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LAC CHAPTER 5

PUBLIC POLICIES IN SUPPORT OF AKST

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Key messages

A policy of food sovereignty that covers the gamut from food supply to the development of skills and capacities. Food is the primary expenditure item for the poor, yet the best option is to take policy measures that go beyond mere subsistence and will bring about changes in the standard of living of the poor. It would be best to target policies at improving access to productive resources (land ownership, water, biodiversity) with a gender focus, so as not to limit women's access to credit and other support.

Strengthening local cultures and know-how in rural communities. An important consideration is to back the efforts of small farmers, particularly indigenous ones, to restore their farming methods as part of their systems for managing their natural resources. Financing should be directed at facilitating the transition to sustainable production systems.

The policy agenda for supporting AKST on the basis of effective participation mechanisms would lead to a new focus for government management based on cooperative networks. In fact, the relationship between government and society would be enriched by uniting stakeholders with different capacities, experience and expectations to collaborate in networks to achieve collective benefits on the basis of selective interests.

The transit to sustainability in agriculture is visualized in three stages, according to the state in which each of the productive systems finds itself: reduction of inputs; levels of diversification; and agro-ecological systems. Conventional systems can evolve towards more sustainable systems. Peasant/indigenous agriculture does not necessarily involve agro-ecological practices, and it would be well to improve its integral management of available resources and its productive competitiveness in the field. Generally, the conditions for transition are: diversified, stable and efficient output; contribution to food self-sufficiency for the family and the domestic market; use of agro-ecological practices for efficient exploitation of the natural

resources of the productive system; development of capacities based on recognizing and using local knowledge and proven technological innovations.

The best option for guaranteeing collective rights over genetic resources is to facilitate channels for participation among the social stakeholders involved. From the viewpoint of genetic resources located on the lands of various ethnic groups, there is concern that they will be plundered for making pharmaceutical or other products that can be patented. Communities fear that they will be excluded from the benefits, which are likely to remain in the hands of governments and users. It is important to democratize, decentralize, and foster participation in decision-making.

The failure to choose a policy that prevents the use of food crops for purposes other than food could threaten food safety and security and biodiversity. With modern biotechnology, food crops can be used to make drugs, biofuels and plastics. The risks are that products not produced for food will enter the food chain, plus the environmental impacts on biodiversity, which are particularly severe in centers of origin of crops.

Building capacities and developing human capital through education policies. The lack of equal education opportunities perpetuates poverty, and women are most vulnerable. It is essential to promote education, from literacy all the way to specialization focused on sustainable development, with financing policies that will strengthen the capacities of rural people and vulnerable groups so as to improve production and competitiveness and/or promote rural employment.

The availability of financial services is an essential factor of support for activating the AKST system to meet the IAASTD goals. In LAC as a whole and in individual countries, investment in AKST systems is low, and this trend needs to be reversed by strengthening investment in various components of the system, in order to sustain its dynamics and to reduce AKST dependency on technological innovations from outside the region. This increased investment should take place not only at the national level but also at the subregional and regional levels in order to capitalize on experience and minimize duplication in R&D.

Differentiated financing policies for the extremely poor and the creditworthy poor. One viable solution to this should be to recognize the differences by creating comprehensive financing services for the extremely poor and for the creditworthy poor. The first group are unable to borrow, and they require specific solutions along the lines of the Grameen Bank in Bangladesh. The second group, on the other hand, can access financial services under certain assumptions, primarily the resolution of property rights, education, management capacities, etc.

Financial support programs for communities to make the transition to a sustainable production system. One very important aspect to consider in financing policies for supporting

AKST systems is the fact that in many parts of LAC communities start from very backward conditions marked by the immediate demands of subsistence and they have few resources of their own. Consequently, it is virtually impossible for them, by themselves, to meet the challenge of moving from their current condition towards a productive system that is sustainable in both economic and environmental terms. This challenge must be addressed through financial support so that the transition can be made in an orderly and progressive manner.

Social spending geared to growth in GDP. Social policies targeted at the rural population should be based on the assumption that social spending in general (and in particular that for promoting AKST) will grow in real terms by at least the same proportion as the increase in GDP, although it would be desirable for it to grow more than proportionally, since LAC faces the challenge of overcoming the severe shortages and needs of rural people and vulnerable groups.

5.1. Introduction

This chapter recommends policy options for supporting AKST in relation to food sovereignty, development and culture; strengthening institutions and developing the legal framework; sustainable management of productive systems and financing, which will contribute to reducing hunger and poverty in Latin America and the Caribbean (LAC), in light of the goals set by the IAASTD. The AKST assessment in LAC has identified a number of economic, social and environmental limitations in the management of agricultural production systems, and a series of support policy measures must be designed and implemented to promote conversion of current agricultural systems to ones that will guarantee sustainability.

To achieve this purpose, we must address the critical points that are hampering system change, relating to capacity development, research and the supply of technology. Currently one of the barriers to achieving competitiveness in Latin America is the limited capacity of those who manage productive units, and policies are needed to address this through rural schools, technology institutes and advanced training centers, with a new curriculum focused on the IAASTD goals.

Similarly, while this is not the purpose of this chapter, we must note that the conversion process will only be possible if research policies are at the same time oriented toward technological innovation based on biodiversity. This resource is an important source for identifying new technologies and alternative inputs, but policies of encouragement and protection are needed so that the various stakeholders will become involved and develop competitive technologies. Experience with productive development projects shows that training and research alone are not enough to achieve sustainable development. The results of those efforts to develop capacities and research must be linked to the market for technologies. The market for technologies and

inputs has historically been controlled by the big agrochemical and seed companies, and there have been no alternative companies present on the market offering clean technologies, which means that policies are needed to encourage small and medium-sized firms to enter the market under better conditions of competitiveness.

The process of converting agricultural systems can also be accelerated if there is an increasingly strong market for safe, high-quality products. This trend is already apparent and is forcing producers to speed up the conversion of their systems. Similarly, public policies can facilitate the process with laws to encourage change, to which must be added a policy for financing and strengthening the institutions involved in facilitating productive development in the countryside.

The table in Figure 1 summarizes AKST support policies and their interactions for moving forward in the transition to sustainable production.

Insert Figure 1

It is useful to note in this introduction, by way of reference, the importance of the framework imposed by multilateral agencies and the general policy guidelines covered by international treaties. Examples are the problems flowing from the stalemate in negotiations on the agriculture chapter in the World Trade Organization, and the outcome of free trade treaties, which have exposed broad segments of agricultural producers to unfair competition without any compensation programs.

As a result of these policy measures, spending on agriculture has declined as a proportion of public expenditure. This model reveals two serious conceptual errors: first, the reduced role of the state, and second, downplaying the role of agriculture and creating jobs in other sectors without understanding that rural people have few options apart from agriculture, and international market distortions are ignored. Budget cuts are reflected in three indicators: (i) reduced investment in research, extension services and education; (ii) few resources for institutional modernization; and (iii) little investment in human resources (Trejos et al., 2004).

Finally, in this introductory overview, it must be noted that this set of policies should ensure that social spending in general (and in particular that for promoting AKST) should grow in real terms (Gonzalez and Avila, 2005), or at least by the same proportion as GDP, although it would be desirable for it to grow more than proportionally, since LAC faces the challenge of overcoming the severe shortages and needs of rural people and vulnerable groups.

5.2. Policies for food sovereignty, development and culture

5.2.1. Food security

An initial issue for AKST support policies is that the rural people targeted by the entire strategy should have a reasonable level of security in their access to basic requirements, particularly food. In LAC this issue is generally addressed through social policies, particularly those relating to food security. There has been much debate on this issue. These social policies in Latin America have been implemented, on one hand, with private, individualistic and unequal models driven by the market, and on the other hand by public, social and egalitarian models for correcting markets (Huber, 1996). These two approaches are reflected in the food policy measures taken to reduce hunger and poverty. The interpretation of poverty as subsistence refers to the fact that income is inadequate to cover basic minimum needs for maintaining physical efficiency. This argument was followed by the work of nutritionists to establish the so-called "poverty line". A family is considered poor if its income falls below this line. This approach has persisted since the postwar period and has been widely applied by international agencies, and is still the criterion for measuring poverty in the United States (Townsend, 1993; FAO, 2006).

