

LAC CHAPTER 5

PUBLIC POLICIES IN SUPPORT OF AKST

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Key messages

1) The objectives of AKST policies are 1) to reduce hunger and poverty, 2) to improve living standards and health for rural people, and 3) to promote development that is economically, socially and environmentally sustainable. To achieve these objectives, policies must move beyond previous models, in particular the one that made the market the central mechanism for allocating and regulating resources and that has had the effect of exacerbating economic and cultural poverty, hunger and inequality.

2) This situation creates the challenge of formulating alternative policies that take account of the economic, social, cultural and ecological heterogeneity that prevails in the various countries of LAC, without ignoring the new situation generated by trade liberalization and economic deregulation. The prerequisites for implementing these policies are: (i) to ensure a stable macroeconomic framework; (ii) to establish strategic guidelines that will give priority to expanding and allocating public resources for the AKST system, strengthening the sustainable output capacity of small productive units, with a gender focus, so as to guarantee countries' food security and sovereignty; (iii) institutional designs that will decentralize implementation of the strategy, with close involvement of local stakeholders, recognizing and strengthening their culture; (iv) permanent mechanisms for monitoring and evaluating the impact of policies so that the instruments used can be reformulated; and (v) designing suitable mechanisms for financing the various policies.

3) The AKST policies proposed here are targeted essentially at alleviating poverty and hunger, reducing inequality, and promoting sustainable development with an emphasis on small-scale peasant/indigenous agriculture and agro-ecology (treated in its broad sense). To this end, policies must move beyond the models used since the 1990s, which were based on liberal approaches in which markets were the central mechanisms for allocating and regulating resources, and which have merely served to increase rural poverty and hunger.

4) A policy of food security and sovereignty that embraces production, the availability of food, and the development of capacities. The idea is to take policy measures that go beyond mere subsistence and will bring improve the lives of the poor, by giving them sustainable access to productive resources (land, water, biodiversity, credit) with a focus on gender and equality. In this context, we propose a policy that will help restore and strengthen local culture and knowledge in the management of productive and natural resources. This calls for intercultural policy instruments that will support the efforts of small farmers to achieve integral development and will strengthen their productive capacities, taking into account the worldview and the heterogeneity of these people.

5) A policy for sustainable management of natural resources. Such a policy must have instruments for territorial planning and the identification of ecological and economic zones as the basis for establishing rules for the use of land, ranging from conservation to intensive farming, with a view to creating a mosaic of agro-ecosystems.

6) Policies to encourage and support the transition from conventional and peasant/indigenous farming systems to models of sustainable agriculture. Policy instruments should be designed for each stage of this transition: reducing industrial inputs, making efficient use of energy, enhancing diversification, and promoting agro-ecological management. Incentives and support measures should seek to maintain the productive efficiency and competitiveness of agricultural systems, and to establish the objectives of each stage and the means for verifying progress.

7) A policy of participation and democratization that will include now-excluded sectors in defining and implementing the AKST agenda. We propose policy instruments that will increase these stakeholders' access to information, help them build or strengthen their capacities to take part in decision making, and provide institutional forums for deliberation and decision. Under these conditions, cooperative networks could be a prime instrument for coordinating the efforts of public and private stakeholders at the local, regional, national and international levels, so as to produce collective benefits that will take account of specific interests.

8) A policy for access to genetic resources and the equitable distribution of the benefits they generate. We propose as a policy instrument the formulation of legal frameworks that will guarantee local communities' access to genetic resources and regulate access for other players. *Sui generis* legal frameworks will also be defined to promote the recognition of traditional knowledge associated with these genetic resources, and the equitable distribution of their benefits among the communities that are the custodians of these resources.

9) A policy that prevents the use of food crops for purposes other than food in countries that are centers of origin of phylogenetic diversity. In other regions, the instruments will be of a regulatory nature. The instruments for this policy will include a precautionary legal framework where the granting of licenses will be preceded by a case-by-case evaluation of the social, environmental, cultural and food safety risk.

10) Intercultural education policies to promote the building and development of local capacities and skills. The idea is to facilitate rural people's access to labor markets through policy instruments such as community-oriented educational reform that provides for intercultural and multilingual instruction, the training of specialized teachers, the development of adequate physical and IT infrastructure, scholarships for low-income students, training programs and skills development.

11) 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 of the region, 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.

12) Differentiated financing policies for the extremely poor and the creditworthy poor. In order to create comprehensive financial systems, we must differentiate between people who are extremely poor and people who are poor but creditworthy. 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 prerequisites, primarily the resolution of property rights, education, the acquisition of management capacities, etc.

13) 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 communities in many parts of LAC are starting 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 these communities, 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.

14) 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. Objectives and Conceptual Framework

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; promotion of markets 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.¹ The AKST assessment of LAC in Chapters 1 and 2 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 the 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 innovation, and the supply of technology, recognizing the opportunities that arise in the productive chains and the need to make trade-offs between domestic market development and export subsidies. 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, consistent with the objectives of each country and recognizing multicultural diversity.

Similarly, we must note that this conversion process will only be possible if research policies are at the same time oriented toward technological innovation based on the sustainable exploitation of biodiversity and natural resources. The challenge is to find new technologies and alternative inputs, and ways of combining them without sacrificing competitiveness, to identify incentives and protection policies for the various stakeholders, and to select readily observable indicators of progress achieved.

Various experiments with productive development projects show that training and research alone are not enough to achieve sustainable development. Those efforts must serve to link producers to the domestic market. To date, technology has been the preserve of export-oriented productive chains. The market for technologies and inputs has historically been controlled by the multinational agrochemical and seed companies, and there have been no alternative companies present on the market offering clean agricultural technologies. This means that policies are needed to encourage small and medium-sized firms to enter the market under better conditions of competitiveness (Lizarraga 2002).

¹ The goals are to improve rural livelihoods and to promote equitable development, with environmental, social and economic sustainability that will reduce poverty and hunger through the generation, availability and use of agricultural knowledge, science and technology.

The agro-ecological conversion of farming systems can also be accelerated if there is an increasingly demanding market for safe, high-quality products. This trend is already apparent and is forcing market-oriented producers to initiate or speed up the conversion of their systems. Similarly, public policies can facilitate the process through incentives scaled to performance. What is essential here is a clear governmental willingness expressed in a policy for financing and strengthening the institutions involved in facilitating productive development in the countryside.

Figure 5.1 summarizes and illustrates the interactions between the set of AKST support policies proposed in this chapter for moving forward in the transition to sustainable production.

Insert Figure 5.1

It is useful to note here the importance of the models that multilateral agencies and international treaties impose on overall policy guidelines. 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. These models betray two serious conceptual errors: first, the reduced role of the State, and second, downplaying the role of agriculture and trying to create jobs in other sectors without understanding that rural people have few options apart from agriculture, while ignoring international market distortions. Budget cuts flowing from these approaches are reflected in three indicators: (i) reduced investment in research, extension services and education; (ii) few resources for institutional modernization; and (iii) scanty investment in human resources (Trejos et al., 2004).

The private sector has not been able to make up for these cutbacks in public spending on the productive sector, which is oriented toward producing food for the internal market, and this has left a significant investment gap.

