher, Mareid, and Sithole-Niang (2006).

<sup>18</sup> Edmeades and Smale (2006).

<sup>19</sup> Sinha (2007).

<sup>20</sup> Cohen (2005).

<sup>21</sup> Cohen (2005).

### Why the slow progress in transgenics?

F.8 There are three main reasons for the slow progress in developing transgenic food staples.

- *Neglect of pro-poor traits and crops.* Investments in transgenics are concentrated largely in the private sector, driven by commercial interests and not necessarily focused on pro-poor traits and crops. Almost all promising technologies for food crops have been developed by the public sector, which has underinvested in R&D generally (chapter 7) and in biotechnology specifically. The CGIAR, arguably the global leader in agricultural research targeting the needs of the poor, spends about 8 percent of its budget, or about \$25 million, on biotechnology.<sup>22</sup> Brazil, China, and India have large public biotechnology programs, which together may spend 10 times this amount.<sup>23</sup> But these numbers are still small in comparison to the \$1.5 billion spent annually by the four largest private companies.<sup>24</sup>
- *Perceived risks.* Perceptions of food safety and environmental risks have slowed release, even though the scientific community widely agrees that the transgenics currently available are as safe as conventional varieties.<sup>25</sup> And scientific evidence to date does not support environmental harm, such as gene flow to weed species, from commercial cultivation of transgenic crops.<sup>26</sup> Despite a good track record, environmental risks and benefits need to be evaluated case-by-case, comparing the potential risks with currently used technologies and taking into account the specific trait, crop, and agro-ecological context.<sup>27</sup>
- *Weak regulatory capacity.* The capacity of regulatory bodies to assess environmental and food safety risks and approve the release of transgenics is quite limited in most countries. Weak regulatory systems fuel public distrust and ignite opposition from various interest groups. Low regulatory capacity is a major factor slowing approval even of products that have already undergone extensive testing, such as Bt-rice in China and transgenic mustard and eggplant in India.<sup>28</sup>

### The political economy

F.9 The challenge of regulating transgenics is closely linked to the global regulatory polarization between the European Union and the United States and the power plays of interest groups supporting either side of the debate. In the United States, the regulation of transgenics is gradually rendered more permissive based on the knowledge coming from laboratory research, widespread cultivation, and human consumption over more than 10 years. EU regulation has become more preventive as the public perception of risk has grown more negative. These differences have been attributed to the asymmetries

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<sup>22</sup> Pingali (2007), Spielman, Cohen, and Zambrano (2006).

<sup>23</sup> Pingali (2007), Byerlee and Fischer (2002).

<sup>24</sup> Pingali (2007).

<sup>25</sup> Pehu and Ragasa (2007), International Council for Science (2003).

<sup>26</sup> Sanvido and others (2006), FAO (2004).

<sup>27</sup> Sanvido and others (2006), FAO (2004).

<sup>28</sup> Pray and others (2006).

in the power of collective action from environmental and consumer groups in the two economies and to the institutional setups of regulatory bodies.<sup>29</sup>

F.10 For developing countries these global political controversies create much uncertainty, dampen investment in R&D, and slow release of transgenics.<sup>30</sup> In this environment countries fear the loss of export markets and have to consider separating the storage and shipments of transgenics from conventional varieties, obtaining clearance for transgenics in the importing country, and building a brand (such as “GMO free”).

### **A way forward?**

F.11 Unless the benefits of biotechnology for development are well articulated and separated from global political polarization and from commercially driven efforts to develop transgenics, the opportunity to apply these technologies to benefit the poor in developing countries may be missed. The international development community should respond to countries and regions calling for access to modern technologies, as in the recent declaration of the African Union.<sup>31</sup> It should fund the development of safe transgenics with pro-poor traits and crops of importance to the poor in partnership with key stakeholders. The focus should be not on transgenics alone but on a comprehensive agricultural R&D program that addresses the priority problems of the poor.

F.12 Introducing transgenics depends on a strong, transparent, and cost-effective regulatory system to control their release and use. Stringent standards and high regulatory barriers may minimize risks, but impose high costs on society by restricting or slowing access to beneficial technologies. High barriers may also restrict competition in seed markets and reduce options to farmers, since public organizations and national seed companies may not be able to pay the high cost of regulatory clearance (estimated at more than \$1 million for the first Bt cotton varieties in India). Whatever the stringency of regulations, countries have to build trust in regulatory systems through transparent and participatory processes, intensify enforcement of regulations, and strengthen socioeconomic assessments to build the confidence of various stakeholders.

F.13 Over the long term scientists, regulators, producers, and consumers need to have the capacity to make informed decisions on appropriate technologies and to regulate them in a cost-effective way for the benefit of society. Substantially increased public funding and international support in interested countries will be required to underwrite high initial costs for developing, testing, and releasing promising transgenics with pro-poor traits. If a new wave of safe and pro-poor technologies is developed and accepted, the regulatory costs should fall sharply.

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<sup>29</sup> Bernauer (2003).

<sup>30</sup> Bernauer (2003).

<sup>31</sup> Citation [www.icsu-africa.org/casp\\_alex.pdf](http://www.icsu-africa.org/casp_alex.pdf) (?)

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## **Chapter 8 Making agricultural systems more environmentally sustainable**

8.1 Asia's Green Revolution doubled cereal production between 1970 and 1995, yet the total land area cultivated with cereals increased by only 4 percent.<sup>1</sup> Such intensification of agriculture has met the world's needs for food and reduced hunger and poverty (chapter 2). And by dramatically slowing the expansion of cultivated areas, it has preserved forests, wetlands, biodiversity, and ecosystem services they provide.

8.2 But intensification has also brought environmental problems of its own. In intensive cropping systems the excessive and inappropriate use of fertilizers and pesticides pollutes waterways, poisons people, and upsets ecosystems. Irrigation has contributed to the growing scarcity of water, the unsustainable pumping of groundwater, and the degrading of prime agricultural land. Globally, one fifth of irrigated areas may suffer from salinisation and waterlogging, and about one percent of irrigated land is lost annually because of severe degradation in irrigated areas.<sup>2</sup> Intensive livestock systems, part of the continuing livestock revolution, also present environmental and health problems. High concentrations of livestock in or near urban areas produce waste and spread diseases, such as tuberculosis and Avian bird flu.

8.3 Even where there has been little if any agricultural intensification, vast areas are being degraded, where agriculture has grown through extensification. This has led to environmental problems of a different kind—mainly the degradation and loss of forests, wetlands, soils, and pastures. Every year around 13 million hectares of tropical forest are degraded or disappear, and over 60 percent of deforestation in developing countries has been attributed to encroachment by farming (especially in Africa and parts of Asia).<sup>3</sup> Costs of land degradation, although they are difficult to assess, could be as high as 3 percent of agricultural GDP per year in parts of Java.<sup>4</sup> This degradation makes poverty even worse because it often reduces off-farm income sources (e.g. timber and non-timber products) and undermines the ecosystem services that the poor rely upon for their livelihoods.

8.4 Poorly understood 25 years ago, this dichotomy in the relationship between agriculture and the environment—either too much intensification or too little—has since received much attention. It is now understood that while agricultural development in both intensive and extensive farming systems has had adverse environmental impacts, many of the problems could be fixed. Much of the technical, institutional, and policy know-how now exists to sustain agricultural growth in both situations. But the main problems lie with the failures of policies, institutions, and markets. Most difficult to resolve are environmental externalities. In intensive farming areas the challenge is to regulate and penalize farmers who pollute waterways, mine groundwater and the like, but the public institutions needed for this are still weak in most developing countries. In less-

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<sup>1</sup> Rosegrant and Hazell (2001).

<sup>2</sup> Ghassemi, Jakeman, and Nix (2007), Wood, Sebastian, and Scherr (2000).

<sup>3</sup> FAO (2005a).

<sup>4</sup> Magrath and Arens (1989).

avored regions, the challenge is to make it more profitable for farmers and communities to pursue natural resource management practices that supply more local ecosystem and global environmental services, of value to society, like watershed protection, biodiversity conservation and carbon sequestration.

### **What drives resource degradation?**

8.5 Some resource degradation in rural areas has little to do with agriculture, such as that by logging, mining and tourism. But farmers are major degraders. And overcoming environmental problems in agriculture needs to be based on a proper understanding of why individual resource users mismanage resources the way they do.

8.6 Many factors impinge on private incentives for managing natural resources, including prices, subsidies, interest rates, market access, risk, property rights, technology, and the difficulties of sustaining effective collective action. These drivers are all reasonably well understood, though globalization is changing some of them in new ways. Market forces, for example, are more powerful today, and farmers are under enormous pressure to cut production costs, even if this means using resources in unsustainable ways. But emerging niche markets for green or organic labeled products are providing new win-win opportunities (good for both agriculture and environment) for farmers who can sell in such markets (chapter 5). Climate change is also increasing production risks in many farming systems, reducing the ability of farmers and rural societies to manage risks on their own.

8.7 Poverty is more likely to drive resource degradation in less-favored regions with poor quality and fragile soils and high population densities, but even in these areas the relationships can be complex.<sup>5</sup> In most other contexts, poor people control only small shares of the total resources available and hence are relatively minor contributors to their degradation. So, reducing poverty will seldom be enough to reverse resource degradation. Yet the poor are typically most affected by resource degradation wherever it occurs, since they depend most on common property resources and have the fewest assets and options for coping with degradation. Women are particularly affected by resource degradation in their gathering of fuel wood and water.

8.8 Population pressure has mixed impacts on resource degradation, depending mainly on the available technology. As Malthus observed in eighteenth century England, population pressure leads to agricultural encroachment into ever-more marginal areas, reducing average yields, degrading resources, and worsening poverty. But if suitable technologies exist, population growth can lead to their adoption and sustain improvements in resource conditions and yields. Since many natural resource management technologies are labor intensive (terracing or contouring land and building irrigation structures), population growth can assist their uptake because it lowers labor costs.<sup>6</sup>

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<sup>5</sup> Ruben and Pender (2004).

<sup>6</sup> Boserup (1965), Tiffen, Mortimore, and Gichuki (1994).

8.9 When population pressure is combined with high initial levels of poverty and few technology options for boosting productivity, downward spirals of degradation and poverty can arise.<sup>7</sup> This seems to be happening in some areas of Africa (such as Ethiopia) where many farms are now too small to support a family and there are too few nonfarm job opportunities. These distressed areas can become breeding grounds for civil conflict, displacing people and disrupting efforts to reach the very poor and vulnerable populations.<sup>8</sup>

8.10 When the costs of resource degradation are not fully borne by the individuals causing it, externalities crop up. For example, removing vegetative cover and cultivating wetlands that protect watersheds may be privately beneficial to the individual farmers who do it but can also lead to siltation and flooding downstream, costly to society. The difficulty with externalities is that avoiding them requires cooperation between those causing the damage and those affected by it, possibly involving large numbers of people separated in space, time, and interests. Intergenerational externalities, even less tractable, arise when farmers use resources today with too little regard for the resource heritage they leave for future generations. Such externalities are important in explaining water pollution, groundwater mining, deforestation, overgrazing, the loss of biodiversity, and the spread of livestock diseases.

8.11 With this as background, turn now to strategies for achieving more sustainable development in intensive and extensive farming systems. The key challenges for irrigated areas are to use less water in the face of growing water scarcities and to stop mining groundwater. In intensive irrigated and rainfed farming areas, modern inputs like seed, fertilizer, pesticides and water need to be managed to sustain high yields without damaging the environment. In intensive livestock systems, particularly in periurban and urban areas, the management of animal wastes and disease risks needs to improve. In less-favored regions sustainable development pathways need to support the livelihoods of local people and still be compatible with other environmental services on a fragile resource base.

### **Improving water management in irrigated agriculture**

8.12 Irrigated farming accounts for 10 percent of the agricultural area in the developing world but produces about 40 percent of the value of agricultural output.<sup>9</sup> On average it consumes about half the fresh water used in developing countries, but its share is much higher in many arid and semiarid countries. The continuing high productivity of irrigated land is key to feeding much of the developing world, yet future trajectories are worrying (chapter 2). Many countries are experiencing serious and worsening water scarcities. Fresh water supplies are already fully used, and urban, industrial, and environmental demands for water are escalating. Groundwater resources are being overdrawn so much that water tables have fallen to levels that make pumping difficult and too costly for many small farmers. Poor irrigated water management is leading to water logging and

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<sup>7</sup> Cleaver and Schrieber (1994).

<sup>8</sup> Messer, Cohen, and Marchione (2002).

<sup>9</sup> Hazell and Wood (Forthcoming).

salinization of some of the best farming land, and waterways are being polluted by the runoff of pesticide and fertilizer.

8.13 These problems will intensify with rising global food demand, projected to double in the next 50 years, compounded by adverse effects of climate change on agriculture. Without improvements in water productivity—or major changes in where and how agricultural production takes place—the amount of water required for food production will increase by anywhere from 60 to 90 percent, depending on population and income growth and on assumptions for the water requirements of livestock and fisheries.<sup>10</sup> Demand will become even greater if there is significant growth in biofuels production, which competes with food and feed for water (see focus H).

8.14 The scope for expanding access to irrigation water is limited because the most accessible and lowest cost sources of water have already been exploited, with some exceptions in Africa and Latin America. Thus, the imbalance between supply and demand can only worsen, unless water is used more productively or local demand falls for the products and services that water provides. Climate change will also affect regional water supplies by disrupting rainfall patterns and degrading mountain glaciers that replenish rivers (see focus E).

8.15 Physical scarcity of water may be a fact of life in the most arid regions, but it is also exacerbated by policies that induce higher water use and the overdevelopment of hydraulic infrastructure. In particular, the expansion of irrigated agriculture has often occurred at the expense of other water uses, biodiversity, and ecosystem services such as damage to fisheries and wetlands. Such situations have typically been encouraged by the low pricing of water supplied to farmers, supporting subsidies, and failures to recognize or account for externalities. Clearly, irrigated agriculture must be reformed.

8.16 Meeting the future challenges of water for agriculture will require a more integrated management of multisectoral water use at river basin levels and greater efficiency in the use of water within irrigation systems. Water is special: its uses can simultaneously exhibit characteristics of public, collective, and private goods as well as pervasive externalities. But it can and should be managed as an economic resource, though there are limits to the application of market-based policies. There are few universal solutions or magic bullets, and the details of policies and interventions require careful and ongoing adaptation to local conditions. The political, economic, social, hydrologic, institutional, historical, and cultural context matters greatly. And only the right mix of governance arrangements, regulation, market-based instruments, and community involvement will deliver the best outcome for a given situation.

### ***Moving toward integrated water management in agriculture***

8.17 Farm production need not be at the total expense of the benefits of other water users or the health of river ecosystems. Agriculture can also generate valuable environmental services (e.g. flood, erosion, and water quality protection, habitat for

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<sup>10</sup> Comprehensive Assessment of Water Management in Agriculture (2006).

wildlife) and cultural and aesthetic benefits. The restoration of the northern Aral Sea is a rare but encouraging success story of what a holistic vision and integrated approach to water management can produce (box 8.1). It also shows the need to recognize the complexity of the hydrological cycle of irrigation, drainage, and subsurface water.

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**Box 8.1 Restoring the northern Aral Sea—by doubling the Syr Darya’s flow**

Poor water management in the Aral Sea basin produced a major environmental disaster. By the late 1980s the Aral Sea had shrunk so much that it divided into two, and by the 1990s much of the land around the northern Aral was a saline wasteland. Then, in 1999, Kazakhstan began a restoration project. A 13-kilometer dike to the south of the Syr Darya outfall raised the northern sea’s level and reduced its salinity. It was thought that it would take up to 10 years to raise the water level. But only seven months after the dam’s completion, the target level was reached, and spare water started to flow over the spillway to the south. Water levels have risen by an average of four meters. Local fisheries, crops, and livestock have begun to recover. And the microclimate may have become less arid. Economic prospects for local communities look positive again—for the first time in more than 30 years.

The key to this transformation: an integrated approach to restoring the Syr Darya River. Rehabilitating dams, barrages, and embankments along the river in Kazakhstan, which fell into disrepair following the collapse of the Soviet Union, doubled the river’s flow and improved the potential for hydropower.

The increased flows in the Syr Darya may eventually bring enough water to the southern Aral to slow the decline there, but the recovery in the north also shows how sustainable water resource management depends on wider economic and political factors. Kazakhstan, benefiting from high oil and metals prices, has enthusiastically invested more to bring the northern Aral closer to its original level.

But to the south both the Amu Darya and southern Aral continue to shrink. Irrigated cotton farming is still a significant part of Uzbekistan’s economy and remains important in Turkmenistan as well. The large investments that would be required to ensure resumption of water flows from the Amu Darya to the levels required to revive the southern Aral Sea are not taking place. In the meantime, the Uzbek government is looking to develop oil and gas deposits on the dry seabed, and upstream Afghanistan’s northern areas are increasing the use of water for irrigation and other activities.

Success for the northern Aral depended on identifying discrete national investments that contribute to wider regional or multicountry plans. For the southern Aral, regional objectives and principles can be agreed, but the work has to be broken into pieces that have national and local ownership, that can be implemented locally, and that deliver local benefits.

*Source:* World Bank (2006a), and Pala (2006).

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8.18 Hydrological interdependencies among multiple users cannot be ignored. Surface and underground water flows are interconnected, and local interventions can have unexpected consequences elsewhere in the basin. For example, local efficiency improvements, such as canal lining and micro irrigation, can reduce the water available to downstream users and the size of the environmental flows.<sup>11</sup> This is especially likely in situations where greater efficiency creates an incentive to increase the total cropping area, and the volume of water consumption does not fall. Other local interventions, such as harvesting water and using more groundwater, can have similar effects on other users in

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<sup>11</sup> Reducing the amount of water that flows back into the river or groundwater aquifer (return flow) beyond a certain threshold level lowers its capacity to dilute pollution flowing into the water body with agricultural and non-agricultural run-off. Environmental degradation of downstream areas and of the water body can occur.

the basin. To avoid misguided investments and policies, the impact of local interventions needs to be quantified within the broader hydrological context of the whole system.<sup>12</sup>

8.19 With increasing water scarcity, governments and water agencies also have to change the way they think about irrigated agriculture. Part of the response involves providing farmers with incentives to encourage efficient water use, but the design of infrastructure also needs to change. For example, many canal based irrigation schemes need to be reengineered to facilitate more flexible water management at the plot level so that farmers can grow a greater diversity of crops and better adjust water supplies to crop needs.

8.20 Greater climatic uncertainties and hydrological variability need to be taken into account in the design of irrigation infrastructure. In Morocco dams were constructed on the basis of past rainfall patterns, but in an unusually intense period of droughts, volume of water stored was insufficient, resulting in major water shortages.<sup>13</sup> Expensive irrigation schemes are thus used far below their capacity and cannot be easily modified to allow for water-saving technologies, such as drip irrigation. As changes in rainfall are expected to have a similar effect in other parts of Africa, Morocco's experience is a cautionary tale for countries planning to make new investments in irrigation in drought-prone areas. According to recent predictions, greater variability in precipitation will significantly affect surface water across a quarter of the continent.<sup>14</sup> Also, because of climate change leading to shrinking mountain glaciers, irrigation systems will not receive enough runoff water from glacial melt in the Andes, Nepal, and parts of China, or they may receive it at the wrong time because of early glacial melt. This may require additional investments in water storage and water-saving technologies.

### ***Improving the productivity of water in irrigated agriculture***

8.21 More irrigation—or better irrigation? The returns to improving the performance of existing irrigation are generally higher than those to expanding the irrigated area. Some investments are needed to restore irrigation capacity degraded by siltation and deferred maintenance, but the focus should be on technical and managerial upgrading to ensure sustainable use of water resources. In Sub-Saharan Africa there has been relatively little development of water infrastructure, and additional investments in expanding irrigation may be worthwhile.<sup>15</sup> But for meeting local needs, investments in small scale irrigation and water harvesting are often a better option than large structures (box 8.2).

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<sup>12</sup> Comprehensive Assessment of Water Management in Agriculture (2006), World Bank (2004).

<sup>13</sup> World Bank (2007a).

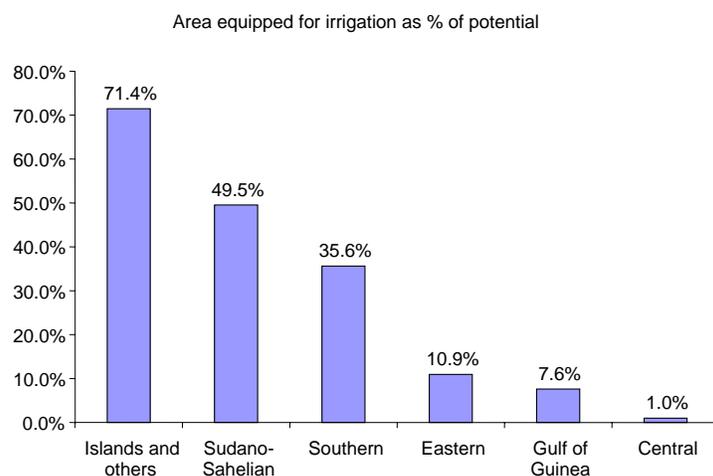
<sup>14</sup> de Wit and Stankiewicz (2006).

<sup>15</sup> Comprehensive Assessment Secretariat (2006).

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**Box 8.2 Enormous potential for expanding irrigation in Sub-Saharan Africa – in the right way**

Sub-Saharan Africa, the poorest region, has a very large untapped potential in irrigation (box figure 8.1). Only 3 percent, of the total cultivated area is under irrigation, with merely 4 million hectares added in the last 40 years, far less than in any other region.<sup>16</sup> Increasing investment and donor financing in agricultural water management is essential for attaining economic growth, reducing poverty and improving the quality of life in marginal areas. New projects are more likely to succeed when accompanied by complementary reforms, training and extension services, and improved access to markets.

**Box figure 8.1 Only a small share of irrigation potential has been realized in Sub-Saharan Africa**


Source: FAO (2005a), adapted from African Development Bank and others (2007).

Investment in irrigation projects steadily declined in the 1980s partly in response to the many failed irrigation investments and partly because of poorer market opportunities and higher investment costs than in other regions. But with the new generation of well designed irrigation projects, costs in Sub-Saharan Africa are now comparable to those in other regions, thanks to improvements in institutions, technology, and market opportunities for high-value products.

In areas with high farming potential, mainly in humid and subhumid zones, agricultural water development opportunities range from simple in-field rainwater management for dryland crops to full irrigation. In some agro-climatically stressed and isolated areas, improvements in agricultural water management are limited.

Small schemes appear to have the most promise.<sup>17</sup> But some small-scale irrigation interventions have failed in Sub-Saharan Africa because of overemphasis on engineering and physical structures coupled with the poor engineering and limited durability of structures. Small-scale irrigation needs a focus on farmer livelihoods and significant changes in community organization to deal with conflicts between users and the environmental problems of salinization, water logging, and soil nutrient mining. When small-scale irrigation is undertaken in the right circumstances, and done well, the benefits can be significant.<sup>18</sup>

Source: African Development Bank and others (2007), Carter and Danert (2007), World Bank (2006b), IFAD (2005a), Kelley and Byerlee (2004).

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**8.22** Many large irrigation systems suffer from bureaucratic institutions and inflexible water delivery systems that constrain farmer responses to changing markets and profit opportunities and encourage unsustainable use of surface and groundwater. In the 1970s a large irrigation scheme in Mali was in disarray due to ineffective management using a

<sup>16</sup> African Development Bank and others (2007).

<sup>17</sup> African Development Bank and others (2007).

<sup>18</sup> Carter and Danert (2007).

highly centralized top-down approach.<sup>19</sup> In the 1980s the government embarked on reforms that succeeded only when the mission of the irrigation agency was redefined—introducing strong private sector incentives in its management, establishing water user associations, and building a strong coalition of stakeholders. Empowering farmers by decentralizing large schemes and devolving authority to water users associations improved efficiency and created broad-based political support for reforms.

8.23 Economic policies should be reformed where they create inappropriate incentives for farmers in the choice of technology and water management practices. In irrigated agriculture, energy subsidies encourage groundwater mining, and the under pricing of canal water steers farmers away from water efficient crops. Subsidies for canal irrigation, power, and fertilizer in India, combined with state procurement of output at guaranteed prices, lead farmers to overproduce rice, wheat, and other low-value crops using water intensive cultivation and making excessive withdrawals of groundwater (see box on energy subsidies in chapter 4).<sup>20</sup> The situation is similar in many areas with pumped irrigation using surface water in Central Asia. More realistic charges for water and power would not only help correct incentives to use water efficiently—they would also enable the agencies that provide these resources to better cover their operation and maintenance costs and improve service quality.

8.24 Market mechanisms for allocating water have often developed naturally at a scale where social control and hydraulic infrastructure make this possible. But it is unlikely that markets will reallocate water on a large scale in developing countries in the near future.<sup>21</sup> So far large water markets have been confined to countries with strong institutional frameworks and traditions of secure water rights. As water scarcity becomes more severe, the interest in water markets will likely increase, because they can efficiently allocate water between different users. The early experience with formal water markets shows that a variety of approaches may be needed, depending on the local institutions, cultural norms, hydrological conditions, and the capacity to transfer water over long distances. Water rights that are perceived as just and equitable are paramount, clearly defined as a first step in introducing water markets (box 8.3). The design of water markets would need to take into account the increasing frequency of droughts as a consequence of climate change and possibly the need for water rationing.

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### **Box 8.3 Global experience with formal and informal water markets**

Informal water markets have existed at a local scale in many traditional irrigation systems for a long time. Examples of formal markets on a larger scale are rare.

Informal markets have developed naturally in South Asia and other regions with groundwater irrigation. In Bangladesh, India, and Pakistan markets for groundwater enable farmers to trade water turns, better matching supply to individual needs, make efficient use of a tube well, and enable small farmers who can't afford one to gain a share of the water resource.<sup>22</sup> At this scale transaction costs are low because users know each other and water is transferred over short distances. Rights are socially determined and enforced, and any third party impacts can be identified and taken into account.

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<sup>19</sup> Aw and Diemer (2005).

<sup>20</sup> Gulati, Meinzen-Dick, and Raju (2005).

<sup>21</sup> Bruns and others (2005), Molle and Berkoff (2006).

<sup>22</sup> Meinzen-Dick (1998), Saleth (1998), Bjornlund and McKay (2002), Molle and Berkoff (2006).

Informal markets for groundwater have clear benefits, but in water-scarce areas they can increase groundwater depletion because of the incentives for overpumping.<sup>23</sup> When Jordan faced severe depletion of groundwater by tube well irrigation, the government initiated a sequenced program to formalize the informal markets by registering, licensing, and metering all wells and assigning individual quotas. A regulatory program ensured compliance with water withdrawals and sales.<sup>24</sup>

Regulatory solutions like this have high transaction costs, however, and may not be replicable in many other countries. They require an expensive monitoring system, a strong implementation capacity, and a well established system of traditional water right that are perceived as equitable.

As an alternative, empowering all affected users through clearly defined water rights and community management by a water users association can sometimes reduce aquifer depletion.

Extending water markets on a large scale through formal markets is more difficult. In Australia water reallocation has improved since the establishment of water markets in the Murray-Darling River Basin, but traded volumes remain limited. The Western United States has a long history of trade in private water rights, but it remains highly contested and litigated.<sup>25</sup> In Mexico's water markets, because of the fear of adverse effects on third parties outside a water users association, water rights have been issued to the irrigation district rather than to individual farmers, and trading is confined to farmers within the district.<sup>26</sup>

*Source:* Meinzen-Dick (1998), Saleth (1998), Bjornlund and McKay (2002), Molle and Berkoff (2006), Easter, Rosegrant, and Dinar (1999), World Bank (2006c), Carey, Dunding, and Zilberman (2002), United Nations Development Program (2006), Simpson and Ringskog (1997).

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### ***Building a consensus for reform***

8.25 Many required changes are politically contentious, and past reforms have often failed or remained partial because of overoptimism about the willingness or capacity of local bureaucracies to carry them out and because of underestimating the time and investment needs. In Indonesia, Madagascar, and Pakistan unrealistic strategies ignoring the political reality have met with slow progress and the failure of many large irrigation projects and institutional reforms.<sup>27</sup>

8.26 Removing subsidies for irrigation services has proven especially difficult. Better pricing and cost recovery are explicit objectives of many irrigation projects and policies, but globally there has been little progress.<sup>28</sup> Applying volumetric charges for irrigation water, especially through marginal cost pricing, has run into obstacles in many developing countries—exceptions are Armenia, Iran, Jordan, Morocco, South Africa, and Tunisia. Even where volumetric pricing has been accepted as a principle, cost recovery is lower than expected because of nonpayment, meter tampering, and measurement problems.<sup>29</sup>

8.27 Accurately measuring water use in irrigation is possible with innovative technologies, such as canal automation and satellite data. Moving from manually

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<sup>23</sup> Easter, Rosegrant, and Dinar (1999).

<sup>24</sup> World Bank (2006c).

<sup>25</sup> Bjornlund and McKay (2002), Carey, Dunding, and Zilberman (2002), Molle and Berkoff (2006), United Nations Development Program (2006).

<sup>26</sup> Simpson and Ringskog (1997).

<sup>27</sup> World Bank (2006c).

<sup>28</sup> Dinar (2007).

<sup>29</sup> World Bank (2006c).

operated to automated channel control of irrigation, successfully applied in Australia, could be used in some developing countries.<sup>30</sup> Remote-sensing technologies measure the amount of water from surface and groundwater schemes actually applied to the fields, and farmers could receive credits for return flows.<sup>31</sup> Although remote-sensing technology requires a substantial initial investment, it can be more cost-efficient than other alternatives.<sup>32</sup>

8.28 Securing water rights should be a major element in building a political consensus for reform. But they need to be perceived as just and responsive to the needs of all water users, including crop farmers, women, pastoralists, fishers and those using water for domestic purposes and small scale industry (box 8.4). In Sri Lanka recent reform attempts were derailed by public perception that powerful industry and large farmer interests were at the core.<sup>33</sup> But in South Africa support for customary water rights and the inclusion of vulnerable groups facilitated reform. Water markets with tradable water rights are likely to fail or have serious social consequences when water rights are not just and equitable.

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**Box 8.4 Secure water rights—a foundation for equitable reforms**

Water rights are individual or collective entitlements to water, perceived as legitimate and enforceable on the basis of customs or formal regulations. Informal rights have existed for centuries, particularly for groundwater in many communities in water scarce areas, including large parts of the Africa, Asia, and the Middle East. With mounting pressure on water resources, securing water rights of indigenous groups, pastoralists, smallholder farmers and women is becoming important. As the Dublin principles established in 1992, including all stakeholders is the best practice for water resources governance.<sup>34</sup>

Inequality in water rights is often embedded in traditional water rights, the distribution of land rights, and the access to irrigation. South Africa is one of few countries that tried to redress inequalities by making redistribution of water rights an explicit goal of integrated water management policies as part of the broader political transition process in the country. A minimum supply of water for drinking is now guaranteed as a legally enforceable right, and in rural areas individuals have use rights to water for domestic purposes and small-scale gardening. Large scale uses require registration and the purchase of a license, so that regulators can limit the overexploitation of resources. Even though the equity objectives remain constrained by the slow pace of land redistribution, including poor and indigenous groups was fundamental in building broad-based support for reforms.<sup>35</sup>

**What about women?**

Women are often excluded from building and maintaining irrigation works, a common way participants obtain rights in the scheme. And they tend to have less decision power in water users associations, even if they are members. Granting women separate rights of access to irrigated land and water is seldom considered necessary because of a common misconception that they can gain access to land and water through their husbands.

Women's water needs are believed to be distinct from men's because of different preferences for water use. Women tend to use water for household tasks, such as cooking, washing, and watering garden plots and livestock. Increasing the access of women to irrigated land and water and recognizing their role as irrigators and decisionmakers have raised agricultural productivity and strengthened their negotiating

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<sup>30</sup> Nayar and Aughton (2007).

<sup>31</sup> Pongkijvorasin and Roumasset (2007).

<sup>32</sup> Bastiaanssen and Hellegers (2007).

<sup>33</sup> Samad (2005).

<sup>34</sup> World Bank (2007a).

<sup>35</sup> Backeberg (2005), United Nations Development Program (2006).

power over use of water.<sup>36</sup> And a considerable body of evidence reveals that women's production and income have a higher impact on children's education and nutritional status than men's.<sup>37</sup>

*Source:* Zwarteveen (1997), Kuriakose and others (2004), World Bank (2006c), Backeberg (2005), United Nations Development Program (2006).

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8.29 Allocation of water rights is complicated by the conflicting incentives of upstream and downstream users. At the local level disagreements can be resolved through innovative institutional approaches to govern the sharing of resources. For example, in Bhutan's downstream villages in the Lingmutey Chu valley farmers often suffered from the lack of water especially during the planting season. Traditionally upstream villages were allocated water rights on a "first come, first served" basis, and this caused inefficient use upstream and shortages in downstream areas. Water users associations, while formally created by law, were ineffective. Working with engineers, the community succeeded in negotiating a more equitable water sharing arrangement, reviving water user associations and improving efficiency of water use in upstream villages. This has transformed water management in the region and influenced the design of Bhutan's national water policy.<sup>38</sup> Reaching agreement between upstream and downstream users at a larger scale, especially in transboundary river and lake basins, is a greater but not an insurmountable challenge.

8.30 Water reforms have a much higher chance of success when they build a political consensus. Even very centralized countries with a history of limited mechanisms for accountability in the sector (Algeria, Arab Republic of Egypt, Republic of Yemen) are beginning to release information to the public, involve citizens groups, and enact changes to increase accountability of governments and service providers.<sup>39</sup>

8.31 Reforms succeed when they have political and not only technical champions. In Chile, Mali, Namibia, and South Africa institutional reforms in water were part of a broader package of political and economic reforms (see box on water reforms in Mali in chapter 11).<sup>40</sup> In Morocco, the governance leadership roles of the Ministry of Finance and Ministry of Economic Affairs were instrumental in building consensus and creating a window of opportunity for pursuing water sector reforms.<sup>41</sup>

### **Greening the Green Revolution**

8.32 A remarkable shift to high-input farming is behind the agriculture's recent intensification in irrigated and high-potential rainfed farming areas. Exemplified by the Green Revolution, it typically involves monocropped fields and a package of modern seed varieties, fertilizers, pesticides, and herbicides—and often mechanization.

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<sup>36</sup> Kuriakose and others (2004).

<sup>37</sup> World Bank (2006c).

<sup>38</sup> International Development Research Centre (2006).

<sup>39</sup> World Bank (2003).

<sup>40</sup> Saleth and Dinar (2005), Aw and Diemer (2005).

<sup>41</sup> World Bank (2007a).

8.33 Despite its success, high-input farming has produced serious environmental problems through the mismanagement of modern inputs. The mismanagement of irrigation water was just discussed. Related problems arise from the injudicious use of fertilizers and pesticides. They include water pollution, buildups of pesticide toxins in the soil, indirect damage to larger ecosystems when excess nitrates from farming enter water systems, and inadvertent poisoning of humans, animals, and non-targeted plants and insects.<sup>42</sup> High-input farming has also reduced biodiversity in local landscapes and genetic diversity in the crops grown.<sup>43</sup>

8.34 But intensive crop farming need not degrade the environment, and better management of modern inputs can reduce environmental damage without sacrificing yields. For example, integrated pest management that combines agro-ecological principles with judicious use of pesticides can increase yields and reduce environmental damage (box 8.5).<sup>44</sup> Other knowledge-based improvements in management that are win-win for farmers include use of pest resistant varieties, better timing and application of fertilizer and water, precision farming (using geographic information system—GIS), and low till farming (see chapter 7).<sup>45</sup>

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**Box 8.5 Integrated pest management to control the Andean potato weevil in Peru**

Together with late blight, the Andean potato weevil was a major threat to potato production, reducing yields by a third to a half. To help farmers, the International Potato Center and Peruvian partners started an adaptive on-farm research project in two potato-growing communities in the Andes in 1991.

The project introduced several integrated pest management practices:

- Chemical control, with selective insecticides.
- Cultural control, adjusting harvest time, soil management, and tillage after harvest.
- Mechanical control, such as covers for transport, ditches around potato fields, vegetative barriers, and the elimination of volunteer plants.
- Biological control, with the fungus *Beauveria*.

There were also practices such as handpicking adult insects and using chickens to eat larvae.

Although farmers did not adopt all the practices, a before-and-after study showed that farmers could substantially reduce damage and increase their net income on average by \$154 per hectare. A cost-benefit analysis using survey data showed an internal rate of return of 30 percent, with all research and development costs included and a service life of 20 years.

*Source:* Waibel and Pemsil (1999), TAC's Standing Panel on Impact Assessment (SPIA) (1999).

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8.35 Despite the improved technologies and integrated management practices that can reduce the need for fertilizers and pesticides, farmers have been slow to take them up. One reason is the subsidies on water and fertilizer that some governments still provide, particularly in Asia and Latin America. By making these inputs less costly, subsidies encourage farmers to be more wasteful in their use. Another reason is that many of these

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<sup>42</sup> Millennium Ecosystem Assessment (MEA) (2005).

<sup>43</sup> McNeely and Scherr (2003), Fowler and Hodgkin (2004).

<sup>44</sup> Pingali and Rosegrant (1994), Susmita, Meisner, and Wheeler (2007).

<sup>45</sup> Pretty (2006).

improved practices are knowledge-intensive and require extension systems that can transfer knowledge and decisionmaking skills to farmers rather than provide blanket recommendations over large areas.<sup>46</sup>

8.36 A third reason is the negative externality of much environmental damage in high-input farming systems, driving a wedge between the private interests of farmers and the larger social value of the environmental services they degrade. Some externalities arise locally and can be solved through local collective action—such as groups of contiguous farmers adopting integrated pest management to prevent the loss of locally beneficial insects. But where environmental externalities have a broader reach, as with the pollution of waterways, other solutions are needed, often requiring greater monitoring and regulation of management practices by public or quasi-public agencies. This has proved to be very difficult in most agriculture-based poor countries because of the general weakness of public institutions.

8.37 The prospects for reforming intensive farming systems are greatest in transforming and urbanizing countries. Farmers there face new market opportunities for diversifying away from monocrop farming and even for expanding into niche markets for organic produce. The high health, quality, and environmental standards of governments and supermarkets, also compel farmers to shift to better and more sustainable farming practices. Public institutions and civil society, well organized in many of these countries, have the capacity both to regulate and to assist farming communities in managing natural resources.

### **Managing intensive livestock systems**

8.38 Intensive livestock systems are burgeoning in the developing world, driven by the growth in demand for meat, milk, and eggs, a direct consequence of rising per capita incomes and urbanization. This intensification has been assisted by technological change, particularly in animal breeding, nutrition, and health. The results? More productive animals.<sup>47</sup> A major shift from beef and mutton to poultry and pork which are less costly to produce. Larger production units that capture economies of scale. And greater integration within the market chain, improving quality and lowering the costs of marketing and transport.

8.39 Livestock intensification has also produced environmental problems linked to a move from dispersed production in rural areas to specialized livestock units in urban and periurban areas, now happening on a grand scale in much of East Asia. The major environmental threats are the pollution of water and soil with animal waste, especially nitrogen, phosphorous and highly toxic heavy metals, such as cadmium, copper and zinc. Dense livestock populations also add significantly to the risk of spreading animal diseases and to the possible economic losses. Some of these diseases are also a threat to

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<sup>46</sup> Pingali, Hossain, and Gerpacio (1997).

<sup>47</sup>Over the period 1980-2005, the annual off-take of a chicken stock with a total live weight of 1000 kg increased, from 1290 kg to 1990 kg live weight, and those of pigs with the same total live weight increased from 140 to 330 kg live weight.

humans, especially where dense populations of animals and humans come into close contact.

8.40 Strategies for managing the environmental and health problems of intensive livestock systems need to disrupt this pattern of urban concentration. Areas that can absorb higher livestock densities can be identified with GIS technology, superimposing current farming systems and their nutrient balances with ecological sensitive areas, prevailing human population densities, and infrastructure.<sup>48</sup> Inducing enterprises to relocate to an environmentally more suitable area requires a combination of “command and control” and “market based” instruments. Command and control measures might include limiting the size of livestock farms (Norway), limiting the livestock density per farm (Germany), and introducing minimum distances between farms (Spain) or between farms and the nearest waterway (Brazil). Market instruments include tax rebates for relocation (Thailand, box 8.6), environmental taxes on urban livestock farms, and investment support for on-farm infrastructure to reduce nutrient leaching (OECD countries). Tradable manure quota systems, with a government buy-back system to reduce overall animal pressure, have worked in the Netherlands.<sup>49</sup>

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**Box 8.6 Managing poultry intensification in Thailand**

Thailand, as an important player in the global poultry meat market (more than 500 billion tons of exports in 2003), has controlled many of the disease risks. A zoning and tax system significantly reduced the concentration of poultry in periurban areas in less than a decade. Poultry farmers close to Bangkok had to pay high taxes while farmers outside that zone enjoyed tax-free status (box figure 8.2).<sup>50</sup>

*Highly pathogenic avian influenza* was also controlled, though it has not yet been fully eradicated. Following an outbreak in late 2003 the Thai government developed disease free zones with 24-hour movement control and high bio-security levels—and hundreds of thousands of inspectors went door-to-door to search for diseased animals.<sup>51</sup> And the large exporters shifted to cooked meat. The incidence of highly pathogenic avian influenza fell. Two outbreaks in August 2006—in village poultry and a small commercial unit with poor biosecurity—emphasize the need for vigilance.

