GLOBAL CHAPTER 8 GRAPHICS

Fig. 8.1 Generalized schematic sequence of land-cover changes from before human settlement to the human domination of the landscape. (DeFries, R. S., et al., 2004)

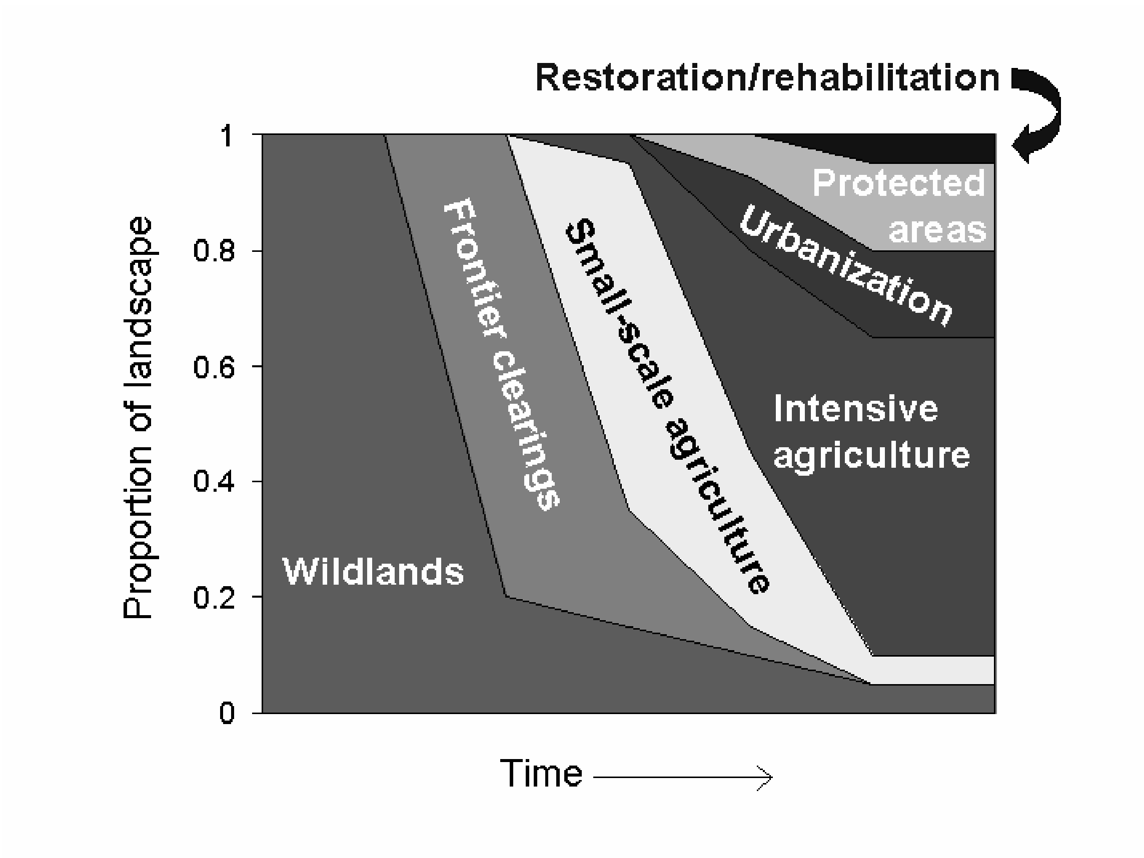


Figure 8.2. Market concentration offers fewer opportunities for small scale farmers