Finally, in this introductory overview, we must stress that this set of policies presupposes that social spending in general (and in particular that for promoting AKST) will grow in real terms at least by the same proportion as GDP (Gonzalez and Avila, 2005), 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

In a setting of nutritional vulnerability, food sovereignty is proposed as a medium- to long-term goal for combating hunger and poverty, but one that also has to do with other aspects such as access to land ownership, basic natural resources, credit, markets, education, health services, women's participation etc.: in other words, the capacity to decide what, how and when to produce in a sustainable way.

Developing policies to achieve this goal will require a dynamic vision that, starting from the current situation, will involve intermediate phases and instruments to subsidize access to food in extreme cases. Food security concerns itself only with the immediate supply of food, providing or guaranteeing access to food by keeping prices low, offering food stamps etc. A number of government programs have been confined to this goal, but they have not been effective in resolving the problem of hunger and poverty.

In this first section of the chapter we put forward some policies and instruments relating to both food security and food sovereignty programs, the importance of women's participation, and the role of development and culture in achieving the IAASTD targets.

5.2.1. Food security

An initial issue for AKST support policies is that the rural people should have a reasonable level of security in their access to basic needs, 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 (see Chapter 1).

These social policies in Latin America have been implemented, on one hand, through 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). Both these 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 it 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 lunches, 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 them 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 the possibility of determining the basic human needs 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 (Hall 1998; Townsend 1993).

The social policy of food security relies on the notion of subsistence and/or basic needs. For Sen and Foster (1997), however, 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 (Sen 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 left.

Policies focused on increasing productivity to raise 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—which is 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 for them in defining 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 and small-scale farming communities that have exploited market niches through certification schemes whereby they can offer specialized products and do not have to sell at spot prices (certification, internationally recognized specific protocols, etc.).²

As an instrument of food sovereignty policy, in the productive aspect, the creation of networks can correct market failures, as explained below.

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).

Among the proponents of food security, there are also groups that use the rule of "the right to food" (Glipo 2003). 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.

² For example in Mexico with organic coffee (Vanderhoff, 2005) or in Peru with organic bananas (Soldeville, 2005).

Following is a detailed discussion of policy measures that could lead toward the goal of food sovereignty.

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, a proportion that is rising (Deere 2005).

Consequently, efforts to alleviate rural poverty and improve food security will not have the hoped-for 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.

Credit institutions should also be encouraged to change the ways they do 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.

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". 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.

Improving household food security can only be achieved if female as well as male farmers have access to agricultural training and extension services (which have so far been geared primarily to men), and specifically to a good level of technological innovation in 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 (see Box 5.1).

Insert Box 5.1

5.2.4. Development and culture³

The LAC region is rich in ethnic and cultural diversity and in “agri-cultures” (see Chapter 1). Culture and development are closely related to agriculture (Sen 2004). Yet development policies in the LAC region have tried to make small-scale peasant/indigenous farmers adapt their “agri-cultures” to models that are foreign to their reality and culture. Culture is indeed a central component that has been overlooked in the drive for development (Warren, Brokensha and Slikerveer 1993, Warren 1992, Hoage and Moran 1998, PRATEC 1983).

Informed by a Eurocentric⁴ vision, development policies and the dominant AKST system have tended to favor conventional agriculture (Grillo 1998). These policies, by promoting the mechanistic Western worldview, predominantly anthropocentric and unsustainable (see Table 1, Chapter 1), ignore the worldviews or cosmovisions (Gonzales 1999, 1996; Toledo 2001; Valladolid 1998, 2001), knowledge, know-how and technologies of peasant and indigenous peoples⁵ (more than 400 ethnic groups) and their respective agri-cultures. They thereby induce a process of marginalization, devaluation and erosion of peasant and indigenous knowledge and AKST systems and their respective resource management systems.⁶

The region’s rural and agricultural development, and in particular its 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),

³ 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, Chapter 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).

⁴ 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).

⁵ For further details, see World Forum on Agrarian Reform (2004).

⁶ At the root of the conflict between conventional, output-oriented agriculture and indigenous-peasant agriculture we see that the cultures and societies that embrace them have two 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.

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) (See Figure 5.1).

Social, political and cultural marginalization. The dominant AKST system in the region is part and parcel of the dominant development and culture. Over the last 60 years, it has promoted the modern or conventional system of agriculture, while largely ignoring the other two existing systems in the region (peasant/indigenous and Agro ecological). It is only in recent years that the emerging processes of resistance, decolonization and cultural affirmation in the region have put forward the concepts of multiculturalism, intercultural knowledge, and "coloniality" of power (Quijano 2002) and of knowledge (Lander 2000) in an effort to explain other ways knowing, understanding and conducting agriculture, and the general features of local life as a whole (Warren 1992, Leff and Carabias 1993, Grillo 1998, Huizer 1999, Rist, S. *et al* 1999, Delgado and Ponce 1999, Ishizawa 2006, Via Campesina 2006, Agrawal 1999, Walsh 2002, 2004).

These concepts are renewing and deepening the epistemological, ontological and cosmological foundations of the AKST system adopted in the region over the last 60 years, and make it possible to revise them. But at the same time these concepts are still striving for incorporation into the AKST system. Policies for promoting AKST, by reproducing the political, social and cultural marginalization and devaluation of peasant and indigenous communities in their treatment by national society, have disregarded the languages, the cosmovisions, the knowledge and the technologies of peasants and indigenous people and local producers, as well as their systems for the on-site conservation of native crops and their wild relatives,⁷ the management of natural resources (hunting, gathering and fishing) and their forms of agriculture.

Intercultural and interethnic policies and policies of cultural affirmation directed toward an alternative AKST system would serve to capitalize on indigenous/peasant knowledge and AKST by incorporating them in their own terms—in other words, without attempting to validate them from some supposedly modern, scientific cognitive authority (Agrawal 1999, Grillo 1998), and as part of a process of food sovereignty and indigenous/peasant self-determination at the local, regional (e.g. a watershed), or national level. Such policies could in this way promote the revitalization and affirmation of indigenous/peasant culture that would contribute to IAASTD objectives.

⁷ Among other experiments in the local conservation and/or community management of natural resources is the "In-Situ Cultivation of Cultivars and Wild Relatives 2001-2005" project in Peru, financed by the Global Environment Facility (GEF), administered by the United Nations Development Program (UNDP), and implemented by the Instituto de Investigaciones de la Amazonia (IIAP), in collaboration with six Peruvian institutions (Ishizawa 2006, Valladolid 2005), <http://www.insitu.org.pe/english.htm>. In addition there are two indigenous research centers working on the management of biodiversity, El PEMANSKY, in southern Panama, and the Instituto Amazanga of the Organización de Pueblos Indígenas, in Puyo, Pastaza, in Ecuador (http://www.cdi.gob.mx/pnuma/c7_10.html).

To give effect to policies for strengthening indigenous/peasant systems of knowledge and AKST, it would be useful to assess the liberal⁸ and/or neoliberal policies of governments, and the transnational network (based on financing and models from Western Europe and North America and sponsored by a network of agencies already mentioned) that supports and provides feedback to the region's AKST system (Escobar in 1995, Via Campesina 2006, González 1996, 1999).

