

## Annex to Chapter 2

### Box 2.1 A pro-poor AKST agenda for LAC

Poverty and/or reducing its negative impacts on the poor have been a secondary focus of the AKST agenda in LAC. The primary goal has been to boost productivity in order to increase the food supply and reduce food prices, and also to increase the productivity of agricultural, forestry, fishery and aquaculture export commodities.

Agricultural research policies seldom mention poverty relief among their specific goals. The incentives system for researchers does not encourage their interest in this issue; (Gunasena 2003). A current and growing challenge facing governments, public AKST organizations and civil society is to define, sponsor and execute a research agenda to help the poor - with their active participation - aimed at developing products and services accessible to poor populations, and whose use may serve to decrease, reduce or mitigate the negative effects of poverty.

Does AKST have the potential to generate knowledge and innovations that will contribute to reduce or mitigate the negative effects poverty on: nutrition, health, energy use and the degradation of natural resources? These are factors that influence the development of human capital, in terms of: health, life expectancy, education, empowerment, organization, recreation, development and well-being.

According to Nickel (1989), "Obviously, agricultural research per se cannot resolve all social problems and inequalities." However, he suggests that, "Research policies and strategies may be designed in such a way as to direct the benefits toward relieving poverty". It is also possible to "develop technologies that will give a comparative advantage to farmers with limited resources and to poor consumers" (Nickel 1989).

Both Nickel (1989) and Gunasena (2003) agree that a pro-poor research agenda should focus on product-systems of interest to the poor, and on the areas where they are concentrated, such as: barren highland areas, semiarid tropics and marginal lands. Although these areas are extensive, their limited ecophysical conditions mean that the poor will not benefit unless research is focused on the natural resources available in the region they inhabit. Research should be designed to find ways of helping the poor to emerge from poverty.

The technologies most likely to succeed in these marginal areas are those associated with mixed livestock and agroforestry production systems, with improvements in deferred grazing, cover crops, etc., which are more in tune with the agroecological farming system (Gunasena 2003). Science and technology policies to support the poor should promote the development of plots or farms in ways that do not require them to purchase more external inputs.

The challenge facing AKST is to develop technologies that require little capital, low energy and can be used by small farmers with few resources. (Dialo, 2005; Pretty and Hine, 2001).

A pro-poor AKST agenda should aim to optimize integrated pest control, promote strategies to increase the organic matter content in the soil or to improve the efficiency of fertilizers through biological nitrogen fixation or technological innovations to conserve genetic resources. (FAO, 2005).

In synthesis, according to Gunasena (2003), "The second green revolution—for poor peasant farmers on marginal lands – should not be a copy of the first. It should seek environmental sustainability, low-cost inputs and better yields on small plots, and should reduce risks to a minimum. It should focus less on crops and more on systems, and on finding ways to diversify production and use the different resources available."

Biotechnology and the poor: new developments in molecular biology offer opportunities for researching and resolving problems that affect developing countries, such as: increasing water scarcity, developing drought-tolerant and salt-tolerant crops, genetic improvement to develop tolerance/resistance to pests, diseases, etc. However, it is unlikely that the potential of biotechnology and nanotechnology will be used to resolve these problems, since substantial investments are required in: laboratories, equipment and highly specialized human resources, as well as financial resources to pay for royalties for access to and use of patented genes and processes. At the same time, small farmers with few resources – the potential users of innovations, products and services - have very limited purchasing power.

Because biotechnology research efforts are mainly concentrated in the private sector, large biotechnology companies focus on crops and livestock products with a large market. The users of these biotechnology products and innovations are large-scale producers with purchasing power.

In synthesis, basic research aimed at understanding the mechanisms and problems that affect crops grown by small farmers in developing countries, will not receive financial backing. For this reason it is essential that the international community create a Trust Fund to finance the use of frontier knowledge and advanced methodologies to address major problems affecting the poor in developing countries.

Financing a pro-poor agenda will test the solidarity between the public and the private sector, both at country level and at regional level i.e. Central America and the Caribbean, and also at the LAC and global levels. The primary responsibility for generating public goods (products and services) and making these available falls on Governments.

#### **Box 2.2 Synthesis: Assessment of the Patronatos that support AKST. Experiences in Mexico**

The Patronatos are civil society organizations that support agricultural and/or livestock research in Mexico. They are led and financed to varying degrees by farmers, the main users of products and services generated by publicly funded agricultural research institutions. They are an example of synergy between civil society and government, within what is known as “participation and/or social monitoring of innovation”, which helps to ensure an appropriate correlation between the AKST agenda and users’ needs, and contributes to transparency and accountability. (Piñeiro, M. et al, 2003).

The Patronatos offer the following advantages: they provide moral, political and economic support to specific research and technology transfer projects of interest to their members; they promote positive synergies between the federal institutions responsible for research and civil society (producers and agro-entrepreneurs) and the users of the products and services generated (improved seeds, vaccines, technological know-how and innovations, etc.); they ensure that agricultural research projects respond to the interests of the productive sector; in addition, they facilitate and promote the early and rapid adoption of innovations by farmers.

The Mexican federal government, through INIFAP, covers salaries and part of the operating and investment costs, which are complemented by the Patronato’s own contributions. In times of financial crisis, this helps to reduce and/or mitigate the government budget cuts and ensures continuity of the research projects under execution.

Other advantages offered by the Patronatos, to a greater or lesser extent, are: setting research priorities based on real needs; encouraging researchers to generate results that are applicable in real agroecological and economic conditions; establishing permanent communications between researchers and farmers; enhancing the credibility and acceptance of the technology generated; taking advantage of the experience and vision of farmers; administering resources more efficiently and promptly; building consensus; diversifying the sources of financing and reducing political influence in decision-making.

Most Patronatos have been established by groups of more organized market-oriented farmers, with medium to large-scale operations. Small subsistence-oriented farmers with few resources and little organization have not participated.

The Patronatos’ performance has been variable (Moncada de la Fuente, 1989), with notable examples of effectiveness, efficiency and continuity over several decades ([www.pieaes.org.mx](http://www.pieaes.org.mx)), and also failures due to: interference by federal and/or state governments; use of the Patronato and its resources for party politics; conflicts of interest in the management of resources and the personal usufruct of the Patronato’s products (improved seeds, services, etc).

The Patronatos’ success or failure reflects the degree of organization, education and civic responsibility of the farmers and local officials involved, and is expressed in their solidarity on issues of community interest, and in joint responsibility, synergy and respect between society and the government. It would be useful to study the development, operation and performance of these institutions, since they constitute a first step in a strategy of “participatory innovation development” and are an example of “social monitoring of innovation”.

In the opinion of Sonora’s farmers ( [www.pieaes.org.mx](http://www.pieaes.org.mx) ), the Patronato’s support for agricultural research in Sonora is a model that has been tested and can be replicated in Mexico and in other countries. The lesson to be learned is that “Farmers perceive research as a productive investment, based on the products and services generated”

**Box 2.3 Civil society's role in supporting AKST. Example: Agricultural Research and Experimentation Board (Patronato) of the State of Sonora. (PIAEAS. AC). Mexico**

The determining factor in the decision by Sonora's farmers to create a Patronato, in 1964, exclusively to support the Northwest Agricultural Research Center (CIANO), was that they already benefited from the improved wheat seeds and technology generated by Dr. Borlaug and his Mexican colleagues at CIANO. This made them aware of the importance of supporting agricultural research that would serve to generate technological information to help them diversify their activities, reduce risks and costs. Research was perceived as a productive investment. CIANO's origins can be traced back to 1943 to the creation of the Special Studies Office, a cooperative program of the Rockefeller Foundation and the Secretariat for Agriculture and Livestock (SAG), involving scientists from the United States and Mexico.

Organization and operation: The Patronato is managed by a Governing Council and an Assembly made up of 38 farmers' organizations -smallholders, tenant farmers and *ejidatarios*. Technical Committees operate in the main agricultural regions and encourage farmers to participate and support the work of identifying and prioritizing problems and research projects, based on local needs. The Patronato also interacts with other national and international institutions, such as CIMMYT, and supports research projects on maize and wheat.