Because expenditure on food is the most important component of subsistence incomes, policies designed from this approach sought mechanisms to provide food at low cost, either by purchasing it on the world market or by increasing agricultural productivity (Torres, 2003). The first strategy resulted in welfare programs for the poor, such as food stamps, school allowances, and subsidies targeted at specific products. These measures may succeed in reducing hunger and poverty in the short term, but they tend to be temporary because making them permanent implies a high cost, or else the lack of funds makes their progress reversible (Kay, 2006). In fact, social spending in the region has been repeatedly cut, and in addition, bolstering the food supply with purchases from abroad can undermine financing capacity if there is instability in the prices of agricultural products (Hall, 1998). Another drawback is that it favors patronage and corruption.

The second strategy for enhancing agricultural productivity focused on sectors with productive potential, through the intensive use of inputs, which compromised sustainable development, and because it depended on returns from investment it did not guarantee attention to the needs of the poor. This output-maximizing focus is related to the notion that raising incomes is the way to resolve the problem of hunger and poverty, i.e. to focus on increasing the national wealth as the way to resolve the problem (Townsend, 1993).

One extension of the concept of subsistence is that of basic needs, which addresses the minimum requirements of private consumption, but also includes essential services provided by the community (drinking water, transportation, education etc.). The problem with this approach lies in establishing the criteria for determining the elements that should be included. Through differences of constitution and location, people require different quantities of basic goods in order

to satisfy the same needs, and so there is debate over our ability to determine basic human needs that are common to members of different cultures, and even to individuals within the same society.

The problem with this approach is that it does not make explicit the fundamental difference between needs and satisfiers. What changes, across time and across cultures, is the way or means by which the needs are satisfied (Max-Neef, 1993).

As noted in Chapter 1, the FAO, the World Bank, USDA, USAID and IFPRI have defined food security and formulated policies according to a basic food basket.

The social policy of food security relies on the notion of subsistence and/or basic needs, but for Sen the key components of living standards and poverty are not goods, nor their characteristics, but rather the ability to do various things using those goods or their characteristics. Consequently, food security policy should start by considering the capacity of individuals and communities to function (Zen and Foster, 1997). For example, the supply of food does not reflect the individual's condition, i.e. his level of nutrition, or his level of utility, or the pleasure or the desire satisfied from consuming food. We must distinguish what the good does for the person from what the person does with the good (Cohen, 1993).

The relationship between income and capacities will be affected by people's age, by their gender, and by their social functions; by their location; by the epidemiological setting and other kinds of variations over which a person has limited or no control (Sen and Foster, 1997). In rural areas of LAC a high proportion of people are elderly or women, and the men capable of working have migrated. Policies focused on increasing productivity for raising incomes among the poor will not necessarily achieve the goal of food security, if they are not accompanied by pricing policy and adequate marketing channels for the output of family farms.

The concept of poverty as subsistence has been sharply criticized, because people are not only organisms that need to renew their energy sources, but social beings who must play various roles in society. Moreover, it is not easy to determine basic food needs, since food is socialized in all societies (Townsend, 1993). Consequently, policy in this area must consider the risk of opting for one food basket alone - that the impact on reducing hunger and poverty will be short-term or fleeting - in addition to the need to have the necessary resources to sustain programs of this kind.

5.2.2. Food sovereignty

To combat poverty we must enhance the capacities of individuals and not merely distribute goods (Sen and Foster, 1997). Beyond competition between people with different capacities there are many other factors that govern the circulation and appropriation of social wealth, such as power relationships and cultural traditions (Reygadas, 2002). The concept of food sovereignty points in this direction.

Food sovereignty combines a series of policies that go well beyond food production, as discussed in Chapter 1. Food sovereignty policy gives priority to local agricultural production for feeding the population, and access for farmers to natural resources, stressing autonomy in the definition of their food and agriculture policy (Via Campesina, 2003).

Policy measures take account not only of productive aspects but also those relating to the standard of living. There are experiences with poor indigenous communities that have exploited market niches through certification schemes that give them access to the world market for organic products, for example in Mexico with coffee (Vanderhoff, 2005) or in Peru with bananas (Soldeville, 2005).

As a policy instrument, in the productive aspect, the creation of networks can correct market failures and facilitate access for the poor to the market and the food supply, and thereby promote food sovereignty.

Oxfam, an NGO that fights hunger around the world, has drawn from its experience a list of measures for moving toward food sovereignty: (a) seek ways of enhancing agricultural productivity in a sustainable manner; (b) foster associations of NGOs and government; (c) promote capacity building; (d) include the participation of women; (e) have participatory extension systems; (f) have alternative sources of income; (g) respect rights to the land; (h) promote good nutrition practices; (i) understand regional food markets (Hall, 1998).

To the extent that food sovereignty incorporates fundamental aspects of economic sovereignty, agrarian reform, women's rights and those of small farmers, it has become a broader platform for those seeking fundamental changes in the national and world order. Among the proponents of food security there are also groups that use the criterion of "the right to food" (Glipo, 2003).

5.2.3. Women's participation: the feminization of agriculture

According to official statistics, women produce 30% of the earnings from agriculture in South America, and account for 26% of the agricultural labor force. Currently, the proportion of female farmers is estimated to be even higher, and to be increasing. These data come from a study by the United Nations Research Institute for Social Development (Deere, 2005), which shows how the economic crisis and neoliberal restructuring have aggravated rural poverty.

Consequently, efforts to alleviate rural poverty and improve food security will not have the expected success unless they take into consideration the need to ensure women's access to productive resources. In this sense, as an alternative for local development, women must be given more flexible access to rural property, recognizing that most farms are still registered in the name of the man, regardless of the degree to which the woman participates in the management and work. The lack of land ownership limits women farmers' access to credit, since the land is generally taken as collateral.

We should also encourage a change in the way credit institutions do their business, by demonstrating to them that women can be fully creditworthy because they take seriously their obligation to repay, and because they are able to pursue productive undertakings with a mindset that is more open to change and to technological innovation adapted to the fluctuations in economic rules and markets. Another aspect to address in relation to this issue is the need to give women the chance to educate themselves, recognizing that an important sector of the adult rural female population remains functionally illiterate, meaning that they cannot incorporate themselves into the market. This is moreover a cultural factor, since males with little education achieve such incorporation. In this respect, guaranteeing equal education opportunities for males and females would help increase the productive potential of countries in LAC and would contribute positively to addressing the problem of poverty.

Full and equitable participation for women and men in rural and agricultural development is an absolutely essential condition for eradicating food insecurity and rural poverty.

The inclusion of gender equity as a variable in development planning would be an important step towards giving women their proper place, and for overcoming what some experts have called the "feminization of poverty".

Improving household food security can only be achieved if female as well as male farmers have access to agricultural services. For example, in the case of training and extension services, these have so far been geared primarily to men. Specifically, it would be well for governments to facilitate and promote women's contributions to agricultural growth by giving them access to a good level of technological innovation that takes into account realistic standards and effective controls for post-harvest management, storage, quality, classification of products and standardization of packaging, optimization of processing and marketing. This would not only improve women's social status but would also allow them to enhance agricultural competitiveness, and facilitate access to food for all people, thereby reducing rural poverty.

5.2.4. Development and culture[1]

A central component that has been overlooked in the drive for development is culture (Warren, Brokensha and Slikerveer 1993, Warren 1992, Hoage and Moran 1998). Culture and development are closely related to agriculture (Sen 2004). Agriculture is related to culture and to development. In the LAC region, this relationship has the following profile:

1. Modern western or westernized culture and capitalistic agriculture dominate the region.

[1] For a definition of the concepts of development and cultures see Chapter 1. Development and culture as concepts and social practices are given particular definitions depending on the worldview (see table 1) and the theoretical paradigms of which they are components. In other words, there is no single definition of these concepts: indeed, there are as many definitions as there are cultures in the world and in LAC (more than 400 indigenous ethnic groups totaling more than 40 million people) (Deruttere 1997).

2. Models, policies and strategies for rural development have been generated from a Eurocentric[2] viewpoint and have tended to favor conventional agriculture (Grillo 1998 a,b), ignoring agro-ecological and peasant-indigenous agriculture and its resource management systems.[3]

The three most important types of agriculture – conventional (AC), agro-ecological (AE), and peasant/indigenous (ACI)[4] - are an expression of specific worldviews or cosmovisions and cultures (Gonzales 1999, 1996; Toledo 2001; Valladolid 2001). AC and AE, while diametrically opposed, both come from a Western scientific approach to understanding agriculture. AC is generally associated with the mechanistic view of the world (Merchant 1992). AE pertains to an eco-centric scientific vision/paradigm (Altieri 1987). The peasant-indigenous is linked to indigenous/peasant worldviews that have a strong precolonial component (Davis 1993).