The rural development models and AKST systems adopted in the LAC region in the last 50 years continue to rely on a Eurocentric vision, transmitted via Europe and North America and their counterparts in the region⁹. Specific policies for institutional change and innovation have facilitated the adoption and adaptation of knowledge, institutions and technologies originating in Europe and North America. Given this situation, when it comes to nonconventional culture and agriculture, the direct and indirect impact of this dominant model has been of little benefit and has indeed eroded local and peasant/indigenous agri-cultures in LAC. The same holds for people's health, and the region's ecology and environment. In this context we must consider policies that reflect experience from the past and that encourage the integral participation of peasant/indigenous knowledge and AKST systems.

Agrarian reform (AR) and landholding are important issues for the region's agricultural development. Such is the heterogeneity of LAC, however, that these issues must be considered separately in each country. AR and landholding in the region are central factors associated with poverty, hunger, and the expulsion of small-scale peasant/indigenous farmers from the countryside to the city. Similarly, living conditions, identity, the environment, and sustainable development are being seriously affected within indigenous communities (Colchester 2001). In general, in the context of the region's system of economic, political and social domination, landholding in the 20th century, during and after the oligarchic regimes, continues to show serious disparities and social divides (Van Dam 1999, Baranyi, Deere and Morales 2004). ARs and the associated policies for land redistribution and modernization of rural production relations, it must be noted, have tended temporarily to reduce social conflict and the demand for more land and justice on the part of peasants and indigenous people in the region.

It must also be noted that these ARs were designed on the basis of western premises and experience bound up with the liberal paradigm, and they had no cultural or environmental orientation appropriate to the great mass of peasants and indigenous people and for this reason

⁸ 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.

⁹ 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?

in some countries there affects ran counter to the competitive development of farming.¹⁰ This aspect could be reconsidered in future AR and landholding policies.

If agrarian reform and land distribution policies had been based on an appropriate cultural and environmental focus, in particular with respect to the peasant/indigenous sector, the results in terms of natural resource management could have been more sustainable and equitable.

Today there is tremendous pressure from the demand for land on the part of landless peasants and indigenous people, and for those who are trapped in the tilling of mini- and micro-plots the pressure is increasingly intense and is sparking social conflict in the countryside. This situation may require compiling reviewing and assessing 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 food sovereignty.

With respect to land rights, territory and indigenous peoples¹¹, this issue is recognized to varying degrees by national constitutions¹² (Colchester 2001) in the region as well as by international conventions¹³ and international case law on human rights. For indigenous peoples, land and territory are closely tied to autonomy and self-determination (Via Campesina 2006, Van Dam 1999), for which reason policy should be established to promote commercial or business undertakings that respect property rights over time.

In this respect, future agrarian reforms should have a clearer profile within the strategy of land distribution, especially when access to land must be created for vulnerable social groups such as indigenous peasants.

It must also be noted that, under current conditions, local indigenous communities must become more competitive in generating income as through the sustainable exploitation of natural resources. Yet there are many legal barriers that prevent communities from making better use of their communal lands, for example, and in any case their organizations can see no way to avoid the fragmentation of their property into "*minifundios*". This situation calls for policies that will give communities the ability to enter the land market so as to grant concessions and to attract investment on the basis of rules and conditions established by the indigenous communities

¹⁰ In the Western world there are three theories of development: the liberal theory, 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.

themselves. To this end, incentives could be established so that those who are no longer making use of the land can dispose of it and in this way help to reorder the size of properties.

The land and territory of indigenous peoples shows a tendency to shrink because of factors related to extractive economic activities, linked to the capitalist form of development supported by liberal and neoliberal policies of the LAC region (Deruyttere 1997, Toledo, Alarcon-Chaires, and Moguel 2001). Under these conditions what is needed is to establish policies to defend these territories or in any case to foster negotiations to pay for the environmental services that indigenous communities provide in the course of conserving their ecosystems and cultures. The important point in this process of globalization and exploitation of natural resources is to find economic mechanisms to recognize payment to those groups that act as the custodians of biodiversity in the various ecosystems.

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. (See figure 1.1, Chapter 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 and cultural affirmation (Grillo 1998), 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 the Participation of Public and Private Stakeholders in the Development of AKST.

Participation, understood as a democratic value that encourages citizens to collaborate in formulating and implementing public action, allows decisions to be taken on matters of collective interest (Bañon 2006, Kondo 1996), and the quality of that participation will depend on whether a suitable institutional, social and cultural conditions exist. A suitable legal framework, mechanisms for participation, and an appropriate degree of decentralization are the best institutional conditions for promoting participation. The history of the community, the types of leadership, its economic resources, political culture, local capacities and educational levels are the social and cultural conditions that will determine the degree of collective participation (Colomer 2006, Cartagena *et al.* 2005).

Participation and decision making take place in different levels or spheres, in which stakeholders will have different perceptions, capacities, influence and roles. In the international sphere, the representatives of governments, multinational agencies and international NGOs work with macro information and take policy decisions that will affect the other levels; in the national sphere, governmental and private sector players and national leaders will take political decisions that affect the other two spheres, but especially the local level; and in the local sphere, communities and families work with information and decide on their resources, with direct influence on the application of policies taken at the other levels, especially at the national level.

One of the fundamental rules of national governments is to facilitate the relationship between the different levels of decision takers. While there may be a series of relationships between the public and private sectors, one challenge will be to move beyond the old schemes of vertical and hierarchical relations between government and society and to make networking a new form of relationship based on interchange and cooperation, thereby strengthening stakeholder participation in decision-making.

Bifarello (2002) explains that the concept of the "associative network" is useful for understanding the public-private societies in Latin America, and how stakeholders relate to each other through formal and informal societies. Associative networks are distinctive not only because they connect people around the taking of decisions, but also because of their multiplicity and their efficiency, and the fact that the relationships they create tend to be based more on interdependence and collaboration than on competition.

Stakeholders at the different levels will insert themselves more efficiently into a cooperative network if the necessary conditions are in place to ensure equity in access to resources, information, training, etc. The following section describes the actions and roles of public and private stakeholders at the different levels of decision-making, for promoting their participation in the development of AKST.

5.3.1. *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 statement and of practice (Perez-Ordoñez 2005). The State must give effect to statements of intent by responding to demands through actions inscribed in a government agenda, while civil society must demand quality in government management and thereby 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. In other words, the greater the connectivity, the greater will be the interactions and the better the results (Wellman 1987).

At this level, the decision-making spaces are forums, summits, conferences and international meetings, among others, in which the governments of the region participate along with multilateral organizations and international NGOs. Participation in decision-making should be directed at prioritizing AKST agendas that include the particular features and sensitivities of the region. A shift in the structures and social relations between nations that have contributed historically to the region's underdevelopment, based on inequitable access to science and technology for the poorest countries, could be addressed through networking as a regional bloc. This work could be based on pre-established regional agreements and on a clear understanding and vision of the problems, potentials and priorities at the national and regional levels with respect to generating AKST.

The particular ecological features associated with the region's cultural characteristics required a regional form of networking to address the shortage of science, technology and innovation and the recognition and use of local knowledge, especially in regions that have been the object of little comprehensive study such as the Amazon and the Caribbean, where studies have for the most part focused on conservation rather than on the people, the environment or development.