Financing. The main source of funding comes from farmers' voluntary contributions or quotas based on their crop production per hectare. The quota is 1.25 pesos per thousand pesos of the value of production per hectare and is collected through planting permits or licenses. The advantage of this system is that farmers pay contributions in proportion to their income; it is also effective and flexible, because it can be adapted to changes in commodity prices. Additional income comes from the sale of registered seeds to producers' organizations; cooperation agreements with public and private firms; donations from Foundations and interested institutions and contributions from the State Government of Sonora.

Advantages of the Patronato. For 44 years a fruitful system of joint responsibility has developed between researchers, farmers and federal and state governments. This offers major advantages such as: setting research priorities based on real needs; encouraging researchers to produce results that can be applied in real agroecological and economic conditions; providing a permanent communication mechanism between researchers and farmers; enhancing the credibility and acceptance of the technology generated; taking advantage of farmers' experience and ideas; administering resources more efficiently and promptly; building consensus; diversifying the sources of financing and reducing political influence in decision-making. In opinion of the farmers, the Patronato's support to agricultural research in Sonora is a model that has been tested and could be replicated in Mexico and in other countries. Source: [www.piaeas.org.mx](http://www.piaeas.org.mx)

**Box 2. 4 Civil society's role in supporting AKST. Case: The *Produce* Foundations, Mexico**

According to a recent assessment (Eckboir et al, 2006), during their ten-year existence the *Produce* Foundations, led and administered by farmers, have been major players in Mexico's institutional innovation. These organizations originated in a special program of the *Alianza por el Campo* (Alliance for the Countryside), created by the Mexican Government at the end of 1995 for the period 1996 - 2000, but still exist today given their wide acceptance and success. The main component, the PRODUCE program, is aimed at training producers and promoting the development of technology to increase the rural sector's productivity and competitiveness in the context of an open economy.

With regard to financing, the Alianza's total budget is shared between the Federal and State Governments. Its main feature is its decentralization, and therefore implementation is entrusted to the State Governments. A Trust Fund operates in each State and, together with a fund-sharing mechanism and tax incentives, helps to mobilize additional financial resources from farmers and from other non-tax financial sources. All the resources are administered by the *Produce* Foundations. The Federation contributes the greater part (82%) of the Foundations' funds (Muñoz 2005).

Originally, the *Produce* Foundations were created to promote closer interaction between the National Institute of Research Forestry, Agricultural and Livestock (INIFAP) and farmers and to increase funding to public research institutions. They represent a new strategy and an innovative organizational model aimed at fostering closer links between the federal government, state governments and the private sector in order to support projects of common

1 interest in the areas of technology generation and transfer, responding to the specific technological problems,  
2 opportunities and needs of farmers.

3 These producers' organizations are constituted as non-profit civil associations, with neither political nor religious  
4 affiliations, with legal status and their own assets. The Foundations are established in each State on the initiative of  
5 leading farmers with knowledge of the agricultural and forestry sector, and with experience in production and business,  
6 who direct and administer them with support from the federal, state and municipal governments. They have statewide  
7 coverage and regional, national and international linkages.

8 Their purpose is to promote liaison between farmers and agricultural research and higher education institutions, and to  
9 promote the transfer and farm-level adoption of appropriate technological innovations.

10 Initially, the Foundations had minimal structures and each one acted separately. Today the system is structured at two  
11 levels: State and Federal. At the national level, the Foundations created a coordinating body (COFUPRO), with its own  
12 assembly, president, council and administrative structure. COFUPRO has played an essential role in the *Produce*  
13 Foundations' development, representing them before the federal authorities, encouraging them to consolidate their  
14 institutional culture, coordinating their collective learning processes and promoting the adoption of common  
15 administrative practices.

16 According to (Eckboir et al, 2006), in their ten-year history, the Produce Foundations have promoted links between the  
17 federal and state political authorities on the one hand, and rural production sectors on the other, supporting the  
18 transformation of public research organizations and influencing the design and implementation of agricultural policies,  
19 including scientific, technological and innovation policies for the rural milieu. New channels of interaction have also  
20 opened up between federal and state authorities on the one hand, and groups of commercial agricultural producers on  
21 the other.

22 The Foundations have had an important impact because they have developed effective learning mechanisms. Initially,  
23 research priorities and the selection of projects to be financed were determined in an ad hoc manner. Currently, the  
24 Foundations use structured methods to identify priorities, and have adopted a clear division of tasks between the state  
25 levels, on the one hand, and regional and national levels on the other. They have also established new contractual  
26 mechanisms to transfer resources to researchers and providers of agricultural services.

27 By contrast, the aspects related to extension have not received sufficient attention and until now remain one of the  
28 weaker aspects of the Foundations' work. For this reason, extension services are another area of opportunity.

29 According to Eckboir et al, 2006, the future recognition of the *Produce* Foundations will largely depend on their capacity  
30 to continue offering valuable elements for the consolidation of the agricultural innovation system and for the  
31 transformation of agricultural research organizations into more efficient and effective institutions in generating and/or  
32 identifying products and services to support innovation in the production processes.

33 Diversifying their funding sources and encouraging increased contributions of resources from state governments and  
34 from the users themselves for innovation projects of mutual interest, is another short-term challenge facing the *Produce*  
35 Foundations.

### 36 37 **Box 2.5 Examples of linkages between the Consultative Group of the International Research Centers (CGIAR)** 38 **and civil society in Latin America**

39 The scientists who work at the 15 CGIAR centers collaborate closely with a broad spectrum of civil society groups,  
40 including farmers, producers' associations and community organizations. Participatory research is a way of ensuring  
41 that the results of CGIAR's research efforts rapidly reach small farmers with limited resources, so that they can use  
42 these to improve their quality of life and their livelihoods. The examples described below offer a brief synthesis of the  
43 participatory research projects currently under implementation and of other programs that foster important linkages with  
44 civil society.

**Local Agricultural Research Committees (CIAL)** - In these committees, coordinated by the International Center for Tropical Agriculture (CIAT), farmers express their views on the development and evaluation of agricultural technologies.. Researchers benefit from accurate feedback provided by farmers, and farmers in turn are encouraged to evaluate new options for increasing agricultural productivity and improving the management of natural resources. Currently, 249 local committees are active in eight Latin American countries. The benefits of this initiative range from increased local capacity in formal research methods, improved local planning and management skills, to a greater availability of improved seed and food security. For example, in Cauca (Colombia), over 80% of farmers from the village of Pescador have adopted a bean variety recommended by the local committee. CIAT has estimated a 78% rate of return on investments to implement CIAL approach ([www.ciat.cgiar.org](http://www.ciat.cgiar.org)).

**Learning partnerships for agribusiness development in Latin America** - CIAT, in association with CARE, Catholic Relief Services and other institutions, is creating "learning partnerships" in Central America. These innovative partnerships are made up of research and development organizations that jointly design and implement strategies and interventions aimed at building local capacity in specific areas. Members of these partnerships, including farmers, jointly analyze the strategies to determine which ones work and which do not. The lessons learnt are applied and generate new cycles of learning. In Nicaragua, thanks to this participatory learning process, the agribusinesses initiative that began in one municipality is now being applied in 10 others ([www.ciat.cgiar.org](http://www.ciat.cgiar.org)).

**Combating bacterial wilt in the Andean region** - Scientists of the CIP have developed an inexpensive detection kit that can be used in an organized seed system to eliminate infected potato seed before it reaches farmers' fields. Although crop rotation can help eliminate the pathogen from the potato fields, the recommended method of abandoning potato cultivation for a few years is not an economically or socially viable option for thousands of poor farmers, who depend on this tuber crop for their food, income and nutrition needs. With CIP's participation, farmer-researcher groups have identified a promising solution that enables farmers working in highly infested soils to sanitize their fields in 9 -17 months by planting three successive non-solanaceous horticultural crops with high market value (e.g. onion, leek, cabbage), or two successive food crops such as lupine, sweet potato or arracacha (an Andean root crop) after the potato harvest. Using this method, farmers were able to recover their fields for potato production in a short time and also managed to triple their potato yields ([www.cipotato.org](http://www.cipotato.org)).