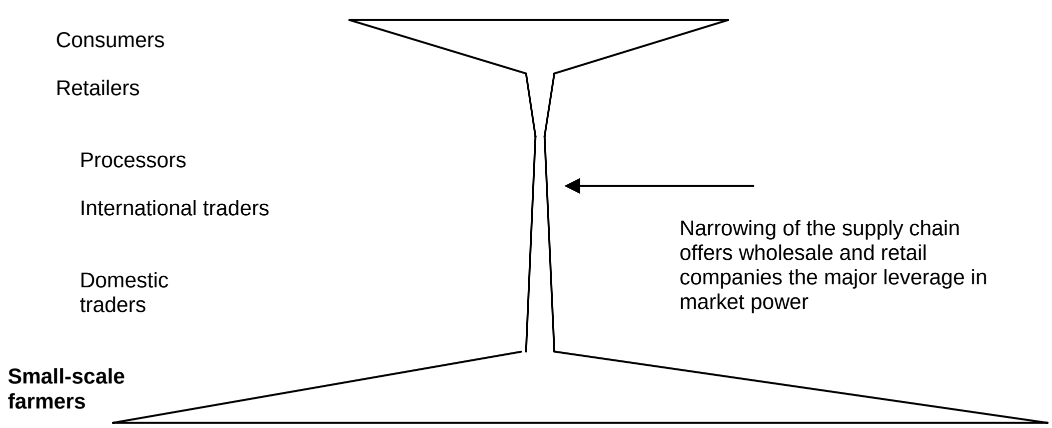


Figure 8.3. Long term trends of non oil commodity prices. Source. Grilli and Lang 2003

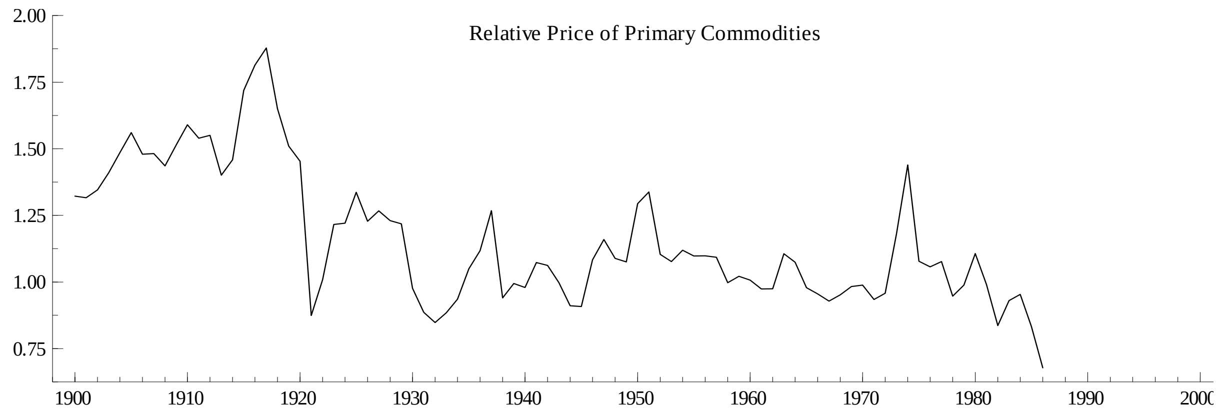


Figure 8.4. Price changes (%) of key commodities between 1980 and 2000. Source Robbins, 2000.