5.3.2. 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 poverty-prone 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 reforms that would help bring greater participation in the development of AKST are described below

5.3.2.1 Suitable legal frameworks

Legal frameworks are instruments that 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. Legal frameworks can only be effectively implemented if public and private stakeholders are included in their design, implementation and evaluation, and this can only be achieved through political will on the part of the authorities to decentralize certain roles and functions that will promote social co-responsibility. Following are some aspects to take into account for ensuring that legal frameworks will produce greater participation in the development of AKST.

- Guarantee the representativeness and legitimacy of the social base, so as to promote genuine participation and governance. Given the region's cultural heterogeneity, inclusion and respect for local forms of organization, representation and prioritizing demands will produce greater participation and commitment on the part of local stakeholders, based on grassroots social oversight.
- Orient the role of the academic sector (universities and research centers) toward the design and implementation of an AKST agenda appropriate to national needs, which will respond effectively to resolving concrete problems and will seek comparative advantages based on domestic agricultural potentials.
- Facilitate participation by the private sector and enhance its capacity to invest in innovation. The legal frameworks must guarantee a suitable institutional context and respond to the promotion of innovation.
- Ensure sufficient economic and technical resources for implementing the legal frameworks, so as to help make AKST development sustainable.

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.

5.3.3.2. Effective mechanisms of participation

Having such mechanisms in place will not only guarantee inclusion of the various sectors related to science and technology, but will also ensure the definition, control and validation of government actions. Councils, committees, advisory bodies and other mechanisms of participation in defining AKST support policies have the advantage of bringing together players with diverse capacities, experience and expectations, an aspect that can be reinforced 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 the demands of their participants, and if they have financing:

- Participatory mechanisms must be institutionalized from the outset in national legal frameworks and must be legitimized by social stakeholders.
- 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 these forums to be properly designed or adapted 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 the social oversight function.
- The inclusion of differentiated demands for the various kinds of users 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 lift 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.
- Governments should ensure financing for these institutionalized spaces, although a combination of public and private funding could guarantee their sustainability and efficiency.

5.3.2.3. Decentralizing the AKST system

Decentralizing the AKST system by delegating greater decision-making power under a new government approach to collaboration and networking could become a key instrument for the 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:

- Decentralization produces economic advantages in the form of efficient expenditure. 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 (Wolman and McCormick 1994).
- The social advantages flow from the fact that decentralized systems for AKST support contribute not only to the accountability of decision-makers and 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 democratic governance. 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 help to create co-responsibility for actions taken within the AKST system.

In the process of decentralization, the private sector should not be involved directly in policy formulation. Its role should come into effect downstream, working with the government to finance rural programs and projects. However, some caution is needed not to expand the private sector's role too far, for experience has demonstrated a relationship between fiscal decentralization and corruption. The private sector can be the voice of the community, to the extent that it identifies local needs and proposes viable solutions. In some cases, if there is a private business in the community, local residents can be informed of the qualifications needed for employment in that business.

Following are some of the areas in which the private sector should be permitted to participate:

- Fostering and strengthening linkages between all interested parties, including small local producers.
- Working with local government to ensure a positive impact on local development.
- Helping in the planning and implementation of local programs and projects, and sharing know-how and skills in the use of resources, financing and employment matters.
- Mobilizing local participation for defining priorities and how they are to be achieved.
- Advocating pro-poor and community initiatives that will be of benefit to all citizens.
- Creating associations to deliver local services such as electricity and rural roads.

These companies can include financial advisory services and micro-finance for local development. It is important to note that if the private sector is to participate in a decentralization process there must be appropriate institutional and administrative structures in place for handling funds. One of the lessons learned about the inclusion of the private sector as a partner with government and civil society is that each side must work with and support the others in order to achieve the objectives of decentralization.

5.3.2.4. Mechanisms for disseminating information

Information dissemination mechanisms 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 mutual understanding of the contribution of each, as the basis for developing appropriate technologies locally. Information generated at this level, if it includes 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 tends to be applied more successfully if they include mechanisms for disseminating information,. A clear policy on information, disclosure and distribution of new findings 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, so as to ensure smooth operation at all levels of decision-making. Given the existing asymmetries between social groups and players, actions should be planned to strengthen negotiation mechanisms so as to strike a fairer balance in the relative clout of the different sectors in setting AKST priorities. If information is clear and readily understandable by civil society organizations and rural people, this will contribute to the operational objective. To this end, specific policies need to be designed to promote access to information for marginalized rural groups.

Participatory methods could be seen as AKST support policies with a view to integrating rural communities into the technical information system, and at the same time integrating the academic sector into local knowledge and know-how, and in this way jointly to generate new knowledge, science and technology.

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 crucial 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, farmer-to-farmer training, and local agricultural research committees.

5.3.2.6. *Effective mechanisms for evaluating and monitoring policies*

Such mechanisms are 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. This weakness is glaringly evident in civil society, which in past decades was under the thumb of government. With the trend towards new forms of government based on collaboration and networking, it is time to consider some basic criteria for evaluating policies:

- Policies that involve civil society in their design and implementation can 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.

5.3.3. Local action

There has been much discussion of the importance and the roles of civil society in a new approach to governance based on cooperation and networking. While civil society can alter in its favor the balance of power between State and society, it can also 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 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:

5.3.3.1. Strengthening local grassroots institutions

Working to reduce rural illiteracy and functional illiteracy and to enhance human capital will be an important task for governments in integrating the local grassroots sectors. As well, building technical and political capacities as part of the rural school curriculum 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. 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

5.3.3.2. 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 active 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, which highlights the urgent need for intercultural education approaches, working through agents external to the communities as well as with the indigenous and peasant communities themselves. The protection of creativity rights and copyright through the intellectual property system hardly exists: in fact, this is not an appropriate mechanism for protecting the traditional knowledge of aboriginal communities and peoples because of the community nature of that knowledge.

5.4. Policies for the Sustainable Management of Production Systems (Biodiversity, Intellectual Property, Education and Training, Climate Change)

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 must embrace all components of the land so as to improve its biological efficiency, maintain its productive capacity, conserve biodiversity, and generate conditions for the system to be self-regulating (Altieri, 1996; Benzing, 2001).

Moreover, in cases of market-induced specialization, such systems must be managed with respect for agro-ecological principles if they are to be sustainable, whatever the size of the farm

and the type of output. This agro-ecological approach should be a goal not only for small farmers and subsistence agriculture but for all production systems, even commercial ones, that are trying to move to sustainability and competitiveness.