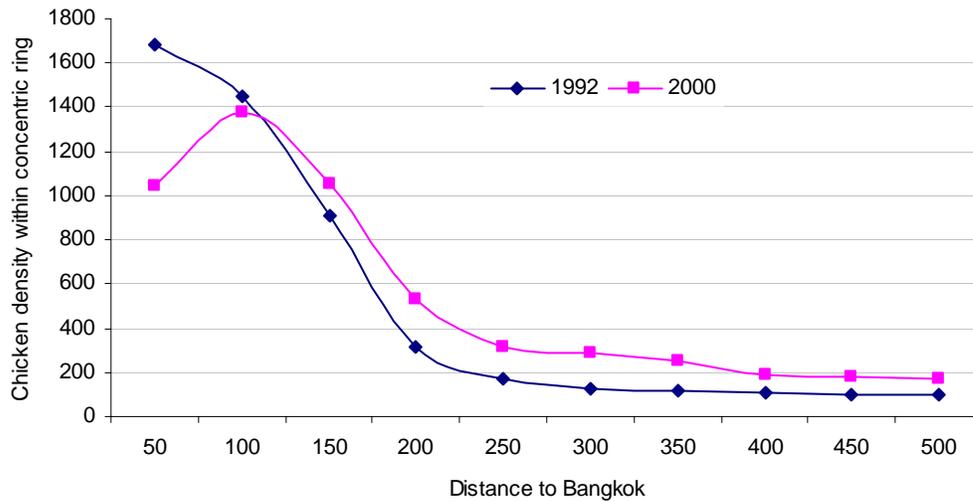
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<sup>48</sup> Gerber and others (2004).

<sup>49</sup> World Bank (2005).

<sup>50</sup> FAO (2007).

<sup>51</sup> Gilbert and others (2006).

**Box figure 8.2 Thailand is shifting the concentration of poultry away from Bangkok**

Source: Steinfeld and others (2006).

8.41 One cause of recently emerging diseases is probably the mix of production systems in areas densely populated by people and livestock, as occurs during urban and periurban drift.<sup>52</sup> Although the epidemiology of highly pathogenic avian influenza is not yet fully clear, its spread in East Asia seems accelerated by that mix. The backyard poultry systems concentrated around urban areas allow the continuing—low level—circulation of the virus. And larger, mostly medium-size operations, with considerable movement of feed, animals, and people, enable the virus to scale up and spread.

### Reversing degradation in less-favored areas

8.42 Less-favored areas have gained little from past agricultural successes in raising yields. They are characterized by the extensification of agriculture, resource degradation, and poverty. They include marginal lands of low agricultural potential because of poor climate, soils, and topography and areas that may have higher agricultural potential but are underexploited because of limited access to infrastructure and markets, low population density, or other socio-economic constraints (chapter 2). Most of them are either hillside and mountain regions (“uplands”) or arid and semiarid zones (“drylands”), together accounting for about 40 percent of the agricultural area and rural population of developing countries.<sup>53</sup> Settlement areas in tropical forests, although smaller in their extent and population, are another important category from an environmental perspective, with deforestation contributing to global carbon emissions and climate change (see focus E).

<sup>52</sup> Slingenberg and others (2004).

<sup>53</sup> Calculated by Ruerd Rubin using information on resource use regimes from Consultative Group on International Agricultural Research/Technical Advisory Committee (2007) and FAO and World Bank (2001).

8.43 Less-favored regions encompass a rich array of low-input farming systems: migratory herding in arid areas; agro-pastoral systems in dryland areas; integrated crop, tree, and livestock production in hillside areas; and managed secondary forest fallow cultivation at forest margins. They cover vast areas environmentally fragile in their soils, vegetation, and landscapes. Some, especially upland and forest areas, also protect watersheds, regulate water flows in major river basin systems, sequester large amounts of carbon above and below ground, and are host to a rich array of biodiversity. Few of these environmental benefits are valued in the market place.

8.44 In many less-favored regions population growth is placing enormous pressure on the natural resource base. Until a few decades ago, natural resources were commonly abundant and, once used, could recover through fallows and shifting cultivation. Many of the more fragile lands were not farmed at all or were grazed by nomadic herders. Sparsely settled forests provided hunting and gathering livelihoods for tribal peoples. Today, many of these lands support moderate to high population densities, providing food, fuelwood, water, and housing. Without adequate increases in land or animal productivity to secure their livelihoods, farmers expand their crop areas by shortening fallows and clearing new land—much of which is environmentally fragile and easily degraded—and add livestock to already over-stocked pastoral areas. Smallholder encroachment into the remaining tropical forest accounts for about 60 percent of all deforestation each year.<sup>54</sup> Population pressure is also leading to more diverse livelihoods, with greater dependence on seasonal migration and remittances from family members working in urban areas or abroad (see chapter 9). One consequence of this has been an increase in women farmers and a general aging of the farm work force in many less-favored areas.

8.45 Agricultural policy reforms and market liberalization programs have removed many of the subsidized services and market protections that these areas enjoyed.<sup>55</sup> In Africa, for example, market reforms reduced the availability of inorganic fertilizers and increased their cost in many poorer regions, making it harder for small poor farmers to maintain the fertility of their soils.

8.46 Land degradation in less-favored regions is most severe in such hot spots, as foothills of the Himalayas, sloping areas in the Andes, southern China, and Southeast Asia, rangelands in Africa and Central and West Asia, and the arid lands of the Sahel.<sup>56</sup> Soil nutrient mining is endemic across much of Sub-Saharan Africa. Overgrazing and degradation of pastoral areas are widespread in much of the steppe of North Africa, the Middle East and Central Asia, and the Sahel. Deforestation is concentrated in the remaining tropical moist forests of the Amazon, West Africa, and parts of South East Asia.

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<sup>54</sup> FAO (2005a).

<sup>55</sup> Kuyvenhoven (2004), Chaherli (1999).

<sup>56</sup> Scherr and Yadav (1995).

### *Strategies for less-favored areas*

8.47 Public interventions to promote more sustainable development are warranted in many less-favored regions to reduce poverty and preserve the environment.<sup>57</sup> The form of the interventions and the cost are important. Much depends on the type of less-favored region being targeted and on the national economic context, given considerable diversity on both counts. Options include encouraging more out-migration, promoting income diversification into non-farm activities, increasing recurrent expenditure on safety nets, supporting more intensive agricultural development, and introducing payments for environmental services. Nonagricultural options are generally more viable in transforming and urbanizing countries with dynamic nonagricultural sectors—and less so in poor agriculture-based countries with stagnant economies.

8.48 Agricultural development in less-favored regions is constrained to varying degrees by fragile and often sloped and already degraded soils, erratic and often low rainfall, poor market access, and high transport costs. Even so, what is typically required most is a shift to more intensive agricultural production systems that can raise land and labor productivity and reduce or reverse the need for further crop area expansions. The challenge is to do this while ensuring the sustainable use of resources at local levels and avoiding negative environmental externalities at higher scales.

8.49 Strategies for less-favored regions need four pillars:

- Better technologies and natural resource management. To a large degree, farmers and local communities have already exploited the available productivity-enhancing technologies and natural resource management practices, often with considerable indigenous adaptation and improvement over the years. But the low productivity of most less-favored regions requires major new technology breakthroughs to reverse resource degradation and improve livelihoods. Unlike the Green Revolution, these breakthroughs have to build on improved natural resource management practices, a complex and site-specific undertaking.
- Putting local communities in the driver's seat. Necessary because of the enormous agro-ecological diversity in less-favored areas and the need to select and adapt technology and natural resource management investments to fit local needs and conditions. Also, because most natural resource management investments require secure long-term ownership or use rights and collective action and these are supplied best by community based organizations.

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<sup>57</sup> Many such interventions have been neglected because of the perception that rates of return to public investments are better in high potential areas, as was indeed true during the early phases of the Green Revolution in Asia and as may be true in Africa today. But some public investments (roads, education, irrigation, and some types of R&D) can produce competitive rates of return (Fan and Hazell (2001)), indicating possibilities for win-win-win outcomes for growth, poverty, and the environment. The public agenda today also places higher priority on poverty and environmental goals (the MDGs) even where tradeoffs do arise.

- Supportive policy environments. The public sector has to provide a supportive policy environment, especially improving rural infrastructure and market access so that farmers can compete in markets, acquire key farm inputs, and diversify into higher value products. Less-favored regions also face significant weather risks that cannot be adequately managed at local levels (chapter 6).
- Dealing with externalities. Because of the very significant environmental externalities of farming in many less-favored areas, mechanisms need to be found to deal with them. Recent developments in payments for environmental services look promising.

### ***Better technologies and natural resource management***

8.50 After years of neglect, less-favored regions have recently attracted more agricultural R&D attention from public, nongovernmental, and private agencies (chapter 7). Initial efforts have targeted natural resource management practices that conserve scarce water, control erosion, and restore soil fertility while using few external inputs (fertilizer). Plant breeding has focused on varieties that are more tolerant of drought and poor soil conditions and that have greater pest and disease resistance. These improvements can produce significant gains in productivity and reverse resource degradation and will be increasingly important as farmers try to adapt to climate change. They can also help create more favorable crop growing conditions, making it profitable to use higher yielding crop varieties and inorganic fertilizers, producing even more significant long-term gains in land and labor productivity.

8.51 Agroforestry is one promising technology that has already had far-ranging impacts in many hillside and agro-pastoral areas in Africa (box 8.7). Conservation farming has been adapted to a wide range of conditions in Africa, Asia and Latin America (chapter 7). In the Sahel simple and low-cost bunding techniques and tree planting retain soil nutrients and reduce erosion, leading to higher and more stable yields and incomes.<sup>58</sup>

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#### **Box 8.7 Agroforestry in Africa**

Agroforestry (incorporating trees into farming systems) is now so widespread in many African countries that the tree cover on agricultural land is increasing.<sup>59</sup> Investments are being driven by new market opportunities for tree products, a growing demand for livestock fodder, and the value of using trees to improve soil fertility.

##### **Market opportunities**

New market opportunities have led smallholder farmers to expand their fruit and nut production. Key species include mango, citrus, papaya, passion, avocado, and some indigenous fruits (*Sclerocarya birrea*). In normal years trees can generate up to \$30 each in net returns. In Kenya about 90 percent of arable-land farmers grow fruit trees, contributing about 10 percent of total household income regardless of wealth. About 60 percent of all firewood and charcoal in Kenya also comes from farms, worth about \$200 million a year. New demand for energy is also opening new opportunities for agroforestry. Farmers in several African countries are testing *Jatropha* and other oil-producing trees.

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<sup>58</sup> Reij and Steeds (2003), Helben (2006), de Graaff (1996).

<sup>59</sup> Otsuka and Place (2007).

### **Livestock fodder**

High quality forage shrubs, easy to grow and generating net returns of \$40 per cow per year, have been adopted by about 100,000 East African smallholder dairy farmers. This translates into total benefits of \$4 million a year for all of East Africa, and there is potential to expand this 20-fold to another 2 million dairy smallholders in East Africa.

### **Soil fertility**

Given the low fertility of soils in much of Africa and the low (and sometimes declining) use of mineral fertilizers, agroforestry-based soil fertility systems now interest farmers (chapter 7).

*Source:* Prepared by ICRAF.

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8.52 Small farmer-controlled irrigation programs that use simple and low-cost technologies—river diversion, lifting with small (hand or rope) pumps from shallow groundwater or rivers, and seasonal flooding—enjoy local success in Africa, especially for high-value horticulture crops. So do small run-of-the-river rice schemes developed at low cost in Tanzania and some community-based irrigation in Ethiopia.<sup>60</sup> Benefits have been shared by both rich and poor farmers. Small watershed development projects have also increased farm incomes and reduced soil erosion, as in some of the lower rainfall areas of Ethiopia and India.<sup>61</sup> There is considerable scope for expanding small scale irrigation and water capture investments in Africa, which has barely begun to tap its irrigation potential. Beyond reducing poverty, small-scale irrigation can increase incomes from women’s agricultural activities and the diversity of families’ nutrition.

8.53 The common constraint on intensifying traditional livestock systems is the lack of feed.<sup>62</sup> To reduce it, farmers are improving pasture management (area rotation, silvo-pastoral systems), producing leguminous fodder crops, and using crop residues and industrial subproducts (feedblocks in Northern Africa, cottonseed in West Africa).

8.54 Uptake has been mixed, however.<sup>63</sup> Some improved natural resource management practices simply do not offer enough gains in land and labor productivity to make the investment worthwhile.<sup>64</sup> Many are labor intensive and incompatible with seasonal labor scarcities, ageing populations, and the increasing role of women farmers. Fallows and green manures (dedicated crops grown for their organic matter and nutrients which are plowed into the soil rather than harvested) also keep land out of crop production, and composting and manuring compete with household energy for scarce organic matter. Natural resource management is also knowledge-intensive, and farmers, especially women, may not have access to appropriate agricultural extension or training. Learning from neighbors turns out not to be very effective for complex natural resource management practices.<sup>65</sup>

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<sup>60</sup> IFAD (2005a).

<sup>61</sup> Pender, Place, and Ehuin (2006), Kerr and Kolavalli (1999).

<sup>62</sup> McIntire, Bouzart, and Pingali (1992).

<sup>63</sup> See Tripp (2006) and Ruben and Pender (2004) for useful reviews.

<sup>64</sup> Pender, Place, and Ehuin (2006).

<sup>65</sup> Tripp (2007).

8.55 Many natural resource management investments need to be at landscape levels, requiring cooperation by groups of farmers or even entire communities.<sup>66</sup> For example, contouring hillsides to control soil erosion and capture water requires a coordinated investment and water sharing arrangements by all farmers on the same hillside. Watershed development requires cooperation amongst all the key stakeholders in a watershed, and this may involve one or more entire communities. Collective action is also needed to manage common properties and guide upstream-downstream equity.

8.56 In addition, investments in better natural resource management, unlike those in single season inputs like fertilizer and improved seed, are long term, requiring secure long-term property rights over resources. Farmers will be reluctant to plant trees, for example, if they are uncertain of being able to retain possession and reap the eventual rewards. And communities are more likely to invest in improving common properties like grazing areas and woodlots if they have secure use rights over those resources and can exclude or control outsiders.

8.57 Land rights are rarely legally defined and registered in less-favored regions. More often they are based on customary tenure recognized and enforced at community and tribal levels. In much of Sub-Saharan Africa, for example, land is traditionally owned by the village, and the village elders allocate land to farmers, uphold and enforce their use, transfer rights, and resolve disputes. The provision of secure property rights thus depends on effective community leadership. Similarly, the ability to organize and sustain collective action is also a key function of local communities. These are powerful reasons why community organizations must lie at the heart of agricultural development in less-favored regions.

### ***Putting local communities in the driver's seat***

8.58 Community approaches can provide the secure property rights and collective action needed for improving natural resource management. They can also manage local externalities and mediate between local people and the project activities of governments, donors, and NGOs to represent local interests and adapt investments and policies to local needs and conditions. There has been a veritable explosion of community organizations for natural resource management in recent years, driven largely by nongovernmental organizations that have become active in many less-favored regions. They have also been encouraged by some donors (such as IFAD) to empower the poor, particularly poor women, and to ensure that they participate in new growth opportunities as in the very successful Southern Highlands Project of Peru.<sup>67</sup> Some governments have also turned to local communities to take over roles formerly fulfilled—usually very inadequately—by the state, such as managing forests in India and rangelands in the Middle East and North Africa.

8.59 To be effective, community organizations need to include all stakeholders.<sup>68</sup> In some cases this may involve a group of farmers in the community, as for contouring part

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<sup>66</sup> Knox, Meinzen-Dick and Hazell (2002).

<sup>67</sup> IFAD (2005b).

<sup>68</sup> See Uphoff (2001).

of the landscape. In other cases it may involve the whole village, as in watershed development. In still others it needs to embrace other villages, as in managing open rangelands that are shared with other local communities or even distant tribes. Including women as farmers and as collectors of fuelwood, fodder and water from communal areas is important. In fact, some of the more successful community organizations are led by women, especially poor women. Gender strategies in the water sector have been shown to improve performance of water users associations. These strategies include representation of women farmers in water user associations, gender training of association staff, allocation of newly irrigated lands giving priority to women farmers and combining irrigation and domestic water supply to reduce the burden on women's time.<sup>69</sup>

8.60 Local organizations, to avoid elite capture and resolve local disputes, need broad representation in their governance. The startup and early development of local organizations are typically difficult because of a lack of leadership and technical and administrative skills in the community—and training and leadership support from outside agencies (NGOs) have often proved crucial in this. For example, in the remote Arsaal region in Lebanon researchers have combined modern technologies with traditional tribal practices of managing natural resources to help resolve land disputes. Land users network, inspired by the traditional community councils, or *majlis*, brought together orchardists and pastoralists, men and women, traditional decisionmakers and new local power figures and became a platform for communication, participation and search for win-win solutions. Herder's and women's cooperatives were formed to help improve livelihoods from livestock rearing, weaving carpets and processing fruit.

8.61 The growing role of community organizations is proving a problem for some government ministries responsible for agriculture and natural resources. These agencies often do not have the organizational culture or human resources to support participatory approaches. New specialist structures may need to be created, cutting across disciplines and relevant ministries. Or organizations could be contracted from the private sector and civil society to link central policies and procedures with practices on the ground.

8.62 Community approaches despite their promise, are not a panacea on their own. There are often situations where acute resource loss, irreconcilable social conflict, the lack of capacity, or simply the absence of a valid community requires more centralized interventions or at least support from outside agencies. Resolving conflicting interests between pastoralists and crop farmers in many dryland areas, or managing and controlling water resources beyond the immediate watershed, may demand more than community approaches can deliver. Much remains to be learned about the conditions for them to succeed and be scaled up.

### ***Supportive policy environments***

8.63 Since the development potential of most less-favored regions is constrained by poor infrastructure and access to markets, the right kinds of public investments can unleash considerable growth. There are many examples of how a new road transformed a

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<sup>69</sup> IFAD (2001).

less-favored village or area by opening new opportunities for diversifying into higher value agricultural products and nonfarm activities.<sup>70</sup> Public interventions are also needed to ensure that farmers have access to long-term credit, to reinforce indigenous property rights systems where necessary, and to ensure that communities have secure ownership rights over all communally owned resources. Supportive risk management aids, such as simple forms of regional weather insurance or safety nets are also needed in many drought-prone areas, and this will become even more important as farmers try to adapt to climate change (chapter 6).

8.64 A dilemma for policymakers is that many interventions are not win-win for growth and the environment. For example, government attempts to help herders manage droughts and grazing areas in the agro-pastoral systems of the Middle East and North Africa ended up further degrading farmland and rangeland (box 8.8). And given the large externalities in less-favored regions, policies that promote sustainable farming and reduce poverty do not necessarily stem environmental degradation. In the forest margins of the Brazilian Amazon, interventions to improve the profitability and sustainability of smallholder farming and increase their access to markets led to additional settlement and deforestation – although smallholder farming is not a major cause of deforestation in the Brazilian Amazon (box 8.9). There are few technological fixes for these tradeoffs—solutions require much more effective mechanisms for managing environmental externalities.

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**Box 8.8 Managing drought risks in the low-rainfall areas of the Middle East and North Africa**

Most of the agricultural land in the MENA region receives less than 400mm/year of rainfall and is devoted to barley-sheep farming systems that utilize available cropping land and the vast grazing areas of the steppe. Drought has long been a significant factor in the region and agro-pastoral societies have developed their own strategies for coping with drought. These include: mobile or transhumant grazing practices that reduce risks of having insufficient forage in any one location; reciprocal grazing arrangements with more distant communities for access to their resources in drought years; adjustment of flock sizes and stocking rates to match available grazing resources; keeping extra animals that can be easily liquidated in a drought, either for food or cash; and income diversification into crop farming and non-agricultural occupations, particularly seasonal migration for off-farm employment.

These traditional risk management strategies have proved effective in managing drought and have enabled pastoral societies to survive for many centuries. The interplay between drought and traditional management systems has also helped to keep total flock sizes in equilibrium with the inherent productivity of the pastures, avoiding the long-term degradation of grazing areas. However, the ability to manage drought shocks has declined with population growth, as more and more people seek to earn a livelihood from the meager resources available in these areas and by more frequent and prolonged droughts associated with global warming. As a result, droughts now bring significant loss of livestock, push many farmers and herders into poverty, and hold back investments in improved natural resources management.

Governments throughout the region have intervened to help manage drought losses, but usually on the basis of crisis relief once the drought has set in and without much thought of the longer term consequences. The most important interventions are feed subsidies for livestock and debt forgiveness and both have had an adverse impact on resource degradation.

Feed subsidy programs (mostly for barley) have been quite successful in protecting livestock numbers and production during droughts but have helped accelerate rangeland degradation in the long term by undermining the traditional process of adjusting flock size to inter-annual climatic variations. Herd sizes

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<sup>70</sup> Pender, Place, and Ehuin (2006).

have increased sharply in recent years, and grazing practices have changed so that many of the animals no longer leave the steppe during the dry season but have their feed and water trucked in. This practice leads to overgrazing during the dry season, reduces the natural seeding of annual pasture species, disturbs the soil, and contributes to wind erosion, particularly in areas near water and feed supply points. High government procurement prices for barley have also encouraged the mechanized encroachment of barley cultivation on to rangeland areas where it cannot be sustained.

While systematic rescheduling of credit for farmers provides some short-term relief to herders and small farmers, this approach has proved of greatest benefit to larger farms, and has contributed to the chronically poor debt collection performance of the region's agricultural development banks.

The result of these interventions has been an increase in unsustainable farming practices that contribute to both future drought losses and farmers' dependence on government assistance, and to moral hazard problems that further add to the government's cost of providing drought compensation. Better alternatives would be simple forms of drought insurance, provision of early warning drought forecasts and safety net programs for the poor.

*Source: Hazell, Oram, and Chaherli (2001).*

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### **Box 8.9 Slowing deforestation by smallholders**

Every year around 13 million hectares of forest are lost or degraded in developing countries, equivalent to just over 1 percent of the current tropical forest reserves (FAO (2005b)). More than 60 percent of deforestation has been attributed to the expansion of subsistence farming, mostly in Africa and parts of Asia. A more common cause in Latin America and other parts of Asia are government backed logging and conversions of forest to other land uses, such as large-scale ranching or oil palm estates.

Better forest and tax policies can manage logging, mining, and large-scale farming in forest areas. But slowing smallholder encroachment is a particular challenge. In the Brazilian Amazon, encroachment by low-income migrants who find livestock far more profitable than food crops or traditional forest products (Brazil nuts) is one of the causes of deforestation. Livestock also require less labor which fits well in labor-scarce settlement areas, and live animals are easier to market than crops. In these circumstances, slowing forest conversion can reduce household incomes and worsen poverty.

Added to the dilemma: interventions that strengthen property rights over cleared land and improve roads, market access, and crop yields increase incomes and reduce poverty, but they also make settlement and deforestation more attractive.

If the forest could yield more income for settlers, that would slow deforestation. Better market outlets for traditional nonforest products can help, but not reach the needed scale. Sustainable timber extraction shows promise but requires effective regulation to ensure that farmers follow recommended practices. 'Avoided deforestation' carbon payment schemes may encourage settlers to retain more forest, especially because the carbon value of standing forest often exceeds the agricultural value.

Otherwise only more effective regulation of the areas for settlement and the amount of deforestation allowed can slow deforestation, but enforcement is expensive and difficult in remote areas.

*Sources: Vosti, Witcover, and Carpentier (2002), World Bank (2007b).*

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## **Dealing with externalities**

8.65 Many less-favored and high potential areas have landscapes that produce a wide range of valuable environmental services: sequestering carbon, harboring biodiversity, protecting watersheds, and providing clean water downstream. But in the absence of markets that can compensate farmers for these wider benefits, there is an inevitable underinvestment in natural resource management practices that could generate additional environmental services. Many traditional approaches to increasing environmental

services are based on the good will and livelihood interests of farmers and local communities, or seek to regulate what farmers can and cannot do. Neither approach has worked well or can be sustained over time. Occasionally win-win technologies can help fix the problem, but these are few and far between.<sup>71</sup>

8.66 The bottom line is that farmers need some form of environmental payment if they are to make the investments in natural resource management that society desires. This has been attempted at small scales in the past, for example by providing concessionary loans for investments, using food for work programs for construction, and supplying key inputs like trees without charge. But these efforts are far too small to address the really big externality problems, especially those with international or global dimensions. The emerging markets and payment schemes for environmental services are an exciting new development that aims to fill this void by compensating farmers and communities for some of the environmental services they provide.

8.67 Most payment schemes attempted so far in developing countries have focused on retaining forest, but interest is growing in agricultural areas. A pilot project for biodiversity and carbon sequestration in Colombia, Costa Rica, and Nicaragua has induced desired changes in land use, and the provision of the desired environmental services appears to have increased substantially.<sup>72</sup> And despite the expensive and technically challenging practices, poor households are participating actively. In Africa, too, there is potential for smallholders to sequester carbon through agroforestry. Grown in blocks, trees can sequester 15 tons of carbon per hectare. At a carbon price of around \$15 per ton, this generates \$225 in carbon value. In China, the government launched the Sloping Lands Conversion Program (SLCP) in 1999 which is now paying farmers to plant and conserve trees in watershed protection areas. The program has a target of about 15 million hectares by 2010 and a total budget of about \$40 billion.<sup>73</sup>

8.68 If payment schemes are to be used more widely, they will have to ensure that the funding base is sustainable for the long term, directly linking service users and providers. This is easier when there are just one or two large service users with fairly clear actual or potential environmental threats—and when the causes and effects between farm activities and environmental outcomes are fairly well understood. Small watersheds with a downstream hydropower plant (usually most vulnerable to sedimentation) or domestic water suppliers (affected by contamination and sedimentation) are good candidates. Large basins with multiple users, where downstream impacts are the cumulative impact of myriad upstream uses, are poor candidates. Biodiversity conservation is also difficult because of the lack of stakeholders with strong financial interests.

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<sup>71</sup> As shown in a recent Consultative Group on International Agricultural Research (CGIAR) (2006) study, more powerful win-win options are elusive.

<sup>72</sup> Data provided by Stefano Pagiola

<sup>73</sup> Bennett and Xu (2006).

## **Conclusions**

8.69 A priority for irrigated farming must be to improve the efficiency of water use while substantially reducing total water use, water pollution, and the unsustainable mining of groundwater. Suitable technologies are already available, but new incentives and institutional arrangements are needed to encourage their adoption. Among them are innovative approaches to cost recovery, greater devolution of water management decisions to local user groups, and more effective regulation of externalities.

8.70 To make intensive farming sustainable, better technologies and better ways of managing modern farm inputs are available today. But their widespread adoption is often hindered by inappropriate pricing and subsidy policies, insufficient training of farmers, and failure to manage negative externalities. The animal waste pollution and disease problems associated with intensive livestock farming can be avoided by discouraging the concentration of livestock farms in urban and periurban areas and carefully locating them in appropriate parts of the watershed so that they do not contaminate surface and groundwater.

8.71 In less-favored regions, more sustainable development will require new technologies and natural resource management practices that can significantly shift the productivity envelope. Some new and promising technologies have emerged, but widespread adoption of better natural resource management is complicated by their long term nature and the need for collective action. There are also difficult institutional constraints to overcome. One of the more promising recent developments has been local organizations for community-based natural resource management. Learning how to scale them up should be a priority.

8.72 Required in both intensive and extensive farming areas are removing pricing and subsidy policies that send the wrong signals to farmers, strengthening property rights, providing long-term credit for natural resource management, policy instruments to help manage climate risks, and additional investments in rural infrastructure.

8.73 Managing the externalities in agriculture remains largely unresolved. In intensive farming the externalities are largely negative, such as water pollution and groundwater mining. Polluters need to be regulated and penalized, but this requires more effective public institutions. In less-favored regions many of the externalities are positive, as with watershed protection and carbon sequestration. These environmental services can be of considerable benefit to society, but farmers and communities are not rewarded for their efforts in the market, so they do not provide enough of those services. In the absence of more powerful win-win technologies, they need some form of financial compensation. The emergence of new markets and programs for payments for environmental services is a promising new development that should be urgently pursued by the international community.

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## **Focus G Using agriculture to mitigate climate change and adapting to it**

*Climate change will affect agriculture more than any other sector. Increased risks of crop failures and livestock deaths are already imposing high economic losses and undermining food security, and they are likely to get far more severe as global warming continues. Abatement of greenhouse gases is likely to be more costly in agriculture than in other sectors, but it presents an opportunity to use carbon financing to reduce deforestation. Adaptation and mitigation measures can greatly reduce the extent and adverse impact of climate change, and concerted international action and strategic country planning are urgently needed to facilitate them.*

### ***Agriculture's impact on climate change is significant***

G.1 Livestock and crop farming activities emit carbon dioxide (CO<sub>2</sub>), methane, and nitrous oxide, making agriculture a major source of greenhouse gas emissions (figure G.1). According to the emissions inventories that governments submit to United Nations Framework Convention on Climate Change, agriculture accounts for around 15 percent of global greenhouse gas emissions. Adding emissions from deforestation, for which agriculture is the leading cause, raises this estimate to about 30 percent. But given the very large range of uncertainty about the share of total GHG emissions from deforestation it could be anywhere between 25 and 45 percent.<sup>1</sup> Agriculture's share of global emissions is even greater if indirect emissions of the livestock sector are attributed to agriculture instead of energy, land-use change and deforestation.<sup>2</sup> Whether or not deforestation is included, most of the emissions from agriculture are from developing countries (figure G.1).

G.2 Agriculture provides a unique opportunity to reduce greenhouse gas emissions by slowing deforestation, breeding and managing plant and animal species to reduce methane emissions, and increasing the production of bio-energy. The value of carbon stored in dense rainforests could be 50 times higher than the current price of carbon in the EU emissions trading market, so the opportunity cost of deforestation is enormous.<sup>3</sup> The emerging market for carbon emissions trading offers some new opportunities for agriculture to benefit from land uses that sequester carbon. But the Clean Development Mechanism (CDM) of the Kyoto Protocol, the main mechanism for these payments, would have to be modified to fully include emission reductions from agricultural practices, deforestation and forest degradation.

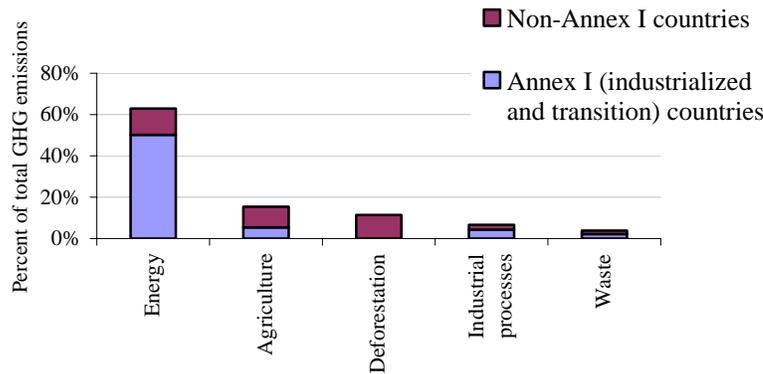
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<sup>1</sup> Watson and others (2000).

<sup>2</sup> FAO (2006).

<sup>3</sup> World Bank (2007).

**Figure G.1 Agriculture is the second largest source of GHG emissions**



*Note:* These are the latest available data for developing countries as a group, and consistent comparison using UNFCCC data is only possible for 1994 data. There is a large range of uncertainty regarding gross emissions from deforestation. Estimates range from 10 to 30 percent of total global emissions during the 1990s Watson and others (2000), thus 11.4 percent UNFCCC estimate from deforestation shown on this chart is conservative. Annex I countries are the 36 industrialized countries and Economies in Transition listed in Annex I of the UNFCCC. Other countries are classified as Non-Annex I.

*Source:* UNFCCC (1994 data reported in 2006).

G.3 The cost of significantly reducing GHG emissions in farming may be higher than that of alternative solutions in the transport and power sectors, although relatively little work has been done to assess the agriculture’s mitigation potential.<sup>4</sup> Emissions of GHG from livestock can be reduced through overall improvements of nutrition and genetics of ruminant livestock and through storage and capture technologies for manure and conversion of emissions into bio-gas. The cost can be lowered through innovative solutions to the problem of methane emissions from livestock and rice paddy fields by breeding low-emissions plant and animal varieties and by developing advanced technologies.

G.4 Agriculture might also reduce climate change through increased production of bio-energy for the transport and power sectors. But the economics and the extent of GHG reductions depend on the maturation of second-generation technologies processing cellulose rich biomass (see focus B).

***Impact of climate change on agriculture could be devastating in many areas***

G.5 Many regions of the world already feel the impacts of climate change on agriculture—impacts that will get progressively more severe as mean temperatures rise and the climate becomes more variable. Droughts, floods, and hurricanes will become more frequent, and monsoon patterns will change. Rainfed agriculture in Sub-Saharan Africa and parts of Asia will bear the brunt of the damage. Glacial melt in the Andes, China, and large parts of the Indian subcontinent will jeopardize water supplies for irrigation and drinking in areas dependent on seasonal water runoff from the glaciers.<sup>5</sup>

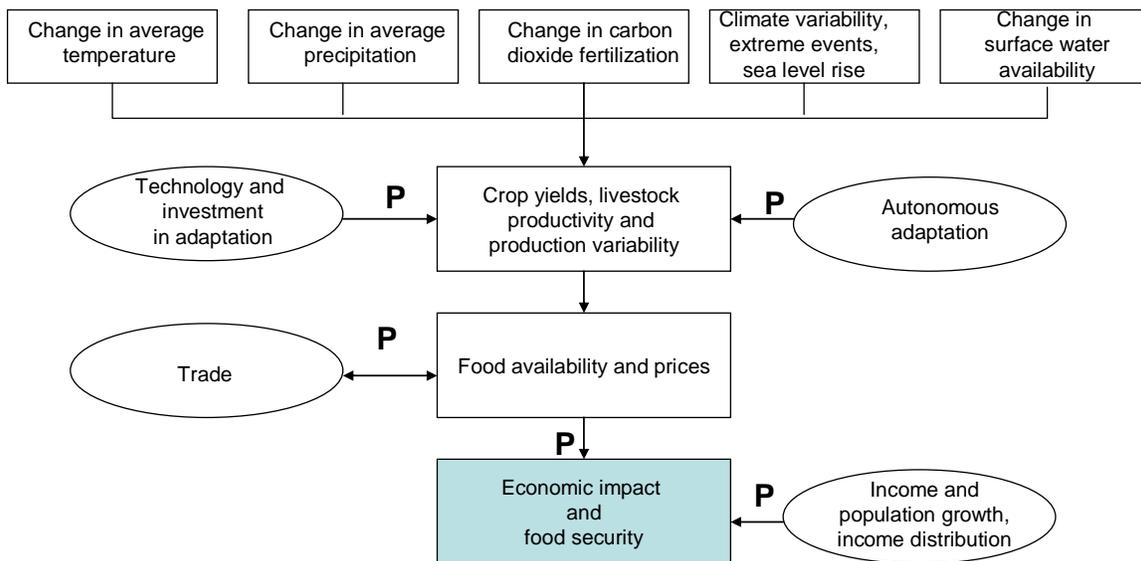
<sup>4</sup> Stern (2006).

<sup>5</sup> Barnett, Adam, and Lettenmaier (2005), Bradley and others (2006).

Large parts of the irrigation infrastructure in developing countries could be made obsolete by these changes in the water cycle. And rainfed agriculture will no longer be possible in many parts of Africa.

G.6 Scientific evidence about the seriousness of the climate threat to agriculture is now unambiguous, but the exact magnitude of the impact is uncertain because it depends on the complex interactions and feedback processes in the ecosystem and the economy (figure G.2). Five main factors will affect agricultural productivity: changes in temperature, precipitation, carbon fertilization, climate variability, and surface water runoff. Assumptions about the magnitude of carbon fertilization effect are critical. Initially, rising atmospheric concentration of carbon has beneficial impact on crop growth and could offset yield losses from heat and water stress, but this effect appears to be smaller in the field conditions than it was previously believed based on experimental data.<sup>6</sup>

**Figure G.2 Policies will affect the costs of climate change to agriculture**



Note: "P" denotes policy interventions.

G.7 Crop-climate models predict a slight increase or a moderate decline in global cereal production, depending on the extent of warming and the strength of carbon fertilization effect.<sup>7</sup> A slight increase is predicted in moderate warming scenarios of up to 3 °C, after which world cereal production would fall marginally. Yields of some crops—including wheat, maize, and rice—are expected to increase slightly by 2050 in regions with temperate climates in a scenario of moderate to medium temperature (1°C and 3°C) along with changes in rainfall and strong carbon dioxide fertilization. But with

<sup>6</sup> Long and others (2007).

<sup>7</sup> Stern (2006), Parry, Rosenzweig, and Livermore (2007).

weak carbon dioxide fertilization, a 5-10 percent decline in global production of cereals could be expected with warming by 2-4°C, according to preliminary estimates.<sup>8</sup>

G.8 In tropical areas even moderate warming can result in significant yield losses because many crops are already at the limit of their heat tolerance. In parts of Africa, Asia, and Central America yields of wheat and maize could decline by 12 to 40 percent as temperature rises by 3-4°C, according to preliminary estimates, even assuming farm-level adaptation to higher average temperature.<sup>9</sup> With carbon dioxide fertilization the losses are about half as large. Rice yields will also decline, though by less than wheat and maize.

G.9 These are conservative estimates, because they do not consider crop and livestock losses arising from more intense droughts and floods, changes in surface water runoff, and threshold effects in the response of crop growth to changes in temperature.<sup>10</sup> And some of the poorest regions will bear the brunt of the damages. Agriculture in some developing countries would also be devastated by flooding and salinization caused by rising sea levels, not included in crop-climate models.<sup>11</sup>

G.10 Livestock productivity will depend on the type of pasture and the prevalent moisture conditions. It is expected to increase in humid temperate grasslands, but decline in arid and semi-arid areas in tropical regions with greater heat stress and droughts. With more frequent droughts, climate change will add to the already devastating livestock losses from drought in Sub-Saharan Africa and other arid areas.

G.11 Access to perennial surface water may be particularly vulnerable in semi-arid regions, because the relationship between precipitation and drainage is non-linear and influenced by a range of biological, geological and atmospheric parameters. In many parts of Africa a small reduction in precipitation could greatly reduce the perennial water supply. For example, a 10 percent decrease in precipitation would reduce drainage by anywhere between 17 and 50 percent, depending on the level of precipitation.<sup>12</sup>

G.12 Declining agricultural productivity can increase the population at risk of hunger in the least developed countries by anywhere between 50 million and 600 million in 2080, without taking into account the important effects of greater temperature variability and intensification of extreme weather events. One third of the additional population at risk is in Africa, one quarter in Western Asia, and about one sixth in Latin America.<sup>13</sup>

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<sup>8</sup> Stern (2006).

<sup>9</sup> Estimates by Warren (2006) based on De Ferranti and others (2004) simulations.

<sup>10</sup> Recent evidence points to a particularly high sensitivity of crop yields to high temperature during flowering, so a small temperature increase, if it occurs during this critical stage, can have a far greater impact on yields, and this is not included in crop-climate model predictions (Challinor and others (2006); Schlenker and Roberts (2006)).

<sup>11</sup> Dasgupta and others (2007).

<sup>12</sup> de Wit and Stankiewicz (2006).

<sup>13</sup> Estimates prepared by Warren (2006), for Stern (2006) based on the integrated crop-climate and socioeconomic model developed by the International Institute for Applied Systems Analysis. These results assume a high degree of adaptation, international trade, and no CO<sub>2</sub> fertilization. Estimates vary by the

Although international trade could reduce food insecurity, it cannot be assumed to be the main solution given the difficulties in transporting food to remote regions and the lack of purchasing power of many poor people.

***Adapting to climate change is urgent***

G.13 Adapting farming systems to climate change can substantially reduce the adverse economic impact. The menu of policies to facilitate adaptation options is broad (denoted by “P” in figure G.2). Key strategies include changes in land use and timing of farming operations, adaptive breeding and technologies, risk management techniques including catastrophe and weather insurance, climate forecast information, irrigation infrastructure and water storage, water management and creation of alternative employment outside of the sensitive agricultural sector. Some actions will be taken by farmers on their own—others will require national and international planning and investment.