3. In the LAC region, the agrarian cultures and visions of the indigenous-peasant world[5] precede the other two kinds of agriculture by more than 8000 years, and their contribution (for example, local indigenous knowledge and germplasm) are an important foundation of modern conventional agriculture.[6]

4. Conventional agriculture is managed exogenously by technicians and experts. AE and ACI are not simple technical processes, nor are they managed from beyond the field. With respect to these latter two systems, there have as yet been no significant and sustained policy efforts of state financial support.

5. Viewed from the perspective of development and culture, globalization and its impact in the rural/agrarian sector is not a recent phenomenon. Globalization is associated with the process of

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[2] Eurocentrism is “the imaginative and institutional context that informs contemporary scholarship, opinion, and law”. As a theory, it posits the superiority of Europeans over non-Europeans. It is constructed on a set of assumptions and beliefs that educated and generally unprejudiced Europeans and North Americans accept as the truth, or as reality, reflecting "the facts". A central concept behind Eurocentrism is the idea of “diffusionism”. Diffusionism is based on two assumptions: (i) most human communities are uninventive, and (ii) a few human communities (or places or cultures) are inventive, and thus remain permanent centers of cultural change and progress. On a global scale, this results in a world with one center -- Europe -- surrounded by a periphery (Battiste & Henderson 2000). For more on this issue see Quijano (2000), Lander (2000).

[3] At the root of the conflict between conventional agriculture and indigenous-peasant agriculture we see that the cultures and societies that embrace them have fundamentally different ways of knowing (epistemology), of being (ontology) and of relating to the world (cosmovision). The dominant liberal approach, which takes a mechanistic and positivistic view of the world, is to develop and modernize rural society through infrastructure (paved highways, improved roads), conventional agriculture, modern AKST, and the transfer of farming, forestry and fishing technology generated in first-world countries and adapted by local agricultural research institutes. This dominant process has not been balanced by any similar openness on the part of states in the region toward peasant-indigenous knowledge and AKST.

[4] For further details, see World Forum on Agrarian Reform (2004).

[5] The origin of agriculture in the Americas (North, Central and South) is closely related to pre-Hispanic societies and cultures that preceded the European invasion. These "cultures of habitat " (Nabhan, 1997) and their agriculture stressed local specifics and "place" (Jackson 1994, Cajete 2000, 1999, Rengifo 1998, Grillo 1998a, Valladolid 1998).

[6] In particular for the scientific "plant improver" of highly industrialized countries and the transnational corporations involved in agribusiness, based in those countries. Indigenous/peasant cultures, agricultures and worldviews, in particular those linked to primary and secondary centers of crop origin, have demonstrated, despite adverse policies, a historic ability to enrich and preserve plant diversity (domesticated and wild) *in situ* (Valladolid 1998, 2001, Diversity 1991).

colonial invasion and expansion (Quijano 2000, Varese 2001). Today's economic globalization is associated with the neoliberal current of thought. This current, and the many policies adopted by governments in the region, show no consistency either in practice or in theory with the concepts of sustainable development, sustainability and eco-centricity, especially when it comes to agriculture.

6. In the LAC region, liberal and neoliberal agricultural policies, the research and extension system, the AKST system, have in general stressed highly specialized and export-oriented conventional agriculture (Via Campesina, 2006). This approach has contributed to environmental pollution, homogenization, standardization, and the spread of monoculture via the "Green Revolution" and the "Biotechnology Revolution", i.e. through the "commercial seed culture" and the associated AKST system.

7. The concepts of space and monoculture are associated with liberal and neoliberal approaches to "globalization from above" (GA), promoted by the state and by supranational regulatory bodies (World Trade Organization/GATT, free trade treaties, MERCOSUR) and "place/local specifics" with processes of "globalization from below" (GB) that encourage multi-crop farming and the breeding of biodiversity. GA is associated with transnational corporations devoted to commercial agriculture, liberal[7] and neoliberal policies, and a sophisticated and well financed transnational network that supports and feeds on research, education and agricultural extension, and AKST (Escobar in 1995, Via Campesina 2006, González 1996, 1999).

8. The rural development models and AKST systems adopted in the LAC region in the last 50 years continue to rely on a Eurocentric vision, via Europe and North America[8]. When it comes to nonconventional culture and agriculture, the direct or indirect impact of this dominant model has been of little benefit and has indeed eroded local and peasant/indigenous agricultures in LAC. The same holds for people's health[9], the ecology and the environment in the region.

Agrarian reform (AR) and landholding in the region is a central issue associated with poverty, hunger, living conditions, identity, the environment, and sustainable development (Colchester 2001). In general, in the context of the region's dominant economic, political and social system,

[7] Liberal theory was developed in the 19th century in Western Europe and is associated with the "Age of Enlightenment". Since then, and particularly in the last 50 years, this theory has become the dominant paradigm in western or westernized countries. Although today this paradigm, and the development theories based on it, are in crisis, their hegemony is recognized worldwide (Harvey 2007, Lander 2000). The state and the development policies applied in the LAC region to date have had a liberal character, and more recently, generally since the late 1980s, have taken on a neoliberal character.

[8] The North American model of progress and of rural and agrarian development, as it developed through the 20th century, has shown many limitations and contradictions that have been highlighted in the literature. For example Gilbert, Word and Sharp 2002, Berry 1996. The question arises then, why do policies in the LAC region insist on trying to replicate the conventional agriculture model applied in North America under liberal or neoliberal models?

[9].There is room for study of the correlation, over the last five decades, between the use of thousands of tons of synthetic chemicals in conventional agriculture and their impact on the region's environment, the ecosystem, and human health. According to the US National Research Council (1989), two-thirds of the water in that country is seriously polluted.

landholding in the 20th century, during and after the oligarchical regimes, continues to show serious disparities (Van Dam 1999, Baranyi, Deere and Morales 2004). ARs and the associated policies for land redistribution and modernization of rural production relations have tended temporarily to reduce conflict and the demand for more land and justice on the part of peasants and indigenous people in the region. These ARs were designed on the basis of western premises and experience, linked to the liberal paradigm, and they had no cultural or environmental orientation appropriate to the great mass of peasants and indigenous people.[10]

Insert Table 2

Today there is tremendous pressure from the demand for land on the part of landless peasants and indigenous people, and of those trapped in the tilling of mini- and micro-plots. This situation requires revising and rebalancing the ARs that have been implemented, and proposing ARs that take account of the stakeholders, the specific features of the resource management systems, the crops involved, sustainable development, and sovereignty over food, land and territory.

With respect to the right to land, territory and indigenous peoples[11], this issue is recognized to varying degrees by national constitutions[12] (Colchester 2001) as well as by international conventions[13] and international case law on human rights. In the agenda of the region's indigenous peoples, land and territory are closely tied to autonomy and self-determination (Via Campesina 2006, Van Dam 1999). This is an issue with a clearer profile that could contribute to better design and application of future ARs involving indigenous peoples of the region.

Insert Table 3

[10] In the Western world there are three theories of development: the liberal theory (see Table 2), the Marxist theory, and the poststructuralist theory (Escobar 2005). With the long-term dominance of Western European colonization, and later that of the United States, the paradigm of liberal theory expanded beyond the confines of those centers of political and economic power. During the 20th century, and especially in its second half, governments and policies in former colonial states, including those of the LAC region, took on a liberal character to various degrees. Since the 1980s, neoliberal thinking has been heavily adopted in government policies in the region.

[11] This issue is part of the "ethnic question" (Stavenhagen 1990) or the "indigenous problem" (Quijano 2005). The situation calls into question the capacity of the state and of Latin American democracy to resolve satisfactorily the issue of land, territory, and self-determination of indigenous peoples

[12] For further detail see Colchester 2001:33

[13] Convention on Biological Diversity, United Nations Declaration on the Rights of Indigenous Peoples, ILO Convention 169 concerning Indigenous and Tribal Peoples in Independent Countries.

The land and territory of indigenous peoples shows a tendency to decline because of factors related to extractive economic activities, linked to the capitalist development supported by liberal and neoliberal policies of the LAC region (Deruyttere 1997, Toledo, Alarcon-Chaires, and Moguel 2001).

Insert Table 4

Even so, depending on their level of organization and strength, autonomous processes (with or without external financial support) can be observed in various parts of the LAC region for restoring local peasant/indigenous agriculture as part of a process of decolonization and cultural affirmation.