5.4.1.1. The stages of transition

We start from the definition of the three types of agriculture given in Chapter 1 (conventional, traditional/indigenous, agro-ecological), characterizing the degree of sustainability of each type: the conventional system is dependent on the intensive use of industrial inputs; the traditional or present system makes little or no use of external (indigenous/forest) inputs; while the agro-ecological system uses resources generated within the system, with perhaps some alternative inputs. All these systems are in constant flux, depending on their components, functions and management. These different production systems contribute in different degrees to conservation of agro-biodiversity and of biodiversity in general, and they also contribute in different degrees to the internal food market and to the export market. Industrial, commercial agriculture systems, which are closely geared to the market, are more homogeneous but they are the ones that contribute least to maintaining biodiversity. By contrast, small peasant agriculture, despite its great limitations in farm size, has made the greatest contribution over time to the conservation, use and exploitation of biodiversity (Tapia 1999, Caporal 2004). A number of conditions must be met if production systems are to move towards sustainable management:

- Diversified, multi-crop production, crop rotation, or a combination of systems (agro-sylvo-pastoral) managed over space and time.
- Meeting with the family's food needs and supplying the domestic market.
- Use of agro-ecological practices for efficient exploitation of natural resources available on the land.
- Reduced energy consumption in running the system (avoiding excessive mechanization and transportation distances, optimizing photosynthesis, etc.).
- Making proper use of the biomass byproducts of farming: stubble for cattle, ground cover, green manure, composting.
- Development of capacities based on local knowledge and proven technological innovations (see Chapter 4).

These conditions for 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 soil fertility and functional biodiversity in agro-ecosystems. There may be a noticeable decline in yields while the ecological balances of the production system are being

restored. During this time incentives may be needed for some producers until their systems recover their productivity.

If production systems are to shift towards ecological or organic farming, farmers will also need to receive a price for their output consistent with its quality, and this may be higher than the international market price. These products are now sold to a limited group of consumers, mainly abroad, with the capacity to pay a premium for them. Yet a number of studies show that this organic market can be expanded, and that it is possible to produce sufficient food without using chemicals to meet the nutritional needs of the world population. Ecological or organic farming is also becoming an important source of rural employment, and is thus contributing significantly to improving living standards.

Figure 5 2 shows the three stages of transition, according to the state in which each production system finds itself initially

Insert Figure 5.2

1. Conventional systems

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. Indeed, there are already various options that are being successfully applied such as sustainable low-external-input farming (Reijntjes et al., 1995)¹⁴, integrated pest management (Cisneros, 1992), good agricultural practices (EUREPGAP 2003), minimum tillage (PROCAS 2001), and other practical models that enhance productive efficiency and reduce 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), as well as greater agro-biodiversity.

Shifting quality demands for food products in external markets and the certification mechanisms now in place may encourage these transitions. Incentive policies would be geared to progress in these stages of transition, assuming the conventional systems that do not follow these paths would then be made conditional upon other poverty reduction goals, such as employment creation, 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, especially for combating insects and diseases in large-scale monocrop operations; in this case, they could be subject to the

¹⁴ 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".

"polluter pays" principle. In turn, the revenues collected could be earmarked to promote further research in agro-ecology and in agro-biodiversity management.

2. Traditional systems

With respect to the peasant/indigenous systems that are already at stage 1 and that use little or nothing 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 (economies of scale), standardizing plots, purchasing commercial seeds, and making greater use of external inputs. (See Chapter 2).
2. Adopt sustainable agro-ecological systems, improving their integral management of available resources, their productive competitiveness and the quality of their output, which could be certified using a certificate of origin, or perhaps an "organic", "green" or "fair trade" certification. (See Chapter 1).

In this second case, suitable incentives would be used to encourage the transition toward stage 2, rescuing local knowledge of agro-biodiversity management.

3. Sustainable system

The third and final stage of transition is the desired shift in production systems. These sustainable systems would rely on optimizing the natural processes of the productive system (such as photosynthesis, atmospheric nitrogen fixation, biological soil activity) and intensive labor input to reconcile environmental, economic and social objectives.

This desired system also implies changes in the food system, together with other energy adaptations, particularly in the fuel used in the case of mechanization, reduced inequality of incomes, and new social relations.

Figure 5.2 shows the different options for ecological transition, but it does not incorporate their economic impacts. For example, it does not show what incentives could be expected from the market so that conventional systems will begin the transition to stage 1: subsidizing the price of inputs, internalizing the costs of environmental degradation, and sustainable agriculture labeling are more realistic proposals than changing international commodity market prices to reflect the quality of products, when those prices have in fact been on a downward trend, with the exception of hydrocarbons. Generally speaking, the proposed transitions move in the direction of reducing production costs, with no associated decline in productivity. They also assume more intensive use of labor, distributed over the year, which could have a positive impact on unmechanized farming and could help compensate for the seasonal nature of monocrop agriculture in the mechanized sector. This process of converting one production system to another usually requires

a prior cost-benefit evaluation. That calculation must include the real costs of production, which will internalize the costs induced by environmental pollution (loss of biodiversity, damage to producers' health, contamination of waterways, etc.). 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).

5.4.1.1. Policies to support sustainable management of production systems

The future 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 agro-biodiversity (Prager 2003).

During these transitions, different levels of progress in different systems of production will coexist. It is clear that if policies are to support this process they will have to arbitrate in the development of highly differentiated technologies.

There is a global tendency to consume natural products, and governments, the private sector and civil society have an important task in promoting product niches. Consumers' concepts are changing, placing greater importance on food quality and safety. Special markets are emerging for products certified according to various concepts of differential quality.

Similarly, rural employment can be boosted with a sound management structure for sustainable production systems. Yet such jobs are still precarious in many countries of the region, and the State must facilitate a process of formalization, so as to improve working conditions within production systems.

Policies are also needed to develop technologies that will contribute to the sustainable management of production systems. Those technologies will need to be differentiated and must respond to different geographic, ecological and social conditions. In addition, production systems must remain competitive. The use of latest-generation technologies such as genetic engineering can be adapted to the various demands of biosecurity, and their use should be prohibited in some countries that are centers of biodiversity.

These changes should facilitate consumer access, 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 or smoked foods, marmalades, etc.) and introduced into mass consumption by various means, such as school lunches. The proliferation of these processing firms, their size varying according to the market but oriented primarily to the domestic market, will have an impact on rural employment.

Other rural jobs should be promoted to increase the employment rate in the countryside and to give rural people a chance to find work at home and raise their incomes, and in this way allow them to stay on the land instead of migrating to the cities. Those jobs could be provided by family

craft businesses, participation in the benefits of tourism (porters, guides, local accommodation etc.), nonagricultural activities, or productive job-creating investments financed with remittances from abroad.

Various production systems have been developed throughout 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 and technical assistance. This support has been used essentially to buy fertilizers, pesticides and hybrid seeds, and to a lesser extent farm machinery. This kind of government support has produced an economic and social divide between market-oriented industrial/commercial agriculture and small peasant farming, focused on the domestic market and food security. 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 for the sustainable management of production systems.
- Encourage approaches such as "polluter pays" mechanisms to discourage the excessive use of chemical inputs, especially in intensive farming systems
- Reform landholding and ownership, access to water, and the mass distribution of credit so poor farmers can (1) stabilize their production system and devote themselves exclusively to it, (2) find a more satisfactory ways of marketing their output, by organizing producers into groups, associations, and producers networks built around on productive chains.
- Develop markets and business opportunities for sustainably produced products, through certification mechanisms.
- Help producers develop the capacity to implement on a large scale production models such as ecological, organic, biological, biodynamic, or permaculture farming.
- Pursue policies to educate consumers on the important of consuming sustainably produced food.
- Promote changes in urban consumer demand toward diversified food consumption and a change in quality standards, including food safety.
- Provide direct incentives with more effective support for the development of agro-ecological production systems, especially in the transition stage where there may be a risk that output and incomes will drop.
- Adopt financing policies to ensure that the objectives of sustainable management can be achieved.