G.14 Farmers are already making adaptations in response to climate change. According to one recent study, common strategies are planting different varieties of the same crop, changing planting dates, and adopting a shorter growing season. In Egypt the move toward non-farming activities and the use of weather insurance are the adaptations most often mentioned. Increased irrigation is the main approach in Kenya and South Africa. But in some countries more than a third of all households that perceive greater climate variability or mean temperature report no change in agricultural practices.<sup>14</sup>

G.15 Barriers to adaptation vary by country, but for many the main barrier is the lack of credit or savings. Farmers in Ethiopia, Kenya, and Senegal also point to the lack of access to water.<sup>15</sup> Although the response varies by country, it is striking how limited the range of actual adaptation options is in relation to what could theoretically be done in the absence of constraints. Farmers in Africa and other countries, with severe savings and credit constraints, will not be able to adapt to climate change without outside help. And the poor may need additional help in adapting, especially where costs are higher.

G.16 The public sector can facilitate adaptation through the provision of information, long-term weather forecasting, catastrophe insurance, infrastructure, safety nets, and the dissemination of technology and drought- and flood-tolerant crop varieties. A study of 11 African countries finds that new irrigation schemes in dryland farming areas will yield high benefits and mitigate the effects of climate change.<sup>16</sup> Only about 5 percent of total cultivable land in Sub-Saharan Africa is irrigated, with enormous untapped potential for growth. Irrigation development in this region has been limited by unfavorable market opportunities and the high cost of irrigation projects, but costs have declined because of improved technical and institutional designs. Climate change increases the urgency of

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assumed SRES scenario of greenhouse gas emissions, technological development, economic growth, and socio-economic conditions as developed by the IPCC.

<sup>14</sup> Maddison (2006).

<sup>15</sup> Very similar evidence emergence from another recent CEEPA survey of 727 farmers in the Limpopo River Basin in South Africa (Gbetibouo (2006)).

<sup>16</sup> Kurukulasuriya and others (2006).

increased investment in irrigation, combined with complementary reform measures and improved market access for high-value products.<sup>17</sup>

G.17 Greater climate uncertainty and variability of rainfall and surface flows need to be taken into account in the design of existing and planned irrigation schemes (chapter 8). Glacial melt in the Andes, Nepal and parts of China will be particularly costly to adapt to. The cost of water supply to the City of Quito is expected to rise by over a third to mitigate the impact of glacier retreat and meet the rising demand for water by 2040.<sup>18</sup> The cost of retrofitting irrigation schemes will similarly run into millions of dollars.

G.18 Better climate information can be very effective way in mitigating some of the losses from climate change. Climate forecasts, whether of droughts or favorable weather, have a positive economic value.<sup>19</sup> Consider a recent agro-meteorological support program in Mali. Initiated in 1982 in response to the Sahelian drought, timely weather information and technical advice helped farmers manage climate risk and reduce the economic impact of droughts. Attempts to replicate Mali's experience in Burkina Faso, Cape Verde, Chad, Mauritania and Senegal were less successful, mainly because of inadequate funding.<sup>20</sup>

G.19 The greater uncertainty from climate change requires contingency planning across sectors. Many least developed countries are preparing the National Adaptation Plans of Action to ensure a long-term holistic vision for their response.<sup>21</sup> Mainstreaming climate change in the broader economic agenda, rather than taking a narrow agricultural perspective, will be crucial in implementing these plans. It remains to be seen whether the governments will elevate these strategies from a champion ministry to national planning.<sup>22</sup>

G.20 Adaptation is urgent because the impact of climate change is already evident and the trend will continue even if emissions of greenhouse gases are stabilized at current levels. Because of the long time lag between development of technologies and information systems and their implementation and adoption in the field, policies and investments in support of adaptation need to be developed now. Overcoming barriers to adaptation will also take time. But many measures are win-win as they result in significant developmental benefits, such as research directed at drought and flood-tolerant crops, improved climate information, or better taking into account hydrological variability while planning investments in irrigation infrastructure.

G.21 Concerted international action is urgently needed to support adaptation in developing countries. The costs—at tens of billions of dollars—far exceed the resources available in developing countries, and significant transfers from developed countries will be needed. Contributions to existing adaptation funds are projected at around \$150-\$300

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<sup>17</sup> African Development Bank and others (2007).

<sup>18</sup> Vergara and others (2007).

<sup>19</sup> Arndt and others (2000).

<sup>20</sup> IRI (2006).

<sup>21</sup> This initiative was funded by the Least Developed Countries Fund, implemented by the GEF.

<sup>22</sup> Stern (2006).

million a year.<sup>23</sup> The recently announced Nairobi Framework for adaptation to climate change is a step in the right direction, but it is not expected to provide even a tenth of the required amounts. The international community needs to accelerate its support by devising new mechanisms to provide a range of global public goods, including climate information and forecasting, research and development of crops adapted to new weather patterns, and techniques to reduce land degradation. New sources of revenues are needed that would not detract from the flows of official development assistance, and carbon taxes could be a significant source of such revenues for adaptation funds. Although facilitating adaptation should be the central pillar of international assistance to developing countries, it cannot be viewed as an excuse to forgo mitigation.

***Agriculture can play a major role in mitigating climate change***

G.22 Carbon financing could help offset agriculture's contribution to climate change by reducing deforestation, and international assistance for adaptation could address the impact of global warming on agriculture, especially severe in some of the poorest tropical countries. The response of the international community in both these areas has been inadequate, even though agriculture presents opportunities for a simultaneous reduction of global greenhouse gas emissions and the vulnerability to climate change. The economic costs of inaction are huge, as recently shown by the Stern Review (2006).

G.23 The emerging market for carbon emissions trading offers new possibilities for agriculture to benefit from land uses that sequester carbon. The main mechanism for these payments is the Clean Development Mechanism (CDM) of the Kyoto Protocol. The CDM seeks to create support for sustainable development and lower the costs of emission reductions by allowing developing countries to sell credits for their emissions reductions to countries with Kyoto targets through a market mechanism (Canada, the European Union 15, and Japan).<sup>24</sup>

G.24 The main obstacle to realizing broader benefits from CDM is its limited coverage of projects and policies related to land-use change. The mechanism includes afforestation and reforestation, but given the long gestation of forestry activities and the short timeframe of the protocol, these activities have not attracted much CDM funding. No incentives were included in the protocol for developing countries (non-Annex I) to preserve forests rich in biodiversity and important for watersheds and erosion control, despite the fact that deforestation contributes to about a third of global GHG emissions, largely through agricultural encroachment. Agroforestry projects are not included either. Given the time remaining on the Kyoto Protocol, which runs to 2012, reform of the CDM will be left to negotiations for the post-2012 period, when a new regime will, it is hoped, correct this major flaw in the current agreement.

G.25 Perhaps even more importantly, the CDM does not adequately recognize sequestration of carbon in soils, which can be a large positive (or negative) impact. In addition, the CDM favors large scale projects and does not provide an effective

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<sup>23</sup> Stern (2006).

<sup>24</sup> Knudsen (2006).

mechanism for involving small farmers and communities. Design of systems that recognize soil carbon sequestration and involve small farmers should be a high priority.

G.26 Measurement and incentive problems complicate the implementation of payment schemes for carbon sequestration through avoided deforestation. Reliance on statistical techniques can greatly reduce measurement costs. Implementation of incentive payments for carbon sequestration requires investments in physical and institutional capacity, such as combination of remote sensing technologies and ground monitoring, and forest law enforcement. But these investments will have high additional benefits as they will facilitate better management of public forest lands. National strategies will be needed for creating the institutions and implementing policies to increase carbon storage in forest and agricultural landscapes and to encourage intensification in areas that have already been converted to agriculture instead of clearing new forest areas not covered by the payment scheme.<sup>25</sup>

G.27 For mitigation, a future climate treaty will need to have a better incentive structure to encourage full participation and compliance, as well as incentives for science and technology in support of low-emission technologies (such as cattle breeds that reduce methane emission), which the current version of the treaty failed to provide to developing countries.<sup>26</sup> For adaptation, because of a very unfavorable distribution of benefits, the international community faces major challenges in obtaining the cooperation and financing of developed countries, which do not perceive any significant direct benefits from contributing. But the growing political leadership has created a momentum to catalyze new funding to tackle both adaptation and mitigation of climate change.

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<sup>25</sup> World Bank (2007).

<sup>26</sup> Barnett, Adam, and Lettenmaier (2005).

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## **Chapter 9 Using labor markets as pathways out of rural poverty**

9.1 Rural areas across most of the developing world face a formidable employment challenge. Even with migration, rural populations continue to grow, sometimes very rapidly, as in Africa and South Asia. Each year's addition to the rural labor force needs to find employment opportunities in agriculture, in the rural nonfarm economy, or in the urban economy.

9.2 Agriculture is a large employer of wage workers, who represent 20 percent of the labor force in agriculture, though this share varies across regions from a high of 40 percent in South Asia to almost zero in Sub-Saharan Africa. Growth potential is emerging in the dynamic labor intensive high-value crop sector. Yet wage labor in agriculture too often means low wages, seasonal work, and exacting labor conditions for mostly unskilled workers.

9.3 Although agriculture remains the main employer in rural areas, nonagricultural employment is increasing rapidly and is very heterogeneous, including many very low productivity, self-employment commercial activities that compete in a narrow local market. The challenge here is to foster the growth of dynamic sub-sectors linked to agriculture or to the urban economy.

9.4 Wages on the agricultural labor market are low, and exhibit little return to education. However, education is the passport to higher opportunity in the nonfarm sector and in migration, where returns are higher. And yet, education in rural areas is shockingly low in many countries, including in some middle income countries.

9.5 What is needed for the labor market to offer a pathway out of poverty? Creating more jobs for the unskilled in agriculture or in other activities, even if low paying; adapting labor market regulation to the conditions of rural work to encourage the formalization of employment; fostering a positive investment climate for the rural nonfarm economy and helping enterprises compete in larger markets so that higher paying opportunities develop in rural areas; and improving the human capital of rural workers so that they can take advantage of these better opportunities. What is needed for the migration pathway? Preparing migrants to avoid a simple displacement of poverty to the urban areas. And for those who cannot take advantage of any of these opportunities ensuring social protection is also necessary to reduce rural poverty.

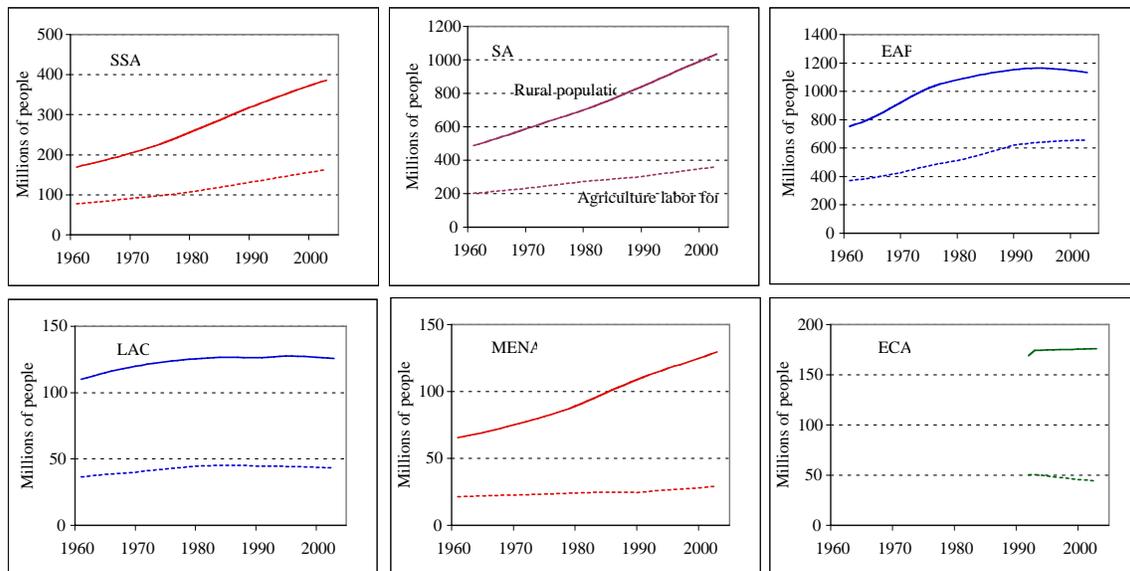
### **The rural employment challenge**

9.6 In India alone the rural labor force still grows at an average of 1.5 percent a year, adding 4 million new workers in need of employment every year. In Bangladesh it adds 1 million people to the workforce every year. Millions of workers currently employed in rural areas are trapped in low earning jobs in need of upgrading. With labor as the principal asset of the poor, landless and land-poor households have to rely on the sale of their labor in farm and nonfarm activities or on successfully exiting rural areas. Making the rural labor market and migration more effective pathways out of poverty is thus a major policy challenge that remains poorly understood and sorely neglected in

polycymaking. It deserves urgent attention, and could make a major contribution to eradicating world poverty, especially for the poorest of the poor.

9.7 In the longer run the agricultural labor force will decline not only relatively, following the structural transformation, but also absolutely, as is already happening in Latin America and the Caribbean and in Europe and Central Asia. But agriculture today still has a large role in generating more and better employment in most developing countries. The gap between the rural population and labor force absorption in agriculture is rising in Middle East and North Africa, South Asia, and Sub-Saharan Africa—and it remains wide in the other regions (figure 9.1). So agriculture alone will not suffice in addressing the rural employment challenge. The rural nonfarm economy will also have to be a key source of new jobs.

**Figure 9.1 Agriculture is not absorbing new rural workers**



Source: FAO (2006).

***The structure of rural employment differs by region***

9.8 The diversity of activities in rural areas leads to the well known phenomenon of diversified income sources in rural areas (table 9.1). In most countries nonagricultural activities account for 30 to 50 percent of incomes in rural areas. As reported in chapter 3, however, this does not necessarily mean that individual households have diverse sources of income, only that there is heterogeneity among them.

**Table 9.1 The rural economy exhibits diversified sources of income**

	Income shares			
	Agricultural income		Non-agricultural	Transfers and others
	On farm	Wage		
Ethiopia 1999	0.74		0.08 <sup>b</sup>	0.18
Ghana 1998 <sup>a</sup>	0.59	0.02	0.36	0.03
Malawi 2004 <sup>a</sup>	0.67	0.08	0.22	0.04
Nigeria 2004 <sup>a</sup>	0.55	0.13	0.30	0.01
Zambia 2003	0.65		0.16 <sup>b</sup>	0.17
Ecuador 1998 <sup>a</sup>	0.20	0.30	0.46	0.04
El Salvador 2001	0.17	0.09	0.55	0.18
Guatemala 2000 <sup>a</sup>	0.18	0.18	0.51	0.13
Nicaragua 2001 <sup>a</sup>	0.27	0.20	0.46	0.07
Panama 2003 <sup>a</sup>	0.16	0.13	0.60	0.10
Peru 1997	0.49	0.07	0.44	n.a.
Bangladesh 2000 <sup>a</sup>	0.15	0.13	0.43	0.30
Nepal 1996 <sup>a</sup>	0.35	0.18	0.34	0.14
Pakistan 2001 <sup>a</sup>	0.58	0.04	0.27	0.11
Indonesia 2000 <sup>a</sup>	0.18	0.09	0.57	0.16
Vietnam 1998 <sup>a</sup>	0.56	0.06	0.31	0.06
Azerbaijan 2001	0.53		0.27 <sup>b</sup>	0.20
Albania 2005 <sup>a</sup>	0.33	0.04	0.37	0.27
Bulgaria 2001 <sup>a</sup>	0.30	0.12	0.23	0.35
Kyrgyzstan 1998	0.42		0.29 <sup>b</sup>	0.30

<sup>a</sup> Using comparable methodology for computing incomes (see box 3.1 and Davis and others (2007)).

<sup>b</sup> May include agricultural wage.

9.9 The structure of rural employment based on a large number of household surveys shows striking differences across regions of the developing world (table 9.2).<sup>1</sup> Off-farm activities in agriculture and nonagriculture account for 55 to 70 percent of male employment in Latin America and the Caribbean, South Asia, and in the Middle East and North Africa, and for 45 percent in East Asia and the Pacific.<sup>2</sup> In Sub-Saharan Africa off-farm activities currently represent only 27 percent of male employment. Shrinking land availability per capita of the farm population pushes working members of land-poor households into scant nonfarm activities. Off-farm employment is also very important for women, particularly in Europe and Central Asia and in South Asia where they absorb 80 percent and 67 percent of female rural employment, respectively. The structure of off-

<sup>1</sup> Measuring labor force participation, and assigning workers to a specific sector of activity, are difficult for reasons inherent to the rural household pattern of activity. Many women will declare themselves as not in the labor force if they consider their main activity as being responsible for household care, even if they have an active role on the farm or in the household business. In addition, to avoid double counting, statistics report only the main activity of workers. The overall participation in any sector of activity or type of employment is thus underestimated. Asymmetric underreporting of wage workers may occur if own farming is considered the main activity, even when it does not represent the main source of income.

<sup>2</sup> Following common terminology, nonfarm refers to employment in the nonagricultural sectors, be it self-employment or wage employment. Off-farm employment includes agricultural wage employment and nonfarm employment.

farm employment for women differs across regions. In South Asia, women participate in the agricultural wage labor market (39 percent), but have little participation in rural nonfarm activities. This contrasts with East Asia and the Pacific and Latin America and the Caribbean, where women have low participation in the agricultural wage labor market but participate more in the rural nonfarm economy.

**Table 9.2 Distribution of rural employment by sector of activity, in selected countries**

Sector of activity	Sub-Saharan Africa	South Asia	East Asia and the Pacific (excl. China)	Europe and Central Asia	Middle East and North Africa	Latin America and the Caribbean
<b>Men</b>						
Agriculture, self-employed	74.4	40.4	55.0	10.3	33.6	44.9
Agriculture, wage earner	6.2	26.8	11.0	13.0	12.7	24.4
Non-agriculture, self employed	7.6	14.2	13.5	17.1	11.8	10.7
Non-agriculture, wage earner	11.8	18.5	20.5	59.5	41.9	20.0
<b>Women</b>						
Agriculture, self-employed	81.8	43.1	60.2	20.5	83.5	47.1
Agriculture, wage earner	2.5	38.8	9.0	15.4	2.1	4.8
Non-agriculture, self employed	10.5	9.9	17.6	7.4	6.0	24.2
Non-agriculture, wage earner	5.2	8.2	13.2	56.8	8.3	23.8

*Source:* WDR team. Based on representative household surveys for 58 countries, which represent 43 percent of the population in Sub-Saharan Africa, 87 percent in South Asia, 66 percent in East Asia and the Pacific, excluding China, 47 percent in Europe and Central Asia, 47 percent in the Middle East and North Africa, 85 percent in Latin America and the Caribbean (see chapter 3, footnote 12 for the methodology and the list of countries ).

9.10 Rural labor markets are highly complex and dualistic, offering both low-paying unskilled jobs and a growing number of higher paying jobs for skilled workers. They tend to be segmented, seasonal, informal, and subject to extensive market and policy failures. Self-employment in the rural nonfarm economy is similarly highly dualistic, with high value added enterprises but also a very large mass of low value added ones that disguise unemployment. Migration can be a pathway out of poverty but can also lead to unemployment, the informal urban economy, and urban slums.

### **Box 9.1 Female labor supply in a social equilibrium**

Female labor supply is both a matter of household decision and a determinant of the household balance of power, which in turn, influences the supply of female labor. Basu (2006a) shows that, as a result, the female labor market can easily have multiple equilibria. Hence, a society in which women do not work can remain that way for a long time. This can be true even as variables exogenous to the household (such as female wages) are changing. Once the exogenous variable crosses some threshold level, however, society can rapidly change with lots of women coming out of their homes to be active participants in the labor market. The model hence suggests that if short-term interventions can alter women's labor market participation, this behavior can stick, since households will move to a new self-fulfilling equilibrium.

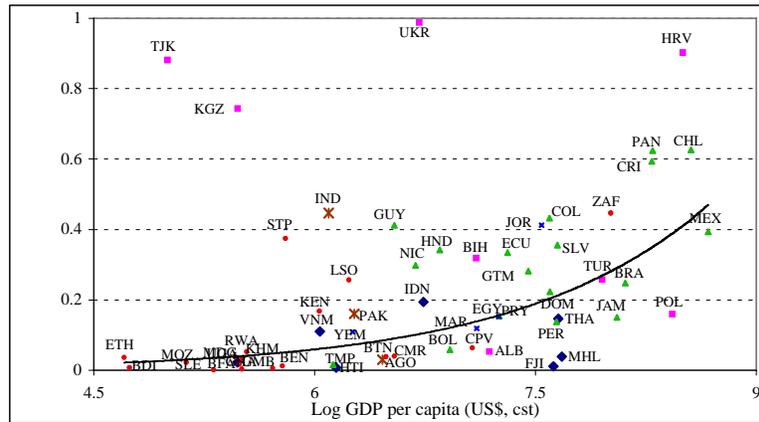
*Source:* Basu (2006a), Basu (2006b).

### Agricultural wage employment

*Agriculture is a large employer of wage labor, and increasingly so*

9.11 Wage labor is an important form of employment in agriculture, both as income rises and over time. As a share of agricultural labor, wage employment rises with a country's income (figure 9.2). Regional aggregates hide wide differences across countries. In Bolivia and Peru self-employment accounts for 90 percent or more of the agricultural labor force. In Chile and Costa Rica, by contrast, wage earners clearly predominate, exceeding 60 percent. In India more than 100 million workers, 45 percent of the agricultural labor force, are in agriculture wage employment.<sup>3</sup> From 1987-88 to 1993-94, the proportion of self-employed there declined from 58 to 53 percent and the proportion of casual workers increased from 38 to 45 percent, with little change since then.<sup>4</sup>

**Figure 9.2 Higher share of wage workers in agricultural employment in countries with higher income per capita**



Source: same as table 9.2.

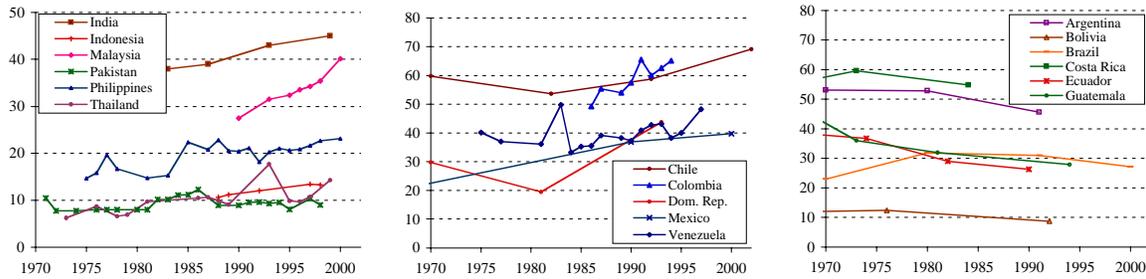
9.12 The number of agricultural wage workers is growing in most regions of the world, and so is their share in the agriculture labor force.<sup>5</sup> Assessing the correct number of paid workers in agriculture is difficult because, in many contexts, agricultural wages complement self-employment. Labor Force Survey and Population Census data that classify workers by their main activity therefore typically miss large numbers of casual wage earners. Even so, the trends show the increasing importance of wage labor in the agricultural labor force in a majority of countries (figure 9.3).

<sup>3</sup> Deshingkar and Farrington (2006).

<sup>4</sup> Glinkskaya and Jalan (2005).

<sup>5</sup> Hurst, Termine, and Karl (2005).

**Figure 9.3 The share of wage labor in agricultural employment is rising in many countries**

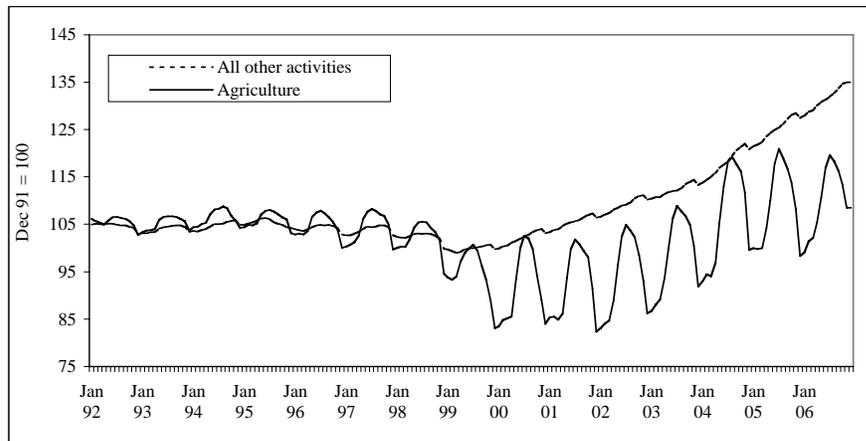


Sources: Census data (Argentina, Bolivia, Brazil, Chile, Costa Rica, Dominican Republic, Ecuador, Guatemala, Mexico); Labor Force Surveys (Colombia, Indonesia, Malaysia, Philippines, Pakistan, Thailand, Venezuela) from ILO website. NSS data reported in Glinkskaya and Jalan (2005).<sup>6</sup>

***The nature of agriculture affects labor demand***

9.13 Several factors unique to agriculture affect the demand for agricultural labor. A primary factor is the seasonality of agricultural operations: the demand for labor is spread over time, characterized by slack and peak seasons. In Brazilian agriculture seasonality of even formal employment has increased since 1999 to reach a level of variation of more than 20 percent within a year (figure 9.4). In Chile average daily earnings for workers in the fruit industry vary 50-60 percent from the peak to the slack season.<sup>7</sup> Men who are more involved in field operations tend to remain in the labor force throughout the year, but female participation drops by nearly 30 percent from the peak to slack seasons. In addition, females remaining in the labor force have high rates of unemployment, exceeding 50 percent on a daily basis during the slack season. Female workers thus incur a disproportionate share of the cost of seasonality in labor demand.

**Figure 9.4 Formal employment in Brazilian agriculture has become more cyclical**



Source: Carneiro (2003).

9.14 Seasonality affects both the demand and supply sides of the labor market. On the demand side, without access to good financial services that enable savings or provide

<sup>6</sup> Glinkskaya and Jalan (2005).

<sup>7</sup> Lovel and Vera-Toscano (2004).

production loans, farmers find it difficult to incur expenditures prior to the receipt of income. On the supply side, a similar inability to save or borrow to separate consumption from variable income flows implies a preference for nonagricultural jobs that may offer steadier income streams. No wonder, then, that in Africa, where the predominance of rainfed agriculture generates very high seasonality in agricultural operations, wage labor contracts are few, and the labor market is thin. Farm households primarily rely on family labor and on informal exchange contracts with neighbors.

9.15 Agricultural production is also subject to risks such as droughts, floods, pests, price fluctuations and other events. These shocks affect demand and supply on the labor markets in ways that exacerbate each other. The demand for labor declines. The supply of labor by small farmers increases to compensate for the shortfall in on-farm profit.<sup>8</sup> As a consequence, wages vary with weather conditions and other sources of agricultural risk. For example, in Bangladesh the real agricultural wage fell by 50 percent during the 1974 drought year. In India an analysis of 257 districts over the 32 years 1956-87 shows wages to be very sensitive to rainfall shocks. Wages respond less in areas with more banks and better access to other markets, where laborers can find work.<sup>9</sup>

9.16 Supervision problems are severe in agriculture. Without incurring significant monitoring costs, it is difficult to observe labor effort or to infer effort from observed output. To overcome this agency problem, contractual arrangements can create the appropriate work incentives for laborers. One arrangement is to offer “piece-rate” wages rather than daily wages. Research has shown that workers do supply more effort under piece-rate schemes than when working for daily wages.<sup>10</sup> But piece-rate wages also mean that wage incomes will vary across workers with their ability to supply work effort; workers with poor health will earn less.

9.17 Agency problems can also be mitigated through long-term labor contracts, delivering at the same time higher welfare to the worker. In dynamic regions, rising opportunities in the nonfarm sector have raised the costs of long-term labor contracts, reducing their prevalence. India, for example, has witnessed a considerable decline in the number of permanent workers with the majority of agricultural wage employment being “casual” workers, employed on a daily or task basis. The proportion of casual workers increased from 65 percent in 1972 to 80 percent in 2002 among men wage earners, and from 89 percent to 92 percent for women.<sup>11</sup> Casual workers are among the most vulnerable groups. Incidence of poverty among them is quite high, reaching 49.4 percent in 1993-94, more than twice the 17.4 percent level among permanent workers.<sup>12</sup> The high reliance on family labor and exchange labor contracts in African agriculture may also be a rational solution to the agency problems.

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<sup>8</sup> Kochar (2000).

<sup>9</sup> Jayachandran (2006).

<sup>10</sup> Foster and Rosenzweig (1994).

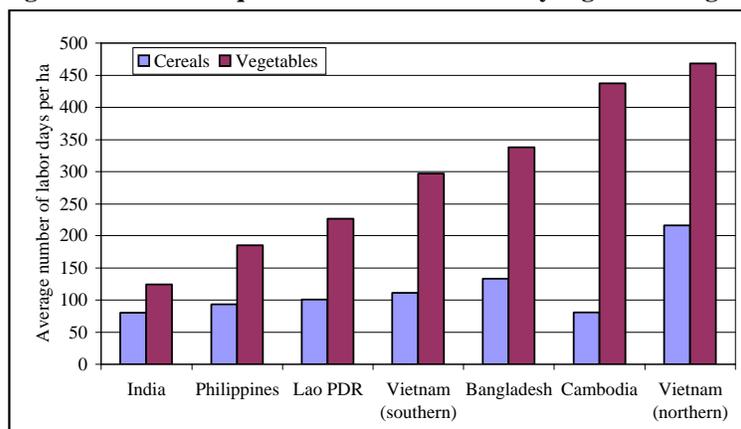
<sup>11</sup> Sundaram and Tendulkar (2007).

<sup>12</sup> Dev (2002).

### *Sources of employment in agriculture are changing with the high value revolution*

9.18 Stimulating employment growth in agriculture remains a high priority in the countries with a large agricultural sector. And raising labor productivity is crucial to workers' welfare. The Asian Green Revolution initially stimulated the demand for labor and reduced poverty through year-round employment and higher real wages.<sup>13</sup> But direct seeding methods, tractors, and threshers led to a subsequent decline in agricultural employment in India and the Philippines.<sup>14</sup> Following the Green Revolution, the high value revolution is creating a second wave of employment growth. Diversification into horticulture, livestock, and other high value crops offers considerable potential for employment generation and productivity growth. For example, vegetable production can require up to five times more labor than cereals (figure 9.5). In Mexico tomato production demands 122 days of labor per hectare, four times the 29 days per hectare for maize. Similar examples can be found in Peru's<sup>15</sup> asparagus and Chile's fruit exports sectors.<sup>16</sup>

**Figure 9.5 Labor requirements are considerably higher for vegetables than for cereals**



Source: Weinberger and Lumpkin (2005).

#### **Box 9.2 Horticulture development in Maharashtra**

In India the Maharashtra Horticulture Development Program and the Employment Guarantee Scheme (EGS) generated employment by diversifying agriculture into horticulture and high value crops. The scheme owed its success to the labor-intensity of horticultural production and to the publicly and privately supported complementary initiatives.

Food crop production in India provides employment for around 100 to 115 person days per hectare per year. Horticultural production requires 275. The goal was to increase labor demand through an increase in the horticultural production sector.

The program created incentives and complementary initiatives to facilitate the execution of the scheme. 100 percent wage and material input subsidies were provided to marginal and small farmers, scheduled caste, scheduled tribes, and other ethnic minorities. 100 percent wage and 75 percent material input subsidies were provided to all other farmers. Other public investments included more than 150 nurseries

<sup>13</sup> Otsuka, David, and Otsu (1994).

<sup>14</sup> Jayaraman and Lanjouw (1999).

<sup>15</sup> Escobal, Reardon, and Agreda (2000).

<sup>16</sup> Lovel and Vera-Toscano (2004).

for high-quality planting materials, an informational website, and a Pune-Mumbai expressway, and airport and port facility upgrades. The infrastructure developments enabled the Maharashtra products to be competitive both domestically and internationally. The private sector also contributed more than 1,600 nurseries, supplied fertilizers, agro-chemicals, and improved seeds, and invested in marketing infrastructure.

From 1996 to 2006, the program created roughly 213 million person days of work, an equivalent of 807,000 person years. From 1989 to 2001, 96 percent of the increased area planted to fruits in Maharashtra was due to the scheme. More permanent full-time employment was created to fill the continual employment requirement of fruit orchard operations. In addition, demand for labor was multiplied throughout Maharashtra in the complementary areas of transport, packaging, and storage.

*Source:* World Bank (2003).

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9.19 Export-oriented agriculture, like cut flowers and vegetable growing, offers new jobs for women in large numbers. In India, globalization is inducing feminization of the agricultural workforce as male workers have shown a greater tendency to migrate to nonagricultural work, and women are replacing them. This is a common pattern in Europe and Central Asia as well.<sup>17</sup> The labor intensity of high value agriculture can generate employment in public-private partnership programs (box 9.2).

9.20 In Chilean agriculture, the structure of employment has changed since the reforms of the 1970s. Of the agricultural workforce 68 percent are wage workers, a higher proportion than in the nonagricultural sector, and it has been rising since 1990. The proportion and the rate of increase of wage workers in the agricultural labor force is highest in the regions that have experienced the export-oriented horticultural boom. In contrast, the areas with greater emphasis on traditional activities (wheat, dairy, and beef) have had a decline in the number of wage workers since 1990. There has also been an increase in the proportion of wage workers who are seasonally employed. Of all wage workers in agriculture in 2003, 53 percent classified themselves as employed temporarily (includes seasonal), up from 47 percent in 1994. For women, who are mostly seasonal workers, this proportion remained at 72 percent in 1994 and 73 percent in 2003.<sup>18</sup>

***Labor demand and supply conditions in agriculture may offer narrow pathways out of poverty***

9.21 Several factors contribute to making agricultural labor markets a narrow pathway out of poverty. First, as discussed below, wages in agriculture tend to be low. Second, agricultural workers face significant occupational, safety, and environmental hazards, rarely covered under labor protection.<sup>19</sup> Third, agricultural wage earners are usually poorly protected by national labor laws. The agricultural sector is often excluded from the scope of labor legislation as most labor laws target industrial employment. Even when legislation exists, a lack of familiarity by employers and workers and a lack of enforcement undermine compliance in rural environments. In addition, child labor is pervasive in agriculture, reducing school achievements and future lifetime earnings (box 9.3).

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<sup>17</sup> Hurst, Termine, and Karl (2005).

<sup>18</sup> Valdés and Foster (2006).

<sup>19</sup> Hurst, Termine, and Karl (2005), citing Olney and others (2002).

9.22 *Work conditions in agriculture can be hazardous.* According to the ILO, agriculture is one of the three most dangerous occupations, along with mining and construction. About half of the estimated 355,000 annual on-the-job fatalities occur in agriculture.<sup>20</sup> Agricultural wage workers face exposure to toxic pesticides, livestock-transmitted diseases, and dangerous machinery, but lack adequate training and protective equipment. Casual workers often receive even less training and instruction and have a greater risk of injury or death. For women, exposure to pesticides can threaten reproductive health. And since work and living conditions are often inseparable in rural environments, exposure to pesticides is extended beyond work periods. Improving occupational health, safety, and environmental standards for agricultural workers—and enforcing them—are clearly vital to protecting vulnerable agricultural workers.

9.23 Balancing flexibility in hiring for employers and basic protections for laborers has been elusive. Consider Brazil. Labor legislation there applies to both urban and rural markets, and both are subject to the same labor code<sup>21</sup>. In the 1990s workers were requested to make direct contributions to social security, representing 36 percent of their take-home pay. Although the additional contribution included payments that would benefit workers directly, such as a 13<sup>th</sup> month's pay, paid minimum vacation times, and severance pay, workers perceived a significant proportion of this tax as having less value than the employer's costs. As a result, informal agricultural worker cooperatives for temporary jobs proliferated, with cooperative members giving up their benefits in return for higher take-home pay and in-kind payments.<sup>22</sup>

9.24 Labor contracting schemes are important to reduce the volatility of employment for agricultural workers. But the employment practices would benefit from more regulation. Unregulated contractors can take advantage of workers by deducting commissions, holding back wages, imposing debt-bondage, and overcharging for transport, housing, and food.<sup>23</sup>

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**Box 9.3 Child labor is pervasive in agriculture—reducing schooling and earnings**

ILO estimates children laborers at 218 million in 2004. Most help their families at home, on the farm, or in the family business. 60 percent of these working children are in Asia, and 52 percent are boys. While 23 percent of the economically active children are in Sub-Saharan Africa, participation rates are highest there, with an estimated 30 percent of the 5-14 years old. While child labor includes prostitution and drug trafficking, at the world scale these are rare.

Compared with 19 percent in urban areas, 31 percent of the children in rural areas between 5 and 14 reported market work, with 9.8 percent working outside the family business and 2.5 percent being paid. Including market and domestic work, 26 percent of rural children worked 20 or more hours and 9 percent worked 40 hours or more.

Not all child labor is harmful, and income from children's economic activities provides needed income to poor rural households. But comparisons across more than 40 countries reveal a negative association between child labor and school enrollment, making child labor a major obstacle to achieving the Millennium Development Goals for education. In nine Latin American countries 3<sup>rd</sup> and 4<sup>th</sup> graders who

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<sup>20</sup> Hurst, Termine, and Karl (2005).

<sup>21</sup> Gill, Montenegro, and Dömeland (2002)

<sup>22</sup> Valdés and Foster (2006).

<sup>23</sup> Hurst, Termine, and Karl (2005), pp 30-31.

worked longer hours outside the home performed less well in school.<sup>24</sup> Evidence from Ghana, Nicaragua, and Pakistan shows similar adverse effects of work on schooling.

The poorer school performance attributable to early child labor can have permanent consequences in lower earnings. Ilahi, Orazem, and Sedlacek (2005) found that Brazilian males who entered the work force before age 12 earned 20 percent less per hour and were 8 percent more likely to be in the lowest income quintile than those who entered after age 12. Emerson and Portela Souza (2003) found that if a parent worked as a child, his or her children were more likely to work at young ages, holding other household attributes constant. And delaying the age of labor force entry for children delays labor market entry for the next generation.

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### **Rural nonagricultural employment—rising**

9.25 Although agriculture remains the backbone of most rural economies, rural employment is diversifying away from agriculture (see figure 9.1). In some Latin American countries, the annual growth rate of nonagricultural economic activities exceeded 10 percent between 1980 and the early 2000s. In Chile, nonagricultural employment rose from 25 percent of total rural employment in 1960 to 49 percent by 2002; in Brazil, from 14 percent to 31 percent. Indonesia went through a period of rapid growth in the nonagricultural share of rural employment prior to the crisis (from 30 percent in 1990 to 40 percent in 1995), before falling to 32 percent in 2003.

9.26 Nonagricultural employment tends to be more important for women than for men in Latin America (table 9.2). In Chile, nonagricultural employment has a higher and faster growing rate of female employment than agriculture. In 1960, female employment represented more than 20 percent of all nonagricultural employment, compared with less than 5 percent in agricultural employment. By 2002 the shares had risen to 30 percent for nonagriculture and 7 percent for agriculture.

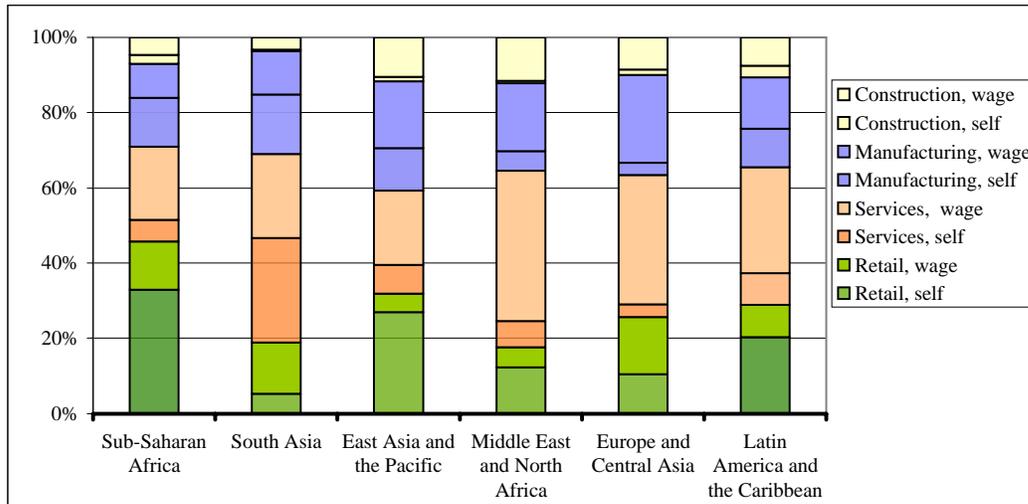
9.27 Retail trade and services are the main sources of nonfarm wage employment, accounting for 60 to 75 percent across continents (figure 9.6). Retail trade is predominantly self-employment, while services provide wage employment. The importance of manufacturing, mainly agro-processing, increases as nonfarm rural activities thicken and rural-urban linkages develop (chapter 1).<sup>25</sup> The sector is heterogeneous. Some jobs require special skills and are not accessible to the uneducated farm population, causing earnings to differ widely.