**CIMMYT and the Agricultural Research and Experimentation Board (Patronato) of the State of Sonora** - In the Yaqui valley, in Sonora, northwestern Mexico, a group of private farmers and the Patronato have donated a new sprinkler and drip irrigation system to CIMMYT that will help scientists to avoid water wastage and better manage this valuable resource in a dry zone. This system will directly benefit farmers in the Yaqui Valley who produce wheat, maize and other crops. Patronato leaders work on a voluntary basis and ensure that the organization only invests in research efforts aimed at minimizing the obstacles to agricultural production ([www.cimmyt.org](http://www.cimmyt.org)).

**Self Help International**, a non-governmental organization based in the United States, is promoting quality maize with a high-protein content (QPM) in Nicaragua. This new and more nutritious variety of maize developed by CIMMYT is helping to reduce malnutrition in a community located at the southern tip of Lake Nicaragua (near Costa Rica), which has the second highest maternal mortality rate in the world. After the passage of Hurricane Mitch, Self Help International In collaboration with CGIAR,, established an innovative seed bank program, giving farmers a bag of seed to be paid back later with two bags of seed that in turn would be distributed to other farmers, allowing them benefit from the new technology. By December 2002, more than 7,000 farmers were planting the new maize seed ([www.cimmyt.org](http://www.cimmyt.org)).

**Consortium for Sustainable Development of the Andean Eco-region (CONDESAN)** - This consortium works with the Water and Food Challenge Program in the watersheds of the Andean region. CONDESAN provides support to this program by creating links between research networks, facilitating its infrastructure and experience, in order to contribute to the efficient execution of research activities. By combining the program with other regional initiatives, CONDESAN prevents the duplication of efforts and at the same time promotes complementary aspects and fosters synergies. The main purpose of this collaborative effort is to promote an eco-regional approach to meet development challenges in the Andean region.

**Conserving agricultural biodiversity.** Yucca, maize, beans, potato and sweet potato are Latin America's leading crops. The Center for Advanced Research and Studies of the National Polytechnic Institute (CINVESTAV) brings

1 together the main national research programs and the CGIAR centers in order to promote conservation activities  
2 throughout the region. The International Plant Genetic Resources Institute (IPGRI), for example, has implemented an  
3 international cooperation project in nine countries to strengthen basic science for *in situ* conservation of cultivated plants  
4 and to incorporate agricultural biodiversity into agricultural development strategies. Similarly, the Latin American and  
5 Caribbean Consortium to Support Yucca Research and Development (CLAYUCA) works to increase yucca production  
6 and expand marketing opportunities of poor farmers throughout Latin America ([www.ipgri.cgiar.org](http://www.ipgri.cgiar.org)).

#### 8 **Box 2.6 Development of public AKST institutions. Case: INIFAP, Mexico**

9 In response to an invitation by the Institute for Political, Economic and Social Studies (IEPES) to critically analyze  
10 governmental support to the agricultural sector, in 1982, an inter-institutional and interdisciplinary group of agronomists,  
11 veterinarians, foresters and economists from the National Research Institutes for Agriculture, Livestock and Forestry  
12 (INIA, INIP and INIF, respectively), prepared an assessment of research and extension services in Mexico. The main  
13 conclusions were:

14 There was little or no interaction between the National Research Institutes for Agriculture (INIA), Livestock (INIP) and  
15 Forestry (INIF).

16 In certain agroecological zones, the study found duplication of efforts by INIA and INIP, in pasture management  
17 programs and in the production of soilage crops and their use to support meat and milk production.

18 A marked contrast was noted between the INIA, INIP and INIF research institutes, in terms of institutional development.  
19 Compared with the Livestock and Forestry Research Institutes, the INIA's research infrastructure was larger and better  
20 distributed through Mexico's main macro ecological zones. It also had a more numerous group of researchers, with a  
21 higher proportion of Masters degrees and Doctorates in the sciences.

22 The study identified the need to institutionalize a policy and a strategy to validate and transfer to farmers the technology  
23 generated by research. To this end, a joint effort was organized involving research institutes, farmers, extension  
24 services, credit organizations and the Secretariat of Agriculture. This challenge continues today.

25 The study recommended the establishment of a Council for Agricultural, Livestock and Forestry Research, presided by  
26 the Secretary of Agriculture, to act as a coordinating body. This Council included the Sub Secretariats of Planning,  
27 Agriculture, Livestock, Forestry and Hydraulic Infrastructure.

28 In 1982 the Research Council was created with an Executive Secretariat to coordinate the design of a Master Plan for  
29 Research, integrating agricultural, livestock and forestry research, based on criteria of integrated production systems.

30 A national program was designed and implemented to support the Institutes of Agricultural and Livestock Research. A  
31 Masters Training Program for Researchers was also established to accelerate the training of livestock and forestry  
32 researchers to post-graduate level.

33 The INIA's Trust Fund contract was modified to incorporate the Livestock and Forestry Research Institutes, also  
34 providing a common pool of financial resources for the timely execution of research work.

35 The Research Council had the responsibility of initiating the merger process of INIA, INIP and INIF, in order to establish  
36 the National Forestry, Agriculture and Livestock Research Institute (INIFAP).

37 The merger process culminated in 1985 with the creation of the existing INIFAP, as a deconcentrated federal body  
38 attached to the Secretariat of Agriculture, responsible at national level for forestry, agricultural and livestock research in  
39 Mexico. When it was created, INIFAP was endowed with a Trust Fund, however this financial instrument was canceled  
40 in 1987, as part of a government policy to eliminate public Trust Funds.

41 As deconcentrated body of the Federal Government, INIFAP operated for many years with a very rigid institutional and  
42 regulatory framework. The fact that it was not a legally constituted entity with its own assets and juridical regimen made  
43 it difficult to sign agreements and formalize relations with other institutions. As a result, it became strongly dependent, in  
44 operational terms, on the Secretariat of Agriculture and Finance.

A group of researchers, farmers, and users associated with the *Produce* Foundations and the Patronatos approached members of the new government during the transition period to submit a proposal (Piñeiro et al, 2003) for the modernization of INIFAP.

In 2001, a process began to change the legal status of INIFAP and on October 2 of that year, the institution became a Public Decentralized Body, i.e. a legally constituted entity with its own assets and regulations allowing it greater operational flexibility and autonomy in managing its institutional resources and relations.

Complementing this change, in June 2003 INIFAP obtained recognition as a Public Research Center under the Science and Technology Law approved on June 5, 2002, and subject to the twelve articles of Chapter IX containing all the regulations (ad hoc) that govern these institutions. The Secretary of Agriculture, the Director General of CONACYT and the Director General of INIFAP formalized this arrangement through a Performance Agreement signed on June 20, 2003.

The new legal-institutional framework governing INIFAP will allow for substantial changes in its operation, enabling it to achieve greater effectiveness and efficiency in generating products and services of interest to its clients. As a Public Research Center, INIFAP will benefit from the new regulations approved by lawmakers in 2006.

Source: [www.inifap.gob.mx](http://www.inifap.gob.mx)

#### **Box 2.7 Regional Fund for Agricultural Technology (FONTAGRO)**

FONTAGRO is a consortium created to promote strategic agricultural research of regional interest, with the direct participation of the Latin American and Caribbean countries in setting priorities and financing research projects. It was established by various countries of the Region<sup>1</sup>, with the sponsorship of IDB, IICA, the Rockefeller Foundation and the International Development Research Center (IDRC) of Canada.

Its purpose is to foster increased competitiveness in the agricultural sector and promote the sustainable management of natural resources and poverty reduction through the development of technologies in the category of international public goods, facilitating the interchange of scientific knowledge, both within the region and with other regions of the world. ([www.fontagro.org](http://www.fontagro.org))

The ultimate goal is to establish an endowment fund of 200 million dollars, based on contributions from the countries of the region. The annual income from this endowment is used to provide sustained non-reimbursable financing for strategic regional research projects. Project funding is allocated through a competitive mechanism, based on the projects' coherence with the Fund's objectives and on technical, economic, environmental and institutional criteria established for the priority research areas defined in the Medium Term Plan 2005-2010, approved by its Governing Council.

The prioritization model has two dimensions: spatial (the region is divided into 12 mega domains) and technological (11 families of technologies). FONTAGRO began its activities in 1998 and has held successive regular meetings every two years, with contributions from the Fund members and other matching funds from sponsoring bodies and development agencies. In 2006 it organized a special meeting co-financed by CGIAR, for a total of 2 million dollars<sup>2</sup>.