- Encourage the development of technologies for sustainable management of the different production systems. These could rely on existing experience with sustainable agriculture in the region, with technical support based on:
- Maintenance or expansion of natural vegetation cover at the level of productive systems and territorial units.
- Proper soil management for conservation, maintenance of natural fertility, and erosion control.
- Protection of natural and second-growth forests, shrub nurseries or tree plantations within production systems.
- Crop diversification and rotation to avoid environmental and economic risks.
- Ecological and economic zoning of production areas and conservation to facilitate their efficient use.
- Establishment of protected areas in the form of biological corridors to make efficient use of beneficial wildlife (pest controllers), depending on local conditions.
- Integrated management of various aspects of production: control of pests and diseases, management of soil fertility, seed bank exchanges.

AKST can be devoted primarily or target more public money to small and medium-scale agriculture. This sector does not have the investment capacity of the big producers' associations that produce for industrial processing and that can co-finance research facilities and extension services. A lesser effort can be obtained from associations involved in some productive chains such as dairy, seed potatoes, wheat, fruit orchards, coffee etc.

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 performance 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 at two levels: (1) taking account of farming-livestock interactions, agroforestry, integrated crop and livestock systems and the planting of trees on farms, and integrated management of soil fertility components; (2) taking account of agriculture's other roles.

AKST must also change to accompany these transitions at the university level, through a rapprochement between agronomy and ecology, and managing agricultural lands with the systemic focus.

To facilitate the evolution of knowledge in the management of productive systems (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 the continued degradation of ecosystems services will contribute substantially to the loss of biodiversity to the year 2050 with a consequent decline in the quality of environmental services, an aspect of particular concern for the objectives of reducing hunger and poverty (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).

In addition, environmental deterioration has reached the point where proactive measures must be taken to reduce the impact of climate change.

The available technology is focused on commercial crops, which require greater industrial inputs, and this perpetuates environmental deterioration. AKST policies have for the most part contributed to environmental degradation and the loss of biodiversity, and are threatening mankind's welfare through the reduction of phylogenetic resources,¹⁵ which are the foundation of food sovereignty for many people. Policies to protect and conserve phylogenetic resources are a major consideration for achieving the IAASTD goals.

In this context, what is needed is a transformation of public awareness and international policy, and a determination to take measures to protect ecosystems throughout the planet, so as to

¹⁵ Phylogenetic 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.

defend basic services such as the secured supply of food and fresh water, and to protect against disasters.

The Earth Summit produced the Convention on Biological Diversity and the United Nations Framework Convention on Climate Change, but it is important to take into account sustainable farming practices in order to enhance food security for the world population and to help protect biologically diverse ecosystems. There must be better coordination between policies and actions; a study is needed of the economic benefits of biological diversity, the costs of its loss, and the costs that will flow from not taking protective measures, compared to the costs of effective conservation.

On the other hand, a framework of action is needed to reach commitment on reducing greenhouse gases (GHG) under the Kyoto protocol, which expires in 2012.

We have the responsibility of forging a global alliance to sustain life on earth, the principal objective of the Rio Summit, which established options for action in order to guarantee prevention, sustainable use, and equitable distribution of the benefits of biodiversity.

We may note that countries of the Third World are demanding that developed countries, which exploit their biological resources commercially, should provide them access to biotechnologies and the indispensable financing (Swaminathan, 2000). The trend of events demands that we change our rules governing intellectual property so that new varieties of seeds can be patented and protected as the basis of food and culture for local and indigenous community is an LAC. The existing system, based on individual and private property, is inadequate to protect the traditional rights of rural communities and of nations to their natural resources.

- Establishment of precautionary measures under the Cartagena Protocol (Article 10) prohibiting the transfer of genetically modified organisms (GMOs) among countries that are centers of origin or of genetic diversity.
- In countries of the region, limit production of GMO plants that have wild relatives and show botanical characteristics that could contaminate the gene pool (for example, the case of corn in Mesoamerica).
- Promote food safety research in cases of transgenic products that are consumed and produced in the region (for example, food safety studies are currently "rubber stamped", and there is no research geared to the particular conditions in the region).
- To protect human health and biodiversity from transgenic risks, governments should establish international standards for the clear, accurate and rigorous documentation and labeling of transgenic products in shipments of grain for human and animal consumption. Products that contain transgenics or derivatives, regardless of their final destination,

should be recognizable as such by their labels, in order to respect the right of purchasers to choose freely. This label should identify the risks and enable the enforcement of biosecurity measures.

- From this perspective, there is also a need for policies to encourage those producers who contribute directly to genetic resource conservation as part of managing their productive systems.

The instruments for achieving such policies involve building capacities in biosecurity, because modern biotechnology is still immature. All stakeholders need to know about its progress and provide continuous feedback. In addition, existing institutions devoted to biosecurity need to be strengthened and new ones created.

When it comes to incorporating agro-biotechnology into the productive processes of small farmers, technical assistance is essential for assessing their risks and possibilities. The idea is not to go back to the old kind of extension services, where programs were designed in offices far from the people directly involved, but rather to strike a proper balance between the generation and validation of scientific and technical progress and the concrete demands of producers with less access to information and resources.

According to the Cartagena Protocol, states must establish a system of objective responsibility for the risks inherent in GMOs. 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 outside the country. This form of illegal appropriation of biological resources has been termed "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 under that scheme 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.

Policy instruments would be designed to produce:

- Research for classifying plants of agri-food importance, so that those not yet classified and registered can be protected.
- Legal frameworks governing access to genetic resources, for example in the context of the Andean Community's Standard 391.

- Special regulatory frameworks to protect traditional knowledge about phyto-genetic resources that will take account of the full scope of knowledge, as well as nontraditional records (oral history, for example) and systems for distributing the revenues generated by access to genetic resources.

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 advances in this leading-edge technology that allow use of food crops to produce pharmaceuticals, biofuels and plastics now pose 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 staple food of Mesoamerican cultures, and its use for producing pharmaceuticals and inedible industrial substances could affect directly the food security and safety of people in the region, without mentioning the effect on biodiversity in the center of origin (Galvez, A. and Gonzalez, R.L. 2006).

The concern over producing biofuels from food crops is that it further threatens food security by increasing the price of foodstuffs, with the attendant impact on hunger and poverty.

When prices for biofuel crops rise, this does not necessarily benefit small producers and peasants in developing countries, because they have no access to such markets, or market imperfections may deny them the benefits.

The idea here is not to discard biofuels production in the region, recognizing that, in some Caribbean countries for example where food must be imported, devoting farmland to biomass production for export could offer a way out of poverty. What is proposed, instead, is that the needed biomass should be derived from agricultural residues, from nonfood crops, and from animal wastes. The challenge is to ensure food security, so that rural families can feed themselves and at the same time lift themselves out of poverty.

One 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

The promotion of education abroad, or indeed in the universities of LAC, is producing highly qualified personnel, but they are not necessarily equipped to address the problems of mega-diversity in agriculture, because their training may not pay much attention to the sustainable management of biodiversity or the care of genetic resources. Moreover, available infrastructure and human capital have been focused on boosting yields and production volumes, under an output- and export-oriented agricultural model.