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<sup>24</sup> Gunnarsson, Orazem, and Sedlacek (2005).

<sup>25</sup> Lanjouw and Lanjouw (2001), Ranis and Stuart (1993).

**Figure 9.6 Retail trade and services dominate nonfarm wage employment**



Source: same as table 9.2.

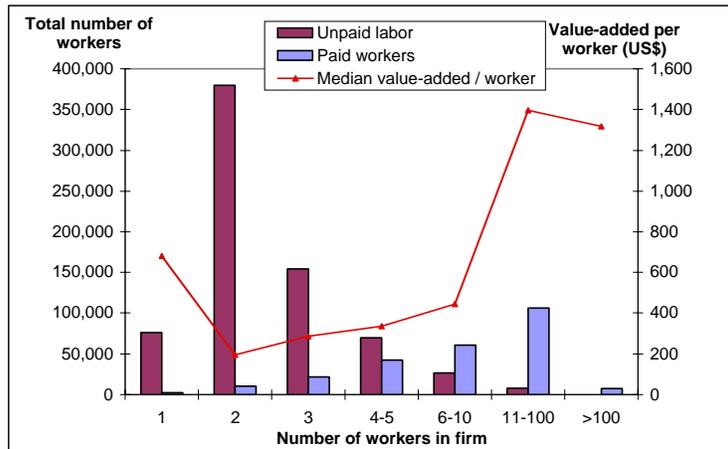
***Rural nonfarm enterprises are mainly for self-employment, focused on trade***

9.28 Rural nonfarm enterprises are transforming the employment structure in rural areas. What are these enterprises, and what do they do? How does the environment foster or impinge on their development? Analyses conducted under the World Bank’s Rural Investment Climate Assessment Program in Bangladesh, Indonesia, Nicaragua, Pakistan, Sri Lanka, Tanzania, and Vietnam provide some answers.<sup>26</sup>

9.29 Most enterprises are small operations providing employment for family members. In Sri Lanka the average number of workers is 2.4, with 79 percent of firms comprising only 1 or 2 persons. In Tanzania 58 percent of the firms are one-person enterprises, and in Bangladesh 45 percent. Very small size enterprises also dominate in Indonesia, Nicaragua, Pakistan, and Vietnam. In addition 80-90 percent of these enterprises rely exclusively on family labor, providing no employment for outside workers. So, while rural nonfarm enterprises have a very important role in providing self-employment and additional income to rural households, they do not appear to have the potential to generate the large wage employment numbers that appear in the household surveys.

<sup>26</sup> Designed to be the counterpart of the Bank’s *Investment Climate Surveys*, Rural Investment Climate surveys collect information on rural nonagricultural enterprises and their perceptions of the main hurdles to their operation and development. All but the Vietnam surveys have a representation of household enterprises (obtained from a sampling of buildings and households) and standalone enterprises (from a census of enterprises). The Vietnam survey is a module of the 2004 VLSS. It covers only household enterprises, but, being part of panel data, it allows some inferences on enterprise dynamics. Rural areas include villages and small towns. World Bank (2006) Tanzania Pilot Rural Investment Climate Assessment: Stimulating Nonfarm Microenterprise Growth; Vijverberg et. al. (2006) Nonfarm Household Enterprises in Vietnam; World Bank (2006) Nicaragua: Investment Climate for the Rural Non Farm Economy; World Bank (2005) Promoting the Rural nonfarm Sector in Bangladesh; World Bank (2006) Pakistan: Promoting Rural Growth and Poverty Reduction; chapter 4; World Bank (2006) Revitalizing the Rural Economy; World Bank/Asian Development Bank (2004) Sri Lanka: Improving the Rural and Urban Investment Climate, Washington DC: World Bank; Manila: Asian Development Bank.

**Figure 9.7 Most rural nonfarm enterprises have only one or two workers, mostly unpaid (Indonesia 2005)**



Source: WDR 2008 team, using RICA data.

9.30 The predominant entrepreneurial activity of rural nonfarm enterprises is trading, accounting for more than 50 percent of the rural enterprises. Rural services come second, with 20 to 35 percent of the rural enterprises. Except in Sri Lanka, where 41 percent of the enterprises are dedicated to production, the manufacturing base is thin. Most businesses buy and sell locally, with little access to outside markets. In Tanzania more than 70 percent sell their product in the same locality, and less than 10 percent outside the district. In Pakistan 73 percent of the village enterprises and 47 percent of the small town enterprises sell in their own village or town. In Nicaragua 73 percent of the input purchases and 77 percent of output sales occur within the firm’s community. This narrow focus on local trade suggests very shallow markets and high transaction costs. It can also indicate that the quality of goods and services is low.

9.31 Are rural enterprises constrained by supply or demand? The investment climate surveys ask entrepreneurs whether they perceive various problems as an obstacle. Not surprisingly, access and cost of finance, access to electricity, and quality of roads score very high. But low market demand also comes among the top four constraints in all surveys. In Indonesia and Vietnam, the lack of demand for goods and services is perceived as the major constraint, far ahead of access to credit and road access, and as the second major constraint in Pakistan.

9.32 Addressing these constraints poses dilemmas. If demand is very local, additional production induced by increased access to finance and lower cost of capital will reduce prices locally, undermining profit. This will only reinforce the intense competition in these crowded markets. Expanding markets by linking the nonfarm sector to the larger economy is thus essential for developing the rural nonfarm economy. Infrastructure improvements can both reduce input costs and open larger markets for local enterprises (chapter 5). But it also raises the challenge of being competitive in the larger market, likely to produce winners that will thrive in the larger environment and losers that can’t compete (box 9.4).

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**Box 9.4 Impacts of road infrastructure on markets and productivity**

Rural road development has the potential to reduce transport costs and generate market activity; however, these effects will be mediated by specific geographic, political and economic settings. In addition, complementary inputs and policies may be required to achieve the full potential benefits from the road. And even if aggregate output gains are forthcoming, there will almost certainly be losers too. How one weights the gains and losses and whether poverty falls is ultimately an empirical question. Recent work using impact evaluation methods shows mixed results, suggesting that to be effective rural road policy needs to adapt to context and setting.

**Policy should focus more on the complementary role of rural roads.** Policy has fixated on the supply of rural roads as a catalyst to development and market activity as opposed to focusing on its complementary role. Poor road conditions often coincide with a number of other bottlenecks inhibiting agricultural productivity and economic development, including poor agro-climatic endowments, low population density, no transport services, low education levels, a lack of electricity, risk, credit and other market failures. Road benefits depend heavily on interactions with other infrastructure and geographical, community and household characteristics. For example, one study in Vietnam found that four to six years after road rehabilitation road transport services were more likely to respond where markets were already established and natural disasters were relatively infrequent. Policy needs to consider more than the absence or dire condition of a road before deciding that a new road is critical. In each specific case, policy should ask whether roads are the right instrument for overcoming the constraints to a given welfare outcome and if so, what other policy initiatives and/or investments are needed.

**Heterogeneities across households will determine who gains and who loses.** Holding community characteristics constant, some households will be better placed to take advantage of the road, due to their endowments and the nature of their occupations. Households will differ in what they buy and sell and hence how much they gain or lose from the changes in prices induced by better roads. Poor households are more likely to rely on the production of non-traded goods and services that may actually be displaced by better roads fomenting increased competition. But, road improvement has a general income effect that could generate demand for services from poor providers. The net effect is an empirical question. The picture that emerges from recent, more methodologically vigorous impact evaluations is a complex one. In Nepal better road access benefited the poor and the non-poor, but the proportionate gains were higher for the non-poor. Dercon and others (2006) find that access to all weather roads in 15 villages in Ethiopia reduced the incidence of poverty by 6.7 percent. Given the heterogeneity of impacts, more attention needs to go to beneficiary selection, recognizing that tradeoffs exist. Moreover, roads may need to be provided as part of a package of interventions that helps certain groups benefit more than they would have and that protects or compensates those who may lose.

**The governance setting and political economy are also important in determining impacts.** Another important source of heterogeneity lies in the way local-level institutions operate. Road project funds may not end up funding what was intended and hence have no impact. Infrastructure expenditures present opportunities for graft and the diversion of resources. This can change when incentives change. One study found that the threat of an audit on road projects in Indonesia significantly increased the actual amounts spent on building materials for roads as well as on labor, thereby bringing the quality of the roads nearer to that originally intended. Fungibility can also dull impacts, as aid or central government funding for road projects may substitute for local government infrastructure spending. Finally, the lack of funding and institutional arrangements for routine maintenance can significantly reduce the impacts of newly improved roads.

**How much roads matter depends on a range of factors.** Of course, roads can matter to economic development. But how much roads matter depends on a number of other factors. These findings reject any simple formula for rural development through basic infrastructure alone. Comprehensive approaches that are compatible with how local institutions work in practice, including what they are capable of delivering, are needed. This may require fashioning a whole package of cross-sectoral investments (roads and complementary investments) and policy change that will ensure a higher efficiency impact, as well as more desirable poverty and equity outcomes.

*Source:* Van der Walle (2007).

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9.33 Are rural nonfarm enterprises in competition with or complementary to agriculture? Survey results show that, given their very local sphere of activity, nonfarm enterprises depend highly on the performance of agriculture for generating demand for their services, both business services and consumer demand. They also perform better in densely populated areas, where demand is less constraining. In Nicaragua the rural nonfarm sector enjoys its highest profitability and growth in the areas of high population densities, which tend to be where the most productive agriculture is found. The low level of employment in agro-processing activities in all countries, however, suggests that the forward linkages between agriculture and the nonfarm sector are not as high as they could be.

9.34 The complementarities between agriculture and nonfarm enterprise are sometimes seen in the countercyclical pattern of activities (Tanzania), although this is not always the case. Rural nonfarm enterprises in Bangladesh, for example, operate long hours year around. Links between the two sectors are also found in households' asset building in several countries. In Pakistan 17 percent of the needed start-up capital for nonfarm enterprises comes from agricultural income, and there is a positive correlation between land ownership and nonfarm business. In Tanzania, a more agricultural country, as much as 55 percent of the start-up capital in rural nonfarm enterprises comes from agricultural revenues. But it's not that simple. In Tanzania many small and informal firms choose to reinvest their profits into agriculture, under the argument that expanding the nonfarm business would require crossing the difficult threshold of becoming formal and reaching beyond the local market. Similar cross-sectoral investments are observed between 2002 and 2004 in Vietnam, with important diversification of agricultural households at all incomes into nonfarm activities, and investment of small business profits into agriculture.

9.35 The young age of the enterprises is disturbing. Across countries, a third and half of the enterprises have less than 2 or 3 years of operation. While this can reflect a dynamic rate of enterprise creation, it also indicates a high business failure rate. An analysis of the household nonfarm enterprises in Vietnam estimated an annual 83 percent survival rate. An average household enterprise thus has a 17 percent chance of not being in operation one year later and a 45 percent chance three years later. This high failure rate is bound to imply asset losses for the entrepreneurs and declines in their household welfare. It calls into question policies that facilitate starting up enterprises or borrowing initial capital, unless they are also accompanied by measures to help select the best entrepreneurs and increase enterprise survival and profitability. Associations of self-employed women entrepreneurs such as SEWA in India can provide some of the assistance to enhance the likelihood of success (box 9.5). SEWA shows that broad support is needed to help micro-entrepreneurs succeed.

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#### **Box 9.5 Women's cooperative in India**

The Self-Employed Women's Association (SEWA) was formed in 1972 in Ahmedabad, India. Initially a small membership organization for poor women working in the informal sector, SEWA now has more than 1.2 million members across India.

Members are involved with SEWA in three ways: through unions, cooperatives, and member services. The unions, available in both urban and rural areas, help members gain access to fair treatment, justice, markets, and services.

The cooperatives help members market and improve the quality of their products while also learning new techniques and how to expand into new products. For example, SEWA has shown salt farmers how to produce higher-value industrial salt as opposed to the lower-value edible salt. The largest cooperative is the SEWA Bank. In 2004, the Bank had over 250,000 accounts with deposits totaling \$14.4 million. The Bank has encouraged thousands of poor women to regularly save their incomes through programs such as “doorstep banking” and offered small loans that average US \$73. Members prefer the 20 percent interest rate charged by the Bank over the exploitative relationship with moneylenders.

SEWA’s member services, funded by a combination of user charges and donor and government grants, include childcare, health care, insurance, and housing. The SEWA Bank and government insurance companies have worked together to create an insurance program that offers maternity benefits and payments in cases of illness, death, or loss of property. The insurance premium and continued coverage is paid for by the interest earned on members’ fixed deposits of US \$22. Since its creation in 2003, the insurance has covered more than 110,000 members.

*Source:* World Bank internal report.

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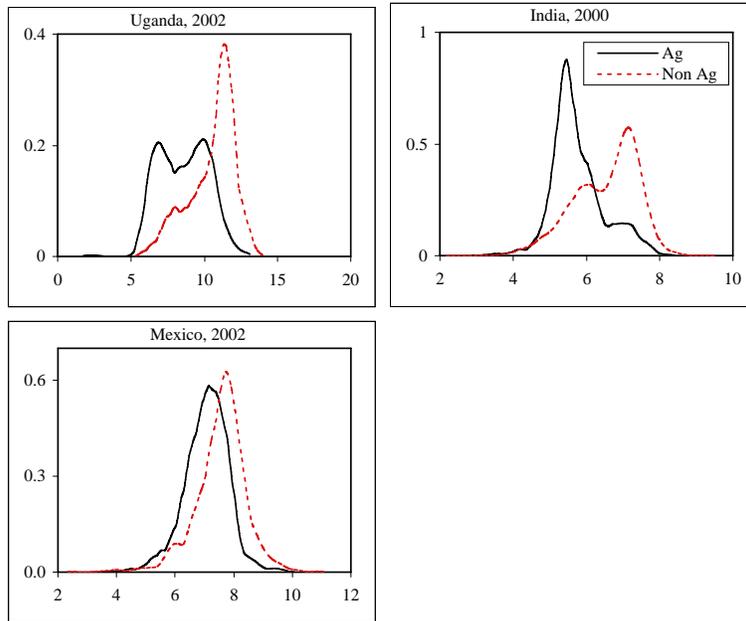
### **Wages and earnings in the rural labor market**

#### ***Wages are higher in the rural nonfarm sector than in agriculture, but much is due to skill difference***

9.36 Two regularities stand out when comparing the entire distribution of agricultural and non-agricultural wages in different countries derived from the population censuses. The first is that wages are considerably higher in rural non-agricultural employment than in agricultural wage employment (figure 9.8). In Mexico, the average wage in nonagriculture is 56 percent higher than in agriculture. The second regularity is that both sectors exhibit a bimodal distribution, revealing dualism, but with a remarkable difference. For agricultural wages, the highest frequency is found to the left; the opposite is observed for the nonagricultural wages. This suggests dualism in both sectors, but that low-paying jobs dominate in agriculture, while nonagriculture jobs get higher wages.

#### **Figure 9.8 Wages are much higher in rural nonagricultural employment in India, Mexico, and Uganda**

Distribution of logarithm of wages in local currency units

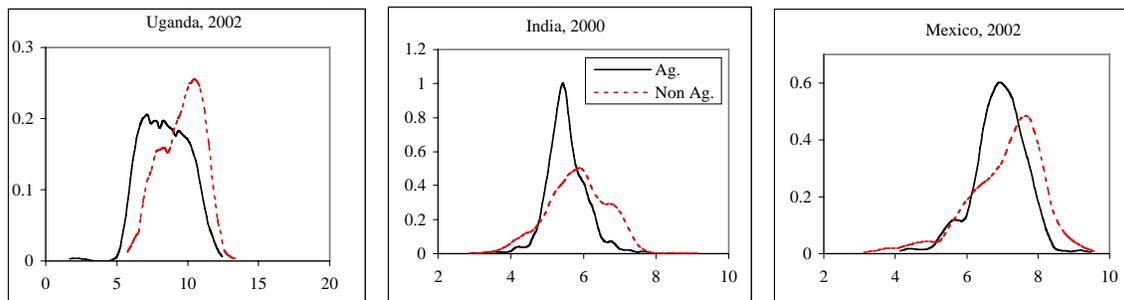


Source: same as table 9.2.

9.37 How much of this simply reflects the fact that agricultural jobs are taken by workers of lower skill? Comparing the distribution of wages for unskilled workers (defined by workers with no schooling), much of the difference in distribution is eliminated, especially in Uganda and India. Even the remaining difference in wage distribution cannot prove any fundamental sectoral difference in labor compensation, since workers choose their sector of activity, and in so doing may select themselves according to other skills not captured by education.

**Figure 9.9 For workers with no education, wages in agricultural and rural nonagricultural employment are not so different across sectors**

Distribution of logarithm of wages in local currency units



Source: same as table 9.2.

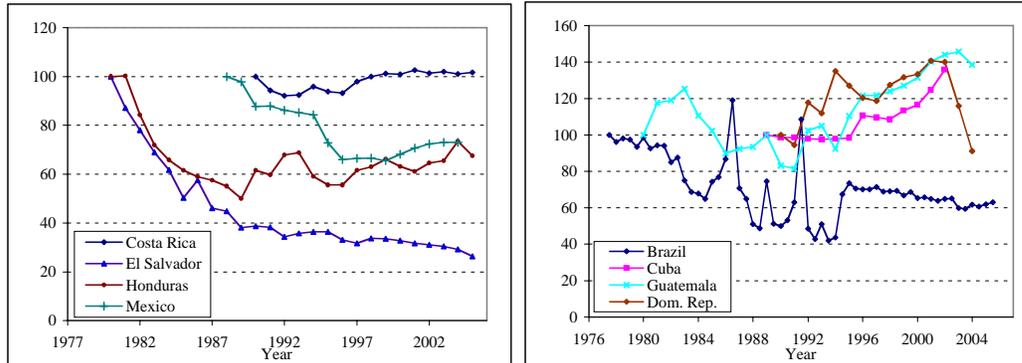
9.38 Comparing wages by gender in the nonagricultural sector, men's wages are higher, though the difference is small in Africa, where employment is mainly in very small firms (figure 9.11). Female wages are more heterogeneous than male wages and tend to show a more bimodal distribution. In India the average wage for agricultural casual work is 30 percent lower for women than for men. Differences prevail even for the same task. Using detailed wage information by task, women's wages are 80 percent

that of men’s for the same task. The difference in the distribution of tasks, with men doing the better remunerated tasks of plowing and well-digging, accounts for the remaining difference between the average wages.<sup>27</sup>

**Wages in agriculture have been declining in Latin America, but rising in Asia**

9.39 There is evidence that, across many Latin American countries, agricultural wages have been declining. Temporary workers have lost a third of their income over the last 30 years in Brazil; they have lost 30 percent of their purchasing power in Mexico between 1988 and 1996, and not regained since. In contrast, real wages have increased in most of the Asian and African countries.

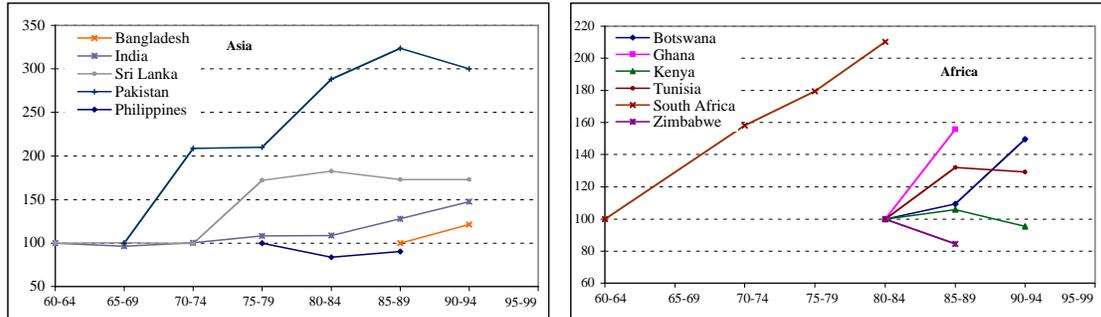
**Figure 9.10 Agricultural wages—have been declining in Latin America...**



Note: Nominal wages deflated by national CPI.

Source: Brazil: Fundação Getulio Vargas. Estatísticas Agrícolas; other countries: CEPAL.

**Figure 9.11 ... but rising in Asia and Africa**



Note: Index based on male and female daily wage of casual workers, deflated by the Consumer Price Index.

Source: Rama and Artecona (2002).

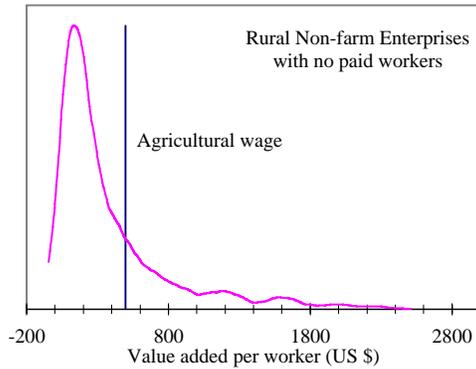
**Earnings in owner-operated rural nonfarm enterprises are heterogeneous, but better paying jobs are found in layer enterprises and in the urban center**

9.40 Is the self-employment in rural nonfarm sector a refuge sector, disguising unemployment, or a source of good earnings? A crude measure of earnings is value-added per worker. The nonfarm sector is very heterogeneous, and this is reflected in the distribution of productivity in enterprises employing only family members as shown in

<sup>27</sup> Sundaram and Tendulkar (2007).

figure 9.12 for Indonesia. The median annual value-added per worker is \$230. As many as 59 percent of firms generate a value-added per worker below the agricultural wage. At the other end, 7 percent generate value-added per worker at least 5 times the agricultural wage.

**Figure 9.12 Labor productivity in self-employment is heterogeneous in Indonesia**



*Source:* Indonesia Rural Investment Climate survey. The annual agricultural wage is computed from the average village level daily wage, multiply by 11 months, 22 days/months.

9.41 Rural nonfarm enterprises that have successfully grown to create employment usually exhibit larger labor productivity. In Indonesia, for example, labor productivity in firms with more than ten workers is \$1400, more than 6 times that of the small farms with 2 or 3 workers. Workers in these enterprises are also more educated, with more than half of them having at least finished secondary school, and almost none without finished primary school in the largest firms. They constitute the higher peak in the wage distributions such as reported in Figure 9.8.

9.42 In countries with high population density, such as Bangladesh, towns and cities are distributed all over the country. As a consequence, the majority of rural population resides within a reasonable distance from a town, opening the option to work in an urban center. In fact many of the most successful rural nonfarm enterprises are located in those urban centers, where they enjoy agglomeration economies, better infrastructure and lower transportation costs. These enterprises show significantly higher productivity, measured either by value-added per worker or total factor productivity.

9.43 Rural-urban labor market integration is important for employment and wages in rural nonfarm employment. In Bangladesh nonfarm wage and self-employment earnings tend to be higher with better access to markets, infrastructure services, and education (box 9.6). In Mexico the rural-urban wage ratio increased from 28 percent in 1992 to 40 percent 2002. In India while agricultural wages are low, there is convergence between rural nonagricultural wages for casual workers and urban wages. These wages remain, however, far below the salaries of nonagricultural employees, and increasingly diverge, displaying the rising sectoral disparity problem that has been the source of political tensions.

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**Box 9.6 Diverse nonfarm employment in Bangladesh**

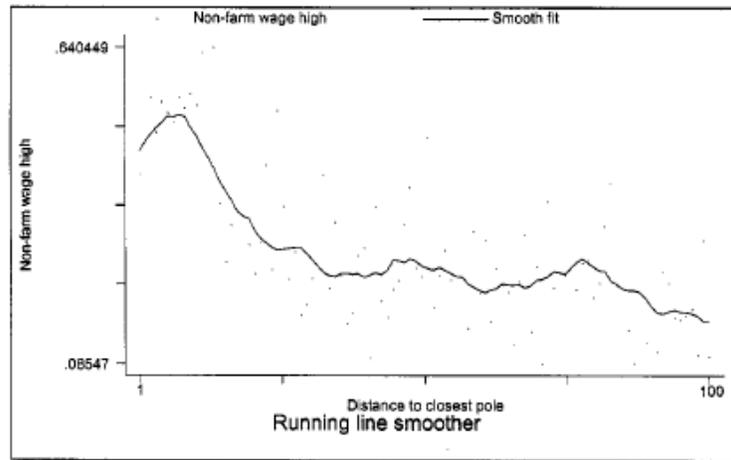
Nonfarm employment in rural Bangladesh has grown at an impressive rate during the 1990s, with annual average growth of nearly 3 percent exceeding the overall growth rate in agricultural employment.<sup>28</sup> The movement out of agriculture occurred mainly as a result of “pull” factors, as labor productivity in most nonfarm jobs, even unskilled, commands a premium over agricultural wages. Judging this trend, Hossain (2003) concluded that “higher productivity and wage earnings in most nonfarm activities are luring labor from relatively low productive, risky, and back-breaking farm activities.”

Manufacturing, trade and commerce, and services are the main components of nonfarm employment in Bangladesh, and activities range from unskilled low-paid occupations to higher paid jobs in manufacturing and servicing farm equipment. Overall, rural nonfarm employment is correlated with lower poverty among Bangladeshi households. Daily earnings of about one-third of all wage workers engaged in rural nonfarm activities are below the agricultural median wage in such occupations as domestic services, transport conductors, salesmen, and production workers in textile, food processing, tobacco industries, and traditional occupations such as basket weaving. For many, however, these jobs act primarily as supplementary income, subject to less seasonality than agricultural work, and helping reduce poverty and vulnerability to income shocks.

Better access to markets, infrastructure, and services is associated with higher returns to nonfarm wage- and self-employment. The share of nonfarm jobs that pay more than the median agricultural wage declines sharply with distance to the regional economic “poles” Dhaka and Chittagong (box figure). In addition to location, education and gender are other major correlates of participation in high-return nonfarm jobs, with the being female having a negative relation and years of education a positive relation.

Significant movement of land-poor rural workers out of agricultural wage work into higher paying nonfarm activities throughout the 1990s contributed to a substantial poverty decline in rural areas. Nonfarm employment is a critical pathway out of poverty, since nearly half of rural households in Bangladesh are effectively landless.

**Box figure Nonfarm rural wages fall with increased travel time to the closest urban center**



Source: World Bank calculations using 2000 Bangladesh Household Income Expenditure Survey.<sup>29</sup>

Source: Adapted from World Bank (2004).

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**Where you work and how much you earn depend on your skill**

***Rural labor markets are integrated and affected by migration opportunities***

<sup>28</sup> World Bank (2004) and Hossain (2004).

<sup>29</sup> Reported in World Bank (2004).

9.44 Wages reflect labor supply and demand. But, on the supply side, workers are mobile. They respond to market options in agriculture and in nonfarm activities, as well as to the opportunity to migrate. This creates strong interdependence between the sectors within rural areas, and links between the urban and rural economies. An increase in labor productivity in the agriculture sector may not induce a release of workers from agriculture if nonagricultural wages are constant (as in Punjab, India, through the first decade of the Green Revolution). Conversely, the proportion of the labor force in agriculture may also remain high under stagnant agricultural conditions, if nonagriculture is also stagnant (as in Sub-Saharan Africa).

9.45 The integration of the labor markets also weakens the direct correspondence between employment and earnings within each sub-sector. Increases in agricultural labor demand, perhaps reflecting a shift toward high value crops, may have only small effects on agricultural wages. Conversely, despite the fact that rural nonfarm enterprises are small, exhibiting little demand for labor, their presence may significantly affect labor market conditions, through labor supply. Any increase in nonfarm opportunities implies a potential reduction in the supply of laborers, increasing wages. So, policy measures that encourage nonfarm employment, even in small enterprises, are likely to generate spillover benefits to rural laborers.

9.46 Similarly, migration affects local labor markets. The first impact is upward pressure on wages in areas with high migration rates.<sup>30</sup> This can have a positive effect on the labor force participation of nonmigrants because the need to replace migrant worker creates a demand for those non-migrants. A second impact comes from remittances, which can create an incentive to reduce the labor supply of nonmigrants by increasing their reservation wage. In particular, remittances can have a gender component by reducing the labor force participation of women in favor of home production activities. A study of the effect of remittances sent from Mexican migrants in the United States finds that women from high-migration states are less likely to work outside the home.<sup>31</sup> Similar evidence is found in the hours of work of these women. But the study finds no effect of remittances on men's labor force participation and hours of work.

***Rural areas exhibit dismal levels of education, partly explained by low return to schooling***

9.47 The main dividing line between high and low paying jobs is skill endowment. Educated adults are more likely to have nonagricultural wage jobs. An intense sorting also occurs in migration. It is the younger, better educated, and more skilled workers that leave the rural areas to find better income opportunities abroad or in urban areas (chapter 3). The large labor supply for agricultural jobs, which largely arises from the inability of unskilled laborers to move into skilled jobs, underlies explanations of persistent poverty and the disparity problem in transforming countries, when the employment of skilled labor takes off outside agriculture.<sup>32</sup>

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<sup>30</sup> Hanson (2005).

<sup>31</sup> Hanson (2005).

<sup>32</sup> Banerjee and Newman (1993).

9.48 Nevertheless, current levels of education of the rural labor force are low compared to urban workers, scandalously so in many countries, including middle-income countries. Regional averages show that rural males have an average of 4 years of education in Sub-Saharan Africa, South Asia, Middle East and North Africa, and Latin America and the Caribbean, and just above 6 years in East Asia and the Pacific (chapter 3). This is 2-4 years less than in urban areas. Women's education is even lower, with regional averages below 2 years in South Asia and Middle East and North Africa. Very high disparities in human capital are observed between rural and urban China, albeit at much higher average levels. In rural areas, only 16 percent of the population lived in households where the average years of schooling was greater than 9 years in 2003; the corresponding figure for urban areas was 77 percent.<sup>33</sup> These low averages reflect the aging of the rural population, and hide real progress over the last decades. Yet, even young people do not have adequate education for entering the competitive labor market.<sup>34</sup>

9.49 Low levels of education in the rural labor force tend to reproduce themselves over generations—poorly schooled parents tend to have poorly schooled children, who then have fewer higher-income opportunities. Poverty itself as an initial condition may affect the ability to continue education—and so is directly a factor in reducing household education investment. Another factor explaining the low level of education is the low return to schooling.

***Returns to education are low in agricultural employment, but higher in the rural nonfarm economy and in migration***

9.50 As for any investment, returns to education depend on the environment. Human capital, measured by years of schooling, has a low return in traditional agriculture. A study of farmers in Bukidnon, Philippines—where most of the employment is in harvesting and is paid piece-rate—found that raising the level of schooling has no effect on incomes.<sup>35</sup> Similar results are found in many other contexts. But, as T.W. Shultz (1975) famously argued, returns come from the ability to better deal with disequilibrium; they are higher where technological change and a more complex environment require more difficult decisions. During the Green Revolution in India, education had higher returns in regions with higher rates of adoption of the new seeds.<sup>36</sup> In Taiwan, China education was also more valuable for production in areas with greater weather instability.<sup>37</sup>

9.51 By contrast, there is ample evidence of correlation between education and access and return to nonagricultural employment. Data for India and China indicate that better education enables rural workers to find high paying nonagricultural employment, whereas the lack of education tends to force them into agricultural employment at worst

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<sup>33</sup> World Bank internal report.

<sup>34</sup> World Bank (2006).

<sup>35</sup> Otsuka and Yamano (2006).

<sup>36</sup> Foster and Rosenzweig (1993), Foster and Rosenzweig (1996).

<sup>37</sup> Gurgand (2003).

and low wage nonagricultural employment at best.<sup>38</sup> Similarly, higher returns were found in nonfarm than in farm activities in Ghana, Peru, and Pakistan.<sup>39</sup>

9.52 Returns to education are consistently higher in urban than in rural markets across countries.<sup>40</sup> This is particularly true for the level of education beyond basic schooling. These higher returns in urban areas provide a strong motivation for the educated to migrate and explain the selectivity observed in migration (chapter 3).

9.53 Taking into consideration the endogenous choice of employment, in the rural farm, nonfarm, and urban economies the return to rural education needs to be understood in a broader sense that includes activity choice. All empirical evidence suggests that the between-activity allocation effects of education dominate the return. A rigorous estimation of such return to schooling was done by Duflo (2001) using an expansion of rural school construction in Indonesia during the oil boom of 1973-1978. Observing a sample of adults in 1995, wherever they live and work, Duflo estimates a return to one additional year of education to be 13 percent, a value close to other international estimates. Studies in Bolivia and Turkey show returns to education to be higher in regions close to urban centers, suggesting that it is off-farm opportunities that enhance the value of schooling.<sup>41</sup>

9.54 With high expected returns to education in the rural nonfarm economy and in migration, interest in investing in education has been high in Southeast Asia's rural areas. In the Philippines and Thailand rural households invest a major portion of their additional income in schooling children who later engage in rural nonagricultural jobs or migrate to cities to seek more lucrative employment.<sup>42</sup> In India, rural-to-urban migration significantly increases the rate of return to rural schooling at levels beyond that of middle school. Rural parents appear to be cognizant of this; decisions to school their children to higher levels are affected by urban rates of return.<sup>43</sup>

***Rural labor market outcomes also depend on other markets, notably the credit market***

9.55 Labor market outcomes can be significantly affected by other markets, notably those for credit, insurance, and land (both ownership and tenancy). The consequences of seasonality in agricultural demand can be significantly reduced by well functioning credit markets that offer households production loans against future output. Similarly, the transition to higher value crops, and the accompanying increase in labor demand, may also be facilitated through the adequate provision of credit for the costlier inputs. On the supply side, a lack of credit is known to be a significant deterrent to migration.

9.56 In the absence of insurance markets, households frequently resort to labor arrangements to mitigate the consequences of income and other shocks, perhaps

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<sup>38</sup> Kashisa and Palanichamy (2006), de Brauw and others (2002), Du, Park, and Wang (2005).

<sup>39</sup> Jolliffe (2004), Laszlo (2004), Fafchamps and Quisumbing (1999).

<sup>40</sup> Orazem and King (Forthcoming).

<sup>41</sup> Orazem and King (Forthcoming).

<sup>42</sup> Quisumbing, Estudillo, and Otsuka (2004), Cherdchuchai (2006), and Takahashi (2006).

<sup>43</sup> Kochar (2000).

explaining the predominance of the family farm in many parts of the world. But such informal arrangements offer only incomplete insurance. Thus, improvements in insurance arrangements could substantially affect rural labor demand, while simultaneously allowing households to make choices about migration and incomes separately from the need to provide insurance.

9.57 Better land markets can also do much to help labor outcomes. The decline in tenancy is sometimes related to a lack of security in land ownership. In China the fear of expropriation of land is limiting demand for land rental contracts—and limiting migration. So, improvements in land security can have a large effect on wages (chapter 6).

### ***The exit option***

9.58 Migration to urban areas in search of higher incomes is common phenomenon and a potential strategy out of poverty. This strategy is most widely adopted in transforming and urbanized economies, where growing urban areas offer more employment opportunities (chapter 1). In all, it is estimated that 575 million people migrated from rural to urban areas in developing countries over the past 25 years<sup>44</sup>. Of these, 400 million belong to transforming countries, where migration flows have increased from 64 million migrants between 1980 and 1985 to almost 100 million between 2000 and 2005. Migration flows as a share of the rural population have been traditionally highest in urbanized economies, where over 8 percent of the rural population migrated from 1980 to 1985, as opposed to 3 percent in both transforming and agricultural based economies. However, the share (and absolute numbers) of population migrating in urbanized economies has decreased over the period, dropping to 6 percent from 2000 to 2005. In transforming economies, the percentage of migrating population has steadily increased, to 4 percent between 2000 and 2005. Migration also increased in agriculture-based economies, although at a lower level, from 2.9 percent of the rural population between 1980 and 1985, to 3.4 percent between 2000 and 2005. In all, 60 million people have migrated in agriculture-based economies over the past 25 years.

9.59 Migration can serve as a pathway out of poverty both for the migrant if insertion in the new labor market is successful and for the emitting household as remittances can provide an additional source of income to families. However, migration flows have in many cases increased urban unemployment. Migrants ill equipped to find good jobs in the cities, remain unemployed or trapped in low-quality jobs with little upward mobility. In some countries, China most particularly, the limited access of migrant workers to social protection in the urban environment has left them vulnerable to economic hardship and hindered their integration into the urban labor market. Casual work and informality persist for these migrants.

### **The policy response**

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<sup>44</sup> Estimates are computed assuming that in the absence of migration, natural population rates for urban and rural areas would be equal, thus providing a conservative measure of migration. Reclassification of rural areas into urban has not been taken into account, although it may account for some of the urbanization, independently of migration.

9.60 From the above discussion of rural and agricultural labor markets, we can focus on four broad objectives of public policy that are conducive for poverty reduction:

- The simple generation of more jobs, although low paying, either in agriculture or in other activities,
- The encouragement of higher-paying employment opportunities within the rural environment, probably mostly nonfarm,
- The improvement of the human capital of rural workers to take advantage of higher-paying jobs in rural areas and elsewhere via migration,
- The provision of safety nets for the extremely poor, the elderly and the disadvantaged.

Within these four broad goals, there are a number of specific areas for policy interventions that crosscut these objectives. What are these specific interventions?

***More rural employment, on farm and off***

9.61 More employment—higher labor demand—even if of low wages, will not occur without a dynamic rural economy, both agriculture and rural nonfarm. Perhaps the most basic policy element for a dynamic rural economy is the promotion of a good investment climate. Governments can contribute through its role in property rights, through investments in roads, electricity and other infrastructure, by removing adverse price interventions adverse to rural products, by developing innovative approaches to credit and financial services, and by aiding in the coordination of private and public actors to encourage agro-based industry clusters. And with more investment and an expansion of rural economic activities comes the potential for higher-paying jobs, particularly off farm.

9.62 Roads and better infrastructure not only improve conditions within a rural area, but also serve to draw rural communities closer to other markets. Integrating the community with other markets enhances the demand for what the rural area can produce and specialize in. Another aspect of enhancing a good investment climate is the capacity of the rural communities to take advantage of potential growth in investments and labor demand, which depends on human capital and entrepreneurial skill. And so education and training policies are important not only for individuals, but also for creating an investment climate that generates jobs. We return to education policies below.

9.63 Seeking to enhance the investment climate (especially one that generates rural nonfarm jobs) works best in areas with higher population density and endowment of natural resources. This applies to both farm and nonfarm jobs. But there are areas that lack these conditions, and so interventions should be adjusted by region. For less favorable regions, the menu of interventions is limited, especially in the context of limited government budgets. Public investments in infrastructure are critical, but also business services, tax incentives, and developmental subsidies (like the forest and soil fertility subsidies in Chile) could create an enabling environment for private entrepreneurs to invest in new ventures.

9.64 Enhancing the dynamics of rural economies can also be approached from a territorial perspective. This includes the promotion of localized agro-based clusters where agricultural producers interact regionally to better compete. Dynamic clusters create linkages with local services and industries and enhance the demand for labor beyond farming. How this can work is illustrated by the Petrolina-Juazeiro region of Brazil's San Francisco Valley, where investment in irrigation and cooperation between commercial entrepreneurs and land reform beneficiaries in the production and marketing of high value export crops produced large direct benefits for participating smallholders, a massive expansion of employment in both agriculture and agriculture-related industries and services, wage gains based on strong bargaining power of labor unions, and sharp reductions in poverty.<sup>45</sup> Lessons learned from successful cases of territorial development point to the importance of innovations as drivers of localized growth, access to dynamic markets, and strengthening linkages among farmers, industry, and services to enhance localized spillover effects.

9.65 But in the frequent case of countries with a shortage of public funds, and isolated rural regions of low population density, there are very few options outside of agriculture and out-migration. Targeting limited funds to promote agricultural productivity and better education would appear to be the priority.

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<sup>45</sup> Damiani (2006).

### ***Investing in education***

9.66 An overall message from many, many studies on education is that formal schooling can give farm and rural households greater access to higher-paying jobs and higher incomes. This is due to the rising potential returns to schooling that come with the trend in rural areas toward activities, farm and nonfarm, that demand more-skilled labor. Better education also gives rural families (especially those in farming) the potential for household income diversification, and gives family members the potential to take advantage of migration to areas demanding higher-skilled workers.

9.67 There are two sides to the human-capital investment problem: in terms of demand, there is the problem of incentives for parents to invest more in their children's education; in terms of supply, there is the problem of improving the availability and quality of schooling. In practice, there is the additional government problem that the two sides are generally managed by different ministries, namely Social Welfare and Education.