The AKST system and the dominant mechanistic view of the world associated with it have helped to shape and establish the objectives and priorities of education, research and agricultural extension systems in the region. This in turn has tended to detract from the importance of peasant/indigenous cosmovisions, cognitive systems, knowledge and know-how, because they are not scientific. The importance, magnitude and possible consequences of attempting to validate them scientifically[14] would require careful thinking and evaluation at various levels, interdisciplinary, intercultural, and participatory, among the key stakeholders.

Rural and agricultural development in the region, in particular the AKST system, has been closely associated from the outset with the financing and the models proposed by Western Europe and North America (Heissler 1996, Trigo, E, Piñeiro, M. and Sabato, J. 1983 a,b), financed and supported by a transnational network of development agencies (USAID, CIDA, European cooperation), financial agencies (World Bank, IDB) multilateral organizations (FAO), international research systems and services (CGIAR) and regional cooperation (IICA). The system works with national and local research, education and agricultural extension systems (agricultural research institutes, national and regional universities) (Pimbert 1994, Escobar 1999, Gonzalez 1996, 1999).

Insert Diagram 1

Yet a great number of small farmers in the region are striving to restore their agricultures as part of their systems for managing local natural resources and as part of the process of decolonization

[14] For more detail see Colchester 2001: 33

and cultural affirmation (Grillo 1998 a,b), as alternatives to the dominant society, culture, agriculture and AKST system. All of this suggests that a relevant policy issue from the development and culture viewpoint is to promote the strengthening of local cultures and know-how in rural communities, particularly those of indigenous origin, including the provision of financing to expand their contributions to strengthening regional and national AKST, from a democratic perspective, in the direction of promoting this component in the transition towards sustainable protective systems.

5.3. Policies for institution building and developing the legal framework

5.3.1. Policies to promote democratization and participatory development of AKST

5.3.1.1. International actions

The state and civil society have specific roles in the design and implementation of AKST agendas for countries of LAC. Policies are government principles for achieving goals for a specific population, and they go through the phases of statements and of practice (Perez-Ordoñez 2005). For the state, it is important to give effect to statements of intent by responding to demands through actions inscribed in a government agenda, and for civil society to demand quality in government management and to contribute to democratic governance.

While policies also respond to the prevailing development models for the region, it is important to recall that political processes are the result of inter-linkages, exchange and dependency between interest groups and nation-states. This means that regional networking among governments could contribute to policy agendas for supporting the development of AKST in ways that will meet the specific needs of the region and its member countries. This networking will be based on the ties between the members of a social system structured by the existing connectivity among them, i.e. the greater the connectivity, the greater will be the interactions (Wellman...).

At this level, the favored decision-making spaces are forums, summits, conferences and international meetings, among others, in which the governments of the region participate, where they could prioritize AKST agendas with the particular features and sensitivities of each case, and indeed as a region. A shift in the structures and social relations between nations that have contributed historically to the region's underdevelopment could be addressed through networking as a regional bloc. This work could be based not only on pre-established regional agreements but also on a clear understanding and vision of the problems, potentials and priorities at the national and regional levels with respect to generating AKST

5.3.1.2. National actions

Under the government management model that has prevailed over the last two decades, the role of the state has been seen as institutionalizing governance through legal mechanisms such as

creating new institution that will extend citizen rights. But it has also led to a reduction of government action for generating AKST, which has affected the most vulnerable social sectors such as small-scale farmers.

Institutional reforms are key instruments for initiating changes in the relationship between government and society, but a new approach to government management based on working through cooperative networks will require humanizing those reforms, given the physical, natural and cultural complexity of the region. Some possible scenarios for AKST in the coming years are described below

Suitable national legal frameworks derive from regional and international agreements, where work is cooperative. These instruments protect civil society and can foster effective participation by the private sector in formulating policies and in other negotiations with the state. It is very important that the authorities be actively involved in applying the legal frameworks in support of AKST, but they must also have active support and participation from the grassroots, the academic world, and the private sector. This can be achieved through political will on the part of the authorities to decentralize power and to involve civil society and the private sector in the formulation, implementation and evaluation of AKST support

The inclusion of social and institutional players in the AKST agendas could produce the following advantages:

- The representativeness and legitimacy of the social base that the government considers will be key not only for promoting genuine participation by the sector, but also for governance. Inclusion and respect for local forms of organization and representation will produce greater participation and commitment on the part of local stakeholders, based on social control.
- Universities and research centers, as academic players, have a key role in the design and implementation of the AKST agenda appropriate to national needs, which will respond effectively to resolving concrete problems and will seek comparative advantages based on domestic agricultural potentials.
- The private sector and its capacity to invest in implementing the legal frameworks will be based on the offer of incentives.

Recognition of the potentials of each of the social stakeholders involved in applying the legal frameworks, and including them in the respective spaces, will help ensure that genuine representatives will understand the particular features of the national-regional problem, and can negotiate critical issues or insert their priorities on the agenda at international forums, since the majority of the guidelines for public policies come from those spaces.

The precondition for applying these legal frameworks at the national level is to guarantee the necessary economic resources for implementing them, i.e. the quality and quantity of human and financial resources that will ensure their sustainability.

Effective mechanisms of participation that also guarantee inclusion of the various sectors related to science and technology, definition, control and validation of government actions. Councils, committees, advisory bodies and other forums of participation in defining AKST support policies are able to bring together players with capacities, experience and diverse expectations, an aspect that can be capitalized by applying a collaborative working philosophy, one that avoids internal power struggles over particular objectives and generates collective benefits through selective incentives.

These forums will be able to function if they have the necessary rules, if they can meet demands, and if they have financing:

- The setting of rules that engage participants, where the merger of formal and informal rules established by internal agreement can help the functioning of forums for taking decisions on AKST. Provided the legal framework is broad and allows the proper design or adjustment of these forums for adapting them to local and regional realities, this will help not only to upgrade social capital but also to secure the participation and commitment of grass-roots players in social control.
- The inclusion of differentiated demands for the various user sectors of science and technology could contribute to the priority objectives of the governments of Latin America and the Caribbean. On one hand, the inclusion of prioritized demands from the private sector and industry could help improve revenues from agricultural exports, increasing their share of GDP; and on the other hand, the inclusion of prioritized demands from small farmers could to a large extent resolve the problem of insecurity and food sovereignty in the countryside, and both actions would contribute to reducing hunger and poverty in the region.

Decentralizing the AKST system, by delegating greater decision-making power under a new government approach to collaborative effort and networking, could become a key instrument for efficient design, execution and evaluation of the AKST agenda. The economic, social and political advantages of decentralizing AKST system are closely interlinked and can be summarized as follows:

- Efficiency of expenditure as an economic advantage of decentralization. A number of studies show that there is greater efficiency of expenditure in decentralized systems than in centralized ones. As well, local revenues will rise, provided they are locally managed. Greater centralization means greater fiscal problems, and there is less fiscal vulnerability in decentralized systems.

- The social advantages flow from the fact that decentralized systems for AKST support contribute not only to the responsibility of decision-makers and improving the quality of services, because of pressure from users, but also to active participation by various sectors, because it provides the opportunity for citizens at the local level to define, debate and decide an AKST agenda. Nevertheless, a decentralized AKST system also requires sound local capacities (technical and political), i.e. to make use of and strengthen human capital in order to ensure that priorities are set equitably, an aspect that will be addressed below.

The policy of promoting a decentralized system of AKST management will enhance the values of governance and democratic government. The implementation of innovative public policies by subnational governments is a characteristic of decentralized decision-making systems. As well, civil society participation in a decentralized AKST system will contribute to creating co-responsibility for actions taken within the AKST system.

Mechanisms for disseminating information should be developed in parallel with decentralization policies, for it is the quality and quantity of the information provided to civil society and the private sector that alone can guarantee that they participate and are well represented. It is important to remember that the diversity of local stakeholders demands a variety of means for disseminating information.

The basic lines of policy for AKST support developed at the local level and those implemented in each area should start from comparative evaluations and a horizontal understanding of the contribution of each, as the basis for developing appropriate technologies locally. Information generated at this level, including information about traditional knowledge and know-how, could be useful to decision-makers as well as to the regional or national technical and academic bodies.

The legal rules with respect to AKST, including mechanisms for disseminating information, must be applied more successfully. A clear policy on information, disclosure and distribution of new knowledge advances in agriculture, science and technology will guarantee their proper use.