The design of project proposals and their subsequent execution is undertaken by the national organizations of the Fund's member countries (research institutes, universities, foundations, private organizations), and regional and international research centers, in association with national technology development organizations.

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<sup>1</sup> In 2000 its members were: Argentina, Bolivia, Chile, Colombia, Costa Rica, Ecuador, Nicaragua, Panama, Paraguay, Peru, Dominican Republic, Uruguay, Venezuela and the International Development Research Center (IDRC). [www.fontagro.org](http://www.fontagro.org).

<sup>2</sup> The 2005 meeting was also for 2 million dollars.

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2 **Table 1: Inventory of Global and Regional AKST Institutions in the Amazon**

RESEARCH INSTITUTIONS	SPECIFIC ACTIVITIES	COVERAGE
Center for International Forestry Research (CIFOR) <a href="http://www.cifor.cgiar.org/brazil/index.htm">http://www.cifor.cgiar.org/brazil/index.htm</a>	Carries out forestry research; headquartered in Indonesia (Bogor). CIFOR's Latin American office is in Belen, in the Brazilian state of Para.	Global
European Tropical Forest Research Network <a href="http://www.etfrn.org/etfrn/index.html">http://www.etfrn.org/etfrn/index.html</a>	Institution that disseminates information through an electronic newsletter and initiatives with other institutions such as Amazon Interactive, Inter.-American Development Bank, Grein, FAO; Amazonia, CATIE, COICA, EMBRAPA, Amazonian Center for Forestry Development	Global
International Union of Forest Research Institutes (IUFRO) <a href="http://www.iufro.org/notfound/?from=//">http://www.iufro.org/notfound/?from=//</a>	Network of forestry research institutions. Related to "Global Forest Information Service"; disseminates work through electronic newsletters.	Global
Tropical Agriculture Research and Higher Education Center (CATIE) <a href="http://webbeta.catie.ac.cr/Magazin.asp?CodSeccion=159&amp;MagSiglaTEMA Forests">http://webbeta.catie.ac.cr/Magazin.asp?CodSeccion=159&amp;MagSiglaTEMA Forests</a>	Training, projects, research programs and international consultancies on forests and protected areas.	Global
Inter.-American Institute for Cooperation on Agriculture (IICA) <a href="http://www.iica.int/">http://www.iica.int/</a>	Emblematic institution with 34 member countries, promotes agriculture and rural development.	Global
Hydrology and Geochemistry of the Amazon Basin (HiBAm) <a href="http://www.ana.gov.br/hibam/">http://www.ana.gov.br/hibam/</a>	International technical-scientific project involving Brazil, Ecuador, Bolivia and France for the study of the hydrology and geochemistry of the Amazon Basin.	Global
Institute for Sustainable Development	Institution in charge of research on tropical vegetation cover.	Global
Amazonian Initiative (IA) <a href="http://www.iamazonica.org.br/home/index.php?id=conteudo.php">http://www.iamazonica.org.br/home/index.php?id=conteudo.php</a>	Consortium of national agricultural research systems, international research institutions of CGIAR, and IICA. In partnership with OTCA works to prevent, reduce and mitigate environmental degradation and improve the livelihoods of the rural poor in the Amazon region.	Global
Laboratory of Biological Evolution and Diversity. <a href="http://www.edb.upstlse.fr/paramazonia/parama.html">http://www.edb.upstlse.fr/paramazonia/parama.html</a>	Project for the Advancement of Networked Science in Amazonia (PARAMA), a European Union Project (PAN AMAZONIA), coordinator of dispersed efforts on global climate change and the workings of the tropical forest ecosystem of the Amazon Basin. Emphasis on promoting cooperation and exchange of experiences, ideas, protocols through the Amazon countries.	Global
Department of the Environment	Sustainable use and conservation of the region's forests and biodiversity,	Global
Cooperative Agricultural Research, Development and Innovation Program for the South American Tropics (PROCITROPICOS). <a href="http://www.procitropicos.org.br/">http://www.procitropicos.org.br/</a>	Network of agricultural research institutions in the Amazon Basin countries.	Global
Sustainable Amazonia. Structural Change and Policy Options in Rural and Urban Areas (SusAm). <a href="http://www.susam.net">http://www.susam.net</a>	Multilateral and interdisciplinary network of academic institutions, non-governmental organizations of Brazil, Bolivia and the European Union. Provides a discussion framework for research and planning efforts.	Global
Association of Amazon Universities (UNAMAZ) <a href="http://www.ufpa.br/unamaz/">http://www.ufpa.br/unamaz/</a>	International network of universities and research institutions in the Amazon. Advocates the development of a common knowledge, science and technology agenda. Supports and is a member of UNESCO/Amazonia-UNAMAZ.	Global
School of Forest Science <a href="http://www.postgradoesfor.edu.bo/">http://www.postgradoesfor.edu.bo/</a>	Postgraduate Course on Tropical Forest Management	Global
National Research Institute of Amazonia (INPA) <a href="http://www.inpa.gov.br/">http://www.inpa.gov.br/</a>	Amazon Research Institute in Manaus	Global
University of the Andes <a href="http://www.">http://www.</a>	Important research work on soil biology	Global
National Institute for Space Research (INPE). <a href="http://lba.cptec.inpe.br/lba/site/">http://lba.cptec.inpe.br/lba/site/</a>	Leads the Large-Scale Biosphere Atmosphere (LBA) Experiment in Brazil, an international research initiative to understand the climatic, ecological, biogeochemical and hydrological functioning of the Amazon, change of vegetation cover and its impact on the operation and interactions between the Amazon and the Earth's biogeophysical system.	Global
Institute for Sustainable Development	Development, incentives and conservation of flooded forests	Global