The "demographic bonus"¹⁶ 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 accrue to the 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 the kind sponsored by multinational companies that sell seeds, agrochemicals and farm machinery.

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

1. A holistic and interdisciplinary vision
2. Breaking down the walls between departments and faculties, so as to deal with such issues as:
 - Climate-soil-plant relationships.
 - Farming-livestock-forestry-fishing relationships.
 - Agroforestry, community woodlots.
 - Fertility management.
 - Systems analysis.
3. Allowing students to gain practical experience in the field.
4. 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 the indigenous 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.

A necessary condition for achieving this is to integrate the university into its region and involve it in resolving producers' problems through coordination and cooperation with regional and local governments. In effect, AKST can be geared to small producers and marginal rural sectors through reliance on a tripod of (i) publicly funded research, (ii) public and private universities, and (iii) networks of NGOs and other civil society players, including representatives of farmers, associations and unions.

The inequality of opportunities in education is a key element in perpetuating poverty, which impacts most heavily on children (Herrera 2002). Considering the scant opportunities for primary

¹⁶ Population of productive age

and secondary education in rural areas, particularly for women, (1) greater emphasis should be placed on technical education that will meet a real labor need (securing value added for products, helping local governments to formulate development projects); these technical institutes are now supported by churches or by universities, (2) continuous education should be encouraged (from basic literacy through to specialized training). One measure that has proven to be effective in rescuing biodiversity and agro-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). More generally, thought should be given to providing small farmers with opportunities to study new techniques, in accounting and marketing for example, in the course of their farming activity.

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.

It is hard for producers, even if they have formed an association, to shoulder the costs of certification and traceability. Public support could be provided for this aspect in the form of loans.

AKST policies should develop a diversity of technological innovations, since the problems to be addressed are varied 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).

Countries can be classed in three groups with respect to their AKST systems.

The countries that are the biggest producers and exporters of food in the region, such as Argentina and Brazil, have maintained a public system of research and agricultural extension services, and Brazil in fact has a government research institute of international renown, EMBRAPA. Achievements in Mexico are more modest.

The Andean countries have abandoned 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. Among these two groups, other countries including Chile have privatized their research in important areas such as fruit, fish and lumber exports, with generally negative consequences for AKST objectives. In light of the results described in Chapter 2, policies should seek to foster

creativity and to strengthen institutions, using public funds to encourage the emergence of technical assistance networks that involve local stakeholders, both public and private.

Figure 5.3 below illustrates the asymmetry in the agricultural research budgets of the Monsanto Corporation, the CGIAR international agricultural research centers, and national research programs in South America.

Insert figure 5.3

It is time to evaluate the private networks that have sought to replace the public sector in agricultural extension work. Agricultural extension services need to be adapted to changes in agriculture: the preponderant role of peasant women, part-time farmers who combine farming with other work, temporary migrations, and non farm rural jobs. Yet there is a certain contradiction between the holistic vision, which insists that agriculture extension must take account of all producers, in particular small producers and all the activities of peasant families, and the fact that funding targeted at these groups is declining.

The solutions must be found in coordinating public efforts with private networks, under contracts that involve competition for public funding. The effectiveness of these private networks and their long-term impacts should be assessed, in light of their ambition to replace the public sector in agricultural extension work. (See Chapter 2).

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 crops serve as 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, but with government incentives.

5.4.4. Climate change

The global climate change that is affecting the planet is due to the release of greenhouse gases, which have increased significantly through massive use of fossil fuels. The root causes of this problem are the generation and consumption of energy in the form of coal or oil, automotive transport, and energy-intensive industrial processes. The burning of biomass in the forests is also harmful, not only because it releases carbon dioxide but also because it reduces the "carbon sink" that photosynthesis represents.

In 1990 the Intergovernmental Panel on Climate Change (IPPC) sounded the warning about rising atmospheric concentrations of carbon dioxide from human activities, leading to higher annual average temperatures accompanied by a changing climate. The greenhouse effect will be felt primarily in higher average world temperatures. This will affect all the processes that take place in the biosphere. The oceans will expand under the impact of warming, and the polar ice caps will melt, raising sea levels. Many low-lying coastal areas are at risk of disappearing under the sea. Preventing such occurrences will involve huge engineering costs (CONAM 2006).

In general terms, the three broad issues that climate change management can and must address are the reduction of poverty and hunger, the improvement of competitiveness, and the achievement of sustainability. In order to do so effectively, climate change management must respond to the following challenges:

- How to reduce vulnerability to climate change (especially for the poorest population groups), the impact on production systems and infrastructure, and how to reap the potential benefits that climate change may offer.
- How to achieve energy and food security throughout the LAC region, through policies to mitigate the greenhouse effect and adapt to climate change.
- How to control emissions from deforestation, industry, and energy production.
- How to bring the LAC region into global policy, taking account of the benefits and impacts of climate change.

These challenges imply broadening the front against climate change to include all polluting countries (with mutual but differentiated responsibilities) and all the sectors involved (transportation in general, deforestation, etc.) (CONAM 2006), through:

- Fostering innovation, which includes the application of existing technologies, and developing new technologies (in particular, active policies that take advantage of the normal replacement of equipment).
- Use and strengthening of market instruments (such as the trading in emission rights introduced by the EU).
- Efforts to adapt to climate change through preventive and curative measures geared to the regions and economic sectors most affected.

These elements could be given shape through the following actions:

- Ensure the immediate and effective enforcement of agreed policies, in order to achieve the Kyoto target of reducing greenhouse gas emissions by 8% below their 1990 level. Those measures are essentially the ones set forth in the Green Paper on energy security

and the White Paper on European transport policy, as well as measures to promote climate-friendly technologies such as eco-technologies.

- Conduct community awareness campaigns to induce people to change their behavior.
- Intensify and target research to improve the understanding of climate change and its global and local fallout, and at the same time develop cost-effective strategies to mitigate climate change (especially in the areas of energy, transportation, agriculture and industry) as well as strategies for adapting to climate change.
- Strengthen scientific cooperation with countries beyond the region, and promote the transfer of climate-friendly technologies, and work with developing countries to prepare climate-friendly development policies and strengthen the adaptive capacities of the most vulnerable countries. The EU would in this way maintain its driving role in international negotiations in this area.

The European program on climate change entered a new phase in 2005, designed to determine the new measures that must be adopted in synergy with the Lisbon strategy, relating in particular to energy efficiency, renewable energy, transportation, and carbon capture and storage (CONAM 2006).

Benefits and costs of the strategy

It is difficult to assess the costs of action. Those costs would reflect primarily the restructuring of transportation and production systems, as well as of energy use. On the other hand, those costs are bound to rise significantly if no action is taken by the other countries that are major producers of greenhouse gases. According to the Commission, a less ambitious policy for combating climate change is not a sound alternative, for it would not achieve the objectives set and would imply additional costs due to climate change.

If dealing with climate change is to become a priority, it must be approached in the framework of the three broad issues of sustainable development, and there must be regular monitoring of its implementation, enforcement and reporting through suitable indicators. To this end, climate change management must focus on the following four lines of action:

- Pursue scientific and technological research to generate basic information in support of decisions and policies to mitigate the impacts of climate change.
- Establish mechanisms for outreach and active participation in the process of implementing the Climate Change Convention.
- Create mechanisms to facilitate the transfer of technology for mitigating the impacts of climate change.