There should be policies to promote consensus-building and coordination between civil society, the state and the private sector as to the kind of information to be shared, which new discoveries should be publicized and when, and what contents should be revealed in light of the potential of civil society, to ensure smooth operation at all levels of decision-making. As well, if information is clear and readily understandable by civil society organizations and rural people, this will contribute to the operational objective. Participatory methods could focus AKST support policies on the needs of rural communities, and integrate local technical information and knowledge; audiovisual aids can also facilitate community understanding.

The kind of information disclosed to rural communities must consider their perspective, the integration of technical information and local knowledge, and the use of visual supports that are

easy for them to understand, and civil society should be included in guidelines for planning and implementing projects and programs.

Finally, it is key to ensure the dissemination of successful experiments in applying the legal frameworks and implementing the AKST support policy agendas or generating new technologies and innovations. To this end there are many tools such as field tours, exchange of experience, or farmer-to-farmer training.

Generating effective mechanisms for evaluating and monitoring policies, as a vital condition to support the process of democratizing AKST. In Latin America and the Caribbean there are policies, programs and projects in place, but there are no mechanisms to evaluate their performance, measure their impact, or reformulate them in light of local needs.

Some basic criteria for evaluating policies are set out below:

- Policies that involve civil society in their design and implementation may respond better to local AKST problems.
- Pilot projects implemented at the local level to test new knowledge and technologies could provide guidance for policy decisions in support of AKST.
- An inter-sectoral approach to policy, i.e. the review of policies in different areas that serve the same national objective and the repeal of those that do not fit the government agenda.
- In implementing policies there must be constant information on the roles and responsibilities of the stakeholders involved.

5.3.1.3. Local action

There has been much discussion of the importance and the roles of civil society in a new government approach based on cooperation and networking. While civil society can alter in its favor the balance of power between state and society, and while it can exert pressure for better government management or articulate interests by acting as intermediary, it is important to recognize as well that it has certain capacities to address these new challenges.

Grass-roots players (peasants and indigenous people) have developed certain knowledge, skills, abilities and other individual attributes relating to economic activities, which are recognized as human capital. As well, local societies have developed a series of social relations and rules for more effectively achieving common objectives, known as social capital (OECD, 1998).

The human and social capital of countries is highly important for addressing democratization, and it is clear that in many countries these capacities are enriched through decentralization and local capacity building. Following are some key actions for dealing with these processes at the local level:

Strengthening local grassroots institutions, in their technical and political aspects, to guarantee better adoption of AKST results over time and to permit genuine participation in decision-making.

Working to reduce rural illiteracy and functional illiteracy and enhance human capital will be an important task for governments in inserting the local grassroots sectors. As well, building technical and political capacities through the rural schools could promote a democratic culture and improve local stakeholders' capacity for participation and negotiation.

Culturally appropriate training programs will be better accepted at the local level, where agriculture extension agents, indigenous or not, can become key links and can even serve as negotiators between the local and the government level with respect to AKST policy needs. As well, those agents must have capacities and skills based on experimental knowledge and learning. Moreover, considering that local technical capacities are weak in the face of innovations and market requirements, it is important to involve the local authorities in capacity-building and technical assistance, as the only way to ensure co-responsibility, to strengthen their role, and to promote sustainability of the program. The objective of this point should be to capitalize on knowledge, science, technology and agricultural innovation and use them to promote economic growth and food security for the peoples of LAC.

Local capacity building

This picture of incipient representation and participation calls for parallel processes to develop capacities at all levels of society, with particular emphasis on rural dwellers who, sooner or later, will be making use of the AKST results developed in research centers, universities and elsewhere, and can then become passive receivers, adapters or improvers of knowledge, science, technology and innovation in agriculture.

An important issue to address through a new form of government management is the effort to recognize and capitalize on local knowledge and know-how, working through agents external to the communities as well as with the communities themselves and aboriginal peoples, in this way protecting innovation rights through the intellectual property system, an area in which the traditional knowledge of aboriginal communities and peoples does not fit because of its community nature.

5.4. Policies for the sustainable management of production systems (biodiversity, intellectual property, education and training)

5.4.1. Sustainable management of production systems

The concept of sustainability is useful for integral rural development, because it treats agriculture as an economic, social and ecological system, the management of which is based on diversifying production over space and time. This approach embraces all components of the land, and

thereby improves the biological efficiency of the system, maintains the productive capacity of the agro-ecosystem, conserves biodiversity and generates conditions for the system to be self-regulating (Altieri, 1996; Benzing, 2001).

Moreover, if market-induced specialization is to be sustainable, it must be managed with respect for agro-ecological principles, whatever the size of the firm. This agro-ecological approach applies not only to small farmers and subsistence agriculture but to any production system.

The three types of agriculture or "production systems" defined in Chapter 1 are in constant change, depending on their components, functions and management. The different types of production systems contribute in different degrees to conservation of agro-biodiversity. Industrial, commercial agriculture systems, which are closely geared to the market, are homogeneous production systems and they are the ones that contribute least to maintaining biodiversity. By contrast, small peasant agriculture, despite its great limitations, has made the greatest contribution over time to the use and exploitation of biodiversity resources.

The strategy of agro-ecological management is one of the simple ways to conserve and make sustainable use of biodiversity. Experience has shown that the sustainability of production systems is closely linked to the way biodiversity is managed within productive units (Caporal, 2004). The move from production systems to sustainable management involves three stages, depending on the state of each system, as illustrated in figure 2. In general, the conditions for making this transition are:

- Diversified, stable and efficient production.
- Contribution to food self-sufficiency for the family and the domestic market.
- Use of agro-ecological practices for efficient exploitation of natural resources.
- Development of capacities based on local knowledge and proven technological innovations.

These conditions for the transition must not affect levels of productivity and competitiveness of the different production systems. This situation implies a gradual conversion that will allow the restoration of functional biodiversity in agro-ecosystems and a possible transition towards ecological and organic farming, the products of which are now sold to a limited group of consumers with the capacity to pay a premium for them.

The possible stages of transition depend on the state of the production system (figure 2).

Conventional production systems, with their high use of chemical inputs, can move toward stage 1, "reduced use of chemical inputs", through greater efficiency in managing the system; there are already various options that are being successfully applied such as: sustainable low-external-

input farming (Reijntjes et al., 1995)[15], integrated pest management (Cisneros, 1992), good agricultural practices, and other practical models that focus on enhancing productive efficiency and reducing production costs.

It is also possible that some of these production systems could move toward stage 2, "agro-ecological management", through a more profound change in system management and greater levels of product diversification in farming, livestock and forestry (Gomero 2001; Willer and Yussef 2004).

Shifting quality demands for food products in external markets and the certification mechanisms now in place may encourage these transitions toward sustainability. The conventional systems that do not follow these paths could well be conditioned on other poverty reduction goals in order to receive subsidies.

It must also be recognized that some systems of cultivation, livestock rearing or plantations cannot be maintained without a package of agro-chemical inputs; in this case, they could be subject to the "polluter pays" principle. Such restrictions could promote more research in agro-ecology and the management of agro-biodiversity.

Insert Figure 2

With respect to the peasant/indigenous systems that are already at stage 1, and that use little in the way of agro-chemical inputs, they have two possibilities for evolution in their management:

1. Adopt the conventional production system by increasing farm size and making greater use of external inputs.

2. Adopt sustainable systems, improving their integral management of available resources and their productive competitiveness.

In this case, suitable incentives would be used to encourage the transition toward stage 2, rescuing knowledge of biodiversity management based on agro-ecological principles. In general, this process of conversion from one production system to another requires a prior cost-benefit analysis. Depending on the results, changes could be made in the systems to improve productivity and help reduce poverty, through concrete policies designed and applied by institutions in the agriculture sector (Gomero 2001).

[15] According to the Technical Advisory Committee of the Consultative Group for International Agricultural Research (TAC/CGIAR, 1998), "sustainable agriculture is the successful management of resources for agriculture to satisfy changing human needs while conserving natural resources".

5.4.1.1. Policies to support sustainable management of production systems

The challenges in moving towards more sustainable production models are enormous. Stakeholders will need to change their views about the value of agriculture in resolving problems of poverty, food security, and the conservation of biodiversity (Prager 2003).

These changes should facilitate access for consumers, in particular in the large cities, to high-quality products and in this way strengthen domestic markets. To this end, local products will need to be promoted, processed (into flour, cheese, sausages, dried foods) and introduced into mass consumption. In turn, these processing firms will increase rural employment.