9.68 The demand for schooling responds to lower costs, and these costs are both in terms of school expenses (fees, clothing, books and the like), and in terms of the opportunity costs associated with travel time over poor roads to distant locations, and associated with not having children doing productive work. Policies can lower these costs to families. For example, the recent elimination of school fees for primary education in Kenya and Uganda induced major increases in school enrollment. In Uganda the free primary education program that started in 1997 had large impacts on completion rates for 4th and 5th graders from poor households, especially girls.<sup>46</sup> But free primary education may not be sufficient for poor children to attend school because of others costs associated with schooling, including the opportunity cost of child labor.

9.69 The use of conditional cash transfers, where regular school attendance is a condition for parents to receive transfers, has been expanding in many countries after an early conditional in-kind transfer program in Bangladesh (*Food-for-Education*), reaching large magnitudes in middle-income countries like Mexico (*Oportunidades*) and Brazil (*Bolsa Familia*).<sup>47</sup> These programs are meant to achieve two immediate objectives: reduce current poverty through the cash transfers and reduce future poverty through increased investment in the schooling of poor children. If successful, these programs can be a one-time investment in breaking the inheritance of poverty whereby poor and uneducated parents keep their children out of school. These programs, though costly, have been successful in middle income countries. Their application in an adapted form to low income countries with extensive poverty and weaker school and civil registry systems remains an unexplored challenge.

9.70 Investing on the supply side of education, and balancing supply-side and demand-side investments, is necessary for success in raising educational achievements. In Mexico, the conditional cash transfer program was targeted at rural communities

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<sup>46</sup> Nishimura, Yamano, and Sasaoka (Forthcoming).

<sup>47</sup> Rawlings and Rubio (2005).

sufficiently well endowed in school facilities. Distance to school was found to be a major determinant of program uptake.<sup>48</sup> The next step, currently being implemented, is to extend these school facilities to all rural areas. In addition, improving the quality of schooling is essential. What is important is that teaching be relevant to seizing entrepreneurial opportunities and finding gainful employment in a changing rural economy, as well as opening opportunities to successfully migrate to the urban labor market. This clearly redefines the nature of rural education and calls for massive investments in human capital, both education and skills, so labor can capture the new opportunities. [Forthcoming focus on rural education and training].

9.71 But then there is the sensitive question of child labor. In the short term, poor families gain from child labor. In terms of development, however, the biggest cost of child labor is lower future education levels, and the associated persistence of long-term poverty. Public policy should make sure child labor is not at the expense of school. Policy proposals for reducing child labor have included punitive measures, such as restrictions and prohibitions on employment, and even trade sanctions have been made to force governments to act. Punitive intervention could cause short-term welfare losses to the poor.

9.72 In contrast to punitive measure, recently conditional cash or in-kind transfers have been used. Analyzing the impact of the Food-for-Education program of Bangladesh, Ravallion and Wodon (2000) show that positive incentives to families increased schooling by 15 percent, reducing child labor by 5 percent.<sup>49</sup> The Mexican government's cash transfer program, *Oportunidades*, reduced the incidence of child labor outside the home.<sup>50</sup> In Ecuador, *Bono de Desarrollo Humano* reduced child work by an estimated 17 percentage points (box 9.7).<sup>51</sup>

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**Box 9.7 Providing direct support to families to reduce child labor in Brazil**

Households chronically poor, or temporarily poor because of a sudden loss of income, may need their children to earn income. Evidence from Burkina Faso and Guatemala shows that child labor increases when poor families face income shocks.<sup>52</sup> In Brazil the Program to Eradicate Child Labor requires not only that rural children attend school but also that parents agree that their children will not work. Impact results show that the program significantly lowered the incidence of child labor in three states (box figure). The largest impact, in Bahia, was estimated to have reduced child labor by more than 23 percentage points.

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<sup>48</sup> de Janvry and Sadoulet (2005).

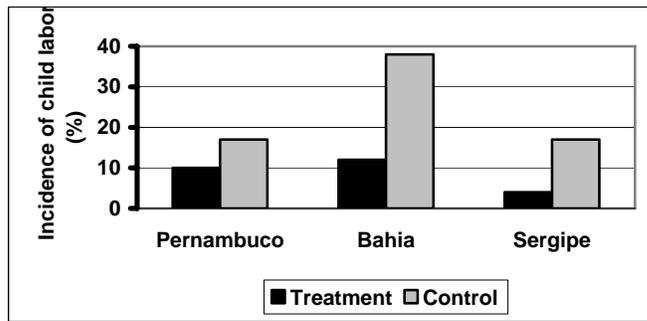
<sup>49</sup> Ravallion and Wodon (2000).

<sup>50</sup> Schultz (2001).

<sup>51</sup> Schady and Araujo (2006).

<sup>52</sup> Guarcello, Lorenzo, Mealli, and Rosati (2003), and Parent (2006).

**Box figure Brazil's program to eliminate child labor**



Source: Yap, Sedlacek, and Orazem (2001), Schady and Araujo (2006), and Raju (2006).

***Remember the complementarities between rural infrastructure, work and education***

9.73 As has been shown in various studies on the supply side of the labor market, the investment in rural infrastructure services contributes to the growth in economic activities and leads to higher labor demand and lower poverty. Rural households have greater potential to increase income and have a lower chance of being poor, if they have access to rural water, electricity, telephone, and road infrastructure. Infrastructure services also can have synergistic effects. As Escobal and Torero (2004) show for Peru, with at least two infrastructure services, households increase work time significantly, and diversify income sources: families with access to at least two services averaged 55 percent of their work time on farming, but families without access to any infrastructure averaged about 85 percent. Making all infrastructure services available to the 30 percent currently without access to any service could contribute to moving a half a million Peruvians out of poverty.<sup>53</sup> Furthermore, Chong and Hentschel (1999) demonstrate that having had access to a group of services simultaneously (electricity, water, sanitation, and telephones) increased Peruvian households' consumption growth (37 percent) compared to households with no access to any service. Access to only two of the services improved consumption growth by 10 percent. As it turns out, access in rural areas to electricity had the single largest effect on household consumption growth.

9.74 More generally with regards to the long-term returns to schooling for the rural labor force, infrastructure services impact the accumulation of human capital, both in terms of schooling and health. For example, improved road networks, and the consequent improvement in local transportation and safety, leads to improved school attendance. The wider accessibility of electricity in rural areas produces a range of benefits, but one in particular—more time for school study—improves school performance. Better education and health care facilities lead to greater opportunities for employment, which leads ultimately to higher rural household incomes. One study by Deolalikar (2001) on Vietnam demonstrates with investments in road infrastructure in poor areas there is better access to—and use of—public health facilities, and secondary school enrollments are higher.

<sup>53</sup> World Bank (2005), p. 195.

9.75 Beyond roads and electrification, as Leipziger and others (2003) show, investments in water and sanitation reduce infant, child, and maternal mortality and increase schooling attainment. Their cross-country analysis of differences in health between rich and poor shows that such differences are linked to infrastructure service coverage: comparing the poorest quintile with the richest, access to water explains about 25 percent of the difference in infant mortality rates, and 37 percent of the difference in child mortality rates. There are complementarities for improving poor household welfare between infrastructure services, education, and rural nonfarm employment.<sup>54</sup>

### *Adapt labor regulations to the conditions of farm and rural employment*

9.76 Should labor regulations treat agriculture and small rural nonfarm activities differently? The World Development Report 2005 emphasized that onerous regulations hurt vulnerable groups, and the main aims of policy recommendations regarding the labor code should be to benefit workers, especially the poor, and to generate more employment, especially among the less skilled, whether formal or informal. Labor regulations impact the formal market and indirectly the informal market and they affect the formal-informal mix of labor demand and supply. As a secondary aim, labor regulations should be consistent with incorporating a larger share of workers into the formal market. Formal markets provide a better environment for worker protection, pension and health security provision, improved connections to credit markets, and long-term investments by firms in workers through on-the-job training.

9.77 Although the wage-earning sector in agriculture is highly informal, the policy challenge is to adapt regulations to the special conditions of seasonality, instability, and fluctuating demand, in part to encourage formality. Even where informal markets are significant, this does not make labor codes uninteresting or irrelevant. Labor regulations do impact agricultural and rural labor markets by encouraging a greater emphasis on informal employment. Formal markets and informal markets interact. Seasonality is particularly important to pay attention to when trying to apply urban-style labor regulations to agricultural work because they might create excessive rigidity for the type of short term employment used in agriculture and rural businesses linked to the agricultural cycle. For rural workers who have minimal protection and limited upward mobility, labor market regulations should draw them into the formal market by balancing protection and labor market flexibility.

9.78 More specifically, labor market regulations, particularly in middle income countries, can unwittingly reduce employment demand and encourage informality by encouraging high minimum wages, high severance payments, and the “implicit labor tax”—the wedge between what the employer pays and what the worker perceives as his true benefits. For example, in Brazil, Mexico, Nicaragua and Poland there is a heavy implicit labor tax on rural labor associated with crossing the frontier between informal and formal employment.<sup>55</sup> Without attempting to examine in depth the pros and cons of minimum wages, another factor driving employers and workers to meet in the informal

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<sup>54</sup> See also Reardon and others (2000).

<sup>55</sup> For Brazil, Mexico and Nicaragua, see Valdés and Foster (2006). For Poland, see World Bank (2001).

market are legal lower bounds on formal wages. To the extent that they are binding, minimum wages depress the formal employment of low-marginal-productivity workers—the unskilled and young—and this might have different effects in urban and rural markets. For example, in Nicaraguan minimum wages are binding in every sector of the economy with perhaps the exception of government employment, but the formal employment of rural and agricultural labor is particularly affected.<sup>56</sup> The evidence shows clearly that minimum wages are set too high relative to the overall distribution of earnings. Of course, because transacting wages below the minimum are not legal—and supposing that businesses operating in the formal sector likely abide by minimum wage laws—low-marginal-productivity workers will take to the informal sector.

***Providing safety nets to reduce vulnerability to shocks and policy shifts.*** Vulnerable rural households need access to safety nets, especially in response to shocks.

9.79 *Rural non-contributory pensions.* In rural areas the elderly and disadvantaged left behind by migration may require additional forms of income support. Brazil, Bolivia, and South Africa have introduced rural non-contributory pensions. These programs create welfare gains for recipients, and spillover effects on the education and nutrition of family members. However, they also create an incentive for firms and workers to remain in the informal sector, and there is an additional cost in terms of fewer contributors and foregoing scale economies.<sup>57</sup> Private transfers can also provide a source of income in rural areas, especially when in the form of remittances. Therefore, policies should reduce remittance transaction costs and encourage investment in local economy.

9.80 *Public works programs for those able to work.* The benefits of public works programs go beyond the immediate income transfer. They also offer an opportunity for low skilled and rural workers to acquire initial work experience while contributing to the building of rural infrastructure. India's Maharashtra Employment Guarantee Scheme provides such employment, guaranteeing an important safety net, reducing the cost of risk management, and protecting in the event of shocks family assets that are often too little. Employment in this countercyclical program expanded by 64 percent in response to a drought in 1982. Similarly Argentina's *Trabajar* program increased participants' current income.<sup>58</sup> Among the participants, about half felt that the program improved their chances of getting a job, two-thirds that it gave them a marketable skill, and about one-third that it expanded their contacts on the labor market.<sup>59</sup> Programs under AGETIP (*Agence d'Exécution des Travaux d'Intérêt Public*) in Senegal combine investment in public infrastructure (roads, buildings, sanitation systems) with jobs and training for unemployed youth.

9.81 *Good safety nets are countercyclical.* Safety nets have also a function of insurance. Ideally, a safety net increases expenditures when income or production declines. In many cases though, safety nets can be more procyclical, since economic shocks often reduce revenues just as they necessitate an increase in expenditures. To

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<sup>56</sup> Ureta

<sup>57</sup> Levy (2007).

<sup>58</sup> Ravallion and others (2005).

<sup>59</sup> Galasso, Ravallion, and Salvia (2001).

counter this, safety nets need to be flexible, quick and efficient. For example, in both Argentina and Mexico in the mid-1990s, economic downturns reduced social spending just when poverty was increasing. India, Mexico and the Philippines now hold reserve funds or earmark specific taxes for their relief programs. In addition, the identification of beneficiaries and the disbursement of funds need to be rapid to remain countercyclical. To ensure smooth operation of safety nets when needs rapidly increase, programs should be designed prior to the occurrence of a shock.

9.82 *Safety nets for policy shifts.* Safety nets to compensate household hurt by policy shifts and to make policy reforms more palatable may also improve economic efficiency. Mexico introduced Procampo to mitigate the costs of adjusting to the North American Free Trade Agreement (NAFTA), but the transfers also helped relax credit and insurance constraints and increase production.<sup>60</sup> Turkey introduced a similar direct income support in 2001 to facilitate reforms. So, programs to address the facts that agricultural transformation is inherently stressful and that few policy changes are unambiguous sources of gains for all households may improve efficiency as well as equity. Note however that, while social safety nets are important short term instruments against poverty and short-term shocks, they can also affect the long-term benefits that might come from encouraging mobility and migration, if benefits are not portable—that is they cannot be carried to other activities and areas.<sup>61</sup>

9.83 *Designing scalable safety nets.* While there is extensive experience with the targeting of transfers on the basis of chronic poverty, ex-post targeting to mitigate state contingent needs requires different implementation. This distinction may be phrased in terms of dynamic versus static targeting. Given the cost of collecting indicators responsive to shock for short-term use, programs may consider using community targeting or self-targeting. Public works and community subsidies for grains primarily consumed by the poor are examples of self-targeting. Critical for the long-term is that safety nets programs are scaled back when the crisis subsides.

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**Box 9.8 The gradual but incomplete move towards cash-based food aid**

Current food aid volumes are at long-term lows; however, this reflects sharp reductions in program food aid and masks steady increases in emergency food aid shipments. Emergency aid now dominates global food aid: over 57 percent of global food aid flows in 2001-04 were emergency aid. The shift to emergency food aid has also ushered in a substantial geographic orientation from Asia to Africa.

Major policy changes in Australia, Canada and the European Union illustrate that donors are now more flexible in sourcing food aid. In 1996, the European Union created the Food Security Budget Line that eliminated restrictions tying procurement of food aid to European suppliers. A significant departure from the past, it encouraged greater use of local and regional purchases. While local purchases can destabilize local prices, they are estimated to be 30-50 percent less expensive to procure and deliver than food shipments from donor countries.<sup>62</sup> Both in-kind food aid and cash-based food aid are open to mis-targeting and corruption; however, in-kind assistance incurs higher distribution costs. In addition, local purchases can facilitate more rapid responses to crises by greatly reducing delivery time. Today, most countries in Europe give almost all their food aid in cash for local and regional purchases by nongovernmental organizations and the World Food Program. In 2005, a record 2.55 million metric tons of food aid were

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<sup>60</sup> Sadoulet, de Janvry, and Davis (2001).

<sup>61</sup> Banerjee and Newman (1993).

<sup>62</sup> Clay, Riley, and Urey (2004).

sourced through local or regional purchases in developing countries. In addition to the EU, Australia and Canada have also relaxed their domestic food aid procurement rules and moved toward more cash-based programming. Now more than half of the two countries' food aid is purchased locally.

Despite these shifts in food aid, the United States, which accounts for more than half the world's food aid donations, remains reliant on domestically sourced food. In recent years, proposals to relax domestic procurement rules have been blocked, under pressure from a coalition of agribusinesses, shipping companies and nongovernmental development and relief organizations. The pressure for reform is present, however, the politics remain difficult.

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### ***A final word on labor markets, mobility and migration***

9.84 This chapter has shown that, as agriculture is intensifying and diversifying, and as economies develop, well-functioning rural labor markets and migration can play crucial roles in reducing rural poverty and in dampening rural-urban income disparities. Nevertheless, as this chapter was being prepared, it was discovered how stunningly little policy attention has been given to the structure, conduct, and performance of rural labor markets and how they integrate with successful transitions out of agriculture. Certainly, special attention is needed to give mobility and training to workers to access good jobs, to adjust labor legislation that protects them but does not stifle employment, and to help migrants find good employment elsewhere. Policy interventions are also needed on the demand side of the labor market, and on safety nets for the disadvantaged. And yet, compared to other aspects of the rural economy, much is left to be explored in understanding how to improve the functioning of rural labor markets.

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## **Focus H The two-way links between health and agriculture**

*Though the livelihoods of the world's poor are often derived from agriculture, agriculture can also pose major threats to their health. Irrigation has been linked to increased incidence of malaria and illness and death from pesticide poisoning is prevalent in developing-country agriculture. Likewise, some of the developing world's major health problems can also have disastrous affects on agriculture. Widespread illness and death from HIV/AIDS, malaria and other diseases decrease agricultural productivity through the loss of labor and knowledge of productive adults and the loss of assets used to cope with the illness. Taking advantage of the positive policy synergies between the agriculture and health sectors has the possibility to yield great welfare benefits for the poor in developing countries.*

H.1 Good health and productive agriculture, both essential in the fight against poverty, are inextricably linked: agriculture affects health, and health affects agriculture. Agriculture supports health by providing food, fiber and materials for shelter for the world's population; among agricultural communities, it provides income which can be spent on health care and prevention. Yet the production and consumption of agricultural goods can also increase risks of major health problems, such as malaria, foodborne diseases, and occupational hazards.<sup>1</sup>

H.2 These health problems in turn have implications for agriculture. Illness and death from HIV/AIDS, malaria and other diseases reduce agricultural productivity through the loss of labor, the knowledge of productive adults, and the assets used to cope with illness. Since the majority of the world's poor work in agriculture, and the poor suffer disproportionately from related illness and disease, taking an integrated view of agriculture and health is necessary to address poverty and promote agricultural development.

H.3 Most of the linkages between agriculture and health were first recognized long ago, yet health considerations still play little part in the decisions of governments about agricultural policy.<sup>2</sup> Nor has the health sector reached out to agriculture as a key partner in addressing global ill health. There have been reasons for this disjuncture—some borne of unawareness, others of distinct policy conflicts. Whatever the reasons, the divisions are undermining efforts to overcome ill health among poor rural communities, and giving short shrift to agriculture's role in alleviating many of the world's most serious health problems.

H.4 Three major health problems affecting poor communities, closely linked to agriculture, are malaria, pesticide poisoning, and HIV/AIDS. (Another important health issue closely linked to agriculture is nutrition, discussed in focus C). The prevalence of these health conditions is directly affected by agricultural activities, and these conditions affect agricultural practices and production. As shown here, interventions in agriculture can alleviate ill health.

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<sup>1</sup> Hawkes and Ruel (2006).

<sup>2</sup> Lipton and de Kadt (1988).

## **Malaria**

H.5 Every year an estimated 300-500 million people get sick from malaria, and more than 1 million die from it, many of them children.<sup>3</sup> Characteristics of agricultural production systems, such as crop rotation, the presence of livestock, and the proximity of villages to fields and water sources affect malarial risk. In particular, agricultural water development can create conditions suitable for parasitic vectors and thus facilitate disease transmission.<sup>4</sup>

H.6 Irrigation brings higher agricultural yields and incomes but can heighten the risk of malarial transmission.<sup>5 6</sup> The interaction between the two affects malaria prevalence. In Ethiopia researchers found malaria prevalence to be higher in those villages close to government-created microdams. But in Tanzania, malaria was less prevalent in irrigated areas, where rice-growing led to improved socioeconomic status, so farm households could afford self-protection measures such as insecticide-treated nets.

H.7 The impact of malaria on agricultural productivity has a long history. In the first half of the 20<sup>th</sup> century, malaria was the leading public health problem in Italy, much as in many developing countries today. Absences due to illness and death were common during the agricultural season, leaving millions of hectares of Italy's most fertile land fallow. In the developing world, illness from malaria continues to reduce productivity. A small-scale study of farmers engaged in intensive vegetable production in Côte d'Ivoire showed that those malaria sufferers<sup>7</sup> produced about half the yields and half the incomes of healthy farmers.<sup>8</sup>

H.8 History has shown that malaria can be controlled by modifying or manipulating agricultural water systems. A case study in India in 1940-41 showed that intermittent irrigation of rice fields reduced malaria contraction from 48 percent to 4 percent. In the early 1900s, better maintenance and improvements of irrigation and drainage systems reduced malaria cases by more than half in Egypt, India, and Indonesia.<sup>9</sup> Today, there are many options to mitigate the negative affects of agricultural water development while maintaining agricultural productivity. They include providing location-specific knowledge of drainage techniques, intermittently wetting and drying rice fields, alternating rice with a dry-land crop, and using livestock as "bait" for mosquitoes.<sup>10</sup>

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<sup>3</sup> World Health Organization (Regional Office for Africa) (2006).

<sup>4</sup> Mutero and others (2005). Snowden (2006).

<sup>5</sup> Keiser and others (2005).

<sup>6</sup> Mutero, McCartney, and Boelee (2006).

<sup>7</sup> The study compared farmers who complained of malaria-like symptoms for more than 2 days in a month to those with symptoms for one or no days.

<sup>8</sup> Girardin and others (2004).

<sup>9</sup> Utzinger and others (2005).

<sup>10</sup> van der Hoek (2003), Mutero and others (2005).

### **Pesticide poisoning**

H.9 Pesticides usually increase agricultural productivity, but are often toxic. Improper handling can have many acute and chronic health affects. Unintentional poisonings from exposure kill an estimated 355,000 people globally each year, two-thirds of them in developing countries.<sup>11</sup> Poor understanding of the risks and a fear of the loss of livelihoods leads poor farmers in developing countries to overuse pesticides without proper safety precautions. Making matters worse, developing countries often have weak regulatory systems for dangerous chemicals: pesticides banned or restricted in developed countries are often used widely in developing countries.<sup>12</sup>

H.10 Although pesticide use brings increased crop yields, it can also bring costs: of medical treatment for pesticide poisoning, of lost labor, and of lower long-term productivity. Nor are the health effects limited to farmers, as family members are also exposed.

H.11 The economically efficient level of pesticide use, where productivity gains outweigh all costs, depends on the crop characteristics. Farmer perceptions of appropriate use also vary with the setting and culture. For example, it is common among Latin American farmers to believe that exposure to pesticides increases their tolerance and makes them stronger and more able to work, leading to very high levels of exposure. For instance, in a potato-farming community in Carchi, Ecuador, researchers documented 171 pesticide poisonings per 100,000 people per year in the late 1990s—among the highest documented rates in the world. Pesticide poisoning was the second largest cause of death for men (19 percent) and fourth for women (13 percent). Although the marginal benefit of pesticide use was positive (an additional dollar spent on pesticides generated more than one additional dollar of income), poisoning led to high healthcare costs and lost work-time that outweighed the benefits. However, farmers who focused on preventing or suppressing pest and using pesticides only when necessary substantially reduced exposure while maintaining yields, increasing profitability.<sup>13</sup>

H.12 Another study, carried out in Nicaragua in the 1990s, found that corn farmers were consistently using three times the prescribed level of pesticides. Yet farmers trained in appropriate pesticide use suffered lower exposure after two years and had higher net returns than those not trained.<sup>14</sup>

H.13 Experiments in rice growing areas of the Philippines from 1989-91 examined the health costs—including the opportunity costs of the farmers' lost time—associated with pesticide use relative to “natural control” (conserving enemies of crop pests by preventing their destruction or preserving their habitat). The farmers commonly applied

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<sup>11</sup> World Health Organization (WHO) (2003).

<sup>12</sup> Goldman and Tran (2002).

<sup>13</sup> Yanggen and others (2003), Cole, Carpio, and Leon (2000).

<sup>14</sup> Hruska and Corriols (2002).

two insecticide doses<sup>15</sup> per growing season, which elevated their health costs by an average of 70 percent above those who did not use pesticides. Researchers estimated that the increased yield from pesticide use was more than offset by the cost of illness.<sup>16</sup>

H.14 To limit the health and economic costs of pesticide use, policymakers can provide context-specific training and information campaigns and reduce the accessibility to the more dangerous agro-chemical through taxation or licensing. Natural control and integrated pest management also show promise. In the aforementioned examples, farmers were able to maintain their productivity while decreasing the acute and chronic affects of exposure by using these techniques.

### **HIV/AIDS**

H.15 In 2006 an estimated 39.5 million people in the world were living with HIV, while an estimated 2.9 million people died from the AIDS in the same year.<sup>17</sup> The livelihoods of the majority of people globally affected by HIV and AIDS depend on agriculture, which in turn is being significantly undermined by the disease in many developing countries. In many sub-Saharan African countries, AIDS demands a rethinking of development policy and practice, and parts of South Asia may face similar situations if the epidemic continues unabated.

Illness and death from HIV and AIDS affects agricultural earnings and productivity. A 1997 study of worker productivity in a Kenya tea estate found the average daily output of HIV-positive workers to be as much as 23 percent less than that of healthy workers in the same fields.<sup>18</sup> A study of rural households in Mozambique has shown that an adult death due to illness, which is likely to be HIV-related, reduces the amount of staple foods produced by these households by 20-30 percentage points. This poses a major problem for households that primarily rely on this production for subsistence (figure H.1).

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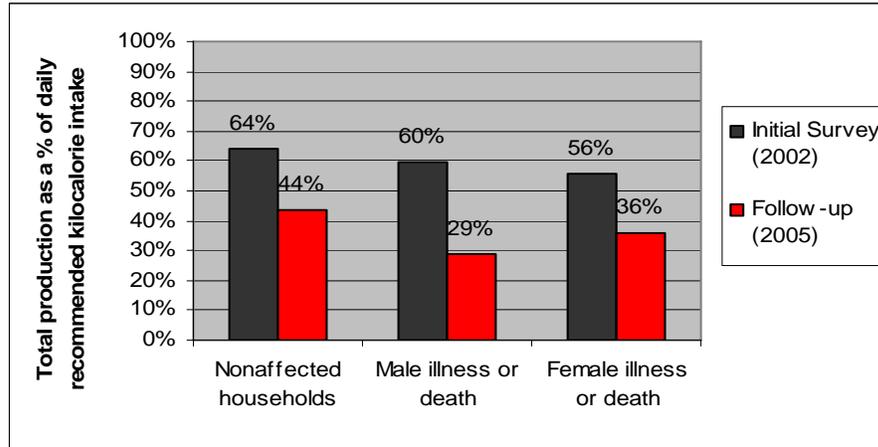
<sup>15</sup> The health affects of herbicide use were not significant in the estimation results. This could be due to the much higher number of insecticide poisonings compared to herbicide poisonings. (Pingali, Marquez, and Palis (1994)).

<sup>16</sup> Pingali, Marquez, and Palis (1994), Rola and Pingali (1993).

<sup>17</sup> UNAIDS (2006).

<sup>18</sup> Kadiyala and Gillespie (2005).

**Figure H.1 Decline in kilocalorie staple food production after AIDS-related death in farm households in Mozambique**



*Source:* Data from Donovan and Massingue (2007) comparing the kilocalorie production of households affected by an adult illness death, likely to be AIDS-related, with unaffected households in rural Mozambique. Because these are subsistence farmers, production can be used as a measure of consumption availability. Percent Daily Recommended Kilocalorie Intake equals the median home production (kcal/day/adult equivalent) divided by the recommended consumption (3,000 kcal/day/adult equivalent).

H.16 There is tremendous scope for agricultural policy to become more HIV-responsive and further both health and agricultural goals. Promoting labor-saving technologies and crops is one way to address lost labor due to AIDS-related mortality in agriculture. But for poorer smallholder households, the main constraints on livelihoods may be land and cash rather than labor. So cash transfers to help them hire labor, more secure land tenure for women, and expanded agriculture extension programs to include women may have a greater impact on welfare.<sup>19</sup>

H.17 Targeted, agriculturally oriented programs can capitalize on the two-way linkages between AIDS and agricultural livelihoods. To overcome the lack of land and labor often facing AIDS-affected households, the Livelihoods Recovery through Agriculture Programme, implemented in Lesotho in 2002 by CARE and the Ministry of Agriculture, promotes production of crops with high nutritional content on small plots of land close to the home. This reduces the labor required for production, increases the accessibility of water for irrigation, and addresses the increased nutritional needs of HIV-positive household members. Of the participant, 53 percent reported that they had stabilized or increased their food production.<sup>20</sup>

H.18 Another program in Mozambique borrows from agricultural extension and social safety nets to address the deaths of adults before they pass on their knowledge and skills to their children. A Junior Farmer Field and Life School program—implemented in 2004 by three rural faith-based organizations, WFP, FAO, and the provincial directorates of the Ministries of Agriculture, Education, and Women and Coordination of Social Action—provides orphans and vulnerable children in high HIV-prevalence areas with crucial farming and life skills as well as nutritious daily meals to mitigate the current and future

<sup>19</sup> Jayne and others (2006).

<sup>20</sup> Abbot, Lerotholi, and Mahao (2005).

impacts of the disease. After one year of activities the program was empowering orphans and vulnerable children and strengthening the capacity of institutions to meet their continued needs. Similar programs are being tested in Kenya, Namibia, Swaziland, and Zimbabwe.<sup>21</sup>

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<sup>21</sup> Gillespie (2006).

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## **Part III How to Implement Agriculture for Development Agendas?**

**Chapter 10 Emerging national agendas for agriculture's three worlds**

*Focus I Rural education and skills (forthcoming)*

**Chapter 11 Strengthening governance, from local to global**

## **Chapter 10 Emerging national agendas for agriculture's three worlds**

10.1 Agriculture has been used far below its potential as an instrument for development, with high costs for growth, poverty, and the environment. To redress this neglect requires national agendas for specific contexts—for the agriculture-based, transforming, and urbanized countries, and for subnational regions—assessing in each case their political feasibility. These agendas must capitalize on the new opportunities for agriculture.

10.2 This chapter proposes five pillars of the agriculture-for-development agenda as well as elements of differentiated agendas for the three country categories, giving most attention to the agriculture-based countries that include most of Sub-Saharan Africa. Chapter 11 explores how to overcome past policy and investment failures and implement these agendas with the implications for governance and public sector reforms. It also explores what global agendas need to deliver in support of national agendas.

### **Five pillars of an agenda to use agriculture for development**

10.3 The main sources of income in rural society—as seen in chapters 3 and 9—are self-employment in farming, wage labor in agriculture, wage labor and self-employment in the rural nonfarm economy, remittances from migration, and transfers. The sources vary according to the demographic characteristics, asset endowments, and context. Smallholders engaged in farming are market participants or subsistence farmers, depending on whether they have a surplus to sell after home consumption. Workers can be skilled or unskilled, determining whether the labor market and migration provide them with pathways out of poverty.

10.4 Many have questioned the future of smallholder agriculture in the context of the changing global environment with rapid differentiation of quality standards, more demanding and complex market chains, and greater technological complexity. This shift in context has raised off-farm transaction costs and reduced the smallholder productivity advantage in some markets. But as chapter 5 shows, smallholder farming can still be competitive in most markets (box 10.1)

10.5 An agenda to use agriculture for development thus has five pillars (figure 10.1):

- Facilitate market chain development
- Promote smallholder competitiveness as market participants.
- Accelerate smallholder transitions from subsistence to market participant.
- Improve livelihoods in subsistence farming.
- Facilitate acquisition of labor skills and job matching in agricultural wage labor, rural nonfarm employment, and migration.

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**Box 10.1 An approach based on smallholder farming**

Smallholder farming, a small-scale farm operated by a household with limited hired labor – also referred to as the family-farm – has remained the most common form of organization in agriculture, even in industrialized countries.

The historical record on the superiority of smallholder farming as a form of organization is striking. Many countries tried to promote large-scale farming, based on the belief that smallholder farming is inefficient, backward, and resistant to change. The results were unimpressive, and sometimes disastrous—as in the case of China’s Great Famine. State-led efforts to intensify agricultural production in Sub-Saharan Africa, particularly in the colonial period, focused on large-scale farming—but they were not sustainable. In contrast, those Asian countries that eventually decided to promote small family farms were able to launch the green revolution. They started supporting smallholder farming only after painful lessons, as in China, or on the verge of a hunger crisis, as in India and Indonesia. Countries that did promote smallholder based agriculture—for various political reasons—were able to use agriculture as an engine of growth and as the basis of their industrialization.

Economists have long shown that small farmers are largely efficient. If they are poor, it is not because of inefficiency, but because they are deprived of adequate access to assets, technology, markets, and supporting services. Their productivity advantage derives from lower labor costs in using family labor and working closely along with hired workers.

Conditions for competitiveness are, however, changing. Rising capital intensity in production with wealth-biased capital markets may erase small farmers’ competitiveness based on labor cost advantage. Economies of scale in supplying value chains and meeting standards for high value products cannot be met by smallholders acting individually.

What are the implications for the future of smallholder farming? To remain in existence, smallholders must participate in markets, run a profitable operation, and be competitive with larger farmers. The process is unfolding, with winners and losers. A broad array of technological and institutional innovations is available to enhance the likelihood of success. ICT can help smallholders compete if the technology is available in innovative ways, for instance in making commodity exchanges accessible to them. Institutional innovations in microfinance and value-chain linkages can bypass commercial bank collateral requirements. Wider options exist for smallholders in selling competitively on traditional food markets. Producer organizations can help achieve economies of scale and market power in integrated food chains. Through service cooperatives, smallholders have not only received a higher price on the coffee market, they are also increasingly able to engage in highly demanding specialty coffee markets. And income diversification where the household engages in a portfolio of activities that includes off-farm activities and migration can be an effective instrument to overcome market failures in credit and insurance, boosting the competitiveness of the farm operation (chapter 3).

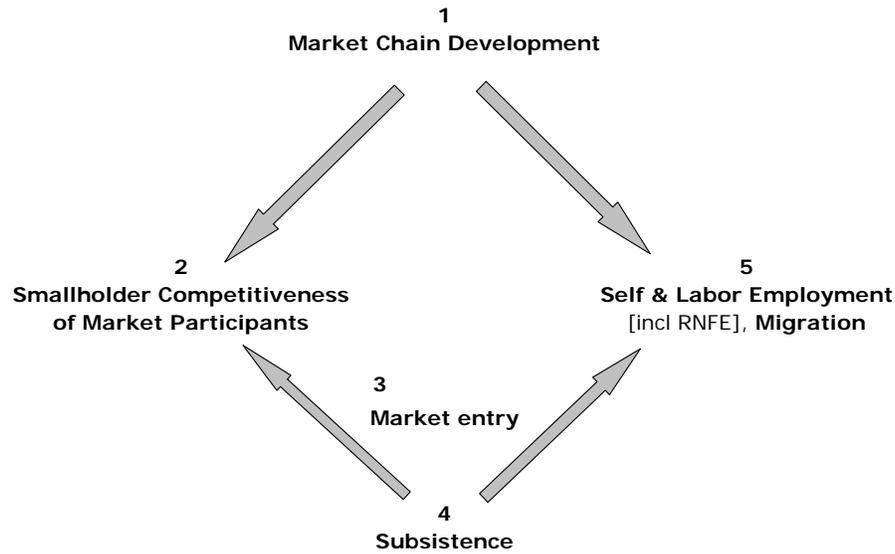
Promoting smallholder farming can thus be an efficient option, with the additional advantage of contributing to poverty reduction, equity, and the maintenance of viable rural communities.

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***Facilitate market chain development***

10.6 The development of market chains can help link demand in agricultural markets to smallholder producers, and create jobs along the chain. Technical advice and finance for smallholder producers of some crops have also been provided by market intermediaries such as traders and processors. Policy interventions to facilitate market chain development include improving the overall investment climate (political stability, policy consistency, rule of law, and property rights), and market facilitation through better infrastructure and technical assistance.

**Figure 10.1 Pillars of an agriculture-for-development agenda**



***Promote smallholder competitiveness***

10.7 Competitiveness is important for smallholders with sufficient asset endowments and in favorable contexts that allow them to market a surplus. They are the key to agricultural and overall growth in agriculture-based countries. Policy interventions to enhance their competitiveness and profitability include greater market access (domestic and external), lower transactions costs, better infrastructure, adequate financial services and inputs, interlinked supply chains, and effective farmer organizations to provide access to supermarkets.

***Accelerate the entry of smallholders to agricultural markets***

10.8 The objective here is to enlarge the pool of smallholders participating in the market. Inducing a transition from subsistence to market requires increasing the access to assets for these households, particularly access to land (through tenure security, land rental markets, land reform), entrepreneurial skills, and social capital. It also requires infrastructure to transform less favored regions with agricultural potential but poor market access into favorable regions, and mechanisms to manage risk.

***Improve livelihoods for subsistence farmers and unskilled workers, complemented by social assistance***

10.9 Subsistence agriculture has many causes—conflict, poor agro-ecological environments, lack of access to assets, high transport costs to market, or predatory taxation of surpluses—each requires a difference solution. Conflict resolution, access to assets, and policy reforms can improve the incentives to produce a surplus. Improved infrastructure can reduce transaction costs. Livelihoods of subsistence farmers can be improved in four ways. First is by increasing land productivity (for higher yields in small plots) and labor productivity (to free labor for off-farm employment). Second is

increasing the resilience of farming systems for food security. Third is improving the nutritional value of foods produced for home consumption. Fourth is diversifying income in agricultural labor markets and the rural nonfarm economy.

10.10 Improving the livelihoods of subsistence smallholders and unskilled laborers also depend on social assistance through food aid, cash transfers, and pensions for the aged. It also requires massive investments in human capital for the next generation to avoid intergenerational transfers of poverty associated with dimly low educational levels in rural areas.

### ***Facilitate new labor skills and job matching***

10.11 The labor market and migration reward skills. On the supply side of the labor market, new skills are important to open pathways out of poverty for the rural poor. On the demand side, investment and employment opportunities for skilled labor can be enhanced in rural nonfarm employment through a better investment climate—and in agriculture through employment in technically demanding tasks, particularly in high value activities. Skilled labor also has greater likelihood of being pulled into successful migration. Preparing people to migrate out of agriculture is the flipside of the economy’s structural transformation as agriculture grows.

### **Relative importance of the five pillars across country types**

10.12 The key focus of policy makers in agriculture-based countries is for agriculture to raise rural incomes, and generate a continuous surplus that can foster growth in the rest of the economy, mainly through the provision of lower price food—to solve the “food problem” (chapter 1). In the transforming countries the widening rural-urban income gap creates political tensions and a call for protecting or subsidizing agriculture—to solve the “disparity problem.” In urbanized economies the rising political power of farmer groups increases pressure for protection and other policies that prevent incomes from falling—to solve the “farm subsidy problem.”<sup>1</sup>

10.13 The relative importance of the five pillars varies according to these policy challenges. Growth based on smallholder competitiveness is fundamental for the agriculture-based countries, but so is supporting market entry for subsistence farmers, improving livelihoods for the poor in subsistence farming, and providing social assistance, primarily for food security. In transforming countries a broad-based approach to poverty reduction in smallholder farming, a thriving rural non-farm economy, and preparedness for migration are the essence of reducing disparities. In urbanized countries competitive smallholders supplying supermarkets, a rewarding agricultural labor market, and thriving rural nonfarm employment are the main elements of tackling the farm problem.

10.14 Allocating a fixed 10 points of needed policy attention across the pillars for each of the country categories leads to the priorities for each country type (table 10.1).

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<sup>1</sup> Schultz (1978) and Hayami (2005).

**Table 10.1 Stylized framework for local, regional and national agriculture-for-development agendas**

Five pillars	Priorities differ by country category			Instruments differ by country category	
	Agriculture-based (+ = 10 points of policy attention)	Transforming	Urbanized		
1. Facilitate market chain development	++	+		Chapters 4 – 8 Trade & price policies Markets Institutions Technology	
2. Promote smallholder competitiveness	++	+	+		
3. Accelerate smallholder market entry	++	+	+		
4. Improve livelihoods	Subsistence farming	+	+	Natural resource management	
	Social assistance	++	++		+
5. Facilitate new skills, job availability, job matching	Agricultural labor			Chapter 9 Safety nets Labor markets Migration	
	Rural non-farm self and labor employment	+	++		++
	Migration		++		++

### **Agriculture-based countries— securing growth and food security**

10.15 Sub-Saharan African countries have 82 percent of the rural population in agriculture-based countries, so they are the focus of this section.

10.16 Agriculture is growing in Sub-Saharan Africa, at 3.3 percent on average between 1990-2005, but it has yet to reach the sustained 6 percent annual rate projected by the New Partnership for Africa's Development (NEPAD) to meet the Millennium Development Goal of halving poverty and hunger by 2015.<sup>2</sup> Faster growth in many countries shows that achieving the 6 percent rate is possible, but it will not be easy.

#### ***It can be done***

10.17 Reforms in macroeconomic policies, trade regimes, and marketing policies over the 1990s in many countries led to better incentives for farmers to produce and invest, more active private traders and processors, and higher returns to public and private investment (chapter 4). Having less conflict and more democracy has also helped. Globalization has opened new export opportunities (flowers from Ethiopia and Tanzania to Amsterdam) and increased the flows of foreign capital and technology (including that from new major players, such as China and India). New biological and information technologies offer the potential for faster agricultural growth if the biosafety protocols and market information systems can be put in place to exploit them. But globalization has also put new competitive pressures on rural economies of Sub-Saharan Africa,

<sup>2</sup> A sustained 6 percent annual agricultural growth is higher than historical performance in any world region.

increasing the competition from subsidized OECD agriculture and from cheap imports of consumer goods that limit the demand for locally produced goods.