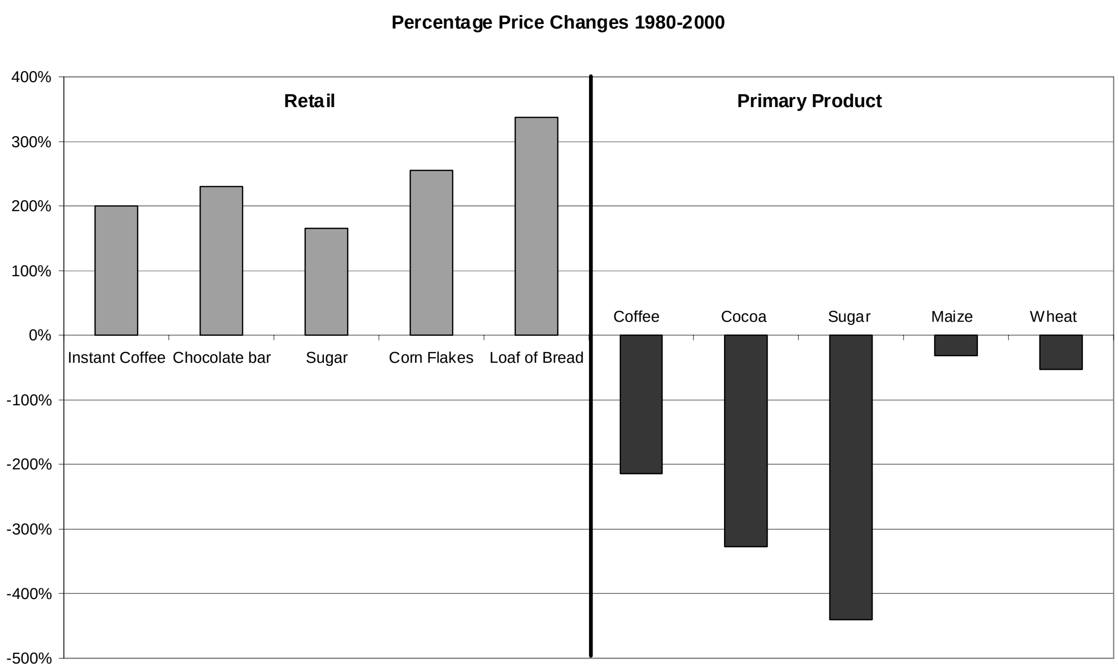


Figure 8.5. Principle classification of infectious animal disease panorama.

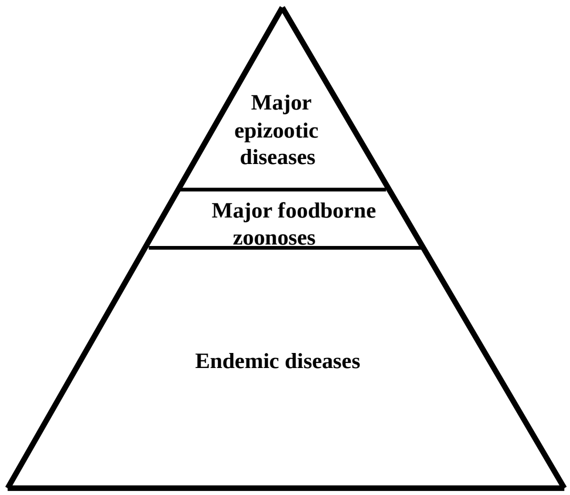


Figure 8.6. Innovation as a function of institutional and technical change

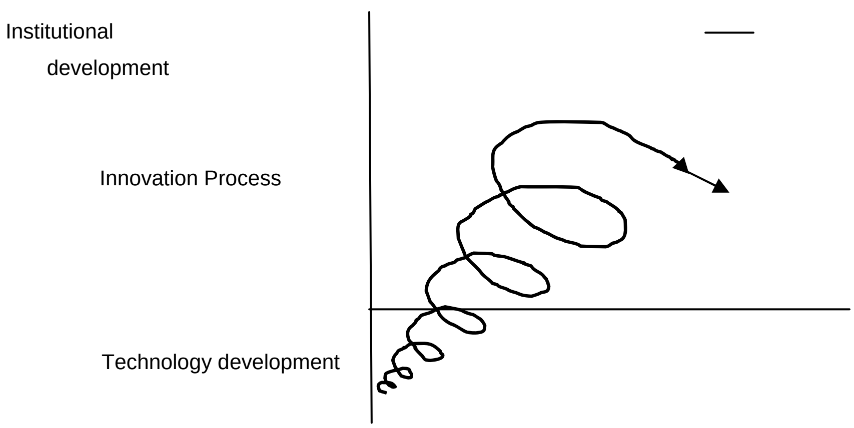
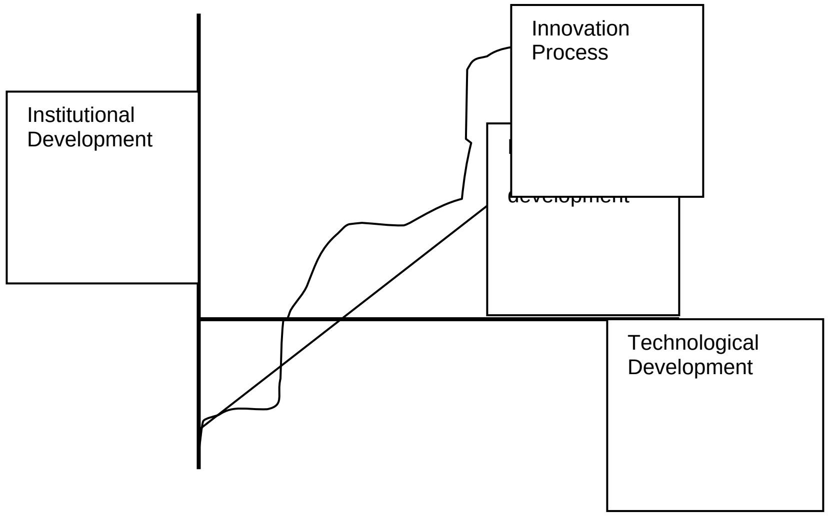