Various production systems have been developed in Latin America, and each has benefited from differentiated support policies: market-oriented conventional agriculture has received the greatest support in terms of subsidies and credit. This support has been used to buy fertilizers, pesticides and hybrid seeds, and very little farm machinery. This kind of government support has produced an economic and social divide between industrial/commercial agriculture and small peasant farming. Policy initiatives to provoke sustainable management of production systems should consider the following aspects:

- Establish concrete policies for reducing fertilizer and pesticide use and promoting alternative technologies.
- Offer direct incentives for more effective support of agro-ecological production systems.
- Reform landholding and ownership, access to water, and credit so poor farmers can stabilize their production systems.
- Develop markets and business opportunities for sustainably produced products, through certification mechanisms. There are many labeling options – “ecological”, “organic”, “biological”, “biodynamic”, “permaculture”, etc., but the class of consumers willing to pay a premium for such products is still small.
- Promote changes in urban consumer demand toward diversified food consumption and a change in quality standards

Production models have been developed over time and are based on spatial management, ecological complementarity, and risk avoidance. These systems take into account:

- Maintenance or expansion of natural vegetation cover, avoiding overgrazing.
- Proper soil management for conservation, fertility maintenance, and erosion control.
- Protection of remaining fragments of natural forest, second growth forest, bushes or tree plantations.
- Crop diversification and rotation to avoid environmental and economic risks.
- Zoning of production areas and conservation for the proper location of production systems of differing levels of intensity.

- Biological corridors for beneficial wildlife (pest controllers).
- Integrated management of pests and diseases.

The sustainable management of production systems is closely linked to the use of agro-biodiversity, which over time has allowed peasant communities to retain their knowledge, their culture and their food patterns. Thanks to the conservation of genetic resources, there are today products that can be marketed at high value-added in specific niches.

There are many gaps in policies for the conservation and exploitation of agro-biodiversity. There has been progress in designing standards, but this has yet to be converted into policies that will guarantee sustainable use of these resources. There remain a number of gaps (Gauchan et al., 2001):

- Costa Rica has made a start with an action plan and legislative framework for agro-biodiversity (MINAE 2004), but other countries of the region have lagged behind.
- There is no policy for conservation *in situ*, a practice that is closely linked to the management of production systems.
- There is a general policy for improving crops, but in most cases there is no policy for research in the characterization, mapping, and documentation of germplasm and the best way to manage indigenous species endemic within productive systems.
- There is a need for more research and extension services in managing agro-biodiversity, stressing minor crops, local varieties, and native animal breeds.

Policy measures for the conservation and exploitation of biodiversity are a priority, particularly in regions that are centers of origin for food crops (Mexico and Peru represent two such “Vavilov” centers). The FAO recommends that the world's "hot points" of high biodiversity should be declared conservation zones because of their great genetic potential, and they should be protected from the introduction of genetically modified seeds (FAO 2005).

5.4.1.2. AKST and its contribution to sustainable management of production systems

Large-scale, specialized producers are assumed to have the means to pay for research and extension services, and they can contribute to the functioning of experimental stations through their producer associations.

AKST can therefore be targeted at small and medium-scale agriculture, where farmers’ associations have little capacity for investment (except in a few productive chains such as dairy, seed potatoes, wheat, fruit orchards, coffee etc.), and where policies are required for government intervention with incentives for investment.

The process of developing technologies for managing productive systems has been exogenous: many sector-specific technologies have been introduced without any evaluation of their environmental impact. Many of them were developed under totally different ecological conditions,

and when applied in other regions their behavior has varied greatly. The assessment is that in some regions they have produced good results, while in others the impact was negative.

If technologies are to contribute to sustainability they must be ecologically appropriate, economically viable, and socially fair (Astier 2005). In this respect, AKST should consider the systemic management of production units in its future development and innovation. This will imply a paradigm shift towards farming-livestock interactions, agroforestry, integrated crop and livestock systems and the planting of trees on farms, and integrated management of soil fertility components.

AKST must also accompany these transitions in university education, through a rapprochement between agronomy and ecology, and managing agricultural lands with the systemic focus.

To facilitate the evolution of knowledge (see Chapter 4) requires:

- Strengthening the human resource capacities of communities for developing appropriate technologies.
- Developing a common network of information and exchange of experience in managing productive systems, with scientific and technological support.
- Designing and implementing a national and regional platform for communication and technical information that will articulate agro-ecological data with sustainable management of production systems.

5.4.2. Biodiversity and intellectual property

The Millennium Ecosystems Assessment (MEA) predicts that there will be continued degradation of ecosystems services and the loss of biodiversity to the year 2050. This situation is of particular concern for the objectives of reducing hunger and poverty, because it is poor rural dwellers who depend most heavily on ecosystems and are most vulnerable if they change. Hence the importance of environmental sustainability as an objective (MEA 2005).

When it comes to formulating policies for managing ecosystems, there are two approaches: one of them is reactive, and most problems are addressed only after they have become obvious; in the other, ecosystem management is proactive and policies seek deliberately to maintain ecosystem services over the long term (MEA 2005:15). Environmental deterioration has reached the point where the failure to take proactive measures is likely to make the situation irreversible, particularly in light of climate change.

The dominant technology on offer relates to commercial crops, using an external inputs model that continuously degrades biodiversity. Most AKST policies have been reactive with respect to environmental degradation, and have shown little interest in biodiversity, meaning that there is no

control over access to phytogenetic resources[16] or any regulation of modern biotechnology. Policies to protect and conserve phytogenetic resources are a major consideration for achieving the IAASTD goals.

The evolution and progress of the intellectual property system has made it possible to patent and protect plant varieties that form the basis of the food supply and culture of local and indigenous communities in LAC. When these varieties are granted broad patent protection this severely infringes the collective rights of rural communities and nations to their natural resources. To ensure the stability of these resources, intellectual property rights or other appropriate legal mechanisms should be established to guarantee the right of peasant/indigenous communities to the conservation and use of their genetic resources. As well, policies should encourage those producers who are contributing directly to the conservation of genetic resources in their management of their productive systems.

The sustainable management of biodiversity entails measures of economic compensation and reparations for damage to biodiversity (through oil spills, deforestation, pollution of water courses, release of GMOs into the environment etc.), which is the basis of indigenous and peasant culture.

There is concern over the plundering of genetic resources located on the territory of various ethnic groups to make pharmaceuticals or other products that can be patented. This form of illegal access to biological resources is known as "bio-piracy" (Dutfield 2004). Work is under way within the Convention on Biological Diversity to prepare an international system of Access and Benefits- Sharing (ABS). Yet communities still fear that the benefits of such access will be shared only between governments and users (Einarsson). The distribution of benefits is thus a topic for debate. The best option would be to arrange channels of participation between the stakeholders involved so that collective rights to natural resources can be guaranteed.

While modern biotechnology developments constitute a competitive advantage for some countries in the region, as the growing of transgenic soybeans has done for Argentina, Paraguay and Brazil (albeit with sharp controversies and social tensions), recent progress in this leading-edge technology that allows use of food crops to produce pharmaceuticals, biofuels and plastics now poses a new threat to biodiversity. Not only could there be environmental impacts, but there is also a risk that products of this kind will pass into the food chain through uses that have nothing to do with human or animal consumption. For example, corn is the basic food of Mesoamerican cultures, and its use for producing pharmaceuticals and inedible industrial substances could affect directly the safety of the staple food of millions of people in Mesoamerica, without mentioning the effect on biodiversity in the center of origin (Galvez and Gonzalez 2006). One

[16] Phytogenetic resources refers to any genetic material of plant origin that is of real or potential value for food and agriculture; they are generally found in the seeds.

possible alternative would be to adopt a policy that would prevent the use of food crops for other purposes, as has been done in the case of wheat.

5.4.3. Education and agricultural extension services

Training people abroad produces highly qualified personnel, but they are not necessarily capable of addressing the problems of mega-diversity in agriculture, because they may not pay attention to the sustainable management of biodiversity or the care of genetic resources. Moreover, available infrastructure and human capital have been focused on increasing yields and output volumes, under the conventional modern agriculture model.

The "demographic bonus"[17] is an advantage for countries of the region if they invest in human capital through education and scientific and technological development, in order to alleviate hunger and poverty. Yet because of heavy migration, the benefits of this "bonus" in coming decades could flow to countries that offer employment, which would lead to the loss of local talent and knowledge. One interesting proposal is to amend the study plans and programs in the agriculture professions to give priority to teaching agro-ecology. A government presence is justified in this field, when it is recognized that the knowledge involved must not be restricted to that disseminated by the multinational companies that sell seeds, agrochemicals and farm machinery.