10.18 Sub-Saharan Africa has had numerous local agricultural successes over the past several decades, with more emerging in the more favorable macroenvironment since 1990.<sup>3</sup> African governments are ready to reinvest in agriculture, and several are allocating more of their own budgets to the sector. Since the turn of the 21<sup>st</sup> century most African governments and donors have stated their intent to invest more in agriculture to spur economic growth and reduce poverty. Needed now is to learn how to scale up and sustain the successes.

***But it will not be easy***

10.19 Raising productivity in parts of Sub-Saharan Africa will be difficult. Growth will need to be compatible with fragile environments, especially in semi-arid forested areas. Many of Sub-Saharan Africa's arable lands are semi-arid, leached, and have lower organic content than those in South Asia. As the land frontier closes, gains in productivity of land and labor will become more important. The cultivated land per agricultural worker has fallen by about 40 percent since the 1960s.

10.20 Changing patterns of climate and rainfall demand the expansion of irrigated area and the development of adaptive technologies. Less than 5 percent of Sub-Saharan Africa's water resources are used, and only 3 percent of cropped land is under some form of irrigation, less than a quarter that of India at the dawn of its green revolution.<sup>4</sup>

10.21 Agriculture in Sub-Saharan Africa is diverse, differing dramatically from that of Asia (chapter 2), so the path to productivity growth in Sub-Saharan Africa will be different. Seven crops: maize, rice, wheat, millet, sorghum, cassava, yams, and bananas/plantains can be considered as major food staples, compared with three in Asia during the green revolution—rice, wheat, and maize.<sup>5</sup> The research agenda is thus demanding, and the need for regional and international cooperation in addressing it is great.

10.22 Sub-Saharan Africa also faces a small country challenge. The majority of the agriculture-based countries in Sub-Saharan Africa have fewer than 10 million people, making it difficult for them to achieve scale economies in research, training, and policy design. And domestic markets are small—implying the need for more effective regional approaches to agricultural development.

10.23 African farmers are predominantly smallholders, with huge diversity in their entrepreneurial skills, productivity, efficiency, market access, and resources (chapter 3). In many countries, roughly a third of smallholders neither buy nor sell, a third are net sellers of staples, and a third are net buyers, relying heavily on selling their labor to

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<sup>3</sup> Gabre-Madhin and Haggblade (2004).

<sup>4</sup> World Bank (2006), Spencer and Badiane (1995), FAO (2006).

<sup>5</sup> FAO (2006).

others to supplement their farm incomes.<sup>6</sup> Data from Ethiopia, Kenya, Malawi, Mozambique, and Zambia show that the bottom half of the size distribution of smallholders frequently has less than one-fifth of a hectare per person, and farm size of the bottom quartile often falls below half a hectare. These households are also the most constrained in their access to capital and improved inputs. Given their constrained resources, it will be difficult for them to climb out of poverty by relying on farming alone.

### ***An agriculture-for-development agenda for agriculture-based countries***

10.24 African smallholders range from the dynamic and commercially oriented to those who produce largely for their own consumption. It is the commercial smallholders who will drive agricultural growth. Subsistence smallholders can transition to commercial farming or rely on farm and nonfarm employment and migration. Investment and policy interventions should recognize these differences. For example, entrepreneurial producers can benefit from matching grants that promote high value agriculture, while subsistence farmers might use such grants to test and adopt low-input agro-forestry systems.

10.25 An agenda for agriculture-based countries (table 10.2):

- Facilitate market chain development
- Promote smallholder entrepreneurs to secure growth.
- Accelerate smallholder market entry.
- Improve the productivity of those producing for own consumption and ensure safety nets are in place.
- Facilitate rural non-farm self and wage employment and migration.

10.26 Such a focus implies different sets of policies, technologies, and programs—one set for farmers whose farming business is a pathway out of poverty, another for those transitioning from subsistence to commercial farming, and yet another for subsistence farmers for whom the indirect effects of agricultural growth (through expanded off-farm labor, lower food prices, and demand-induced linkages) offer the most promising path out. Too often a single set of policies and public investments has tried to achieve all three objectives, leading to conflicting signals, suboptimal uses of resources, and limited impacts on growth and poverty.

### ***Facilitate market chain development***

10.27 *Investment climate:* Improving the investment climate can reduce transaction costs and risks and increase investment in trade and value addition. Regular surveys of the incidence of investment climate constraints are a first step for creating awareness and

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<sup>6</sup> Jayne, Mather, and Mghenyi (2006), Jayne and others (2003).

policy dialogue. Such assessments do not reveal what should be done, but they can help to identify priorities for policy reform, institutional development, and public investment.

10.28 *Technical assistance:* Support to establishing partnerships with export companies and improving logistics (including storage and transport) can facilitate market chain development as is demonstrated by the case of mangos in Mali.

***Promoting smallholder entrepreneurs to deliver growth***

10.29 *Price and trade policy.* Both OECD and African governments still have to do more on price and trade policy. Trade barriers in developed countries (tariff and non-tariff barriers in agriculture) continue to impose high costs on African farmers—particularly for key export crops such as cotton and sugar (chapter 4). Cross-border trade barriers need to be reduced so that African producers and consumers can benefit from participating in larger markets. Nontariff barriers (frequently unofficial), border formalities, and problems with currency transfers limit the scope of the market and need to be addressed.

10.30 *Agricultural technology.* More investment is needed in agricultural research. Past investments have shown high payoffs, but the volume of investment has declined in recent years in about half the region's countries (chapter 7). This must be reversed—urgently. Recent examples of success in technology generation are the cassava mosaic resistant varieties in East Africa and NERICA high yielding upland rice varieties—all with significant payoffs.

10.31 The spread of modern varieties can produce significant yield improvements. Adoption rates of modern varieties in Sub-Saharan Africa are low—less than 20 percent for maize (compared with 45 percent in Latin America and 75 percent in Asia), and 30 percent for sorghum (compared with 70 percent in Asia). Improving adoption requires investments in agricultural extension systems, access to financial services, smart subsidies to stimulate input markets, and better mechanisms for risk management (chapters 6 and 7). For example, farmer-driven extension in Uganda and matching grants in Tanzania are improving adoption rates. For some crops, such as tea, the private sector is providing some of these services.

10.32 *Human capital.* To sustain agricultural growth, Sub-Saharan Africa needs to renew its human capital base in agriculture and natural resource management and to train the next generation of agricultural entrepreneurs. The human capital base of African universities in agricultural sciences is aging due to the decline of donor support for long-term training over the past 20 years, and the HIV/AIDS epidemic is further weakening capacity (as in extension services). Regional efforts in graduate training, such as that in Southern Africa, merit particular support.

10.33 *Irrigation.* Past investments in irrigation in Sub-Saharan Africa used technologies that were expensive and hard to maintain and that depended overly on public sector management. New cost-effective technologies offer better prospects today. Lower-cost small-scale irrigation and cost-effective larger schemes are already expanding the

irrigated area, and more can be expected in the future (chapter 8). Examples of success include the institutional reforms for large-scale irrigation management in Mali, which significantly increased incomes of rice and vegetable farmers. Improved small-scale irrigation management in Tanzania has increased both farmer yields and water use efficiency.

10.34 *Infrastructure.* Landlocked African countries face transport costs that on average are 50 percent higher than in the typical coastal country, and trading volumes are correspondingly lower by about 60 percent.<sup>7</sup> Transport costs accounted for 50 to 60 percent of the total marketing costs of a range of agricultural commodities in Benin, Madagascar, and Malawi (chapter 5) and two-thirds to three-quarters of the farmgate price of fertilizers in Malawi, Nigeria, and Zambia (chapter 6). Customs delays, roadblocks, and arbitrary costs at the border all tax agricultural trade and need attention. An example of reducing these costs is improving the Kenya-Uganda transit links.

### ***Accelerate smallholder market entry***

10.35 *Risk management mechanisms.* Like most people, very poor farmers try to manage their risks, leading them to focus on providing for their own consumption rather than the market. Tried and true technologies are often preferred over the newer and potentially more profitable ones. New ways to manage these risks show promise. Weather-based index insurance can reduce weather risks and cover loans to finance new technologies—an approach being explored in Malawi. Hedging instruments and options can reduce price risk, are being piloted among smallholders in a few countries.

10.36 *Land markets.* Weak or absent land markets (and land rental markets) limit the ability to consolidate very small parcels and produce marketable surplus, a problem that is worsening as population pressure fragments more land. Very small farm sizes mean small marketed surpluses per farm, raising per-unit costs of assembly and marketing. Initial steps at formalizing customary ownership—particularly for women—are underway as in Uganda. Plot demarcation and certificates of land use can reduce conflict and stimulate rental markets, as in Ethiopia (chapter 6).

10.37 *Collective action.* High-value, labor-intensive horticultural and livestock products—not only for export but also for growing domestic and regional markets—offer vibrant growth opportunities. But the marketing and coordination problems in the markets for these more perishable and quality-sensitive products have to be overcome. Smallholder participation in this growth will depend on successful collective action and contract farming, as for dairy and horticultural production in Kenya.

### ***Improving the productivity of those producing for own consumption and ensuring that safety nets are in place***

10.38 Not all smallholders will be able to farm their way out of poverty. For those with very limited access to resources and market opportunities, improving productivity in subsistence agriculture can allow them to secure their consumption and health over the

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<sup>7</sup> Limao and Venables (2001).

next 10-20 years and eventually to move into other, more remunerative jobs. In the interim, their greatest needs are for yield-stabilizing technologies to reduce their risks—such as the improved maize cultivars that tolerate drought and low soil fertility now becoming available in Southern Africa (chapter 7)—and for better access to such assets as small livestock. Off-farm employment (including that on the more dynamic family farms) to raise their incomes, easier migration, remittance of earnings, and better access to education for them and their children are also important to their livelihoods.

10.39 *Land management.* Sub-Saharan Africa must replace the soil nutrients it has mined for decades. African farmers apply less than 10 kilograms of fertilizer per hectare, compared with more than 100 kilograms in South Asia. Programs to develop efficient fertilizer markets, and agroforestry systems to replenish soil fertility through legumes, need to be urgently scaled up (chapters 6 and 7). Conservation tillage in Ghana has reduced soil loss and improved yields.

10.40 *Food programs and safety nets.* Because many migrants are young men, the remaining women and elderly on these farms need agricultural technologies that are less labor-intensive and extension and credit systems that are more responsive to women's needs. Because the migrants, particularly in southern Africa, are also vectors of HIV/AIDS back into their rural communities (as for mine workers returning from South Africa to rural Lesotho), improved health care and health education are also needed as part of a broader set of safety nets that protect the assets of the poor and near-poor from drought, disease, and the death of a family member (chapter 6). The “food for education” programs in the Sahel, offering incentives for families to keep their children in school during droughts, are an example of safety nets to ensure opportunities for non-farm employment and migration for younger generations.

***Rural employment opportunities to assure the broad sharing of growth and migration***

10.41 *Labor markets.* Dynamic growth in the family farm sector translates into new job opportunities for those in subsistence. Avoiding premature mechanization of more successful smallholder farms (through subsidies on tractors and credit) will help assure that the growth in output also produces rapid employment growth. Nor is there necessarily a conflict between a smallholder-based strategy and certain types of large-scale, labor-intensive farming and processing operations (flowers for export) that generate a large number of semi-skilled jobs. Improving the investment climate can increase private investment in such operations.

10.42 *Food prices.* Assuring competition and cost-reducing technical and institutional change in the food marketing system will also ensure that increased staple-food productivity on the more successful farms reduces food prices for the poor. That will increase their real incomes and the incentives to work in nonagricultural enterprises, as in much of Asia during its green revolution.

***How should this be done?***

10.43 Implementation should be multisectoral, focusing on farmer empowerment, public-private partnerships, regionalization, and decentralization. Further details on implementation are in chapter 11.

- *Multisectoral.* The agriculture-for-development strategy will not succeed if it focuses exclusively on the agricultural sector. The reason? Capitalizing on the poverty-reducing potential of agricultural growth depends on complementary investments in education, health, rural roads, and rural electrification which can also improve competitiveness of nonfarm enterprises.
- *Farmer empowerment.* Women provide most agricultural labor but often lack rights over assets (land)—this needs redress. Strengthen rural producer organizations to enhance their bargaining power in input and output markets and in policy formulation and service provision. And give farmers a controlling interest in funding of research and extension to improve relevance and efficiency of technology development and dissemination.
- *Decentralization.* Only with decentralization can agricultural development be tailored to local conditions and priorities. So strengthen the capacity of local governments to deliver core public services efficiently and improve incentives to invest.
- *Regional cooperation.* Only with regional cooperation can small-country markets be expanded to capture economies of scale in agricultural research and to improve natural resource management. Regional research organizations, transboundary river basin management, and regional agreements to improve trade can support such cooperation.
- *Public-private partnerships.* The financing needs for Sub-Saharan Africa's agricultural development cannot be met by the public sector alone. Investments needed for sustained agricultural growth far exceed the \$2 billion in annual ODA flows to Sub-Saharan African agriculture. Much of the investment will need to come from the private sector, with the investment climate as an important determining factor.
- *Work through home-based structures and home-grown initiatives.* Rather than create parallel projects and programs, donors should work through country structures and home-grown initiatives in the public and private sectors. Program interventions will likely become more sustainable and local capacity better strengthened.

### **Transforming countries—reducing rural-urban income gaps and rural poverty**

10.44 Transforming countries are the largest of the three groups, with about 1.52 billion people below the \$2 a day poverty line. The group comprises 98 percent of the total rural population in South Asia, 96 percent in East Asia, and 93 percent in the Middle East and

North Africa. About 80 percent of the poor in these countries are rural. Agriculture accounts for about 17 percent of GDP.

10.45 Transforming countries have been the fastest growing, with GDP growth exceeding 6 percent per year since 1990. India has been growing at more than 8 percent a year over the last three years. Agricultural growth, in aggregate however has slowed, following the green revolution-induced growth in the 1970s and 1980s. Between 1990 and 2005 annual agricultural GDP growth was 2.9 percent. Slowing growth in the agriculture sector, a rapidly growing non-agricultural sector and segmented labor markets have widened rural-urban income gaps, adding political pressure, as evident in India's last elections.

10.46 The priority for agriculture is to reduce rural poverty and rural-urban income gaps. Smallholder farming needs to be diversified and intensified by transiting into high value activities and extending green revolution benefits to less favored regions. The approach targets the mass of smallholders and the less favored regions with large populations. With continuing population pressure in rural areas, agriculture alone will not reduce income gaps, hence the need for employment in nonfarm enterprises in secondary towns.

10.47 An agenda for transforming countries (table 10.3):

- Promote smallholder farming diversification into high value activities and extend the green revolution to less favored regions.
- Promote rural nonfarm employment in secondary towns.
- Make major investments in human capital to accelerate the transition out of agriculture into the dynamic sectors of the economy.
- Provide safety nets.

***Transiting to high-value agriculture and extending the green revolution to less favored regions***

10.48 Driven by high income growth rates, urbanization, and women's involvement in the work force, consumption patterns in these countries are gradually changing. This shift toward high value products, which is more labor intensive, offers a significant opportunity and challenge to smallholders.

10.49 Cereals will remain important, particularly in Asia in the years to come, and efforts have to continue to raise their productivity, particularly in extending the green revolution benefits to less favored regions. Average farm size in these countries is small, requiring major increases in productivity for cereal producers to reduce poverty through large investments in irrigation and water control, technology upgrading, extension services, and pricing and procurement policies.

10.50 *Improve marketing linkages.* While the green revolution was largely state-led and state-supported, the unfolding revolution in high value agriculture is led by the private sector, with the state facilitating. For highly perishable products, infrastructure, credit, and institutions are needed to link farmers with processors and retail chains (farm-firm-fork linkages). And the growth of high value agriculture cannot be supported only on the farm, isolated from what happens to processing and retailing, the upper layers of the food system.

10.51 Liberal policies in agro-processing and retailing over the last decade are leading to consolidation in these activities. Scale economies seem to be the underlying factor, in contrast to what is happening at the farm level, where farms are fragmenting and the average holding size is shrinking. With farms fragmenting and shrinking, policymakers, business leaders, and agri-analysts need to foster innovative institutions that can reduce the transaction costs of smallholders to satisfy the marketing requirements of processing and retailing.

10.52 Linking smallholders to processors and retailers reduces their market risk, encourages them to invest more, and can also give them access to more financial capital through banks. The food industry, driven by consumer preferences, develops backward linkages with farms, providing them technology, extension, and buy-back arrangements, while monitoring food safety. That this can be done in smallholder economies is clearly demonstrated by the rising exports of high value agriculture from transforming countries (chapter 2). But the way benefits are distributed along the value chain depends on the bargaining power of different players. Smallholders can bargain better as a group than as individuals. So there is a role for facilitating collective action (through farmer organizations) to reach scale in marketing and bargain for better prices (chapter 6).

10.53 *Manage water resources.* Many countries in this category are experiencing serious and worsening water scarcities. Integrated water management practices are becoming more important, and hydrological interdependencies among multiple users cannot be ignored (chapter 8). As water becomes more scarce, water markets will come into play, with support needed for their emergence and eventual regulation. Some examples. Informal water markets have developed naturally in South Asia. Jordan has formalized the informal market by registering, licensing, and metering all wells, and assigning individual quotas. The Indian state of Maharashtra recently created a regulatory framework for the water sector, has provided for transfer of irrigation system management to legally empowered and elected water users associations, and allowed cost recovery for operations and maintenance through user charges.

10.54 *Rational public spending.* The governments in these countries, particularly in India and China, have committed to provide more financial support to agriculture. But the use of public resources in agriculture can also be improved, offering higher returns to expenditures. For example, three-quarters of India's agriculture budget is spent on subsidies for food, fertilizer, power, and irrigation. The marginal returns to input subsidies have been falling way below the marginal returns, in both growth and poverty reduction, to other investments in the sector, suggesting significant gains from changing allocations (chapter 4). Scaling up investments in R&D, irrigation, rural roads and rural

education and health—and reducing and rationalizing subsidies—can boost growth. Targeting subsidies to the poor or using income policies to transfer resources to the poor would be better for agricultural growth and poverty reduction.

10.55 *Price and trade policy.* The anti-agriculture bias, typical in the trade and marketing policies of most transforming economies in the 1970s and early 1980s, has almost disappeared.<sup>8</sup> Net taxation of agriculture in these economies declined on average from 10 to 5 percent from 1980-84 to 2000-04, but with significant variation across countries. Some countries shifted to net protection of the sector (Indonesia, Malaysia, Thailand, and Vietnam) while others continue to tax the sector, although at lower levels than in the 1980s (China, Egypt). Of the three country groups, transforming economies have the highest protection on agricultural imports (particularly India, Indonesia, Malaysia, Thailand, and Vietnam) suggesting remaining efficiency gains from further reform (chapter 4). In addition, trade liberalization can improve price stability, as in Bangladesh in the 1998 floods (chapter 5).

***Promote rural nonfarm employment in secondary towns and migration***

10.56 *Education.* Agriculture alone will not reduce rural-urban income gaps and rural poverty. Also needed is a major thrust to promote rural nonfarm employment in secondary towns, based on agricultural clusters, major infrastructure investments, better local investment climates, and rural-urban linkages. While the share of off-farm income in total income is rising, the movement of labor out of agriculture is slow. Major investments in human capital can accelerate the transition out of agriculture to the more dynamic sectors of the economy. Local institutions can also facilitate regional development (chapter 9).

10.57 *Land markets.* The land market is also a key to facilitating the shift to non-farm activities and to migration, but this has been constrained in many countries (as in China and India). Land leasing is prohibited in several states in India. Tenancy remains hidden, and farmers do not want to rent out their lands for fear of losing them permanently. Improving land records, especially for women, and freeing the land lease market can go a long way in consolidating operational holdings as people move out of agriculture. In some countries land rental markets have expanded significantly—participation in Vietnam’s rental markets quadrupled to 16 percent in five years (chapter 6).

***Safety nets***

10.58 *Employment schemes.* These countries have the largest concentration of the world’s poor, so direct support through well designed and governed employment schemes in rural areas (rural infrastructure, watersheds, desiltation of canals and ponds) can also assist with poverty reduction. India launched one of the biggest—the National Rural Employment Scheme. It creates basic infrastructure in rural areas to help raise farm and nonfarm productivity. And it protects farm families from sudden crop failures resulting from droughts or other shocks. Significant monitoring and accountability mechanisms

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<sup>8</sup> Pursell, Gulati, and Gupta (2006).

have to be in place to ensure effective resource use. And further evaluation is needed to determine if this program meets its objectives and provides an effective safety net instrument.

### **Urbanized countries—linking smallholders to dynamic markets and creating jobs**

10.59 Agriculture accounts for a small share of national growth in urbanized countries—7 percent over 1990-2005. But several agricultural subsectors have strong comparative advantages which have sustained rapid growth, and agriculture remains the dominant source of growth and poverty reduction for many subnational economies. Eighty-nine percent of Latin America’s rural population and 92 percent of Eastern Europe’ rural population is in these countries.

10.60 In Latin America and the Caribbean (LAC), rising incomes and rapid urbanization (80 percent of the population according to country definitions of urban, 56 percent using the OECD definition) have increased the demand for higher value products, with domestic food markets growing even faster than in industrialized countries.<sup>9</sup> Domestic consumption is the main source of effective demand for LAC agriculture, absorbing three-quarters of output, with 60 percent of domestic retail sales channeled through supermarkets (chapter 5). Traditional exports remain important, accounting for 80 percent of the region’s agricultural exports.<sup>10</sup> They offer dynamic new markets as they become “de-commoditized” to adjust to differentiated consumer tastes. High value exports have been expanding very rapidly, and smallholders have been able to achieve significant participation in niche markets, particularly for organic coffee and Fair Trade where LAC dominates world trade.<sup>11</sup>

10.61 For smallholders, however, it is the new domestic food market that represents the most important dynamic market opportunity. But they face huge challenges in maintaining competitiveness in these markets. The agricultural labor market and the rural nonfarm economy are increasingly important for rural livelihoods, accounting for 70 percent of rural incomes and employing 55 percent of the active rural labor force (chapter 9). Even so, a large smallholder population remains in subsistence farming until it is absorbed in the market economy, or retires from the labor force.<sup>12</sup>

10.62 A striking observation, however, is that while agriculture has been doing well in Latin America, with a sustained 2.5 percent annual growth in value added over the last 40 years, rural people have not fared well (figure 10.1). Rural poverty remains stuck at 60 million<sup>13</sup> (at a \$2/day poverty line), and the rural poverty rate in 2004 is 46 percent compared to an urban poverty rate of 28 percent, and unchanged over the last ten years. Urban poverty is rising, reinforced by intense rural-urban migration that absorbed 15 percent of the rural population over the last 10 years. The character of rural populations is

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<sup>9</sup> Wilkinson and Rocha (2006).

<sup>10</sup> Comision Economica de las Naciones Unidas para America Latina y el Caribe (CEPAL) (2006), Food and Agricultural Organization (FAO) (2004).

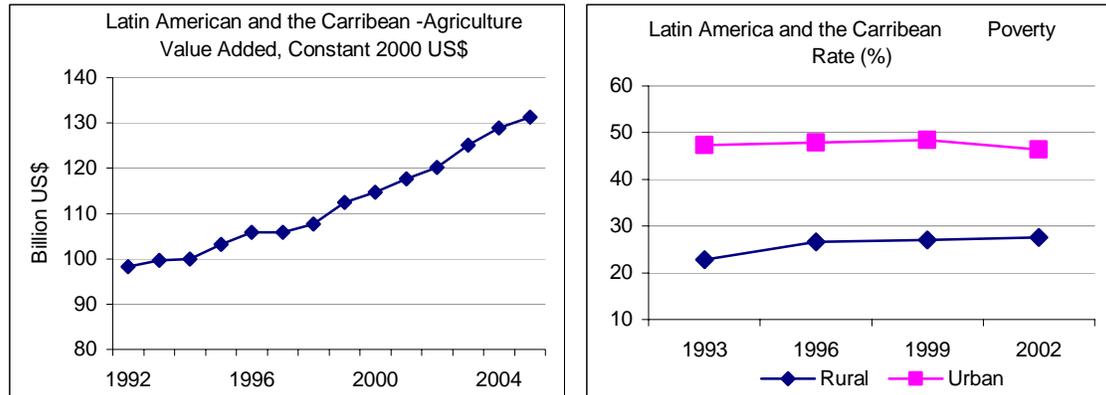
<sup>11</sup> Henson (2006), Farnworth and Goodman (2007), Lyon (2006).

<sup>12</sup> Berdegueé and others (2006).

<sup>13</sup> de Janvry and Sadoulet (2000).

also changing with selective migration (leading to feminization, loss of the more educated, aging, and a rising share of indigenous people), increasing land inequality, rising wage employment, and diversification of sources of income toward the rural non-farm economy.

**Figure 10.1. Strong agricultural performance in Latin America and the Caribbean, with weak benefits for the poor**



Source: World Bank (2006) and Ravallion, Chen, and Sangraula (2007).

10.63 Following structural adjustment, the model that has been followed in most LAC countries has been one of accelerated growth in sub-sectors of agriculture with comparative advantage, supported by public investment to induce private investment in agriculture, complemented by social assistance delivered via (often conditional) cash transfers targeted at the chronic poor and at regional pockets of poverty. In Brazil, social security transfers and the rural non-farm economy have been the fastest growing sources of income for rural households over the 1991-2000 period.<sup>14</sup> This approach based on transfers has been costly, and ultimately of limited effectiveness in reducing neither rural nor urban poverty. With structural adjustment effectively over at the macro level, most countries have been considering an alternative approach that uses agriculture for development, based on increased rural earned incomes in agriculture and the rural non-farm economy as opposed to social assistance. In Ecuador, the Poverty Reduction and Local Rural Development Program (PROLOCAL) is based on increased access to assets for the rural poor, an improved context for asset use with emphasis on territorial development, and social protection. In Peru, the Sierra Exportadora program similarly builds on assets, rural institutions, and social protection.<sup>15</sup> A similar assets-context-protection approach is implemented in Guatemala, Honduras, and Nicaragua.<sup>16</sup>

10.64 Three factors dominate an agriculture-for-development agenda for the urbanized countries in Latin America. First, a large and dynamic domestic higher value food market, driven by the supermarket revolution creates demand opportunities for smallholders, if they can compete.<sup>17</sup> Second, better employment opportunities can be created for rural populations in agriculture and the rural nonfarm economy. Third, a large

<sup>14</sup> Helfand and Levine (2005).

<sup>15</sup> Pichon (2007).

<sup>16</sup> Pichon and others (2005).

<sup>17</sup> Reardon and Berdegue (2006).

subsistence sector needs social assistance and preparedness to migrate. Added to these three are two structural features: large less favored regions with many of the extreme rural poor dependent on agriculture (the Meso-American and Andean Plateaus and the Brazilian Northeast) and stubbornly high inequality that severely restricts access to assets and participation to the policy-making process for the rural poor. While modern markets are largely in place in LAC, the major limiting factor to implementation of an agriculture-for-development agenda for the region is weakness of governance for agriculture and rural areas, incomplete decentralization, and long standing constraints on empowerment of the rural poor.<sup>18</sup>

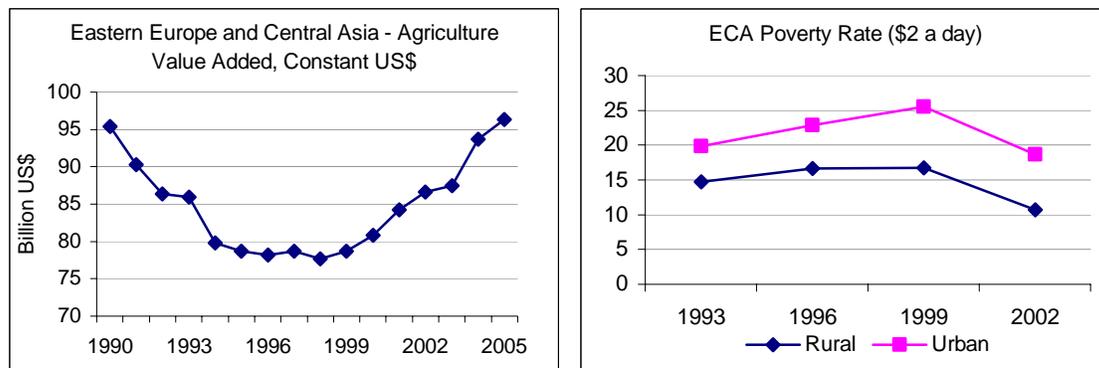
10.65 Eastern European and Central Asian countries have several features that distinguish them from Latin America following their history of central planning and incomplete transition to market economies (box 10.2).

**Box 10.2 Special features of agriculture in Eastern Europe and Central Asia**

Agricultural production and food consumption were massively distorted under Communist central planning, which was imposed from the 1920s in the former Soviet Union and since the 1950s in Central and Eastern Europe. The distortions resulted from a combination of collective property rights, forced organization of production in large-scale collective and state farms, centrally controlled organization of production allocation, processing, input provision and marketing, as well as distorted prices, and state controlled trading and exchange rate systems. Direct subsidies to processing and trading companies kept consumer prices and farm input prices low and producer prices high. The fall of the Berlin Wall and the disintegration of the Soviet Union led to dramatic changes in the agricultural and food policies in the 1990s. Prices, exchange rates, and trade policies were liberalized, subsidies were cut, hard budget constraints were introduced, property rights were privatized throughout the agri-food sector, and production decisions were shifted to companies and households.

Removal of subsidies and disruptions associated with the liberalization and privatization of farms and food companies initially caused dramatic declines in production and consumption. But since the mid 1990s improved incentives and reformed institutions led to recovery and sustained productivity growth. Poverty that increased while agriculture value added was falling has shown a remarkable decline with the recovery of agriculture (Figure 10.2).

**Figure 10.2. Recovery in Eastern Europe and Central Asian agriculture accompanied by a sharp drop in rural poverty**



Source: World Bank (2006) and Ravallion, Chen, and Sangraula (2007).

<sup>18</sup> De Ferranti and others (2004).

The current situation varies tremendously across the region. Ten Central and Eastern Europe countries have undergone dramatic institutional reforms and have now been integrated in the Common Agricultural Policy of the European Union. Productivity growth there has benefited importantly from massive foreign investment in the food sector with spillover effects on both large corporate farms and smaller family farms.

In the Caucasus and part of Central Asia, regions with low incomes and high rural poverty, agriculture has undergone a dramatic shift towards small-scale farming on land that households received under the land distribution programs. This has induced important gains in productivity because of improved labor governance on these small farms. There, access to credit and input and output markets is the main constraint.

In other parts of the Former Soviet Union, such as in large parts of Russia, Kazakhstan, and Ukraine large-scale farms still dominate, and in some regions, land concentration has taken extreme forms. Large vertically integrated farm holdings are controlling vast areas of (mostly grain) land in Kazakhstan and Russia. The aftermath of the Russian financial crisis (which improved the terms of trade) and the growth of government revenues from mineral and oil exports (which increased government transfers to farms and rural areas and cut payment arrears) has been the main engine behind strong growth in output and productivity since 2000, in addition to vertical integration in agriculture with capital injections from domestic and foreign companies. Other countries, such as Belarus, Uzbekistan, and Turkmenistan, considerably lag behind the rest of the region in the implementation of market reforms.

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10.66 An agenda for urbanized countries consists of the following four pillars, including a focus on improved governance and territorial development which is distinctively multisectoral and participatory:<sup>19</sup>

***Link smallholders to new domestic food markets***

10.67 Maximizing the participation of smallholder farmers in dynamic domestic food markets requires special attention to deep-rooted inequalities in access to assets and public services, inequalities that challenge their competitiveness.<sup>20</sup> Important is to reinforce the capacities of smallholders still at the margins of markets to take advantage of the new environment through greater access to land, research, training, technical assistance, financial services, and farmer organizations. With a majority of the poor smallholders located in the best endowed areas, this is where the greatest market entry response will be achieved. Reduction of public sector support following structural adjustment and limited private sector entry have left huge gaps in key services crucial for the competitiveness of smallholders, especially in finance, research and development, and representation. Important as well are public-private partnerships with an active role of agribusiness in organizing and capacitating smallholders to be competitive suppliers in these markets.

10.68 Most asset-poor farmers are de-facto excluded as suppliers to supermarkets and exporters in Central America (bananas), Guatemala (lettuce), and Mexico (tomatoes). Assisting them in making threshold investments can increase their participation (chapter 5). Producer organizations and contract farming are essential to meet the demands of value chains. Support to farmer organizations is needed to build capacity, empower more

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<sup>19</sup> Inter-American Development Bank (2005).

<sup>20</sup> World Bank (2005).

marginal members (women and youth), and enhance participation in consultative processes (chapter 6).

***Increase high-productivity employment in agriculture***

10.69 Major improvements in employment conditions are needed in agricultural labor markets. This requires increasing the productivity of workers and upgrading and diversifying their skills. It also requires improving work conditions, particularly through greater continuity of employment, worker protection adapted to agriculture, and promotion to more remunerative appointments in a job ladder that includes agro-industry. Little policy attention has been given to these emerging issues.

***Promote self-employment and wage employment in the rural nonfarm economy***

10.70 The rural nonfarm economy is an increasingly important source of self and wage employment, but it is highly dual, with high and low skill jobs and high and low value-added enterprises. Promoting skills that open access to the high productivity jobs can provide a pathway out of poverty. Territorial development can stimulate the emergence of rural nonfarm enterprises, supported by policies to make regions and localities more dynamic and flexible in offering local employment and investment opportunities, with successful examples in Brazil (Petrolina in the San Francisco Valley) and Chile (Central Valley).

10.71 The LAC region is pursuing a distinctly territorial approach, with yet large challenges in implementation. The model pursued is to promote clusters of complementary firms to achieve territorial competitiveness. Local agricultural production systems can emerge by capitalizing on the comparative advantages of a territory based on agro-ecology, proximity to urban centers, and institutional and cultural endowments. Territory-driven development projects go beyond community-driven development (CDD) approaches in seeking to create new economic opportunities based on scale, complementarities, and market access, while CDD have been most effective to improve the delivery local public goods and construct local social capital. This territorial approach to rural development is extensively pursued in Eastern Europe as well.

***Improve livelihoods in subsistence agriculture and provide social assistance***

10.72 Subsistence farming can be a holding pattern in the long transition out of non-viable family farming. Some subsistence farmers can become viable smallholders, diversifying their income to improve their well-being, but the agricultural part of their income (self-employment) in most circumstances has limited potential for growth. There are, however, clear social benefits in investing in the agricultural component of these households' incomes for two reasons: it is critical for the food security and basic nutrition of these households, and it helps sustain income above extreme poverty in the absence of better employment options. Investments include more resilient farming systems and better coverage of nutritional needs based on home production. Improved livelihoods also requires social assistance, in particular old age pensions for those too old

to retrain. Progress with introducing rural non-contributory pensions has been rapid in the region.

10.73 There also needs to be massive investment in human capital to support the successful transition out of agriculture of rural inhabitants with limited opportunities for productivity gains. Dismally low rural educational levels have been catching up, often induced by conditional cash transfers, but major efforts are left to be done with the quality and relevance of the education dispensed in rural areas. For many smallholders, migration is the best option, but successful migration requires preparedness. This is particularly important for those in marginal areas with little prospect for increased economic activity.

### ***The critical importance of effective governance***

10.74 The design and implementation of an agenda based on earned incomes instead of transfers is more demanding on the role of the state than an approach based on transfers. It consequently requires a reassessment of existing governance mechanisms, institutions, and agents. Most important are: (1) to redesign of Ministries of Agriculture corresponding to the new functions of the state and the transformations of agriculture and value chains, (2) coordination between agriculture and other sectors of the economy in order to manage increasingly multisectoral agendas, (3) effective decentralization that serves the purpose of agriculture for development, including through a territorial approach, and (4) greater engagement of civil society as an active participant in this new form of governance.<sup>21</sup>

### **Political, administrative, and financial feasibility**

10.75 Many policy agendas have gone to waste for lack of political, administrative, and financial feasibility. Effective implementation requires assessing the feasibility of the policy and investment instruments that make up the proposed agendas. Feasibility varies significantly by instrument, but also by country category, particularly the capacity to implement. Understanding the likely political, administrative, and financial hurdles to reforms can improve implementation.

10.76 Table 10.5 illustrates the feasibility deficits for the main policy instruments in the proposed agendas. Price and trade policy reforms are expected to have losers as well as gainers, with uncertainty in the distribution of both gains and losses, and lack of commitment devices to ensure compensation. The result is the well known difficulty in mobilizing political support for price and trade liberalization reforms. But as many of these policy reforms are “stroke of the pen,” there are few administrative capacity constraints and they usually do not require budget outlays and in some cases they may even reduce debt, as with reforms of some price stabilization schemes, while in others there may be revenue losses through lower tax and tariff revenues.

10.77 This general assessment of price and trade policy reforms suggests, for the three dimensions of feasibility, that attention is needed on identifying the gainers and losers of

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<sup>21</sup> Nogueira (2007).

reforms and ensuring that appropriate complementary programs and commitment devices are in place to increase political feasibility. Mexico’s PROCAMPO program introduced to make the North American Free Trade Agreement (NAFTA) politically feasible through decoupled cash transfers targeted at expected losers is an example. Transfers were set proportional to the area planted in the crops whose prices were expected to decline two years before NAFTA’s implementation.

**Table 10.5 Flagging the feasibility deficits of policy and investment instruments**

Chapter	Instruments	Political support	Administrative capacity	Financial affordability
		++ very high + high 0 neutral - opposed -- very opposed	++ easy + feasible - low -- very low	++ cheap + affordable - expensive -- very expensive
4	Price and trade policy	-	++	+
5	Transport infrastructure	++	+	--
	Market rules	0	+	+
	Price stabilization	+	-	--
6	Land certification	+	-	+
	Land reform	--	-	-
	Fertilizer subsidies	++	-	-
	Rural Finance	+	-	+
	Farmer organizations	-	-	+
7	R&D	0	-	-
	Extension	+	-	-
8	Irrigation	+	-	--
	Environmental services	0	-	+
9	Education	++	+	-
	Food programs	++	--	-
	Rural pension schemes	++	-	-

***Political feasibility***

10.78 Political feasibility is usually determined by: the incidence of gains and losses from the reform and by the visibility of impact. Price and trade policy reform, land reform, and irrigation, while visible, often require tradeoffs for both gainers and losers of reform. These tradeoffs make decisions more difficult. Agricultural research has fewer tradeoffs, but the impacts are often less immediate and less visible than other investments. Education and food programs have no or very few losers, are highly visible, and usually have strong political support.

10.79 What can be done to improve political feasibility? Increase the political capital of those advocating for reforms to enhance growth and poverty reduction (including social justice) (figure 1.8). When there are reform tradeoffs, the strategies for increasing political capital include using research-based evidence for information and debate, identifying administratively feasible complementary support programs to assist the losers transit to other sources of income, and providing needed social assistance—as done in Mexico (chapter 4). When reforms are less visible, commitment devices for future support can help. Uganda legislated research and extension reforms through a National Agricultural Advisory Services Act and a National Agricultural Research Act, which

commit the government to implement these programs. This raises the cost of abandoning the current program and likely improves continuity in implementation.

### ***Administrative capacity***

10.80 Capacity to implement is often very low—particularly in agriculture-based countries. Many program designs have erroneously assumed the existence of a much higher capacity to implement than exists. The result: poor implementation and unsustainable investments. The lesson: align long-term programs more closely with existing capacity while providing support to strengthen capacity. What can be done to improve capacity? That is the focus of chapter 11.

### ***Financial affordability***

10.81 Many of the proposed instruments are not financially affordable. Even with better efficiency in current allocations, increasing the government budget allocations to agriculture will often be necessary. Infrastructure programs (irrigation and roads) are the most costly, and the agriculture-based countries require significant increases in current budget allocations and innovative public-private partnerships to make these investments. Tanzania is experimenting with providing supplementary funds on a competitive basis to local governments to finance medium scale irrigation schemes, and focusing national public spending on inducing private investment for irrigation. Food and cash transfer programs are also costly, requiring credible exit options to make them affordable.

10.82 What can be done to improve financial feasibility? Progress with democratization and empowerment has increased the political capital of smallholder farmers to influence those allocations. Increasing the political capital of those advocating for more efficient and higher budget allocations to agriculture can help.

### ***Learning from the past***

10.83 The feasibility deficits in table 10.5 identify possible bottlenecks to implementation. The 1982 World Development Report recommended (1) greater investments in R&D and technology, particularly for Sub-Saharan Africa, (2) greater investments in irrigation and road infrastructure, and (3) more effective trade and price policy reforms. Of this, what has been achieved today? Certainly, there has been success in reducing indirect price distortions due to appreciated real exchange rates and in reducing direct taxation of agriculture—but slower progress on developed country trade reform and a shift to protection in some transforming countries. For technology the agenda is lagging, with pervasive underinvestment and a growing knowledge divide for Sub-Saharan Africa. For investments in infrastructure, especially irrigation, there has been little progress in Sub-Saharan Africa as well. In all cases, significant hurdles to political support (price and global trade policy reforms), administrative capacity (R&D, irrigation), and financial affordability (R&D, infrastructure, irrigation) required attention.