Figure 8.7 Innovation as a function of technology, market and institutions



Box 8.1. International conventions, regimes or instruments with potential to address negative impacts of agriculture

Water: Ramsar Convention on Wetlands, UN Convention on the Law of the Sea, World Water Forum, Boundary Waters Treaty and International Joint Commission

Land: UN Convention to Combat Desertification (UNCCD)

Forests: UN Forum on Forests, International Tropical Timber Agreement

Atmosphere: UN Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol, Vienna Convention for the Protection of the Ozone Layer and Montreal Protocol on Substances that Deplete the Ozone Layer

Biodiversity: Convention on Biological Diversity (CBD) and Cartagena Protocol on Biosafety

Energy: UNFCCC

Box 8.2. Mechanisms and measures for increasing carbon sinks and reducing carbon dioxide and other GHG emissions in agricultural systems

Mechanism A. Increase carbon sinks in soil organic matter and above-ground biomass

- Replace inversion ploughing with conservation-tillage and zero-tillage systems
- Adopt mixed rotations with cover crops and green manures to increase biomass additions to soil
- Adopt agroforestry in cropping systems to increase above-ground standing biomass
- Minimize summer fallows and periods with no ground cover to maintain soil-organic-matter stocks
- Use soil conservation measures to avoid soil erosion and loss of soil organic matter
- Improve pasture/rangelands through grazing, vegetation and fire management both to reduce degradation and increase soil organic matter
- Cultivate perennial grasses (60—80% of biomass below ground) rather then annuals (20% below ground)
- Restore and protect agricultural wetlands
- Convert marginal agricultural land to woodlands to increase standing biomass of carbon

Mechanism B. Reduce direct and indirect energy use to avoid GHG emissions (carbon dioxide, methane and nitrous oxide)

- Conserve fuel and reduce machinery use to avoid fossil-fuel consumption
- Adopt grass-based grazing systems to reduce methane emissions from ruminant livestock
- Use composting to reduce manure methane emissions
- Substitute biofuel for fossil-fuel consumption
- Reduce the use of inorganic N fertilizers (as manufacture is highly energy intensive), and adopt targeted- and slow-release fertilizers
- Use integrated pest management to reduce pesticide use (avoid indirect energy consumption)

Mechanism C. Increase biomass-based renewable-energy production to avoid carbon emissions

- Cultivate annual crops for biofuel production, such as ethanol from maize and sugar cane
- Cultivate annual and perennial crops, such as grasses and coppiced trees, for combustion and electricity generation, with crops replanted each cycle for continued energy production for combustion and electricity generation, with crops replanted each cycle
- Use biogas digesters to produce methane, so substituting for fossil-fuel sources
- Use improved cooking stoves to increase efficiency of biomass fuels

Source: (Pretty et al. 2002)

Box 8.3. Some examples of the dominant policy model in action

1. A senior official in the National Council for Agricultural Research in an African country used the following logic during an interview in August 2006: ‘Our farmers get one ton of maize per hectare. In our research stations we get seven. The challenge therefore is to transfer technology’.

2. The Economist of Sept.16-22, 2006:90 reported that the Melinda and Bob Gates and Rockefeller Foundations have provided $150 million over five years to train scientists, and to breed and distribute new seed varieties that are ‘suited to sub-Saharan Africa’s parched climate, denuded soils, and stubborn pests’. Technologies are assumed to increase productivity at the farm level and allow farmers to sell more and to increase their incomes. As The Economist pointed out, such outcomes depend on the nature of the market and cannot be assumed.

3. Bindraban and Rabbinge (2005) write: ‘In combination with close and remote sensing, geographical information systems and robots, the progressive precision in agriculture increases the efficiency and productivity of mono-crop cultivation. In an increasingly liberalized world, this far-reaching specialization, accompanied by increases in scale, would appear to be the only economically feasible development trajectory. The environmental impact of this system is low per unit of produce and, as such, environment-friendly. (At the time of writing, the second author had just been appointed as Chairman of the Science Council of the CG.)

4. NERICA, WARDA’s New Rice for Africa was honored with the World Food Prize in 2002. It was hailed as a break-through by international research that would help poverty reduction in Africa. The real story is that farmers in Sierra Leone discovered hybrids of African rice (Riza glabberima) and Asian rice (Riza sativa) in their fields. Such hybridization had been considered impossible by science and was not a subject of research. A Sierra Leonean researcher, the late Dr Malcolm Jusu (1999), recognized what had happened and submitted a proposal for further research into the matter. This allowed WARDA to further develop the technology and be rewarded with the prize, in line with the dominant policy model (pers. com. Paul Richards, October 2004).