RESEARCH INSTITUTIONS	SPECIFIC ACTIVITIES	COVERAGE
Museu Paraense Emilio Goeldi <a href="http://www.museu-goeldi.br/">http://www.museu-goeldi.br/</a>	Research institute on natural, socio-economic and socio-cultural systems of the Amazon, located in Belem, Brazil.	Global
Colombian Institute for the Development of Science and Technology "Francisco Jose de Caldas" (COLCIENCIA). <a href="http://zulia.colscience.gov.co:8098/port.alcol/">http://zulia.colscience.gov.co:8098/port.alcol/</a>	The most important organization in promoting research in the Amazon.	Global
Colombian Family Welfare Institute <a href="http://www.icbf.gov.co/espanol/default.asp">http://www.icbf.gov.co/espanol/default.asp</a>	Carries out and supports indigenous families in the Amazon, focusing on food security.	Global
Colombian Institute of Anthropology and History (ICANH). <a href="http://www.icanh.gov.co/">http://www.icanh.gov.co/</a>	Research on anthropology of indigenous peoples and other cultural aspects of the Amazon.	Global
National Training Service (SENA). <a href="http://www.sena.edu.co/portal">http://www.sena.edu.co/portal</a>	Carries out technical and technological training and business development activities.	Global
Nucleo de Altos Estudos Amazônicos NAEA <a href="http://www.naea.ufpa.br">http://www.naea.ufpa.br</a>	Interdisciplinary higher education center of the Federal University of Para (UFPA) - Brazil. Specialized courses, Masters in development planning, and a Doctorate in sustainable development for the moist tropics.	Global
Corporation for the Sustainable Development of the Northern and Eastern Amazon (CDA). <a href="http://www.cda.gov.co/">http://www.cda.gov.co/</a>	Implements sustainable activities in the Departments of Guania, Guaviare and Vaupes	Global
Venezuelan Institute for Scientific Research (IVIC). <a href="http://www.ivic.ve/antropologia/">http://www.ivic.ve/antropologia/</a>	Research on the Amazon region and on the development of socio-environmental links between indigenous peoples, Afro-Venezuelans and <i>criollos</i> . Facilitates health programs in indigenous communities.	Global
Alexander von Humboldt Biological Resources Research Institute. <a href="http://www.humboldt.org.co/">http://www.humboldt.org.co/</a>	A leading research institution conducting interdisciplinary studies in biological, ecological and socio-cultural aspects based in Colombia. Offers a course on Bio-trade and provides environmental advisory services.	Global
Amazon Scientific Research Institute - SINCHI. <a href="http://www.sinchi.org.co/">http://www.sinchi.org.co/</a>	Amazon Institute for ecological, biological, economic, social and cultural research.	Global
University of the Andes, <a href="http://www.uniandes.edu.co/home-visitantes/">http://www.uniandes.edu.co/home-visitantes/</a>	Research on anthropological, biological and territorial and other aspects related to indigenous peoples.	Global
Pontificia Universidad Javeriana. <a href="http://www.javeriana.edu.co/fear/m_des_rur/">http://www.javeriana.edu.co/fear/m_des_rur/</a>	Undergraduate and postgraduate programs to promote research in the Amazon	Global
National University of Colombia. <a href="http://www.imani.unal.edu.co/">http://www.imani.unal.edu.co/</a>	Higher education and training with Master and Doctorate programs on Amazon issues	Global
Corporation for the Sustainable Development of the Southern Colombian Amazon (COORPOMAZONIA). <a href="http://www.corpoamazonia.gov.co/">http://www.corpoamazonia.gov.co/</a>	Carries out technical and technological training and business development activities.	Global
Corporación Autónoma Regional-CORMACARENA. <a href="http://www.cormacarena.gov.co/">http://www.cormacarena.gov.co/</a>	Promotes conservation, the sustainable use of renewable natural resources and the environment in the Macarena Special Management Area. Fosters cooperation among institutions working to generate appropriate technologies for natural resource conservation.	Global
Research Institute of the Peruvian Amazon IAP. <a href="http://www.iap.org.pe/">http://www.iap.org.pe/</a>	Research institute in the Peruvian Amazon.	Global
German Social-Technical Cooperation Service /Deutscher Entwicklungsdienst (DED). <a href="http://ecuador.ded.de/cipp/ded/custominfpub/content.lang.4/oid.1873/ticket.g_u_e_s_f/">http://ecuador.ded.de/cipp/ded/custominfpub/content.lang.4/oid.1873/ticket.g_u_e_s_f/</a> ~ /Program_para_a_amazonia_ecuatoriana.html	DED Program in the Amazon to improve the living conditions of indigenous peoples and families of small farmers. Carries out participatory local and regional planning processes. Implements sustainable natural resources strategies. Support methods and approaches for the peaceful resolution of socio-environmental conflicts.	Global
United Nations Forum on Forests UNFF (port: FFNU/esp: FNUB). <a href="http://www.un.org/esa/forests/">http://www.un.org/esa/forests/</a>	The United Nations International Forum on Forests is responsible for promoting the management, conservation and sustainable development of forests.	Global
Sustainable Development and Human Settlements Division (ECLAC). <a href="http://www.cepal.org/dmaah/">http://www.cepal.org/dmaah/</a>	Division of ECLAC responsible for sustainable development	Latin America
Southern Common Market (MERCOSUR)	Subregional organization that aims to promote and lead South American integration.	
Forestry Commission for Latin America and the Caribbean (COFLAC). <a href="http://www.coflag.fao.org">www.coflag.fao.org</a>	Consultative body of FAO for forestry policies in Latin America and the Caribbean. Promotes information sharing among the respective countries.	Latin America
South American Community of Nations. <a href="http://www.comunidadandina.org/SouthAmerica.htm">http://www.comunidadandina.org/SouthAmerica.htm</a>	Political body of the 12 South American countries	South America
Amazon Cooperation Treaty Organization (ACTO). <a href="http://www.otca.info">www.otca.info</a>	The Amazon Cooperation Treaty Organization (ACTO) facilitates cooperation among Amazon Basin countries to promote the region's sustainable development. Its permanent Secretariat has been based in Brasilia since	Amazon

RESEARCH INSTITUTIONS	SPECIFIC ACTIVITIES	COVERAGE
	2002. It evolved from the Amazon Cooperation Treaty (ACT).	
Latin American Faculty of Social Sciences (FLACSO). <a href="http://www.flacso.org.ec">http://www.flacso.org.ec</a>	Research and higher education institution.	Latin America
Andean Community of Nations (CAN)	Subregional organization that aimed to create a free trade zone and promote mobility of personas	

Source: Prepared by Bernal (2007), TCA data, 1997; MeJia & Duran, 1991:22; SPTV, 1997; SPTP, 1996a; SPTV, 1996b; SPTP, 1995a; SPTP, 1995b) Instituto mamiraua, 2007; GTZ, 2005a; GTZ, 2005b; GTZ, 2005c; AECI, 2007; COICA, 2007; OTCA, 2007; CAN, 2007; DED, 2005; LBA, 2005a; LBA, 2005b; GTA, 2006; IA, 2007; IA, 2007; IAP, 2005; SP, 2004; IAP, 2001a; IAP, 2001b; URSA, 2003; IIRSA, 2004; POEMA, 2005; PROAMAZONIA, 2005;

**Table 2: Inventory of national AKST Institutions in the Amazon**

RESEARCH INSTITUTIONS	SPECIFIC ACTIVITIES	COVERAGE
School of Forest Science. <a href="http://www.postgradoesfor.edu.bo">http://www.postgradoesfor.edu.bo</a>	Postgraduate course on management of tropical forests	Bolivia
Nucleo de Altos Estudios Amazonicos (NAEA). <a href="http://www.naea.ufpa.br/">http://www.naea.ufpa.br/</a>	Interdisciplinary higher education center of the Federal University of Para (UFPA) - Brazil. Offers courses in development planning and sustainable development in the moist tropics.	Brazil
Faculty of Forestry and Environmental Science. <a href="http://www.forest.ula.ve/">http://www.forest.ula.ve/</a>	Postgraduate programs in the area of forest and natural resource management	Venezuela
MacArthur Foundation	International Technical Cooperation	Colombia
Ministry of Sustainable development MDSP <a href="http://www.mds.gov.bo/">http://www.mds.gov.bo/</a>	Ministry of Sustainable Development and Planning	Bolivia
Forestry Office of Bolivia <a href="http://www.sforestal.gov.bo/">http://www.sforestal.gov.bo/</a>	Bolivian Government agency to promote the sustainable use and conservation of Bolivia's forests.	Bolivia
Fundação Nacional do Índio FUNAI. <a href="http://www.funai.gov.br">http://www.funai.gov.br</a>	Indigenous Affairs Authority. Indigenous Policymaking in Brazil.	Brazil
Instituto Brasileiro de Meio Ambiente do Brasil (IBAMA). <a href="http://www.ibama.gov.br/">http://www.ibama.gov.br/</a>	Brazilian Environmental Authority	Brazil
Social Solidarity Network <a href="http://www.red.gov.co/portal/default.aspx">http://www.red.gov.co/portal/default.aspx</a>	Allocates resources for production projects	Colombia
Ministry of the Environment of Brazil (MMA) <a href="http://www.mma.gov.br/">http://www.mma.gov.br/</a>	Ministry of the Environment of Brazil. Programs and projects for the Amazon region. ( <a href="http://www.mma.gov.br/port/scalindex.cfm">http://www.mma.gov.br/port/scalindex.cfm</a> )	Brazil
Nova SUDAM- Supertintendencia da Amazônia / ADA – Amazon Development agency. <a href="http://www.ada.gov.br">www.ada.gov.br</a>	Agency that promotes development in the Brazilian Amazon	Brazil
Ministry of the Environment, Housing and Territorial Development. <a href="http://www.minenvironment.gov.co/">http://www.minenvironment.gov.co/</a>	Ministry of the Environment of Colombia	Colombia
Council for the Development of the Indigenous Peoples and Communities of Ecuador (CODENPE). <a href="http://www.codenpe.gov.ec/">http://www.codenpe.gov.ec/</a>	Council established to promote the participation of indigenous peoples and communities in planning, setting priorities and decision-making by the Government. – Information on Ecuador's indigenous peoples (name, number, location, social and political organization, population, territorial situation, economic data)	Ecuador
Institute for the Eco-development of the Amazon Region (ECORAE). <a href="http://www.ecorae.org/">http://www.ecorae.org/</a>	Agency that promotes the development of Ecuador's Amazon region.	Ecuador
Ministry of the Environment. <a href="http://www.environment.gov.ec/">http://www.environment.gov.ec/</a>	Ministry of the Environment of Ecuador	Ecuador
Instituto Misionero Antropologico (IMA). <a href="http://www.yarumal.org/ima/">http://www.yarumal.org/ima/</a>	Provides support through social services and education	Colombia
Environmental Protection Agency. <a href="http://www.epaguyana.org/">http://www.epaguyana.org/</a>	Ministry of the Environment of Guyana	Guyana
National Council for the Environment (CONAM). <a href="http://www.conam.gob.pe/">http://www.conam.gob.pe/</a>	Institution responsible for planning, development, coordination and oversight of natural resources in Peru	Peru
National Institute of Natural Resources (INRENA). <a href="http://www.inrena.gob.pe/">http://www.inrena.gob.pe/</a>	Environmental Authority of Peru	Peru
National Parks Institute. <a href="http://www.inparques.gov.ve">http://www.inparques.gov.ve</a>	Institute attached to the Ministry of the Environment and Natural Resources, created to oversee the conservation, administration and management of protected areas. Web site contains information on all the parks in Venezuela	Venezuela