10.84 Not repeating implementation failures but replicating past success requires addressing the “feasibility deficits”. Other glaring deficits in table 10.5 include the political feasibility of land reform and support to farmer organizations, the administrative

capacity for institutional innovations (price stabilization, land certification, fertilizer subsidies, rural finance, payments for environmental services, food programs, and rural pension schemes), and the financial affordability of price stabilization, subsidies, and social protection programs. Designing implementation strategies to address these deficits is essential for success.

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**Focus I Rural education and skills**

*(Forthcoming)*

## **Chapter 11 Strengthening governance, from local to global**

11.1 Agriculture remains one of the most promising instruments for reducing world poverty, as shown repeatedly throughout this Report. Chapter 10 identified the elements of national and global agendas essential to realizing that promise. This chapter deals with four major questions: How to translate the national agendas into country-specific agricultural strategies? How to address the necessary political commitment for these strategies? How to implement them effectively? And how the international community can best work together to support national and global agricultural agendas?

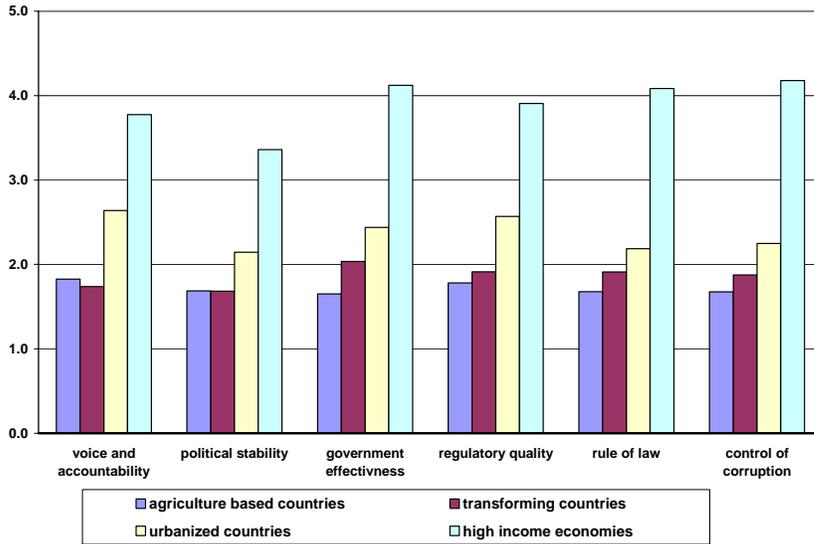
11.2 The political economy of agricultural policy makes it difficult to create the necessary political commitment to use agriculture for development—both among developing country governments and among donors (chapters 1 and 4). But even if governments and donors are committed, selecting the right mix and sequence of agricultural policies and investments is a challenge, too, given the complexity of the sector and its changing role over time. Even if these challenges are met, another major challenge remains: effective implementation of agricultural policies and investments. Many policy instruments of the agriculture-for-development agenda require strong administrative capacity (chapter 10).

11.3 The governance problems that lead to misinvestments and implementation failures in agriculture are at the core of a vicious cycle that reduces commitment to the sector. The agriculture-based countries—where state involvement is particularly important to compensate for market failure and private sector deficiencies—score lower than transforming and urbanized countries on governance indicators that affect policy implementation, such as government effectiveness, control of corruption, and rule of law (figure 11.1).

11.4 This chapter discusses how this vicious cycle can be turned into a virtuous cycle of good agricultural sector governance, where the appropriate selection of agricultural policies and their effective implementation reinforce the political commitment to use agriculture for development (figure 11.2). The prospects for overcoming the governance problems that affect the agriculture-for-development agenda are now promising, because the world has turned its attention to governance. The current emphasis on democratization, public sector management reforms, controlling corruption, and decentralization holds great potential for improving agricultural performance.

11.5 However, one needs to take into account that rural areas are often subject to particular governance problems, such as ethnicity- or religion-based civil strife and military conflict as well as deeply entrenched feudal political and social structures that perpetuate severe inequalities. These problems are not unique to fragile states, they also occur in rural areas of countries with a relatively high state capacity, such as Indonesia, India, Thailand and China. These problems require specific governance reform efforts. They are among the most fundamental obstacles to realizing the agriculture-for-development agenda.

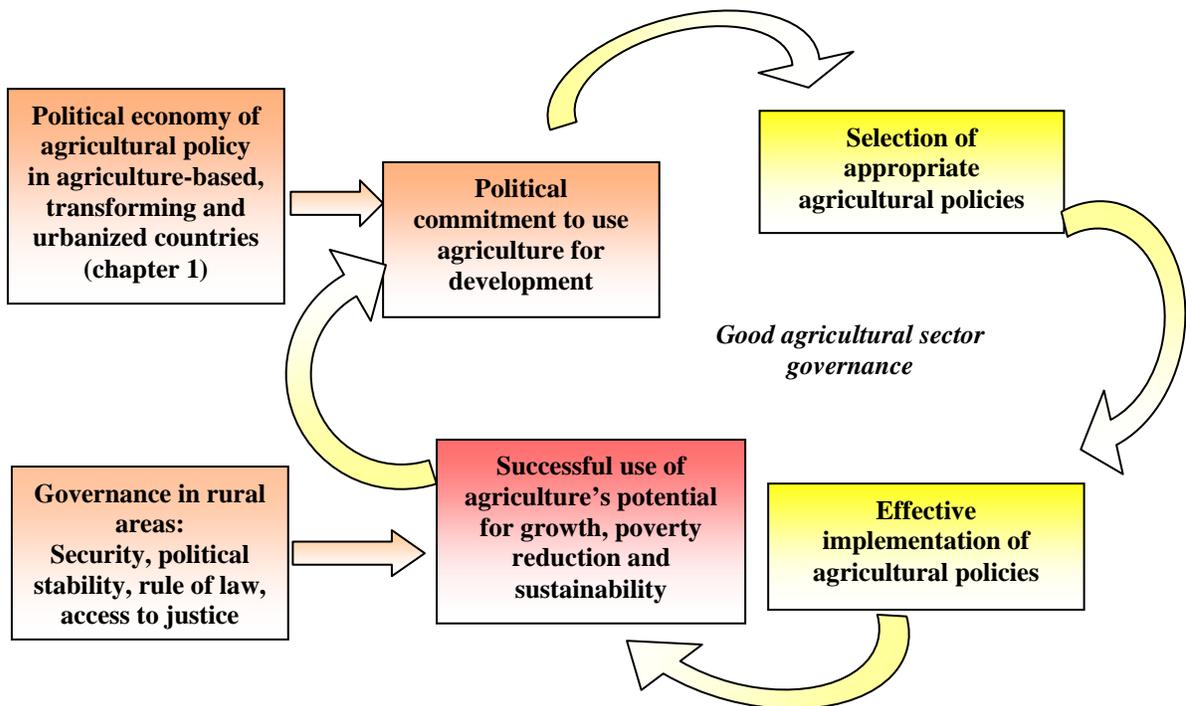
**Figure 11.1 Agriculture-based and transforming countries get low scores for governance**



*Note:* The governance indicators presented here reflect a statistical aggregation of responses on the quality of governance given by a large number of enterprise, citizen and expert survey respondents in industrial and developing countries, as reported by a number of survey institutes, think tanks, non-governmental organizations, and international organizations. Countries' relative positions on these indicators are subject to margins of error that should be taken into consideration when making comparisons across countries. Kaufmann and others (2006) report the indicators on a scale from -2.5 to +2.5. This scale has been transformed here into a scale ranging from 0 to 5.

*Source:* Kaufmann, Kraay, and Mastruzzi (2006).

**Figure 11.2 Creating a virtuous cycle of good agricultural sector governance**



11.6 Reforming governance is essentially a process of institutional change that cannot be transferred or adopted. Better governance is always the outcome of a political and social process, conditioned by a country's history, embedded in its institutions, and driven by its social movements. It is the citizens of a country and their leaders who reform governance. Donors can only support those reforms.

### **New roles of the state, the private sector and civil society**

#### ***Overcoming market failures while avoiding failures of government and collective action***

11.7 Although agriculture is largely a private sector activity, market failures are pervasive due to non-excludability for most technologies (chapter 7), externalities in natural resources management, scale economies in a sector dominated by smallholders, and asymmetries of information in market transactions. Isolation and spatial dispersion, the lack of assets that can serve as collateral, and the vulnerability to climatic shocks lead to high transaction costs and risks, which add to the prevalence of market failures.

11.8 Because of widespread market failures, agriculture—which is essentially a private sector activity—continues to be unusually dependent on the public sector. As in other sectors, governments attempt to overcome market failures through regulation, institutional development, and investments in public goods (table 11.1).

11.9 In agriculture, however, governments have also frequently supplied essentially private services, including the distribution of agricultural inputs and the marketing of farm products, often through parastatals. While some countries have had remarkable success with such interventions—enabling them to launch the green revolution (chapter 2)—the results have often been negative, and in some cases catastrophic. The reason: public sector interventions often lead to government failures through actions that are ill advised, poorly implemented, and subject to rent seeking and corruption.

11.10 Figure 11.3 illustrates this point. The horizontal axis indicates the range of public sector activities in support of agriculture (“scope of the state”). The vertical axis reflects the capacity of the agricultural administration to perform these activities effectively (“strength of the state”).<sup>1</sup> The move from point A to B represents increased government intervention in agriculture in the 1970s and into the 1980s, while at the same time experiencing a deterioration of the effectiveness of the agricultural administration due to government failure. The paradigm of strong state interventions of the 1970s was replaced by structural adjustment in the 1980s and 1990s, which emphasized the primary role of the market and the withdrawal of the state (move from B to C in figure 11.3).<sup>2</sup>

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<sup>1</sup> Fukuyama (2004).

<sup>2</sup> Wolfensohn and Bourguignon (2004).

**Table 11.1 State functions in support of the agriculture-for-development agenda**

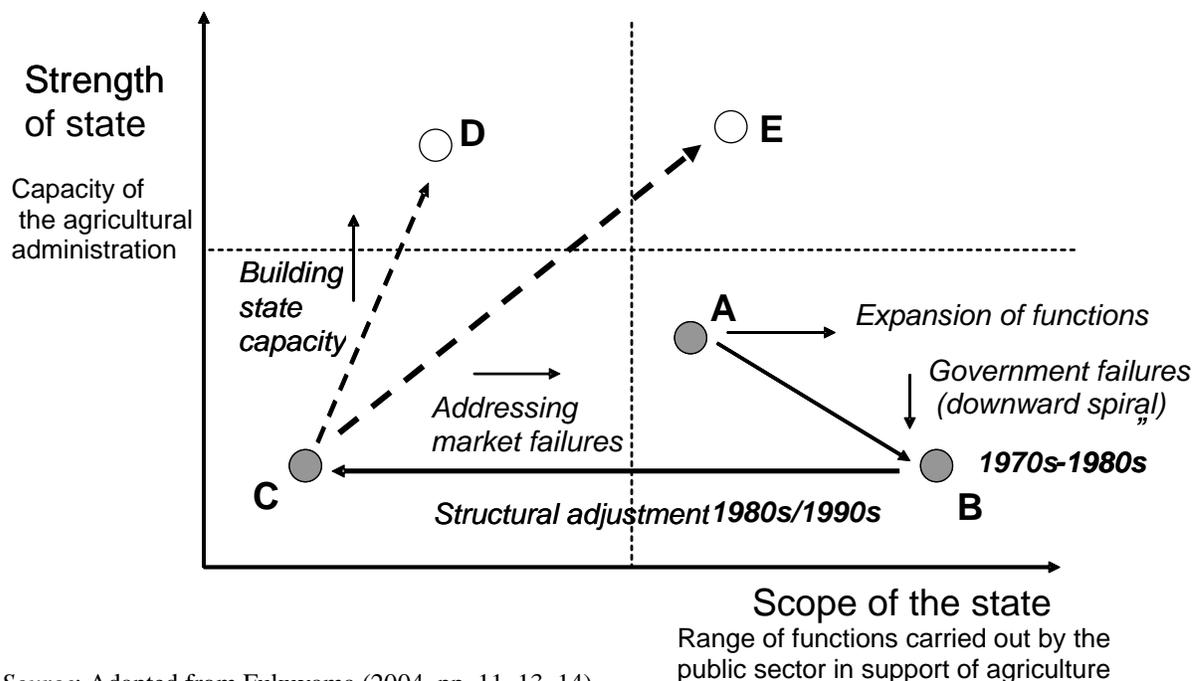
State function	Examples	Governance challenges
<i>Functions related to public policymaking and evaluation</i>		
Policy formulation	Designing agricultural development strategies	Avoiding special interest capture ensuring participation, using evidence
Policy coordination and facilitation	Coordination across ministries and stakeholders	Create incentives and institutional arrangements for effective coordination
Policy analysis and evaluation	Statistical services; analysis, monitoring and evaluation of agricultural policies	Building and maintaining capacity for statistical services and policy analysis
Participation in international agreements	WTO	Coordination with other ministries and stakeholders; balancing tradeoffs
<i>Areas of public policy interventions</i>		
Protecting property rights	Land rights; intellectual property rights, farmers rights	Expanding access to secure property rights; Reducing corruption in land administration
Providing core public goods	Agricultural research and extension (for non-excludable technologies); agricultural education; roads	Effective and equitable provision of appropriate amount of public goods; avoiding corruption in infrastructure
Regulation / addressing externalities	Regulation for biosafety, food safety, pesticides, veterinary drugs; seed certification	Finding a balance between “overregulation” and “underregulation”; Reducing regulatory costs; effective implementation
Overcoming economies of scale problems and market coordination problems	Irrigation infrastructure; measures to kick-start input, financial and output markets (one-off grants)	Avoiding rent-seeking and corruption; identifying “market-smart” interventions <sup>3</sup>
Reducing vulnerability and improving equity	Safety nets; targeted investments and subsidies; redistributive land reform	Identification of appropriate policy instruments; targeting efficiency; effective implementation

11.11 The emphasis on “getting prices right” and improving the macroeconomic environment had important positive effects for agriculture, such as reducing the taxation of the sector (chapter 4). But it left many market failures unresolved, creating “second generation” problems (chapter 5), especially where a weak private sector could not respond to fill the gap. In the 1990s a consensus emerged that the state and the market have to play complementary roles.

<sup>3</sup> See chapter 6 for an explanation of “market-smart” approaches.

11.12 There is now general agreement that the state must invest in core public goods, such as agricultural R&D, property rights, enforcement of rules and contracts, and rural roads, even in highly developed economies. Beyond these core public goods, the state has a role in facilitation, coordination and regulation, though the degree of “state activism” in these roles is debated.<sup>4</sup> And the agriculture-for-development agenda described in chapter 10 assigns a strong role to public policy to promote poverty reduction and equity, including building productive assets and safety nets.

Figure 11.3 Changing Role of the State



Source: Adapted from Fukuyama (2004, pp. 11, 13, 14).

11.13 But how can government failures be overcome in implementing this agenda, especially in agriculture-based countries where the need to address market failures is strongest? The “remnant” agricultural bureaucracies left after structural adjustment are particularly weak,<sup>5</sup> so governance reforms have to strengthen the capacity of agricultural administration (move upwards in figure 11.3). Since building state capacity takes time, it is important to match the scope of state intervention with government capacity by concentrating on the most binding constraints in agricultural development, rather than engaging in the full range of activities outlined in table 11.1. In the long run, countries may realize different choices regarding the level of state involvement in agriculture they consider appropriate (represented by point D versus E in figure 11.3).

11.14 The so-called “third sector”—producer organizations and other civil society organizations—can also overcome market failures while avoiding government failures. Collective action through producer organizations can enable economies of scale—in

<sup>4</sup> Dorward and others (2004).

<sup>5</sup> {Nogueira, 2007 5175 /id}.

input supply, extension and marketing, and managing common property resources, such as irrigation systems. Collective action can also increase farmers' voice in public decisionmaking and hold service providers accountable. And the unique competencies of many NGOs can be harnessed to deliver services, especially at the local government and community levels. But there are also failures of collective action, for example, due to lack of inclusion of disadvantaged groups and benefit capture by local elites. In some cases, partnerships among the public sector, the private sector and the third sector can help overcome the failures of markets, governments, and collective action.

### ***Emerging state roles in coordination, facilitation, and regulation***

11.15 The need for a coordinating role of the public sector has increased as the food supply chain has grown. Coordination failures occur when farmers or processors are working in an isolated or disconnected way, or when complementary investments are not made by others at different stages in the supply chain.<sup>6</sup> These coordination failures may have increased following the withdrawal of parastatals in Sub-Saharan Africa, where poor infrastructure, high risks, and high transaction costs discourage private investment (chapters 5 and 6). In such situations, joint public-private-civil society action can reduce transaction costs and limit the risks of private investment in critical services for smallholder agriculture. To support specific value chains, the public sector can finance business development services and make one-off grants to develop institutions such as insurance and financial services.

11.16 Also to be coordinated is policymaking for the agriculture-for-development agenda. This agenda is cross-sectoral, embracing food safety and biosafety, animal health and the effects on human health, physical infrastructure, environmental services, trade and commerce, and managing natural disasters and safety nets. These areas fall under the jurisdiction of different ministries, and even agriculture is often dealt with by several specialized ministries that concentrate on crop production, irrigation, livestock, fisheries and food. And sectoral interests often dominate over broader development objectives.

11.17 Policy coordination is particularly relevant in formulating agricultural development strategies, integrating them into national development strategies, and allocating appropriate resources to them (box 11.1). Coordinating subnational actors, such as local governments, and international actors, such as regional economic organizations and donors, adds to the challenge. Policymakers and bureaucracies at all levels need new skills as facilitators and coordinators.

11.18 Regulation, too, has become a more important role of the state. States are asked to regulate biosafety, food safety, grades and standards, intellectual property protection, agricultural input quality, ground water extraction, and environmental protection. The privatization of agricultural markets also requires appropriate regulatory frameworks (chapter 5). And dozens of international agreements oblige countries to put in place many regulations, even where doing so may be costly. Regulation is, however, not a function of the public sector alone. The private sector can engage in self-regulation and adopt

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<sup>6</sup> Dorward, Kydd, and Urey (2002).

corporate social responsibility practices that support the agriculture-for-development agenda. The third sector is also engaged in standard setting, as with the Fair Trade label (chapter 5).

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**Box 11.1 Translating vision into practice? A minister's view of Uganda's Plan for Modernizing Agriculture**

The Plan for Modernizing Agriculture is Uganda's strategy for reducing poverty by increasing rural household incomes, food security, and employment by transforming subsistence agriculture to commercial agriculture. Coordinated by the Ministry of Finance, the plan operates under 13 government ministries/agencies as well as local governments, the private sector, civil society, and development partners. The approach fits the government's policy of deepening participation and empowerment through decentralization, liberalization, privatization, gender sensitivity, and environmental protection. But progress has been slower than expected.

Institutional change is a slow process, not easily visible, and difficult to comprehend or appreciate, creating difficulties in the deepening of reforms. Changes in political leadership, inconsistent policies and the different interests of ministries present additional challenges. Indeed, operating in a cross-sectoral environment, requires changes in mindsets and capacities, not yet fully developed. The Poverty Reduction Sector Support program made the budget processes participatory, but each ministry is still constrained by the expenditure ceilings imposed by the Ministry of Finance, making it difficult to fund the planned services.

The Plan's multisectoral framework is poorly understood, resulting in weak and uneven integration across different line ministries. Departments are more used to projects than to a program approach requiring cross-sectoral budgeting and implementation. Accustomed to centralized practices, government officials are now devolving responsibilities but not decentralizing finances.

Overall, the Plan is an emerging success. It calls for patience, consistency, and buy-in from key stakeholders to ensure appropriate funding (members of parliament make final budgetary decisions) and accountability in terms of results. A Steering Committee of different ministerial stakeholders keeps the Plan's funding mechanisms focused on its activities even at times when diversion for other pressing needs would have negatively affected it. Sensitive crosscutting issues can be settled in the office of the prime minister.

*Source:* Wilberforce Kisamba Mugerwa, personal communication.

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11.19 The role of the public, the private and the third sectors in supporting an agriculture-for-development agenda differs considerably across countries—and in the end it is the outcome of political decisions shaped by political values and ideologies. (In terms of figure 11.3, countries need to make their own choices on whether they aspire to move towards point D or E.)

**Formulating sound agricultural development strategies**

11.20 A sound agricultural and rural development strategy (box 11.2) furthers the agriculture-for-development agenda and—in the “virtuous cycle” of good agricultural governance (figure 11.2)—puts it on the national development agenda. Of 17 poverty reduction strategies finalized in 2004 and 2005, 13 build on a national rural development strategy.<sup>7</sup> These strategies appear to have improved the treatment of agriculture and rural development in these national strategies. They also promote cross-sectoral coordination.

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<sup>7</sup> World Bank (2005).

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**Box 11.2 Key elements of an agricultural development strategy**

A national agricultural development strategy identifies the key issues and opportunities facing the agriculture sector and develops operationally sound programs to promote pro-poor growth. It may be part of a broader rural development strategy. A good strategy needs to provide a clear vision for the sector and a policy framework and investment priorities to achieve that vision. An agricultural development strategy is most effective if it is country-led, developed with broad stakeholder participation, and informed by evidence. A review of 19 national agricultural development strategies suggests four key elements:<sup>8</sup>

- A “snapshot” of the current status of the agricultural sector, preferably within a historical context, and underpinned by sound analytical work.
- A national vision of agriculture in the timeframe of a generation, to ensure continuity during changes of political administrations.
- An analysis of the main opportunities and a diagnosis of the key constraints—while drawing on relevant global experiences, and putting them in the context of local conditions to ensure “home-grown” approaches.
- Action plans for implementing the vision, including the institutional arrangements, a medium-term expenditure framework (to be updated on a rolling basis while preparing annual investment plans aligned with the key policies and strategies), and a results management framework of key performance indicators.

A living document, an agricultural development strategy, needs periodic updating. But its long-term vision can also be put into law, as Senegal shows (box 11.3).

*Source:* World Bank (2007).

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***The role of participation in formulating agricultural strategies***

11.21 In line with a growing interest in deliberative democracy, more national development strategies and policies involve key stakeholders and the broader public. But it is not easy to involve organizations that represent the rural poor. Senegal shows how producer organizations, including organizations that represent rural women, can form national umbrella organizations to increase their voice in national policymaking (box 11.3). Stakeholder workshops and “citizen juries” can also promote citizen participation. In India “scenario planning” involved stakeholders in discussions of the reform of the agricultural research system engaging people to think outside their everyday domains and technical competence.<sup>9</sup> And the NGO Global Voices uses ICTs to engage thousands of citizens in townhall meetings to deliberate specific policies. The spread of ICTs in rural areas of developing countries makes this type of deliberative democracy more feasible for the agricultural policy dialogue.

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<sup>8</sup> World Bank (2006b), World Bank (2007).

<sup>9</sup> Rajalahiti and Janssen, 2007, personal communication,

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**Box 11.3 Empowering producer organizations and developing a vision for the agricultural sector in Senegal**

In March 2002 Senegal's new president, Abdoulaye Wade, announced that the Senegalese needed a grand vision for the agricultural sector. This vision was to be constructed through more than two years of consultations with development partners, civil society organizations, producer groups, and ministries within the government. The result is Senegal's Agro-Sylvo-Pastoral Law, the *Loi d'Orientation Agro-Sylvo-Pastorale*, a vision of how to modernize the agricultural sector in the next 20 years. It provides legal recognition for the institutional reforms of decentralized services, responsive and accountable to producers, and empowered farmer organizations. Its main objective is to reduce poverty and diminish inequalities between urban and rural populations and between men and women.

One of the most active groups in the law's elaboration was the national umbrella organization of agricultural producer organizations, CNCR (Conseil National de Concertation et de Cooperation des Ruraux; see Box 6.10). To ensure that the Agro-Sylvo-Pastoral Bill reflected the views of smallholders, the CNCR held 35 consultations at the local level, 11 at the regional level, and one at the national level. The majority of the propositions in the final bill were recommended by the CNCR which is frequently referenced, indicating the political capital that agricultural producers created.

In 2004 the bill was approved by the National Assembly. The Ministry of Agriculture then engaged in a vast communication campaign to distribute the law and an adapted text, with illustrations and explanations. The text was also translated into the country's six national languages: Jola, Mandinke, Pulaar, Serer, Soninke, and Wolof.

Much of the success can be attributed to the CNRC, created in 1993 with support from international donor organizations to organize the country's disparate federations of producer organizations to improve communication and cooperation among existing producer groups and to ensure that producers spoke with a single voice when engaging with the state and other development partners. Today, CNCR encompasses 22 federations spanning agriculture, livestock, women, fisheries, and forests.

*Source:* Resnick (2006), World Bank (2006c).

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### ***Using evidence to select policies and promote policy reform***

11.22 Evidence-based policymaking uses rigorous research and solid monitoring and evaluation. It can use randomized design to evaluate policy interventions, as in Mexico's widely quoted poverty alleviation program, PROGRESA.<sup>10</sup> Policy experiments and scenario modeling can also make agricultural strategies more evidence-based. Such research-based evidence can build political capital (figure 1.8) and make policy changes possible.<sup>11</sup> The rice policy liberalization in Vietnam in 1995-97 was promoted by a study showing that liberalization would not reduce food security and would have beneficial effects on farm prices and poverty, addressing key concerns of the opponents of reform.<sup>12</sup>

### ***Aligning agricultural strategies with budgets***

11.23 Aligning agricultural strategies with appropriate budgets is important in implementing strategies and avoiding underinvestment as well as "misinvestment." Overcoming underinvestment is a particular challenge for the agriculture-based countries, since the financial resources required to meet the agriculture-for-development agenda are

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<sup>10</sup> Schultz (2001)..

<sup>11</sup> Sabatier and Jenkins-Smith (1993).

<sup>12</sup> Ryan (1999).

considerable. The annual growth in public spending on agriculture required to meet the first Millennium Development Goal in Sub-Saharan Africa is projected to be about 18 percent, or an average of about \$US 1 billion annually.<sup>13</sup>

11.24 While donor funding is necessary to meet these requirements, increasing the domestic revenue base and improving budget planning and management is a national responsibility. Medium-term expenditure frameworks, based on program budgets with clear objectives, specific costing and transparent planning help to align financial resources with priorities. Vietnam is playing a pioneering role in using evidence-based assessments to ensure agriculture's participation in medium-term expenditure plans (box 11.4).

11.25 Ultimately, however, the budgetary process is a political process (figure 1.8). Coalitions promoting agriculture for development need capacity for sound budget management as well as political capital to translate the agriculture-for-development agenda into medium-term expenditure frameworks and annual budgets. In transforming and urbanized countries, the challenge is to create political capital for reallocating budgetary resources to more effective policy instruments (chapter 4). In Indonesia, for example, subsidies accounted for 43 percent of fiscal support to agriculture in 2006.<sup>14</sup>

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**Box 11.4 Vietnam's progress in revising traditional role of ministries of agriculture**

In 2002 the Ministry of Agriculture & Rural Development reorganized its structure and role as part of Vietnam's public administration reform. Since then it has been steadily becoming more market-oriented, to retooling the functions and competencies of its staff, re-aligning and refocusing its public expenditures on new priorities. It is also developing a medium-term expenditure framework with clear performance and outcome indicators and preparing three-year rolling and annual expenditure plans. And it recently started evidence-based assessments of its rural development strategy and selected investment projects. These reforms still need to be deepened and sustained, however, as they endeavor to improve expenditure management at the local level, given the recent significant decentralization of public spending.

*Source:* World Bank (2006a).

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11.26 Parliaments are also increasing their influence in decisions on agricultural budgets, but support of parliamentarians for agricultural budgets is an open question. For example, the inability of Uganda's Ministry of Agriculture to inform, engage, and persuade parliamentarians and other stakeholders on the merits of its Plan for Modernization of Agriculture was one of the main factors in not being able to secure adequate funding for some of its core public services.

### **Governance reforms for better policy implementation**

11.27 Better agricultural governance is essential for implementing agricultural strategies effectively and using public resources efficiently and equitably. The agriculture-based economies have the farthest to go in public sector management (figure 11.1), but

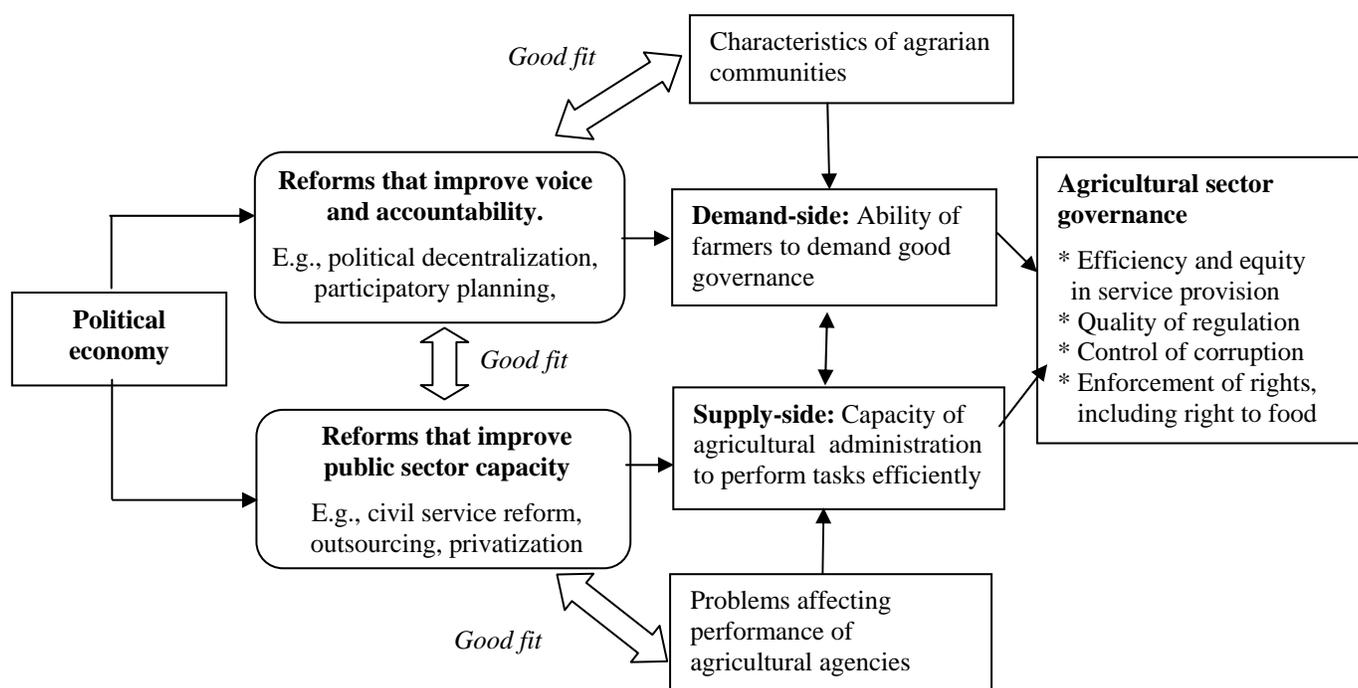
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<sup>13</sup> Fan, Johnson, and Saurkar (2007).

<sup>14</sup> Edmeades (2007).

transforming and urbanizing countries face considerable governance challenges, too. How best to improve agricultural governance? It helps to distinguish between “demand-side approaches” from “supply-side approaches” (figure 11.4). The challenge is to identify a combination of reform approaches that is politically feasible, and fits the country-specific frame conditions.

**Figure 11.4 Demand-side and supply-side approaches to improve agricultural governance**



***Internal reforms of ministries of agricultural and rural development***

11.28 Even though direct state involvement in agriculture can be reduced, though outsourcing for example, internal reforms of the agricultural administration remain essential in realizing the agriculture-for-development agenda. Agricultural ministries require new skills and management structures to fulfill their new roles. For example, while outsourcing of agricultural extension reduces the need to manage large numbers extension personnel directly, it creates the need for a variety of new skills: selecting and managing contracts, ensuring the quality of extension services under contracts, controlling for corruption in procurement, and collaborating with farmers’ organizations involved in managing the contracts.

11.29 Since agricultural ministries are part of the general public administration, and subject to general civil service regulations, essential internal reforms, such as adjusting the salary structure and recruitment system, are often possible only as part of general public sector reforms. So far, agricultural specialists and researchers have paid little attention to how such general reforms could best improve the performance of agricultural

ministries.<sup>15</sup> Where promising general reforms are not forthcoming, it is advisable to unbundle the public administration reform agenda and pilot reform episodes in key government agencies. In any case, creating a mission-oriented and results-oriented public service, in which staff members from the top level to the field level are committed to the agriculture-for-development agenda, requires vision and leadership from people within the administration—change agents or reform champions—backed by strong political support (box 11.5).

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**Box 11.5 How to make a green revolution happen? Vision and leadership**

India's green revolution was possible only because political and administrative leaders created an institutional and policy environment that addressed market failures and enabled large numbers of smallholders to intensify their production. It had the full political support of the prime minister (chapter 1), but it also required the vision and leadership of highly competent officials in the public administration. C. Subramaniam, Minister of Agriculture from 1964-67, believed in the ability of smallholders to modernize agriculture and convinced the skeptics to overcome all kinds of administrative and regulatory obstacles. Vision and leadership is also required to make intensive agriculture environmentally sustainable. M.S. Swaminathan, the scientific leader of India's green revolution, is now spearheading an "Evergreen Revolution."

The Office du Niger (ON) irrigation scheme, covering 60,000 hectares in Mali (chapter 8), shows that green revolution successes are also possible in Africa. Rice yields there quadrupled between 1982 and 2002, thanks to a far-reaching institutional reform, which empowered the farmers to participate in the scheme's management through three-party performance contracts, valid for three years. The ON agency is accountable to the farmers, and joint-staff farmer committees set priorities and outsource maintenance fully paid for by the farmers (chapter 8). The minister of rural development, Boubacar Sada Sy, and the manager of the ON agency, Traoré, took the lead in creating an innovative institutional and policy environment encouraging small-holder farmers to intensify their production. As in India, these reform champions in the public administration had the full support from their prime minister.

*Sources:* Aw and Diemer (2005), Swaminathan (1993).

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***Rolling back the boundaries of the state***

11.30 Public sector reforms that roll back the boundaries of the state have been discussed in previous chapters:

- *Contracting out* is suitable for functions that require public finance but not necessarily public provision. It has been widely used for veterinary services and for agricultural advisory services, as in Uganda (chapter 7).
- *Public-private partnerships* go beyond outsourcing, creating joint responsibilities for financing and providing agricultural services and infrastructure, as with Banrural (see box 6.5), which provides financial services to smallholders in Guatemala. Not all such programs are suitable for targeting the poor, but they can still free up public resources, which can then be targeted toward the poor under other institutional arrangements.
- *Public-private-people partnerships* involve third sector organizations, such as farmer organizations, along with public sector agencies and private business enterprises. The

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<sup>15</sup> Binswanger (2006).

Sustainable Uptake of Cassava as an Industrial Commodity Project in Ghana is an example (chapter 7).

- *Devolving management authority to user groups* is widely applied in natural resource and irrigation management, as with the Office du Niger irrigation scheme in Mali (see box 11.5 and chapter 8). The opportunities and challenges of devolution to user groups are comparable to those of community-driven development, discussed below.
- *Privatization* works best where there is no need for state involvement, often in the livestock sector. In 10 Sub-Saharan countries, the number of private veterinarians increased from 70 in the mid-eighties to 1,780 in 2004.<sup>16</sup> Reforms that create a conducive rural investment climate are important to make privatization work (chapter 9).
- *Service cooperatives*, formed and owned by farmer organizations, can be important for pro-poor agricultural service provision. In India dairy cooperatives provide services to more than 10 million households, benefiting women particularly, due to their role in dairy farming (chapter 6).

### ***Creating effective regulatory agencies for agriculture***

11.31 Effective regulatory agencies can create an enabling investment climate for the private sector and farmer organizations, but agricultural regulation also has to address wider development objectives—ensuring food safety and public health, reaching environmental goals, protecting agricultural laborers, meeting other societal goals. Outsourcing, devolution and privatization may require agencies to take on new regulatory tasks.

11.32 Regulation has to strike an appropriate balance among different interest groups, avoiding both overregulation and underregulation, especially if there are big risks and uncertainties, say with a new technology. Apart from creating appropriate regulatory institutions, which may be independent from ministries and involve public participation, enforcement is a major governance challenge, too. If farmers receive spurious seeds due to weak enforcement of seed certification systems, they can face considerable income losses, as the recent case of Bt cotton in India shows.<sup>17</sup>

11.33 To save regulatory costs and bundle expertise for regulation, regional systems of regulation can be created. An example is the joint regulatory system for pesticides of the Sahel countries, implemented by the Sahel Institute of the Permanent Inter-State Committee for Drought Control (INSAH/CILLS) and widely acknowledged as effective.

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<sup>16</sup> C. de Haan, 2007, personal communication.

<sup>17</sup> Sharma (2007).

### ***Controlling corruption in agriculture***

11.34 Corruption is a challenge for implementing the agriculture for development agenda (figure 11.1). Land administration is often one of the most corrupt government agencies (chapter 6). Large agricultural infrastructure projects, such as irrigation projects, are also prone to corruption problems, as is water allocation in public irrigation systems.<sup>18</sup> Companies may bribe regulators, as in biotechnology regulation in Indonesia and in pesticide regulation in India.<sup>19</sup> And the more the state is involved in supplying inputs such as fertilizer and credit, and in marketing agricultural products, the greater is the scope for corruption.<sup>20</sup> This is why rolling back the state can reduce corruption.

11.35 Both demand-side and supply-side approaches can overcome corruption in agriculture (figure 11.4). Public expenditure management reform is a typical supply-side approach, often part of a general public sector reform. A successful demand-side approach is the monitoring of food prices in ration shops by women's groups in India.<sup>21</sup> A study on strategies to reduce corruption in village road projects applied a randomized experimental design to compare social audits, a demand-side approach, and government audits, a supply-side approach. It suggests that grass-roots monitoring may be more effective in reducing theft when community members have substantial private stakes in the outcome.<sup>22</sup> New technologies, especially ICTs ("e-government"), can also reduce the scope for corruption, as with computerizing land records in Karnataka (chapter 6). Despite such evidence, studies on strategies to deal with corruption in agriculture are rather scarce, and more research would be useful to find out "what works, where, and why" in fighting corruption, especially if public investment in agriculture is to be increased.

### **Decentralization and local governance**

11.36 Implementing the agriculture-for-development agenda requires horizontal coordination across sectors and vertical coordination among levels of governance. With extensive decentralization and the rise of civil society organizations, a new approach to coordination is to assign greater roles to local governments and local communities. Decentralization can make government more responsive to the needs of the (often overlooked and disenfranchised) people living in rural areas and working in agriculture. It can correct market failures through greater access to local information and by mobilizing local social capital for enforcement. It holds particular promise for African agriculture, where it can deliver goods and services more relevant to the diverse agricultural and rural needs (chapter 10).

11.37 Decentralization has been widespread: 80 percent of all developing countries have experimented with some form of decentralization, and 70 percent of Sub-Saharan

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<sup>18</sup> Rinaudo (2002), Wade (1982), Wade (1984), Huppert and Wolff (2002).

<sup>19</sup> BBC News (2007), Both companies were fined in the USA. Fredriksson and Svensson (2003).

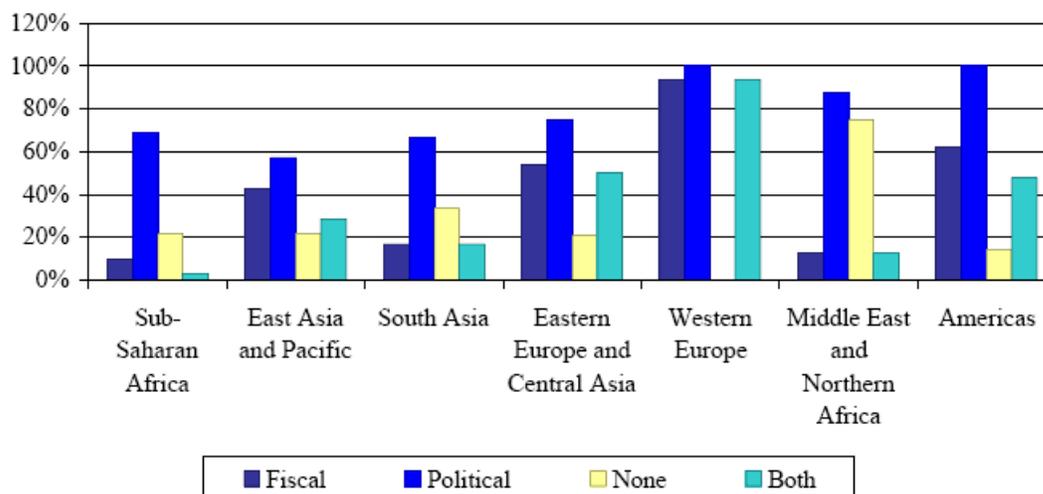
<sup>20</sup> Azmat and Coghill (2005), Jeffrey (2002), Gupta and Chaudhuri (1997).