5. African agriculture is called ‘stagnant’ because increase in productivity per hectare has not taken off (e.g., IAC 2004). This perception ignores the fact that African farmers have more or less kept up food production with the rapid population growth in the past decennia. They have done this in the virtual absence of the use of fertilizers, the relentless revenue seeking by local and national governments and other rent seekers, major wars and epidemics, and the competition from countries which have benefited from 60 years of treadmill policies that have made their agricultures very efficient. Most observers agree that African farmers are highly innovative. Says Hounkonnou (2001): ‘These rural dynamics provide the one glimmer of hope in an otherwise dismal landscape’.

Box 8.4. Köytür supplies 40% of the broilers consumed in Turkey (Unver 2005)

The late Dr Altan Unver had a dream. Even as a student he experimented with it in Tarsus: small farmers produce broilers for the urban market through a corporation (farmer owned) that provides inputs and extension, as well as processing, packaging and marketing. ‘Development should pay’ was his favorite saying. When he had become a successful businessman and director of the Development Foundation of Turkey (DFT), he captured the opportunity of an impending World Bank loan for Livestock Development that was to go to two huge companies that were already producing broilers for the rapidly growing Turkish market. Unver was able to persuade the Government to allow DFT to manage the loan. Over 20 years, DFT made a huge effort to develop 1200 small farmers into successful broiler producers. Per 100 out-growers, one small centre ensures a supply of day-old chicks, vaccines, ration ingredients, and management support. It also collects the broilers when they are ready for market, slaughters them, processes and packages them. A central organization, *Köytür,* markets the birds through outlets in major towns. *Köytür* now supplies 40% of the broilers sold in the country.

Box 8.5. The Kenya Government's SRDP project in Tetu

In 1970-73, the Special Rural Development Programme of the then Kenya Government featured a scientific field experiment in Tetu Division, Central Province that was based on the following rationale (Ascroft et al., 1973; Röling et al., 1976; Röling, 1988, esp. chap 6).

1. The approach followed was a not-for-profit marketing strategy (Kotler and Andreasen 2003). That is, the project developed an offering based on careful market research and on segmentation (using natural cut-off points of key population parameters, in this case number of innovations adopted by a farmer) and choice of a specific target segment (in this case, 'laggards' or 'forgotten farmers' who tend to fall off the treadmill). Thus the study deliberately turned around the rationale of the technology supply push model in that it did not target the 'progressive' contact farmers who tend to capture the windfall profits, but the usual victims of technology push. In that sense, the experiment was 'pro-poor'.
2. A hybrid maize package for one quarter acre included hybrid seed (requiring re-packaging of the usual bags in which it was sold), 50 kg of compound fertilizers, some pesticides, credit-in-kind (made possible through a special deal with the Kenya Agricultural Finance Corporation), and a two-and-a-half day course for farmers who fitted the target segment at Wambugu Farmer Training Centre in Nyeri (as a condition for receiving the credit).
3. The entire experiment was carefully evaluated and recorded. The package was taken up by more than 90% of the participants and the loan repaid by 86%. These figures astounded the skeptics who believed that 'laggardness' is an inherent inferiority. In this sense, the field experiment demonstrated the power of a package approach in terms of generating pro-poor agricultural innovation.
4. The experiment was not replicated (scaled up) by government. The credit system was too cumbersome and ensuring repayment was labor-intensive (maize does not allow supervised credit). The provision of the inputs was not possible for a normal government department. The intensive course at Wambugu could not be maintained after the input of university staff was withdrawn.

Box 8.6:.Small-scale dairy producers and Nestlé in Southern Chile (Berdegué 2001)

The process begins with the company collecting milk from a central collection point. All farmers can bring their small cans of milk and be certain that it will be purchased. Once that system is in place, the company requires farmers to store their milk in a cooled communal tank. Then acceptance of the farmers' milk is made dependent on the quality of the milk (bacterial count) and farmer groups are assisted in sampling the milk of their members to find out who cause the higher counts. Eventually, the company does away with the collection points altogether and requires individual farmers to have their own cooling tanks. The factory only collects the milk a few times a week, considerably reducing its costs.