University training in agro-ecology needs to be strengthened through:

1. Breaking down the walls between departments and faculties, so as to deal with such issues as:
    - Climate-soil-plant relationships.
    - Agriculture-livestock-forestry-fishing relationships.
    - Agroforestry, community woodlots.
    - Fertility management.
    - Systems analysis.
2. Allowing students to gain practical experience in the field.
3. Integrating scientific knowledge with peasant know-how in ethno-botany (knowledge of Amazon plants and ecosystems), household remedies, ways of organizing time and space, and their worldview. One way of restoring and capitalizing on peasant knowledge is to sift through it with the scientific knowledge at our disposal and subject it to reciprocal questioning. Participation by the rural poor in the design of projects will promote greater integration of traditional and scientific knowledge.

[17] Population of productive age

A necessary condition for achieving this is to integrate the university into its region and involve it in resolving local development problems. In effect, AKST can be supported by three pillars: (i) publicly funded research (gene banks, self-sufficient regional experimental stations, statistics and agricultural trends); (ii) public and private universities involved in their regional milieu; and (iii) networks of NGOs and other civil society players, including representatives of farmers, associations and unions.

There is significant room for the development of technical education, for the training of intermediate technicians in technical institutes, which the universities themselves could run. This would respond to a real labor need.

The inequality of opportunities in education is a key element in perpetuating poverty among the current generation of youth (Herrera 2002). Considering the scant opportunities for primary and secondary education in rural areas, particularly for women, continuous education should be encouraged (from literacy through to specialized training). One measure that has proven to be effective in rescuing biodiversity is to encourage self-training through the organization of agricultural fairs and competitions with prizes. If such initiatives could be generalized in networks this would help to collect and preserve the diversity of local seed populations (Raven 2003).

There are some new topics that should be included or pursued in specialized training curricula: (i) protection of genetic resources, bio-piracy, legal provisions and intellectual property; (ii) food quality, standards, food labeling, guarantees for organic products, marks of origin for foods.

AKST policies should develop a diversity of technological innovations, since the problems to be addressed are diverse and are not all susceptible to the same response (FAO 2004). More government spending on research and development and on agricultural extension services should be considered.

Innovation policies need to take account of cultural aspects. It has been documented that culture can influence or alter development policies that appear adequate, without falling into the kind of cultural determinism that could lead to isolation and immobility (Sen 2004).

If AKST policies are to alleviate hunger and poverty, they must start from a sound basis of information on genetic resources, to which producers' organizations, NGOs and independent advisers could contribute (Serratos 2003). The countries that are the biggest producers and exporters of food in the region, such as Argentina and Brazil, have developed a public system of research and agricultural extension services, and Brazil has a government research institute of international renown, EMBRAPA. Achievements in Mexico are more modest.

The small Andean countries have destroyed their national research institutes under pressure from the IDB and the World Bank. They are left with very little possibility to pursue their own research on national genetic resources, in order to strengthen their food independence. In fact, much of

the genetic research is being done outside the countries that are the centers of origin of germplasm. It is time to investigate how private networks have managed to replace the public sector in providing agricultural extension services. Among these two groups, other countries including Chile have privatized their research in important export areas, such as fruit, fish and lumber.

Agricultural extension services need to be adapted to changes in agriculture: the preponderant role of peasant women, part-time farmers who leave for a time or take nonfarm rural jobs. Yet there is a certain contradiction between the holistic vision of agriculture extension that takes account of all producers, in particular small producers, and the fact that funding targeted at peasant families is declining. The solutions must be found in coordinating public efforts with private networks, under contracts that involve competition for public funding, but it is difficult to measure the long-term impact.

These problems explain why some local products are overlooked and do not receive sufficient support to penetrate national, regional or international markets.

A portion of agricultural extension services is paid for by organizations of producers, when their products are feedstocks for a processing industry: soybeans, sugarcane, cotton, coffee and to some extent milk. The problem arises in farming-livestock or multi-crop units. A better understanding of peasant organizations would help bring them into the networks that now exist or are being constituted. What the mono-crop associations are now doing through the organization of their productive chain should be extended to diversified producers including small farmers, with some incentives.

5.5. Financing policies

The availability of financial services is essential for supporting the AKST system's efforts to meet the IAASTD goals. Yet for more than a decade agricultural financing has been facing a dilemma in developing countries (FAO 1996). There is growing demand for food, because of worldwide demographic growth, especially in low-income and densely populated countries, which requires heavy investment in agriculture. But at the same time the number of donor-supported farm credit programs has fallen and there are few indications that governments or commercial lenders are taking steps to compensate for the decline in funding for agricultural production, processing and marketing.

Steps to address these financial problems must consider the conditioning data resulting from new arrangements in international financial relations and the new macro financial configurations prevailing in the region, as a result of liberalization and deregulation during the 1990s. In particular, this means that the desired financial policies must work in an international setting of

extraordinarily high liquidity and low interest rates at a time when there is still systemic weakness and instability in the international financial system.

As for the countries of the region, they will generally pursue such policies in a climate of relative price stability, with little pressure on the exchange rate, fiscal balance or government deficits, but at the same time real interest rates will be high and the private financial sector will offer little in the way of financial services to low-income groups.

The solution to the AKST financing problems mentioned above is complex, not only because of the context but also because of the particular conditions of the sector in Latin America. As noted in CGAP 2003, some of the key problems are:

- the thin demand for financial services,
- high information and transaction costs,
- inadequate institutional capacity of rural lenders,
- the fact that much of farming activity is seasonal in nature, and that many crops take a long time to maturity;
- risks relating specifically to cultivation of the land;
- absence or insufficiency of usable collateral because of lack of clarity in ownership rights and institutional factors.

All of this must be viewed in the context of great heterogeneity in the conditions of the rural poor, and the productive possibilities of agriculture in different countries, and of regions within the same country, as well as their relations with the various national and international markets. Finally, within this heterogeneity there are great differences in local capacities for AKST in the different countries of the region.

At the same time, the range of possibilities for financial systems in their relations with poor and low-income groups has expanded considerably in recent decades, as much in terms of institutional organization as in sources of funding, the operating conditions of financial institutions, and accessibility to rural people who can use the new information and communication technologies. There has been great progress in the capacity to offer low-cost financial products and risk cover for highly diverse situations. This means that there are many and varied options for assessing the feasibility of different financing policies designed to promote development and reduce rural poverty in Latin America.

In light of the foregoing, financing policies should address at least three priority aspects of support for AKST systems in the region: strengthening the capacities of those systems, and those of rural people and vulnerable groups, and providing funds to permit the transition of communities towards sustainable productive systems. For these various purposes there is a range of financing policies that can be considered, depending on the institutional context and development

strategy adopted in a given country or region. These are considered here in relation to the three goals proposed.

5.5.1. Financing capacity-building for the AKST system

In LAC as a whole and in the individual countries of the region, investment in AKST systems has been low, and this trend needs to be reversed through greater investment in various components of that system, in order to sustain its dynamics and reduce dependency on technological innovation from outside the region. Investment must be increased not only at the national level but also at the subregional and regional levels in order to capitalize on experience and minimize duplication of R&D effort. Since indigenous and agro-ecology systems have received virtually no financial support, and recognizing that agro-ecology systems in particular have made great progress over the last decade (e.g. in Cuba), investment in these systems could produce great rewards for the IAASTD goals in terms of supporting AKST, including specific technologies consistent with conditions in the different subregions of LAC, so they can be adapted to local needs. In particular, greater investment should be encouraged in:

- Strengthening agro-ecology programs and research centers, national and local universities and other educational institutions that foster cultural diversity in LAC.
- Personnel training
- Upgrading and maintaining research and outreach facilities
- Maintenance of education centers for urban agriculture.
- Establishing education programs that will promote LAC values and culture.

To meet the objectives of strengthening capacities in the AKST system, the traditional approach of financing policies has been to work through national science and technology councils. Funds will be earmarked for agriculture, but the drive to develop AKST will be left for the most part in the hands of big transnational enterprises with robust R&D programs. Mexico is a typical case. From this perspective, the use of these financing policies for development and application of AKST will have an impact over the medium and long term, because it is subject to the reallocation of capital and labor that occurs through the play of supply and demand under market conditions.