RESEARCH INSTITUTIONS	SPECIFIC ACTIVITIES	COVERAGE
	and current news.	
Ministry of the Environment and Natural Resources. <a href="http://www.mam.gov.ve/">http://www.mam.gov.ve/</a>	Ministry of the Environment and Natural Resources of Venezuela.	Venezuela

Source: Prepared by Bernal (2007), TCA data, 1997; Mejía 8. Duran, 1991:22; SPTV, 1997; SPTP, 1996a; SPTV, 199Gb; SPTP, 1995a; SPTP, 1995b); Instituto mamiraua, 2007; GTZ, 2005a; GTZ, 2005b; GTZ, 2005c; AECI, 2007; COICA, 2007; OTCA, 2007; CAN, 2007; DED, 2005; LBA, 2005a; LBA, 2005b; GTA, 2006; IA, 2007; IA, 2007; IAP, 2005; SP, 2004; IAP, 2001a; IAP, 2001b; IIRSA, 2003; IIRSA, 2004; POEMA, 2005; PROAMAZONIA, 2005;

**Table 3: Inventory of non-governmental organizations in the Amazon region**

RESEARCH INSTITUTIONS	SPECIFIC ACTIVITIES	COVERAGE
World Wide Fund for Nature (WWF)	Management and conservation of flora and fauna	Global
OMACHA Foundation. <a href="http://www.omacha.org/">http://www.omacha.org/</a>	Carries out research on Amazon fauna and social aspects	Colombia
Natura Foundation. <a href="http://www.natura.org.co/">http://www.natura.org.co/</a>	Research on natural resources	Colombia
Consolidación Amazónica (COAMA) – Colombia. <a href="http://www.coama.org.co/">http://www.coama.org.co/</a>	An umbrella group of various that work in the Amazon region, promoting a decentralization process in the Colombian Amazon through the political-administrative strengthening of traditional indigenous authorities, cultural respect and the protection of biodiversity.	Colombia
Tropenbos <a href="http://www.conservation.org/">http://www.conservation.org/</a>	European NGO working in the tropical rainforests of Guyana, Surinam and Colombia.	Amazon
Conservation International	Environmental NGO of global scope headquartered in the United States	Global
Rainforest Alliance. <a href="http://www.rainforest-alliance.org/">http://www.rainforest-alliance.org/</a>	Environmental NGO for the protection of ecosystems and their respective communities, from the perspective of best practices in trade, management, use and sustainable conservation of biodiversity in the area of "Neotropics Communications": Eco-Index with information on projects, best practices, etc. - Eco-Exchange: Bimonthly Publication	Global
World Rainforest Movement. <a href="http://wrm.org.uy">http://wrm.org.uy</a>	Evaluates information on issues such as: Situation of forests; causes of deforestation; international processes and actors; indigenous peoples	Global
Central American Indigenous and Peasant Coordinator of Community Agroforestry (ACICAFOC). <a href="http://www.acicafof.org/">http://www.acicafof.org/</a>	Grassroots community organization, integrates local social and production issues with a strategy of eco-development and empowerment of indigenous peoples and peasants.	Latin America
Coalizão Rios Vivos (Living Rivers coalition) <a href="http://www.riosvivos.org.br/">http://www.riosvivos.org.br/</a>	Carries out research on water, energy and agriculture.	Latin America
Fundación Futuro Latinoamericano. <a href="http://www.flla.net/">http://www.flla.net/</a>	Research and development on environmental issues with emphasis on conflict resolution and political dialogue.	Latin America
Latin American Forests Network. <a href="http://www.fnatura.org/paginas/textos.php?id=113&amp;val=0">http://www.fnatura.org/paginas/textos.php?id=113&amp;val=0</a>	Dissemination and exchange of information related to the international political and environmental debate on forests.	Latin America
International Union for the Conservation of Nature (IUCN Sur). <a href="http://www.sur.iucn.org/">http://www.sur.iucn.org/</a>	Carries out activities related to sustainable natural resource management. A network with approximately 900 members, including countries, government organizations and NGOs.	Latin America
Alianza Amazonica. <a href="http://www.amazonalliance.org/index-es.html">http://www.amazonalliance.org/index-es.html</a>	Defends the rights and territories of indigenous peoples and other traditional aspects of the Amazon.	Amazon Region
Amazon Watch. <a href="http://www.amazonwatch.org/">http://www.amazonwatch.org/</a>	Monitors and accompanies organizations that implement mega-projects so as to prevent the destruction of the Amazon environment	Amazon Region
Bolsa Amazônia. <a href="http://www.bolsaamazonia.com/">http://www.bolsaamazonia.com/</a>	Promotes sustainable development by supporting the consolidation of production chains based on the exploitation of local agricultural species.	Amazon Region
Coordinator of Indigenous Organizations of the Amazon Basin (COICA). <a href="http://www.coica.org/">http://www.coica.org/</a>	The most important indigenous peoples' organization.	Amazon Region
The Pan-Amazon Social Forum. <a href="http://www.coica.org/">http://www.coica.org/</a>	An umbrella group of civil society organizations that promotes networking among Pan-Amazonian institutions.	Amazon Region

RESEARCH INSTITUTIONS	SPECIFIC ACTIVITIES	COVERAGE
Guiana Shield Initiative (GSI). <a href="http://www.coica.org/">http://www.coica.org/</a>	Involves communities, local authorities and international and local NGOs to identify sustainable development plans and proposals.	Amazon Region
Amazon Indigenous Health Network <a href="http://www.redsiamia.org/">http://www.redsiamia.org/</a>	Works with government bodies and indigenous organizations to promote health through networks.	Amazon Region
Red Forestal Amazonica (RFA). <a href="http://www.amazoniaforestal.org/">http://www.amazoniaforestal.org/</a>	Network that promotes the conservation and sustainable use of forest cover	Amazon Region
Amigos de la Naturaleza Foundation. <a href="http://www.fan-bo.org/">http://www.fan-bo.org/</a>	Implements activities on different fronts to promote environmental protection.	Bolivia
Liga de Defensa del Medio Ambiente (LIDEMA). <a href="http://www.lidema.org.bo/">http://www.lidema.org.bo/</a>	Environmental protection network made up of approximately 29 NGOs.	Bolivia
Amazonlink.org. <a href="http://www.amazonlink.org/">http://www.amazonlink.org/</a>	Works to protect the rights of indigenous peoples and traditional societies. Denounced the practice of bio-piracy of copoazú (a fruit similar to cacao). Based in Rio Branco - Acre	Brazil
Conselho Nacional de Seringueiros (CNS). <a href="http://www.cnsnet.org.br/">http://www.cnsnet.org.br/</a>	Group of organized extractivist producers	Brazil
Forum da Amazônia Oriental (FAOR). <a href="http://www.faor.org.br/">http://www.faor.org.br/</a>	A broad coalition of local organizations and NGOs from Brazil's northeastern Amazon engaged in networking actions.	Brazil
Programa para Amazônia (FASE). <a href="http://www.fase.org.br/regionais.asp?categoria=regional_amazonia">http://www.fase.org.br/regionais.asp?categoria=regional_amazonia</a>	In its thirty years of work in the State of Para, FASE has focused on political and educational activities, and the organization of rural and urban social movements.	Brazil
Brazilian Biodiversity Fund (FUNBIO).	Mobilizes funds to support strategic conservation activities and the sustainable use of biodiversity.	Brazil
Greenpeace Brazil – Amazon Campaign. <a href="http://www.greenpeace.org.br/amazonia/">http://www.greenpeace.org.br/amazonia/</a>	Carries out awareness raising efforts, advocacy and legal counseling activities	Brazil
Grupo de Trabalho Amazonico (GTA). <a href="http://www.gta.org.br/">http://www.gta.org.br/</a>	The most powerful network of its type engaged in information, advocacy and communications on behalf of the Amazon Region and accompanies PPG7.	Brazil
Imazon. <a href="http://www.imazon.org.br/">http://www.imazon.org.br/</a>	Promotes sustainable development through various scientific studies. Contributes public policy approaches to promote the sustainable management of forests.	Brazil
Eware Foundation	Research and development work with the indigenous peoples of the Amazon	Colombia
Socio-environmental Institute. <a href="http://www.socioenvironmental.org/">http://www.socioenvironmental.org/</a>	Contributes sustainable solutions that protect collective property rights and promote social and environmental diversity. Information on indigenous peoples.	Brazil
Environmental Research Institute of Amazônia (IPAM). <a href="http://www.ipam.org.br/">http://www.ipam.org.br/</a>	Advocates demonstrative research in relation to forest management. Publications on forestry policies.	Brazil