Box 8.7. Convergence of Sciences (CoS) Programme in Ghana and Benin (Hounkonnou, et al 2006)

To ensure that the research problems chosen related to the needs and opportunities of resource poor farmers, CoS pioneered a new pathway for science that used technography, diagnostic studies, and with-farmer participatory research. A key component was *ex-ante* impact assessment and pre-analytical choice to optimize sensitivity to context and avoid *cul-de-sac* path dependencies. Technography (Richards 2001) was used to map the coalitions of actors, processes, client groups, framework conditions and contextual factors at a macro level, so as to identify realistic opportunities that could be mobilized through innovation. Given small windows of opportunity, technography identifies space for change. Diagnostic studies (Röling et al. 2004; Nederlof et al. 2004) ensured that research outcomes would be realistic in the local context and address needs of resource-poor farmers. In addition to being technically sound, pro-poor research outcomes need to work in the local context, be appropriate to prevailing land tenure, labor availability, and gender, and take into account farmers' opportunities, livelihood strategies, cultural inclinations, etc. The diagnostic studies identified and established forums of stakeholders for learning from a concrete experimental activity, and gave farmers a determinant say in the design of field experiments.

CoS conducted eight two-year experiments with small farmers in Benin and Ghana on themes such as cotton, cocoa, soil fertility and weed management, crop agrobiodiversity and integrated pest management (IPM). The studies showed that participatory low external input *technology* development within carefully identified windows of opportunity can be beneficial. However, the studies soon ran into the limitations of this approach and included experiments with creating space for change through *institutional* innovation. Saïdou (2007), for example, found that soil fertility improvement depends on land tenure. He negotiated land use rules between migrant farmers and landowners and their formal written agreements allowed improved soil management practices. An example from Ghana is an organization to procure Neem seeds from the North to allow reduced use of synthetic pesticides in cocoa (Dormon et al. 2007). This in turn stimulated arrangements for processing Neem seeds because the use of maize mills is unacceptable due to the bitter taste of Neem.

CoS showed that the bottleneck in West African agriculture is not so much innovativeness and productivity at the farm level, *within* the existing very small windows of opportunity. The challenge is to *stretch* those windows through access to markets, better prices, the development of services, the removal of corrupt and extractive practices, and the breaking up of patrimonial networks. Of particular importance is to create access for West African farmers to West African urban food (super) markets. When given the right conditions, local farmers have demonstrated time and again that they can considerably expand production without major technical change. Technology becomes important once conditions begin to improve.

Box 8.8: Asal Bapak Senang

When Java's rice fields were being devastated by the pesticide-induced resurgence and destruction of the natural enemies of the Brown Planthopper (which led to the development of Farmer Field Schools, Box 8.7.8), it took considerable time for the government to react, even though rice food security was a politically very sensitive issue. The problem was a principle called '*asal bapak senang'*. *Bapak* means father and *senang* means happy. So the principle is: as long as father is happy. This principle means that you do not want to upset your boss with negative information. So at each level in the hierarchy, civil servants were reluctant to pass up the bad news about the devastation of the *sawas*. By the time the information got to President Suharto, there was no serious issue to worry about. It is only when the people from his own village came to him to ask for help did he hear that anything was seriously amiss.

Box 8.9. Velugu (Dhamankar, et al. In press)

Velugu is a Government of Andhra Pradesh project funded by the World Bank and implemented by the Society for Elimination of Rural Poverty (SERP). SERP was established as an autonomous body of the State Government of AP in an attempt to provide a special institutional environment to develop micro-credit based models of livelihood promotion and poverty alleviation. Velugu works through self-help groups and village and mandal-level apex institutions of rural women from the poorest of poor families. The project has partnered with multiple entities both GO and NGO in the process of promoting livestock-based livelihoods for rural poor people.

Box 8.10 Farmer field schools

The invention of the Farmer Field School (FFS) by the Indonesian FAO team that introduced IPM in rice after the emergence of the Brown Planthopper (*Box 8.7.6*) was an enormous breakthrough, given the prevalence of the TandV system of extension at the time (Pontius et al. 2000). The FFS turned the linear model upside down: instead of ultimate users, farmers became experts; technology transfer was replaced by experiential learning; and instead of teaching content up front, the agent stayed in the back and facilitated the process. Evaluations of FFS programs (Van de Fliert 1993; Van den Berg 2003) show that FFS participants increase their productivity, reduce pesticide use, lower costs, and show remarkable signs of empowerment, in terms of speaking in public, organizational skills, and self-confidence. The effect is so remarkable that the most effective ways to convince politicians and senior civil servants of FFS impact is to expose them to an FFS in action. Such visitors quickly grasp what the FFS can do in terms of enlisting the elusive small-scale farmer in the national project.