On the other hand, with policies that stress sovereignty in a context of competition for hegemony in the international sphere, the government will maintain private financial markets for allocating funds, but may apply financing policies to sectors deemed strategic in order to maintain the supply of certain goods without depending on imports, for example for reasons of food security. These funds can be mobilized by public or private banks or by trust funds. In this case, policies for financing AKST through national science and technology councils could involve the use of public or mixed funds to promote development in specific sectors for reasons of sovereignty. Brazil may be a typical case.

The time needed for these policies on rural development and application of AKST to have an impact on rural living conditions will depend on the intensity with which the government applies resources and efforts, in light of its strategies with respect to sovereignty objectives.

Within the new approach to public management, the government may assume that it has limited capacity to manage the use of funds devoted to strengthening AKST capacities in the country, and so it will encourage the emergence of nongovernmental public or mixed entities that will apply those funds to developing specific sectors. The impact of these policies will depend on the state's capacity to make those entities efficient, through various mechanisms of monitoring and accountability.

These policies have an impact on the sustainability of institutions and instruments, since accountability produces an incentive for these new public management entities to make more efficient use of public funds. It could also produce a "virtuous circle" in the application of funds, with progressive involvement of rural people in financial services and technological dissemination, if their development follows the precepts of decentralized private management, but with broad participation and local social control.

In these policies, financing of AKST schemes is decentralized and in many cases involves both public and private funds, but with great involvement of medium- and large-scale producers in defining the institutional work agendas. Consequently, steps should also be taken to include small producers and indigenous communities in managing and monitoring these entities to make sure their needs are addressed. All of this could translate into strengthening the capacities of the AKST system through further creation of decentralized technology centers run according to highly efficient private criteria and with an emphasis on environmental and biotechnology services and the promotion of human capital.

In a more systemic approach, the government could implement these financing policies by forming networks of research centers and institutions to articulate and socialize knowledge, while promoting activities at a scale adequate to assure specialization. As well, selective policies could be applied for financing AKST, through support for competitive networks, local environmental networks, networks promoting innovation, based on training and use of local resources, etc.

5.5.2. Financing to strengthen the capacities of rural people and vulnerable groups

When it comes to financing policies for strengthening the capacities of rural people and vulnerable groups, these should promote employment in agricultural firms that foster sustainable production and the integration of small producers into productive chains that operate in accordance with principles of sustainability and equity, and finally they should consolidate the efforts of indigenous communities by promoting their productive and organizational capacities within the context of their practices and cultures. The goal should be to enhance their productive

capacities and thereby reduce poverty, exclusion and vulnerability. This means addressing a number of problems: in traditional visions, policies will be proposed for financing segments of the population living in poverty, particularly in the countryside, and this will be done with the help of multilateral agencies like the World Bank and IDB, through such programs as "*Oportunidades*" in Mexico. There will also be efforts to mobilize funds for these agencies to promote small businesses under market rules, for example through the IDB's MIF programs. The government will promote financial innovation, so that rural producers will have the instruments to cover risks in the main agricultural products, farm insurance, etc.

Given the changes in the financial systems, modern financial regulation is emerging with less emphasis on traditional schemes of official bank lending. Nevertheless, in this traditional perspective there is also a tendency to promote financing for rural development and agricultural production through policies to diversify financial systems by addressing the particular needs of rural people - specifically, legislative and regulatory reforms to strengthen different types of financial institutions in sectors such as micro-finance, cooperatives etc.

From this traditional perspective, the impact of these financing policies will depend on articulation with other policies for promoting rural development, while the time needed for these policies to have an impact on rural development will depend on the involvement of the various intermediaries that will play roles in the new financial fabric.

In contrast, from the viewpoint of public management described above, financial policies will seek to strengthen these population groups with the central objective of establishing and strengthening rural financial markets, going beyond the former approach to government financial intervention that focused on development banks.

This points to the need for new, nongovernmental public or mixed entities for mobilizing credit to the creditworthy poor. These institutions work with government funds or funds from multilateral development institutions (World Bank, IDP). They need to be articulated within the national institutional framework for sustaining macro financial balance.

This encourages the development of privately operated financing systems that can take the form of efficient local cooperatives. An example might be the *Fundaciones Produce* in Mexico.

These financing approaches seek to promote efficiency and financing, and decentralized private management can sharply reduce transaction costs.

Viewed from the context of competition for hegemony, but operating under market rules, the government could apply financing policies to groups seeking to reinforce the presence of the national economy in the global context. Such policies could encourage the consolidation of producers' networks that would bring economies of scale and efficiency to the output of rural SMEs for the domestic market. The selection of sectors would be a mixed result, between

favoring the most efficient ones and safeguarding the national economy, although under a "pick the winners" approach. The government promotes policies for financing the sectors, encouraging private financial intermediaries to channel funds to them, by offering government guarantees etc. As well it will invest in infrastructure that will create positive externalities in the sectors. It promotes the policy of financing AKST through the establishment of internal market support networks and creating decentralized entities associated with those networks.

Approaching the financial issue more systematically, policies should try to encourage rural people and vulnerable groups to develop "popular" or grassroots financing institutions offering a full range of financial services (deposits and payment systems, savings, credit and insurance), operating with market efficiency and sustainability. These institutions should be developed in relationship with local producers' networks. An example of this vision is FAO 2004.

The financing of institutionalized forums for taking decisions and implementing the policy agenda for supporting AKST is an aspect that will contribute to their success. If financing for these activities can be made more independent of external cooperation, those agendas can be designed, implemented and evaluated more successfully, and they will contribute more to reducing hunger and poverty in the region.

A viable solution must recognize existing differences by creating comprehensive financial services for the extremely poor and for the creditworthy poor. The first group are unable to borrow, and they require specific solutions along the lines of the Grameen Bank in Bangladesh. The second group, on the other hand, can access financial services under certain assumptions, primarily the resolution of property rights, education, management capacities.

These policies for promoting institutions offering a full range of financial services will help generate decentralized financing networks of varying kinds, reflecting the varied conditions of different kinds of producers' networks, which will be supported with regulatory reforms and training policies for the efficient development of financial networks. These policies will promote local savings and financing capacities, and may trigger virtuous circles that will be differentiated according to the specific evolution of the various networks.

The greater efficiency of “popular” financial institutions of this kind is based on lower moral hazard, derived from specific knowledge of the borrowers, and lower transaction costs through local operation. In turn, it could require the government to provide offsetting policies and support for the weaker networks. Depending on these conditions, rural people and vulnerable groups will have better access to financing, and their communities will stand a better chance of survival in a context of progressive development.

In recent years, the potential for fostering grassroots financial institutions has been greatly enhanced by the emergence of information and communication technologies, which have made it

possible to develop efficient and competitive rural financial networks that can achieve economies of scale and reduce the costs of producing and distributing financial products under market conditions. At the same time new, non-banking financial instruments have been developed: trust funds, investment funds, assets securitization, factoring etc.

Assuming that the necessary IT and regulatory infrastructure is in place, these policies could have a swift impact on agricultural productivity and living standards by expanding access to low-cost financial services. This is all the more likely because the use of ICTs can help resolve the problem of access to financial services for rural people: the Internet and cellular phones make it possible to overcome the drawbacks of geographic isolation and can bring rural people into the banking system.

Such policies would also provide tools for training rural people and producers through distance education.

The time that these policies will need to have an impact on development will be relatively short, if they are accompanied by other policies for training people in the use of ICT's, etc.

Nevertheless, all of this will have to be accompanied by a policy of investing in access to ICT's for rural sectors, if these policies for access to financial services are to work.

Finally, and no less importantly, it is clear that financial policies for improving conditions and capacities for rural people face the great challenge of promoting instruments and institutions for channeling remittances to support the development of regional and local financial services, in communities with heavy emigration rates. This should help to retain people in the countryside and boost employment through the development of family enterprises or small businesses.

5.5.3. Financial support programs for helping communities make the transition to a sustainable productive system

A very important aspect to consider in financial policies for supporting AKST systems has to do with the fact that in many parts of LAC the process must be launched under very backward conditions with pressing subsistence needs and no significant local resources. Consequently, these rural communities find it almost impossible to lift themselves out of their current condition and establish a productive system that is sustainable in both economic and environmental terms. This makes it necessary to offer financial support for making these transitions in an orderly and progressive way. That means formulating policies to provide structural funds through joint efforts by national, regional and local governments, so that communities can make the transition to a new configuration based on an agro-ecological system. Competitive funds should be established, to which multilateral agencies as well as national governments and regional institutions can contribute, in association with local development bodies.

These measures should help to retain people in the countryside and boost employment through the development of family enterprises (in food processing, handicrafts, tourism, nonfarm activities).

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