<sup>21</sup> Ackerman (2004).

<sup>22</sup> Olken (Forthcoming).

countries have pursued political decentralization (figure 11.5).<sup>23</sup> But fiscal decentralization is lagging, particularly in the Middle East and North Africa, South Asia, and Sub-Saharan Africa. Local governments remain dependent on transfers from the center, with weak accountability mechanisms to control the use of the resources transferred.

**Figure 11.5 Decentralization by region**



Source: Work (2002).

11.38 The implications for agriculture depend on how local governments and communities allocate budgets. Local governments may have priorities that favor social expenditures over productive expenditures, at least when there are huge unmet needs in their social infrastructure and services. Fulfilling these needs is thus essential for success in implementing an agriculture-for-development agenda, both as a prerequisite and as an essential complement. Community-driven approaches offer promise in this, but they need to be improved and adapted to serve agriculture. Links to state services need to be established, accountability mechanisms strengthened, municipal budgets and practices embedded, and community failures reduced.

***Appropriate levels of decentralization for agriculture vary by function and capacity***

11.39 The appropriate level of decentralization depends on a range of technical, economic, and political factors: spillovers, scale economies, administrative capacity, strategic importance of the function, likelihood of elite capture at different levels, regional imbalances, and political feasibility.<sup>24</sup> So the appropriate level for delivering different public sector functions relevant for agriculture differs across functions and countries.

<sup>23</sup> Work (2002).

<sup>24</sup> Bardhan (2002), classical fiscal decentralization literature.

11.40 Public functions of strategic relevance—such as food security regulation and control of the major epidemic diseases—need to remain national responsibilities, even though their implementation may require considerable administrative capacity at intermediate and local levels. For agricultural research, agro-ecological zones rather than administrative levels may be the appropriate level of decentralization for efficiency, but not for political support (box 11.6). And agricultural extension, which confronts local heterogeneity and a dispersed clientele, is usually best organized at the lowest tier of government in close interaction with community organizations.

11.41 Also important is capacity or potential capacity for the provision of a good or service at the central or local level, rather than simply assigning tasks based on the technical nature of the good or service being provided. The prospects for capacity development depend on governmental actors (at the state or local levels), and on farmer and community organizations.

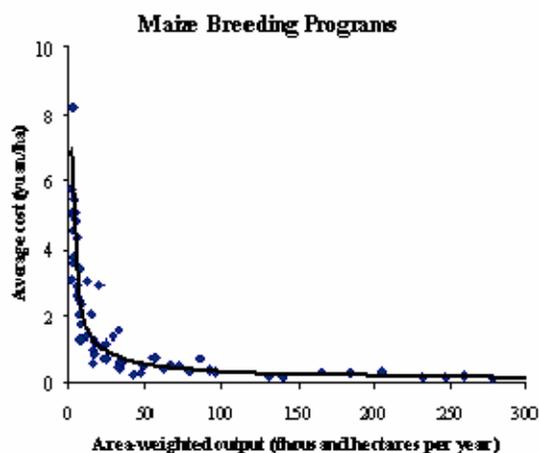
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#### Box 11.6 Decentralization or centralization of agricultural research?

Determining the appropriate decentralization in public agricultural research systems presents delicate tradeoffs between improving the efficiency of supply of agricultural research, meeting the heterogeneity of demand for R&D at local levels, and building support from farmers.

Many types of R&D, especially strategic and applied research, are characterized by considerable economies of scale. In China, maize breeding programs targeted on small areas are several times more costly than those targeted on larger areas (box figure). Decentralizing research of this type increases costs and often faces capacity constraints at lower levels of government, given the specialized nature of science. In many small countries it may not be economic to do this research at all.<sup>25</sup>

#### Box figure Maize breeding in China—several times more costly when targeted on small areas



Adaptive research, such as testing new technologies, is best decentralized, since there are few economies of size and the objective is to tailor technologies to local conditions. Decentralization can include participatory approaches to draw on local knowledge and capacity to produce innovations suited to different interests and local conditions.<sup>26</sup>

<sup>25</sup> For example, Maredia and Byerlee (2000) found that only 20 percent of wheat breeding programs in Sub-Saharan Africa were operating at the appropriate scale.

<sup>26</sup> Rajalahti, Woelcke, and Pehu (2007).

Decentralizing agricultural research poses another dilemma: Efficiency is best served by “deconcentration” to specific agro-ecological zones that maximize the likely applicability of locally developed technologies to local conditions. In India research stations cater to the needs of the 126 defined agro-ecological zones. But political support and local financing are likely to be greater when research is decentralized to political jurisdictions, such as states or even local governments for some adaptive research. This has been the system used in countries such as the USA and China where states fund 50 percent of all agricultural R&D and lower levels of government 90 percent.

Source: Traxler and Byerlee (2001), Rozelle and others (2003).

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### ***How much revenue do local governments contribute to agriculture?***

11.42 One goal of fiscal decentralization is to improve revenue generation while making local governments accountable to local tax payers. So far, sub-national governments contribute little to the sector resources. In Mexico, state governments contributed 16 percent on average (during 1996-2004) of the resources for agriculture, livestock and rural development programs with the remainder from tied central transfers. In Uganda, locally generated revenue is less than 10 percent of the funds administered by local councils. The remainder consists of transfers from central government, most of which (84 percent in 2000/01) are earmarked conditional grants<sup>27</sup>.

11.43 In spite of their limited contribution to overall revenue generation, efforts by local governments to raise local revenue have often added a significant tax burden to agriculture with little benefit from improved services. This was the case in Uganda<sup>28</sup> and Tanzania.<sup>29</sup> Improving the fiscal capacity of local governments will require a mix of instruments: the transfers of more elastic tax bases to these jurisdictions, the creation of revenue-sharing funds from better-off to poorer regions, and the use of cofinancing funds to favor specific investments or groups, such as the very poor.

### ***Do local and central governments have different priorities for agriculture and development?***

11.44 *Representation affects priorities:* Local government institutions can set priorities for agriculture and development. Political leadership matters, and those elected to represent local interests influence decision-making.<sup>30</sup> Constitutional codification of representation matters too. In India the Panchayati Raj (village councils) reserve seats for women and for members of scheduled castes and tribes. A study of the effects of reserving seats for women in two Indian states found that female leaders invest more in the type of infrastructure relevant to the needs of women.<sup>31</sup>

11.45 The decentralization of agricultural functions to local governments does not necessarily give priority to agricultural development. Greater discretion over local spending leads to prioritize investments with greater electoral rewards such as physical

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<sup>27</sup> Bahigwa, Rigby, and Woodhouse (2005).

<sup>28</sup> Bahigwa and Ellis (2005).

<sup>29</sup> Brosio (2000).

<sup>30</sup> Besley, Pande, and Rao (2006).

<sup>31</sup> Chattopadhyay and Duflo (2004).

infrastructure or social services. In Bolivia, the 1994 Law on Municipal Decentralization significantly increased public spending on education, rural infrastructure, and water and sanitation, with the shift in investment patterns across municipalities driven by filling gaps in unmet “needs.” Average investment in agriculture dropped as a share of total investment.<sup>32</sup>

11.46 Local participation drives priorities first toward basic social infrastructure: health, education, and water and sanitation. As these basic needs are satisfied, and the community gains experience, priorities gradually shift toward productive projects. Pursuing an agriculture for development agenda through decentralization thus shows the importance of meeting basic needs for effective economic performance.

***Community-driven development: can the community manage agriculture-for-development agendas?***

11.47 Community-driven development (CDD) aims at empowering communities and local governments with resources and the authority to take control of their development.<sup>33</sup> This approach was partly motivated by the need to overcome market failures on the one hand, and state failures on the other hand. The capacity of community relations to correct for market and state failures has been illustrated in Asia.<sup>34</sup> While comprehensive evaluations are yet to come, the approach has found considerable enthusiasm in the development community and now absorbs over 9 percent of World Bank lending.

11.48 The approach also has promise in integrating agriculture with its development functions. But implementation is difficult, still at a stage of experimenting and learning.

- Communities can be quite effective for information sharing, mutual assistance, and such functions as watershed management. But just like markets and states, they too can fail. Because they do not have formal structures of authority and accountability, they can be riddled with low transparency, abuses of power, social exclusion, and social conservatism.<sup>35</sup> Success is possible, but there is no guarantee unless special attention is given to improving community practices.
- Creating accountability is an iterative process that evolves over time. In the case of the CDD rural poverty program in Northeast Brazil, programs have gradually been decentralized from the state to municipal development councils, based on the transparency and participatory performance that actors at each level were able to demonstrate (figure 11.6). At the community level, decisions are made in an open, participatory environment. Initially, funds for approved investments were released directly to community associations, and a community committee oversaw implementation and monitored the use of funds, with legal provisions in place to penalize the misuse of funds. Later on, the program gradually decentralized

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<sup>32</sup> Faguet (2004).

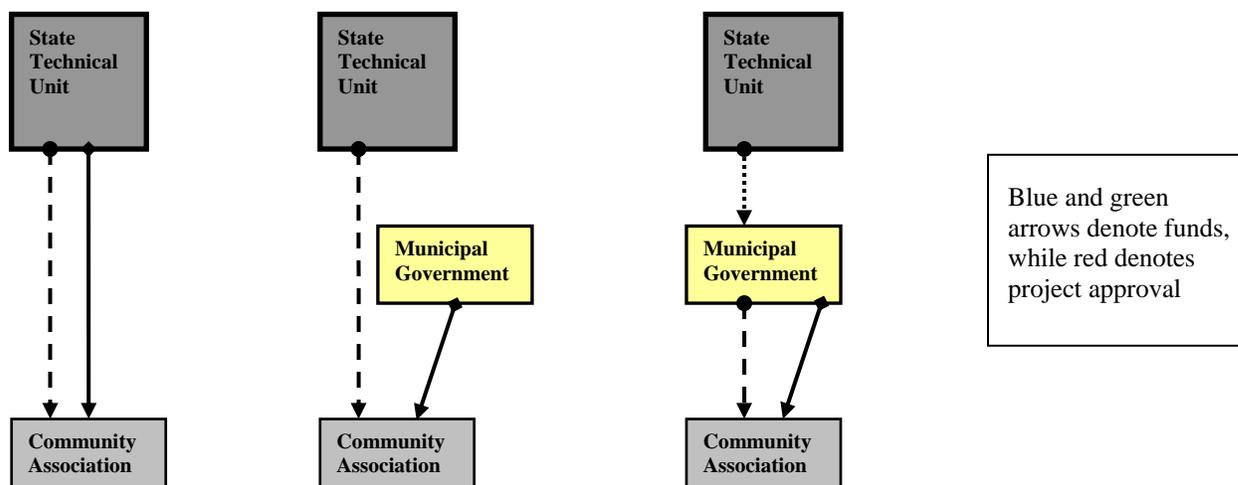
<sup>33</sup> Binswanger and Azyar (2003).

<sup>34</sup> Hayami and Kikuchi (1982).

<sup>35</sup> Platteau and Abraham (2002).

investment planning and decision-making processes to municipal councils. Decisions about investment priorities are made transparently in open, democratic meetings on the basis of an annual budget. This approach has resulted in more accurate poverty targeting and cost-effective use of funds. Some state governments have even piloted a more decentralized scheme that permits municipal councils with excellent performance to receive and manage an annual budget given by the state on the basis of an annual investment plan.

**Figure 11.6 Sequencing of CDD approval mechanism and flow of funds in Northeast Brazil**



- With basic needs better met through early CDD expenditures, income-generating activities are increasingly supported. Although CDD projects have potential for raising incomes, productive projects under the Rural Poverty Alleviation Program in Northeast Brazil show that success depends not only on community capacity but also on market demand, technical assistance, and capacity building. The most successful productive projects are those with little exposure to market risk, such as small irrigation schemes. More complex productive projects have proven more difficult unless supplemented with technical assistance and training.<sup>36</sup> Income-generating projects often provide private goods, such as livestock, rather than public goods, such as health facilities. Therefore, they are often implemented with producer groups, rather than the entire community. Such projects need to be designed carefully, so that they do not undermine agricultural finance and micro-finance institutions.

### Increasing aid effectiveness for agricultural programs

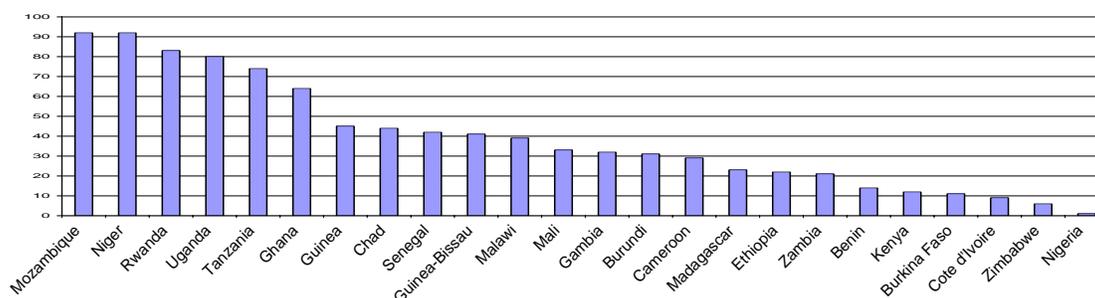
11.49 While increased donor funding is required to finance the agriculture-for-development agenda, development assistance is already a large part of the budget in most agriculture-based economies, 28 percent of total agricultural spending in 24 Sub-Saharan countries.<sup>37</sup> In several African countries, ODA commitment contributes more than 80

<sup>36</sup> Zyl, Sonn, and Costa (2000).

<sup>37</sup> OECD credit reporting system at <http://www.oecd.org>.

percent of agricultural spending (figure 11.7).<sup>38</sup> With this aid dependence,<sup>39</sup> good “aid management” requires that recipient countries have effective leadership, a sound institutional environment, and solid economic strategies. Meanwhile donor countries need to increase the predictability of aid flows, harmonize aid procedures, and enhance their reliance on the financial and accounting systems of the recipient countries.

**Figure 11.7 ODA commitments cover a high share of agricultural spending in many Sub-Saharan countries (2002)**



Source: Calculated based on data from OECD credit reporting system at <http://www.oecd.org>.

11.50 The reality on the ground is often very different, with fragmented, complicated, and sometimes contradictory donor interventions and procedures. In Ethiopia, almost 20 donors supported more than 100 agricultural projects in 2005, most providing less than \$5 million over three to five years. Donor effectiveness is further eroded by inconsistency of policies. In Malawi, inconsistent donor priorities and shifting government priorities have led to several stop-start efforts to enhance food security by using hybrid seed and fertilizer for maize, its main food crop.<sup>40</sup> To reduce the time and attention paid to donor missions, Mozambique, Nicaragua, and Tanzania now have “mission vacation time” during several months of the year.

### *Initiatives by donors*

11.51 With the centrality of agricultural development for achieving the MDGs and a greater commitment by donors to fight rural poverty,<sup>41</sup> better “aid management” has become crucial. The Paris Declaration<sup>42</sup> outlines five principles for increasing aid effectiveness: strengthening national ownership and government leadership; aligning donor support to government priorities, systems, and procedures; harmonizing government and donor processes; managing resources for development results; and ensuring mutual accountability.

<sup>38</sup> The percentage would be lower, if disbursement data rather than commitment data are used. However, available disbursement data bases are either incomplete or not disaggregated by sector. Therefore, the OECD Creditor Reporting System (CRS) appears to be the best source for assessing cross-country development aid allocation over time periods.

<sup>39</sup> Brautigam (2000).

<sup>40</sup> Blackie and others (2006), Evans, Cabral, and Vadnjaj (2006), Harrigan (2003), Chinsinga (2007).

<sup>41</sup> Global Donor Platform for Rural Development at <http://www.donorplatform.org>.

<sup>42</sup> High Level Forum (2006).

11.52 Although many donors are starting to operationalize these principles, incentives within donor agencies to do so are still weak. It has proven difficult to translate commitment at the political level to action at the working level.<sup>43</sup> Up to now, little attention has been given to incentives provided to staff on the ground to develop coherent programs with other donors.

11.53 Some initiatives are promising: The Global Donor Platform for Rural Development, a network of 29 donor agencies, provides independent facilitation services to recipient government and donors to support the joint development of support to agriculture and rural development, the joint monitoring of commitments, and the implementation of a sector-wide code of conduct. The Neuchatel Initiative, an informal group of representatives of bilateral and multilateral donors, develops common views and guidelines for in-country donor coordination of support to agricultural extension.<sup>44</sup>

### ***Government leadership***

11.54 Evidence of the vital role of effective leadership by partner country governments is provided by a cross-country review of the relations between aid flows, poverty, policy and institutions.<sup>45</sup> In Uganda a coherent country-led poverty reduction strategy was supported by a sound agricultural sector strategy and institutional reforms (box 11.4). The pro-active management of aid flows on the basis of coherent pro-poor expenditure strategies, including rural sectors, has resulted in long term and stable commitments of donor support. In Tanzania, government leadership has overcome fragmentation (17 bilateral and multilateral donors supported agriculture in 2005) largely through “basket funding” guided by an agreed agricultural sector development program.

### ***Using SWAps to align donor support***

11.55 With sector-wide approaches (SWAps, originally developed for education and health)<sup>46</sup> several donors agree to support a coherent agricultural sector development program coupled with policy and institutional reform. While seemingly attractive for donor harmonization and alignment, the application of SWAps to agriculture has encountered problems. Important determinants of agricultural livelihoods and growth are often outside the ministry of agriculture's mandate, underlining the role of cross-ministerial coordination.

11.56 If properly designed, phased, and implemented according to government priorities and capacities, agricultural SWAps offer a useful way to align donor support and use the government's fiscal system. Where ministry capacity is weak, subsectoral support may be appropriate. SWAps also require that both governments and donors “stay the course,” and sequence reforms into feasible steps.

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<sup>43</sup> De Renzio (2004).

<sup>44</sup> See <http://www.neuchatelinitiative.net>.

<sup>45</sup> Mosley and Suleiman (2005).

<sup>46</sup> Sector-wide approaches aim at subsuming all significant funding in a single policy and expenditure program under government leadership and at adopting common approaches across the sector relying on government procedures to disburse and account for all funds (Foster, Brown, and Naschold (2000)).

11.57 Nicaragua's sector-wide PRORURAL, launched in 2005, addresses some of these requirements. The government and 15 donors—supplying more than 90 percent of donor assistance for agriculture—signed an agreement (“code of conduct”) to promote country leadership, harmonization and alignment. A common fund, set up in 2006, merges the contributions of an increasing number of donor agencies into a single account, used for the priorities defined by Nicaraguan sector institutions.

### ***Sharpening the focus on results***

11.58 The structural transformation of agriculture takes time and perseverance.<sup>47</sup> Continuing adjustment and learning require monitoring results and evaluating impacts. In addition, mechanisms are needed to set incentives for achieving results. In Uganda and Tanzania more resources go allocated to areas and institutions that have a good track record in delivering agreed results.<sup>48</sup>

11.59 The quality of donor support to agriculture has been improving. For example, the percentage of World Bank supported loans to agriculture rated with satisfactory or higher outcome by the Independent Evaluation Group, increased from 57 in 1992 to 88 in 2005, similar to the average for all sectors. Even so scaling up support to the agriculture-for-development agenda will require more experimentation, learning, and adjustment, using a variety of mechanisms, such as adjustable program lending and learning and innovation loans.<sup>49</sup>

## **Progressing on the global agenda**

11.60 While better governance and donor coordination are important to realize the agriculture-for-development agenda, this agenda also requires global cooperation. The global agenda is broad and varied, with dimensions of growth, poverty reduction, and environmental sustainability (chapters 4-9). Many of the major elements are global public goods that generate positive spillovers or avoid negative ones (public bads). Other global public goods relate to setting the rules and regulations that govern exchanges among countries and the stewardship of natural resources of global significance. The global agenda also includes issues that may not be global public goods in the strict sense but that are critical to global justice and equity, such as in the Millennium Development Goals.

### ***Elements of the agenda***

11.61 *Trade rules and standards to reduce transactions costs.* Barriers to trade and transaction costs in international exchange are greatly reduced by clear rules of the game that regulate a wide variety of public policies set at the national level, including rules of tariffs, subsidies, sanitary and phytosanitary standards, grades and standards for specific products, and intellectual property protection. These issues are especially important for

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<sup>47</sup> See <http://www.africaforum.info>.

<sup>48</sup> World Bank (2005).

<sup>49</sup> World Bank (2005).

agriculture given concerns about food safety, spread of pests and diseases, and privatization of science (chapter 5).

11.62 *Global R&D to generate spillovers.* Agricultural research generates positive spillovers across countries (chapter 7).<sup>50</sup> Many types of agricultural research are characterized by economies of scale, which make it uneconomic for all but large countries to carry out. Moreover, North-South spillovers are limited by the agro-ecological specificities of countries in the sub-tropics and tropics, as well as the existence of many orphan crops (millets, cassava, yams) and orphan livestock species (goats) where there is little or no research done in the north. Collective action is therefore efficient for generating economies of scale to produce pro-poor technological spillovers.

11.63 *Avoiding negative spillovers—plant and animal diseases and invasive species.* Plant and animal diseases and invasive species have become an important global problem, partly because of the explosions in international travel and trade, both of which can spread pests, diseases and invasive species quickly. While the costs of these diseases in some countries may not be high relative to other pressing agricultural and health problems, they could be very high if the diseases spread and become prevalent globally, especially if there are human health risks (Highly Pathogenic Avian Influenza for example). There is a clear case for international cooperation both to prevent and control infectious plant and livestock diseases at the source and to prevent their spread between countries in ways that minimize disruption of trade in agricultural products.

11.64 *Conserving genetic resources for future food security.* Genetic resources and seeds have been the basis for some of the most successful agricultural interventions to promote growth and reduce poverty (chapter 7). Conserving the world's rich heritage of crop and animal genetic variation is essential to future global food security. Gene banks and in-situ resources that provide fair access to all countries and equitably share the benefits clearly qualifies as a global public good that requires global collective action.

11.65 *Managing the global commons—climate change.* Climate change illustrates the failure to manage the world's most important common property resource, its atmosphere. Its low priority in some major polluting countries is a clear example of the "tragedy of the commons," and the economic costs of global inaction are huge, as recently shown by the Stern Review (2006). Agriculture presents major opportunities for reducing global greenhouse gas emissions through carbon sequestration, better livestock management, and possibly by producing biofuels (focus B). Agriculture is also the sector most vulnerable to climate change, and crop failures and livestock losses are already imposing high economic costs on the poor, undermining food security (focus G).

11.66 *Environmental stewardship for sustainable development.* Since the 2002 Earth Summit in Rio, the thinking on agriculture and environment has made the environmental sustainability agenda inseparable from a broader agenda of agriculture for development.<sup>51</sup> Since regional or local solutions are often insufficient, collective action at the global level

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<sup>50</sup> Pardey and others (1996).

<sup>51</sup> Kherallah and others (2002).

is required to solve desertification and the loss of biodiversity from agricultural encroachment on forests.

11.67 *Achieving global justice and equity.* The Millennium Development Goals, set by the heads of state at the 2000 UN Millennium Summit, have become the overarching guide to global justice and equity. Four of the goals—for poverty and hunger, for gender equity, for environmental sustainability, and for equitable exchange in international trade—are closely linked to the agriculture-for-development agenda in this Report. International development assistance is one of the major instruments for realizing global justice and equity, but other efforts are also important. For example, export subsidies and import protection by some countries harm other countries’ potential to use agriculture for development—and thus matter for global justice and equity.

11.68 A hallmark of the new global agenda is that many of the issues relate to each other and to other sectors. For example, animal diseases relate to sanitary standards for trade, to health, and to the environment. Genetic resources relate to efficient management of international agricultural research and technology spillovers as well as to management of intellectual property and the capacity to control plant diseases. Almost all of the issues now have an environmental and a poverty dimension, and many intersect with human health or trade. This interrelatedness heightens the need for multisectoral and interinstitutional efforts.

#### ***Who is doing what—old actors and new***

11.69 In the second half of the 20th century, global institutions and agreements were created to support the agriculture agenda (table 11.2). The Food and Agriculture Organization (FAO) of the United Nations was one of the first global institutions created at the end of World War II, acknowledging the need to assure adequate food for all as a precondition to security and peace. With the creation of the Consultative Group on International Agricultural Development (CGIAR), the international community provided agricultural science and technology as a global public good (box 11.7).

11.70 Efforts to standardize rules including for trade in agricultural commodities led to the creation of the World Trade Organization (WTO) in 1995, but the results for developing country agriculture have been limited. Even so, recent progress in OECD trade and subsidy policies shows that change is possible (chapter 4).

11.71 The global institutions and agreements for the environment were created in parallel to those for agriculture, development, and trade, initially with little recognition of each other. And the traditional “agricultural actors,” such as the FAO, played a rather limited role in the negotiations of global conventions on biodiversity, climate change, and desertification, all signed in Rio.

11.72 In the 1990s new actors, especially a vibrant international NGO community, entered the global arena, pushing governments to move ahead on the global environment and development agenda. The budgets of some of the most influential of these organizations—Oxfam, WWF, and CARE—are comparable to or even exceed the FAO

budget.<sup>52</sup> The new actors do much in advocacy and harness private and mixed public-private financing for global public goods, which has dramatically risen in the last decade.<sup>53</sup>

**Table 11.2 A partial list of global institutions for agriculture<sup>a</sup>**

Rationale for global engagement	Global public goods (bads)						Global justice and equity	
	Issue area	Trade rules	Food safety SPS	Agricultural knowledge	Genetic resources	Crop and livestock diseases	Climate change	Finance / aid for agriculture
<b>FAO</b>	K	K	K	R	K	K	F	K
<b>OIE, IPPC and Codex</b>		S, K,			S, K,			
<b>WFP</b>								F
<b>IFAD</b>			F				F	
<b>Other UN organizations</b>	R, F, K	R, K		R, F		R, F	F	
<b>CGIAR</b>	K	K	K	K	K	K	K	K
<b>WB and other IFIs</b>	K	K	F, K		F, K	F, K	F, K	F, K
<b>NGOs</b>	A		A		A	A	A, F	A, F
<b>Charity foundations</b>			F	F	F	F	F	F
<b>Multi-nationals</b>	SR	SR	F, K		F, K			

A = advocacy

F = financing

K = knowledge generation and management

R = Setting rules and standards, SR = Self-regulation (private standards and labels)

<sup>a</sup> Excludes many global networks and programs

### Box 11.7 Global action has paid off handsomely in agriculture

#### CGIAR

The CGIAR was a pioneering example of global collaboration in support of the agriculture-for-development agenda. A collective effort with informal governance, it started with 18 members (funders), a budget of \$US 100 million (2007 dollars) and four research centers in 1971. It has since grown to 64 members, with a budget of \$470 million supporting 15 research centers. Investing in the CGIAR has paid off handsomely, even under the most conservative assumptions.<sup>54</sup> The system helps small agriculture-based countries benefit from the scale economies of R&D (chapter 7).

#### Rinderpest

Another remarkable example of international collaboration, still unfolding, is the near elimination of rinderpest, a highly contagious viral disease in cattle. In the early the 1980s the disease was raging across Africa with losses estimated at \$2 billion in Nigeria alone 1979-83, and spreading over much of Asia and into Europe.<sup>55</sup> The Global Rinderpest Eradication Programme—led by regional organizations and supported by FAO and other donor organizations—was created to coordinate the worldwide eradication of

<sup>52</sup> McCalla, 2007, personal communication.

<sup>53</sup> Conceicao (2006).

<sup>54</sup> Raitzer (2003).

<sup>55</sup> See <http://www.csiro.au>.

rinderpest by 2010 through the collaboration of community animal health workers, herders, NGOs, and governments in a systematic surveillance and vaccination program. Today, Rinderpest is close to being completely eradicated, though possible circulation of the virus in the Somali eco-system is still a concern.<sup>56</sup> The cost-benefit ratio of the program is estimated to be in the range between 1.4 and 2.6.

Source: Anderson (2007).

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11.73 In the private philanthropic sector, the Rockefeller and Ford Foundations were among the first to support the agriculture-for-development agenda, beginning in Mexico in 1942 and then spearheading the creation of the international research centers of the CGIAR. The Gates Foundation has recently become one of the largest funders of the agriculture agenda, mainly in Sub-Saharan Africa. Private business networks like the Africa Business Roundtable have also started to promote investment in agriculture.

### *New challenges and opportunities*

11.74 In spite of past achievements, the emergence of new challenges in recent decades has left global organizations and mechanisms insufficiently prepared for the 21<sup>st</sup> century.

11.75 *Tackling coordination.* Pervasive coordination failures for global public goods—associated with different interests of countries, beliefs about regulatory standards, ineffective governance mechanisms, and incoherent or inconsistent international agreements—raise the transaction costs of global governance. Aggravating the coordination challenge is the emergence of new players and the highly interconnected global agenda.

11.76 Coordination failures also arise from lack of coordination at the national level across responsible ministries as discussed earlier in this chapter, producing conflicting international agreements and actions. At least four different types of agreements—trade and intellectual property rights, the environment, culture and traditional knowledge, and conservation—govern the use and exchange of genetic resources.<sup>57</sup> Overlapping and inconsistent agreements burden developing countries with already weak implementation capacity. The scope for such coordination failures has also increased with the proliferation of international agreements, many driven by other sectoral interests and developed without effective participation of agricultural stakeholders.

11.77 One reaction is the emergence of issue-specific global networks and partnerships of old and new actors. Pragmatic, flexible, and informal networks can often be mobilized quickly, as can new funding to allow the network to function. The Harvest Plus Program to reduce micronutrient malnutrition through biofortification includes four CGIAR centers and several universities. It has attracted about \$70 million in grants, including \$31 million from the new actors (the Gates Foundation) and in-kind contributions from

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<sup>56</sup> Mariner, Roeder, and Admassu (2002).

<sup>57</sup> Louwars, 2006. These are the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPs) under the WTO (trade and intellectual property rights), the Convention on Biodiversity (environment), the Intergovernmental Committee on Genetic Resources, Traditional Knowledge and Folklore under the World Intellectual Property Rights Organization (culture and traditional knowledge) and the International Treaty for Plant Genetic Resources (agriculture).

Monsanto and Syngenta, and mobilized partnerships in Brazil, China, and India. The Global Fund for Control of Highly Pathogenic Avian Influenza (HPAI) raised \$2.5 billion in two years (often by reallocating funds from other uses rather than raising “new money”).

11.78 The number of global partnerships has increased dramatically. While these networks may be highly effective in addressing specific issues, their proliferation has led to new coordination challenges. The main ones are holding down the transaction costs of coordinating many actors and sustaining funding within weak governance structures.<sup>58</sup> The networks compete not only with each other but also with country programs for the same funds.<sup>59</sup>

11.79 Global programs also require effective coordination with national programs to achieve desired impacts, but that coordination is often weak, partly because of lack of complementary national investments. For example, using the results of R&D requires a minimum investment at the national level to select, test, adapt, release, and extend technologies (chapter 7). And the weak voice of developing countries in the governance of global programs means that priorities do not always reflect needs on the ground.<sup>60</sup>

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#### **Box 11.8 Global institutions for agriculture—challenges and reform options**

**FAO:** *(Text will be included when currently ongoing FAO evaluation is publicly available)*

**IFAD:** The International Fund for Agricultural Development (IFAD), set up in 1977, was the first international financial institution with a specific mandate to improve food security and wellbeing in rural areas, especially for the poorest groups. By the mid 1990s, IFAD had evolved from a pure funding institution to a development bank with a broad range of functions. Its strategic objective had shifted from a narrow focus on agricultural production and food security to addressing broader challenges of rural development, including a range of activities to enhance access of the rural poor to productive and financial assets. Operational policy and strategy development have lagged behind the Fund’s broadened mandate, and the need for change has been recognized. IFAD is now at the crossroads between further broadening its mandate or reinventing its leadership as a niche institution focused on experimental approaches to reduce poverty in remote rural areas and to work with marginalized groups.

**CGIAR:** Despite the past success, funding and focus have become issues in maintaining the productivity of the CGIAR. There is a steady shift toward country specific, short run payoffs and development activities, increasingly determined by donor preferences, at the expense of strategic investments in international public goods with long-term payoffs. This is evident in the shift in donor funding from core funding for system priorities to funding restricted to particular projects and programs. In particular, there is major underinvestment in such long-term priorities as genetic resources, biotechnology, and plant breeding, calling for a reassessment of the CGIAR’s strategy in these areas. CGIAR centers also need to link to other major players such as global life science companies in biotechnology, new and influential actors such as the Gates Foundation, science and technology systems outside of agriculture including dynamic systems in Brazil, China, and India, and to a growing number of regional science and technology cooperation agreements and organizations. Meeting these coordination challenges without increasing already high transactions costs require innovative solutions, because the CGIAR is a loose network of donors and other stakeholders.

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<sup>58</sup> Lele and Gerrard (2003).

<sup>59</sup> World Bank (2004).

<sup>60</sup> Lele and Gerrard (2003).

Sources: International Fund for Agricultural Development (2005), World Bank (2003), see <http://www.sciencecouncil.cgiar.org>.

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11.1 *Reforming global governance.* The need to reform global institutions is widely recognized, and various reform options are being discussed, ranging from management and operational reforms to improve the efficiency of existing UN agencies to consolidating the many agencies into three—for development, humanitarian affairs, and the environment. But simply reforming some elements of the global governance system will not be enough.

11.2 Institutional innovations are needed for the global governance of agriculture—reforming from within and forming new flexible global networks that have the capacity to respond to opportunities and threats in agriculture. A lean and flexible global platform—with representation of key agriculture related actors—could facilitate task-specific and time-bound networks with clearly specified goals. The networks to be supported could still be largely demand-driven but some scope would be provided for supply-driven initiatives that are clearly in the global interest. Networks could deal with specific topics such as a global weather information system for agriculture to facilitate local adaptation to climate risks.

11.80 *Increasing financial commitments: the political economy of global (in) action.* While institutional reform is a precondition for meeting the new global agenda, realizing this agenda requires adequate financial resources. The incentives to finance the global agenda are determined by the political economy of global action, linked to national political interests and incentives. Coalitions that support the global agriculture-for-development agenda need to create political capital. And interests, values and policy beliefs matter. Where industrial countries have a strong self-interest, progress is obviously easier, as the case of Highly Pathogenic Avian Influenza shows.<sup>61</sup> The significant element of self-interest suggests that additional financing could be provided beyond normal development assistance channels by directly tapping the budgets of ministries of agriculture as well.

11.81 Where industrial countries have less self-interest, it has proved difficult to leverage adequate financial support. There is strong evidence that the global community is massively underinvesting in global public goods for food and agriculture.<sup>62</sup> Financing seems to be most difficult for issues that have long payoffs, such as science and technology, genetic resources, and climate change. For example, the estimated costs of adapting to climate change in developing countries—tens of billions of dollars—far exceed the resources available. Contributions to support adaptation are projected at only around \$150-\$300 million a year.<sup>63</sup>

11.82 Adequate funding of the global agenda is a question of global equity and justice. The most challenging elements of that agenda—such as establishing fair trade rules and

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<sup>61</sup> Winters-Nelson and Rich (2006).

<sup>62</sup> Lele and Gerrard (2003), Reitzer and Kelly, 2007.

<sup>63</sup> Stern (2006).

supporting poverty reduction—will not be tackled without recognizing development as a matter of rights rather than self-interest. The recent upward trend in donor support to agriculture shows that it can be done (box 11.9).

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**Box 11.9 Renewed donor support for agriculture**

Since 2001 government and donor interest in agriculture has turned around, at least in discourse, and modestly in financial support—for several reasons. First, rapidly expanding domestic and international markets in high value products, regional markets for staple foods, and biofuels create new sources of demand for agriculture. Second, OECD farm policies are becoming somewhat less distortionary, though there is still a long way to go in reform (chapter 4), and many international commodity prices have stopped declining. Third, debt crises and meeting the conditions for debt relief are largely over, with donor strategies becoming more balanced again between aiding the social and productive sectors. Fourth, developing country governments are more explicitly recognizing the importance of agriculture for growth (Africa) and poverty reduction (China, India), as seen in their policy declarations and more recently in their budget allocations to agriculture. Fifth, new approaches to agricultural and rural development projects have been introduced, based on decentralization and participation and public-private partnerships. Sixth, opportunities are being recognized to enlist agriculture as a provider of environmental services.

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11.83 *Progress in setting standards and rules.* Well defined and transparent rules and standards governing cross-border movements of products are especially important in agriculture, given concerns about food safety and the spread of pests and diseases. While much of the discussion centers on south-north trade, these are major issues in south-south trade as well, especially in regions where small countries predominate and regional trade is central to expanding markets. Countries clearly have different values and risks associated with food products, leading to asymmetries of interest in setting rules and standards. Yet the potentially very large payoffs require little long-term financing; funding to support good analytical work to understand the benefits, costs, and risks is probably the most important.<sup>64</sup>

11.84 *Enhancing leadership and capacity of developing countries.* Some technically complex agreements, such as the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPs), were developed with little participation by developing countries, despite the far-reaching implications to them. The negotiating and technical capacity of developing countries needs to be strengthened to address such complex issues. For example, from 2001 to 2004, WTO increased its support to developing countries for trade policy and regulation from \$2.5 million to \$18.9 million. This program helps countries negotiate, reform, and prepare for closer integration in the multilateral trading system. More participation of developing countries in financing global public goods can also increase their participation in governance and ownership. The CGIAR now has 25 members from developing countries, contributing around 13 percent of the annual budget.<sup>65</sup>

11.85 *More analytical work and advocacy.* Better data and scientific certainty on the costs of failing to supply particular global public goods—combined with more vigorous advocacy—can help to create political capital for the global agenda (figure 1.8). In view

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<sup>64</sup> Unnevehr (2004).

<sup>65</sup> Consultative Group on International Agricultural Research (CGIAR) (2004).

of information asymmetries, analytical work is important to inform actors about the benefits and costs of global action—or lack of action.<sup>66</sup> Nonstate actors and the media are now powerful advocates highlighting policies in industrial countries that harm developing countries. An example is the pressure for agricultural trade reform led by Oxfam, an international NGO that is having some impact, as with the EU sugar agreement (chapter 4). Better information and advocacy can also reduce the rate for discounting the future costs of climate change, by giving a stronger preference to not completely certain but potentially devastating future damages. These actions can reinforce altruism and harness support of developed countries for global public goods, even if they benefit mainly the poor countries.

### **Conclusion**

11.86 Governance problems are a major reason why key recommendations of the 1982 World Development Report on agriculture were never successfully implemented. Two types of governance problems hamper the agriculture-for-development agenda: (i) political economy problems that lead to underinvestment and misinvestment in this sector; (ii) and state capacity problems that cause failures in implementing the agricultural policies, especially in agriculture-based countries. These governance problems foster negative policy beliefs about the potential of agriculture and reduce the political commitment to use it for development. Thus, governance problems are at the core of a vicious cycle.

11.87 The prospects to solve the governance problems affecting agriculture are much brighter today than they were in 1982. Improving governance has taken center stage on the development agenda. Democratization and the rise of participatory policymaking have fundamentally increased the possibilities of smallholder farmers to exercise political voice. Public sector reforms and decentralization holds great potential for making government more effective and accountable to rural people, and to adjust policies to agriculture's complex nature. An emerging consensus about the complementary roles of the state, the private sector and civil society promises to overcome market failure, state failure as well as community failure.

11.88 Yet we cannot take it for granted that these opportunities will be used to create a virtuous cycle of good governance for agriculture. Smallholders can only use the new political spaces created by decentralization to exercise political voice, if they are able to overcome collective action problems and form effective organizations that represent the rural poor. Sound agricultural development strategies require capacity in policy analysis and evaluation, and a commitment to evidence-based policy-making. Finding innovative options for coordinating the agriculture-for-development agenda across different sectors remains one of major challenges to be resolved.

11.89 Considering the diverse nature of agriculture, the appropriateness of different demand-side and supply-side approaches to improve governance depends on country-specific conditions, implying a need to move from best practice to best fit. Clearly, more

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<sup>66</sup> Unnevehr (2004).

evidence is needed to find out what works, where, and why, to improve governance for agriculture, and to overcome ideological debates on this question.

11.90 Finally, the agriculture-for-development agenda cannot be realized without international action to meet the challenges of the 21<sup>th</sup> century. Institutional reforms that promote efficiency, coordination across sectors and actors, and the ability to respond quickly are required to meet today's challenges. Realizing the global agenda requires commitment, vision, and leadership. It is ultimately a matter of equity and justice between North and South, and between present and future generations.

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