However, it is one thing to implement an effective FFS pilot, quite another to scale it up to the national level. A certain set of practices determine FFS quality. Erosion of these practices soon leads to loss of fidelity and loss of the remarkable effects. Vulnerable are the curriculum (e.g., use of a field as the main tool for teaching), process facilitation (e.g., avoiding reverting to technology supply push or promoting government agendas), training facilitators in non-directive methods, timeliness (i.e., coinciding with the growing season), financing (e.g., utilizing public funds for snacks for farmers), etc. The FFS does not fit a bureaucratic, centralized, top-down government system. Furthermore, the FFS is a form of farmer education rather than a form of extension , that is not ‘fiscally sustainable’ in the short term (Feder et al., 2004). FFS programs are vulnerable to corruption by the pesticide industry (e.g., Sherwood, 2005).

Table 8.1. The money trail (September, 2002)

In Kintuntu, a small village in Uganda a farmer sells 1 kg of coffee beans for 10-14 cents to a trader.
The trader will mill the product and sell it onto an exporter for 20-26 cents / kg
The exporter sells FOB at Mombasa port for 40-45 cents / kg
CIF prices for coffee in Felixstowe 52 cents / kg
Transport to factory in UK, for example takes price to 63 cents / kg
Processing losses --- product price increases to $1.64 / kg
Supermarket price for product is $26.40
Price of a cup of coffee in a coffee shop in UK is $3.50
Price differential between farm gate and shoppers trolley is an increase of 20,000 percent, increasing to more than 30,000 if drinking a retail cup of coffee
The global figures show that coffee producing nations produce about $5.5 Bn in a market worth $77Bn.

Independent 18th Sept, 2002.

Table 8.2. Actual production and estimated losses for eight crops during 1988-90, by pest and region

		Losses due to			
Region	Actual production	Pathogens	Insects	Weeds	Total
	US$ in billion				
Africa	13.3	4.1	4.4	4.3	12.8
North America	50.5	7.1	7.5	8.4	22.9
Latin America	30.7	7.1	7.6	7.0	21.7
Asia	162.9	43.8	57.6	43.8	145.2
Europe	42.6	5.8	6.1	4.9	16.8
Former Soviet Union	31.9	8.2	7.0	6.7	22.1
Oceania	3.3	0.8	0.6	0.5	1.9
Source: Oerke et al. 1994					

Table 8.3. Three dimensions of human coordination in various discourses

Discourses	Use instruments of power	Assume rational choice	Rely on emergence from interaction
Forms of rationality (Habermas 1984)	Instrumental	Strategic	Communicative
Basis for behavior change (Kelman 1969)	Compliance	Identification	Internalization
Ways of arranging human affairs (Hood 1998)	Hierarchy	Individualism	Egalitarianism
Coordination mechanisms (Powell 1994)	Hierarchy	Market	Network
Causes of wealth of nations (Bowles and Gintis 2002)	Resources (e.g., natural resources), State power	Invisible hand of market forces	Social capital, Trust, Community
Innovation model (Röling 2006)	End of pipe outcome of technology transfer and diffusion	Induced innovation (Ruttan 2007), Outcome of the treadmill (Cochrane 1958)	Emergent property of multi-stakeholder interaction (e.g., innovation systems)

Table 8.4. Coordination mechanisms

Properties	*Hierarchy*	*Market*	*Network*
Dynamics	Causation	Rational choice, Invisible hand	Exchange of meaning, Sense making, Interdependence
Mechanism behind effect	Power, Legitimation, Technology	Utility functions; Satisfying preferences	Social learning, Cooperation, Negotiated agreement, Reciprocity
Origin of welfare	Access to resources, Power, Technology	Autonomous market forces	Social capital, Community, Concerted action
Purpose	Control	Win, Gain advantage	Equity, Resolve resource dilemmas
Intervention levers	Regulation, Coercion Engineering	Laissez faire, Fiscal policy, Deregulation	Process facilitation