- Strengthen inter-institutional, regional and international cooperation and forge strategic partnerships.

Policies for dealing with climate change demand the setting of national and regional priorities for reducing its impact in a concerted manner. These could be linked to programs and projects with targets for reducing GHG omissions in Latin America and the Caribbean. If this is to happen, the environment must be part of the political agenda of governments in the region (CONAM 2006).

Governments could also reform their own organizational structures to promote the effective management of environmental issues. Those structures need to be made less bureaucratic and more participatory, they must have more concrete targets and the resources needed to meet commitments under the Climate Change Convention. Efforts are also needed to develop the technical and organizational capacities to address the problems created by GHG (CONAM 2006).

Policies could also offer incentives to various social players and producers to attack the main causes of GHG omissions, and these would need to be accompanied by an active outreach and public awareness campaign.

Clean technologies are also needed to address the problems of climate change, as an alternative to the main sources of GHG emissions. In this connection, research into alternative energy sources needs to be evaluated in light of social, environmental and economic variables.

5.5. Marketing and Market Access Policies

5.5.1. Policies for negotiating access to international and regional markets,

The access to the agriculture and agro-industrial markets of developed countries that protect domestic production should be based on strategies that recognize the competitive handicap of small farmers and peasants/indigenous producers in the region, as well as the specific impact that such agreements can have on the weakest sectors, and their differential impact on poverty. Implementing such policies will require absolute transparency in international and regional negotiations in LAC, from the initial stages of the negotiating process, and organizations of small producers and peasants/indigenous farmers must acquire the capacities for monitoring those negotiations. To this end, small producers and peasant and indigenous organizations should have more opportunities for representation.

Another area that requires regulation is the growth of large-scale food distribution through supermarkets. Small producers cannot compete with the oligopsonistic power of these companies to impose purchase prices, and government regulation is needed.

5.5.2. Active commercial policies for the domestic and international markets

These policies should be designed to generate market power through the creation of differentiated assets, for example by using different promotional instruments (designations of

origin, internationally recognized protocols, eco-labeling, organic production, integrated production, etc.). The purpose here is to create specific assets that are differentiated from commodities, and in which small-scale and peasant/indigenous producers have special characteristics and advantages. This will also require appropriate institutional frameworks to promote these undertakings commercially (environmental standards, certification etc.), and enhance their negotiating power vis-à-vis the "downstream" sectors in the marketing chain.

5.6. Financing Policies for the Rural Economy

The availability of financial services is essential for supporting the AKST system's efforts to meet the IAASTD goals, and for the rural economy as a whole. Yet for more than a decade, and for various reasons, agricultural financing has been facing a dilemma in developing countries (FAO 1996). Currently these issues are being examined by the Consultative Group to Assist the Poor (CGAP), an international consortium of 33 public and private development agencies working together to expand access to financial services for the urban and rural poor. For further information, see CGAP 2003.

On one hand, there are the challenges of financing the investments needed so that the AKST system can enhance production in the rural sector, for which there is a strong incentive in light of the growing worldwide demand for food, spurred by demographic growth, particularly in low-income and densely populated countries. Here, the countries of LAC could expand their supply significantly. Within the region there are countries with large agricultural surpluses that could help meet this demand, but if their supply is to be sustained they will have to maintain the pace of investment. By contrast, there are other countries in the region with significant shortfalls in their food supply, and this is a point of national vulnerability. All of this suggests the need for financing policies for the AKST system that will recognize these contrasting situations in the region.

Other financial services are also important for the rural economy. A serious problem facing many rural towns, especially the smaller and more remote ones, is the lack of efficient, prompt and cost-competitive payment systems. Information and communication technologies and cellular telephony now offer broad possibilities in this area, but government policies are needed to create the technical conditions to finance the infrastructure that will make those resources usable.

On the other hand there are financial services that can reduce risks, both the general risks that arise from the uncertainties of day-to-day life, and those relating to crop losses through natural phenomena. The first requires an efficient and suitable savings system, while the second calls for the development of farm insurance systems with competitive costs and conditions appropriate to the activity.

Finally, if producers are to switch to new farming methods that will improve their lives, they will need to change the current organization of their production to one with higher capacities. This will

require, among other things, financing in adequate amounts and at appropriate rates and terms. Overall, the rural sector in the region is in need of financial services to support its activities, and in particular its investments in pursuit of the IAASTD goals, at a time when the number of donor-supported farm credit programs has fallen. 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. As well, there are the new conditions governing international financial relations and the new macro-financial configurations prevailing in the region as a result of liberalization and deregulation during the 1990s.

On the first point, the current international financial environment is characterized by extraordinarily high liquidity and low interest rates, and at the same time there is still systemic weakness and instability in the international financial system that could threaten the progress achieved in national economies. Together with this, multilateral agencies are pushing market solutions to meet financing needs, and are restricting the scope of subsidies and transfers of public funds.

On the second point, most countries in the region currently enjoy a climate of relative price and exchange rate stability, fiscal balance or low government deficits, but at the same time financial services in many countries are provided predominantly by private entities that charge high real interest rates on loans to low-income sectors and offer them only limited services of other kinds, and at high cost.

The solution to the AKST financing problems in the rural sector is complex, not only because of the international and domestic context described above, but also because of the particular conditions of the sector in the various countries of 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.

In contrast to this complex and problematic situation, recent decades have seen a notable expansion in the possibilities for financial institutions geared to meeting the financial needs of poor and low-income groups, as much in terms of institutional organization as in sources of funding, the operating conditions of financial institutions, and the accessibility that the new ITCs offer rural people. There has been great progress in the capacity to offer low-cost financial products and risk cover for highly diverse situations.

If such institutions and systems are to be launched or consolidated they must be supported and promoted with government strategies and policies for institutional development and seed capital. Care must be taken however to ensure that the risks inherent in this type of financing are not used as an excuse to charge excessively for these services. Moreover, there are certain kinds of risks that cannot be handled by the markets alone, and that will require public systems of guarantees or non-reimbursable funding.

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.

5.6.1. 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 in national and local universities and other educational institutions that will 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 reasons of food security, for example. 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 the agricultural 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 oversight.

In these policies, the financing of AKST schemes is decentralized and in many cases involves both public and private funds, but there will be heavy influence exercised by 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.

5.6.2. 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. In conventional approaches, 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 encourage 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 financial systems, modern financial regulation is emerging with less emphasis on traditional schemes of official bank lending. Nevertheless, in this conventional 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 conventional 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 issue point out the necessity of developing new, nongovernmental public or mixed entities that mobilizes micro financing to the poor farmers. These institutions work with government funds or funds from multilateral development institutions (World Bank, IDB). 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 in 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 outcome, 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 these 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 conjunction 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 indigent 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. However, it could require the government to provide offsetting policies and support for the weaker networks to help them stand on their own. 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, asset 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 ICTs, etc.

Nevertheless, all of this will have to be accompanied by a policy of investing in ICT access 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.

5.6.3. Financial support programs for helping communities make the transition to a sustainable production system

An 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. Hence there is a need to offer financial support to farmers in order to make 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.