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2 **Table 4 - Some objectives of soil science, demands of society and challenges for soil**  
 3 **science**

OBJECTIVES OF SOIL SCIENCE	DEMANDS OF SOCIETY	CHALLENGES FOR SOIL SCIENCE
Knowledge and distribution of soils Knowledge of the rules of soil management.	Sustainably increase the productivity of farming systems  Definition of territories	Adapt the soil factor to the optimization of farming systems using sustainable criteria.  Find relevant soil parameters for identification of "territories"
Knowledge of the workings of soil.	Maintain a greater ecological balance	Increase the soil's power to fix carbon and pollutants and learn how to decontaminate soils.
Changes in the potential of soil.	Support decision-making systems for land assessment/ appraisal.	Find simple and relevant indicators of soil quality
Knowledge of soil degradation processes and technologies to rehabilitate degraded soils.	Reduce land degradation (erosion) and improve rehabilitation of degraded soils.	Evaluate soil and water conservation methods and assess the status of hillsides from a land use perspective.
Establish a database on soils	Develop geographic information systems (GIS) for natural resource management (MNR)	Identify relevant data on soils that can be incorporated into MNR / GIS
Education in soil science	Increase public awareness of the importance of soil and other natural resources	Teach the different public services how to manage and conserve soil and other natural resources for future generations

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5 Source: (Burbano, 2004: 74)

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2 **Table 5. Impact Assessments of Agricultural Research in Different LAC Countries**

Authors	Countries	Products/Levels	Rates of Return* (%)
Ayer & Schuh (1972)	Brazil	Cotton	77
Fonseca (1976)	Brazil	Coffee	23-26
Moricochi (1980)	Brazil	Citrus	28-78
Avila (1981)	Brazil	Irrigated rice	87-119
Cruz & Avila (1983)	Brazil	Aggregate	20 -38
Roessing (1984)	Brazil	Soy	45-62
Monteiro (1985)	Brazil	Cacao	61-79
Barbosa, Cruz & Avila (1988)	Brazil	Aggregate	34-41
Teixeira et al. (1989)	Brazil	Aggregate	43
Gonçalves, Souza & Rezende (1989)	Brazil	Rice	85-95
Evenson & Avila (1995)	Brazil	Wheat	40
		Soy	58
		Maize	37
		Rice	40
Oliveira & Santos (1997)	Brazil	Aggregate	24
Almeida, Avila & Wetzel (2000)	Brazil	Soy	69
Almeida & Yokoyama (2001)	Brazil	Rice	93-115
Barletta (1971)	Mexico	Wheat	74-104
		Potato	69
		Maize	26-59
		Other crops	54-82
Himes (1972)	Peru	Maize	65
Ardila (1973)	Colombia	Rice	58
Montes (1973)	Colombia	Soy	79
Peña (1976)	Colombia	Potato	68
Scobie & Posada (1977)	Colombia	Rice	87
Pazols (1981)	Chile	Rice	16-94
Yrarrazaval R. 91982)	Chile	Wheat	21-28
		Maize	36-34
Martinez (1983)	Panama	Maize	47-325
Norton (1987)	Peru	Beans	14-24
		Maize	10-31
		Potato	22-48
		Rice	17-44
		Wheat	18-36
Mendoza (1987)	Ecuador	Potato	28
		Rice	44
		Soy	17
		Palm oil	32
Scobie (1988)	Honduras	Fruits, nuts	16-93
		Other crops	17-76
Cordomi (1989)(**)	Argentina	Aggregate	41
Echeverria (1989)	Uruguay	Rice	52
Evenson & Cruz (1989b)	PROCISUR Southern Cone Region	Wheat	110
		Maize	191
		Soy	179
Ruiz de Londoño (1990)	Peru / Colombia	Beans	15-29
Traxler (1990)	Mexico	Wheat	22-24
Pino (1991)	Ecuador	Wheat	29
		Potato	29
		Maize	3
		Beans	5
Palomino & Echeverria (1991)	Ecuador	Rice	34
Taxler (1992)	Mexico	Wheat	15-23
Cruz & Avila (1992)	Andean Region	Aggregate	245
Vivas, Zuluaga & Castro (1992)	Colombia	Sugarcane	13
Racines (1992)	Ecuador	Palm oil	32
		Soy	35
Palomino & Norton (1992)	Ecuador	Flint Maize	54
Byerlee (1994)	Latin America / Caribbean	Wheat	81
		Wheat	53
Cap (1994)	Argentina	Beef cattle	74
		Milk	55
		Maize	77
		Potato	69
		Wheat	67
		Other crops	54-59

Macagno (1994)	Argentina	Maize Wheat Other crops	47 32 34
Pena (1994)	Argentina	Potato	53-61
Romano, Bermeo & Torregrosa (1994)	Colombia	Sorghum	70
Byerlee (1995)	Latin America	Wheat	82
Fonseca (1996)	Peru	Potato	26
Ortiz (1996)	Peru	Potato	30
Farfan (1999)	Colombia	Coffee	21-31
Manzano (1999)	Ecuador	Rice	58
Amores (1999)	Ecuador	Cacao	31

Source: partial figures taken from Dias Avila, Antonio Flavio et. al. (2006) "Agricultural Productivity in Latin America and the Caribbean and Sources of Growth".

(\*) Internal rates of return, except in the cases indicated with (\*\*) which are estimates of the marginal internal rates of return

**Table 6. - Growth Rates of Agricultural Production in Different Regions of LAC during the Period 1962-2001(annual %)**

Regions	Crops			Livestock			Average Growth		
	1962/1981	1982/2001	Average	1962/1981	1982/2001	Average	1962/1981	1982/2001	Average
Southern Cone	2.79%	2.98%	2.89%	1.74%	2.95%	2.34%	2.27%	2.96%	2.62%
Andean	2.43%	2.65%	2.54%	3.95%	2.92%	3.44%	3.19%	2.79%	2.99%
Central America	3.60%	1.32%	2.46%	4.35%	2.84%	3.59%	3.97%	2.08%	3.03%
Caribbean	1.20%	-0.71%	0.24%	2.78%	0.77%	1.78%	1.99%	0.03%	1.01%
Averages	2.55%	1.57%	2.06%	3.56%	2.38%	2.97%	3.05%	1.98%	2.51%

Source: Dias Avila, Antonio Flavio et al. (2006) "Agricultural Productivity in Latin America and the Caribbean and Sources of Growth", with FAOSTAT data (indices of agricultural production).

**Table 7 – Social segments, importance and current knowledge of demand (in Brazil, Cuba, Mexico, Panama, Venezuela and Peru)**

Economic & Social Segments	Historic importance of the segment as a beneficiary of agricultural research*	Current knowledge of the demands of each segment*
Subsistence farmers (not linked to agricultural production chains)	Very Low	3.5
Small peasant farmers (campesinos), linked to agricultural production chains	Medium	4.2
Medium and large agricultural producers	Very high	6.2
Agroindustry and other industrial segments	High	6.1
Consumers of food and non-food products	Low	5.7
Wholesalers and retailers	Low	5.0
Input suppliers	Medium	5.9
Public policymakers	Medium	5.7
Communities (extractivist, indigenous, black) in agro-ecosystems	Low	3.2
Non-Governmental Organizations	Medium	5.0

Ten-point Scale (9-10 Very High, 7-8 High; 6-5 Medium, 3-4 Low, 1-2 Very low).

Source: Castro et al, 2005 (adapted).

**Table 8– Matrix for the assessment of the agricultural research effort in Latin America and the Caribbean.**

Types of Research	Current dedicated research effort in the PUBLIC SECTOR (Percentage of the effort)	Current dedicated research effort in the PRIVATE SECTOR (Percentage of the effort)
<u>Basic research</u> : aimed at advancing knowledge, without being directed at a specific use or application.	15	10
<u>Applied research</u> : aimed at developing products or processes applicable to different types of activities and problems.	47	40
<u>Adaptive research</u> : aimed at modifying products and processes developed (by applied research) for new uses and contexts.	28	37
<u>Strategic research</u> : aimed at generating knowledge, methods and tools as inputs (pre-technological) for applied research.	10	13
Total	100	100

Source: Castro et al, 2005 (adapted).



**Table 10 - Evaluation of the current importance and dominion of knowledge in the processes carried out by public sector agricultural research.**

Process related to:	Current importance for the public sector*	Current dominion of knowledge for the development process *
Biological pest and disease control	High	6.5
Nutrient content, soils and residues in the specific production systems where these are applied	High	6.3
Increasing energy efficiency in production systems	Medium	5.2
Treatment and recycling of agricultural and agroindustrial residues	Medium	5.0
Uniform rate of maturation of agricultural crops	Medium	5.5
Plants and animals with accelerated growth	Medium	5.0
Monitoring pathogens in animal and plant production	High	6.5
Precise evaluation input requirements, water, etc., for plant development (precision agriculture)	Medium	5.2
Monitoring safety and quality in food processing	Medium	5.6
Production processes with low environmental impact (e.g. use of non-governmental organizations for reducing environmental impacts, direct planting, etc.)	Medium	5.2
Advanced animal reproduction techniques (e.g.: <i>in vitro</i> fertilization, sexing, cloning, etc.)	Medium	5.5
Plant varieties and animal breeds adapted to hostile environments (thermal, hydric and nutritional stress)	High	5.5
Increasing the efficiency of physiological processes in plants and animals (nutritional efficiency, adaptive capacity, etc.)	High	5.2
Resistance to pests and diseases	High	6.5
Integrating chemical and genetic characteristics (e.g. resistance to herbicides)	Medium	5.2
Enhanced productivity	High/ very high	6.4
Integrating agriculture and health (bio-fortification of foods, promoting quality, functional foods, etc.)	Medium	4.6
Developing products adapted to specific groups of consumers (e.g.: <i>tailor made food</i> )	Low	3.8
Agricultural processes focusing on biosafety (invasive organisms, contaminating organisms and bio-terrorism)	Low	4.1
Bio-availability of nutrients from unimproved sources (minerals, sources of phosphorus and potassium, for example)	Medium	4.5

(\*) Scale of 10 points: Scale of 10 points (9-10 Very High, 7-8 High; 6-5 Medium, 3-4 Low, 1-2 Very low).

Source: Castro et al, 2005 (adapted)

**Table 11: Assessment (medians) of the current strategic importance of different research objectives in public sector R&D in LAC.**

Research objectives	Current strategic importance, public sector				
	Brazil	Mexico	Panama	Peru	Venezuela
Basic research in biotechnology	6	5	4	3	4
Basic research in nanotechnology	4.5	2	1	1	1.5
Applied research in biotechnology	7	5	5	3	5
Applied research in nanotechnology	4.5	2	2	1	1.5

Source: Castro et al. (2005)

**Table 12: World and LAC: Indicators of public and private R&D activities around 1995 Expenditure on agricultural research and development (millions of dollars) in 1993**

	Developing World		Developed World	World Total
	LAC	TOTAL		
Public	1,947	11,469	10,215	21,684
Private	91	672	10,829	11,511
Total	2,038	12,141	21,044	33,194

1 **Intensity ratio of agricultural research (percentage)**

	Developing World		Developed World	World Total
	LAC	TOTAL		
Public	0.98	0.62	2.64	1.04
Private	0.01	0.04	2.80	0.61
Total	0.99	0.66	5.43	1.65

2 Source: Figures used in Pardey and Bemtema (2001)

3

4 **Table 13: Assessments (medians) of current strategic importance of different research**  
5 **objectives in public sector R&D, in LAC**

6

Research objectives	Current strategic importance, public sector				
	Brazil	Mexico	Panama	Peru	Venezuela
Basic research in biotechnology	6	5	4	3	4
Basic research in nanotechnology	4.5	2	1	1	1.5
Applied research in biotechnology	7	5	5	3	5
Applied research in nanotechnology	4.5	2	2	1	1.5

7 Source: Castro et al. (2005)

1

2 **Figure 1. Regional Agricultural Technology Innovation System for the Americas**



3

4 **GFAR NARS SECRETARIAT**

5 **CGIAR SYSTEM**

6 **NETWORKS**

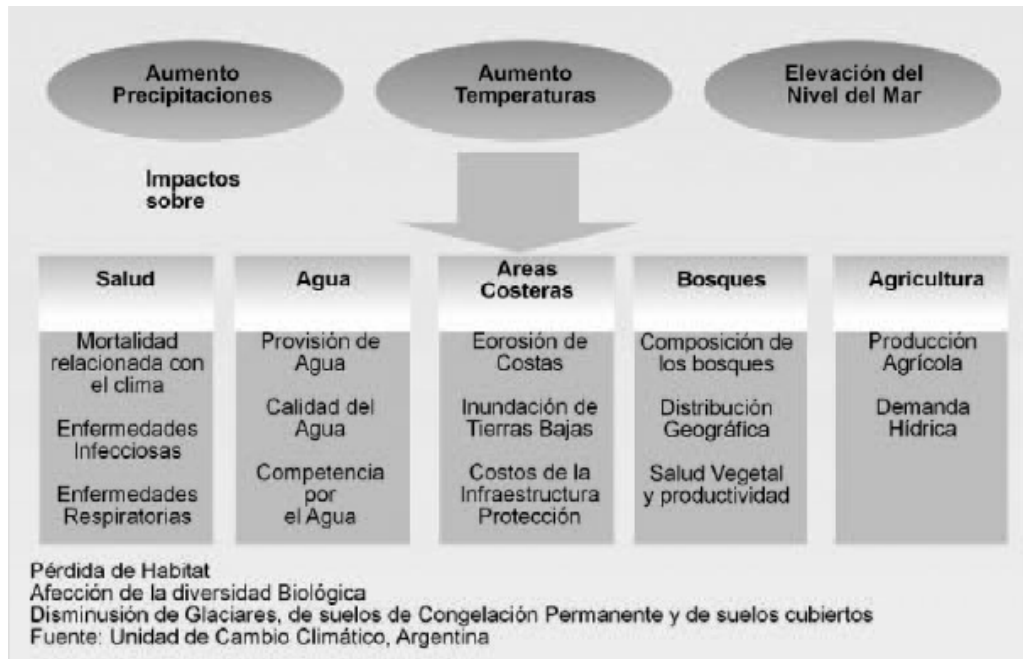
7 **NATIONAL TECHNOLOGY INNOVATION SYSTEMS (INIAS-OTHERS)**

8 **PROJECTS OF AGENCIES OF DEVELOPED COUNTRIES**

9

1

2 **Figure 2. Impact of vectors associated with global climate change and disasters**  
3



4

5 Increased Rainfall                      Higher Temperatures                      Rising Sea Levels

6 IMPACTS ON:

7 HEALTH - Climate-related Mortality, Infectious diseases, Respiratory diseases.

8 WATER - Water supply, Water quality, Competition for Water

9 COASTAL AREAS – Coastal erosion, Flooding of lowlands, Protection/Infrastructure costs

10 FORESTS – Composition of forests, Geographic distribution, Plant health and productivity

11 AGRICULTURE – Agricultural production, demand for water

12 Loss of habitat

13 Loss of biodiversity

14 Melting of glaciers, permafrost and frozen ground.

15 Source: Climate Change Unit, Argentina

1 **Figure 3: Multidimensional effects of El Niño in South America and Central America**

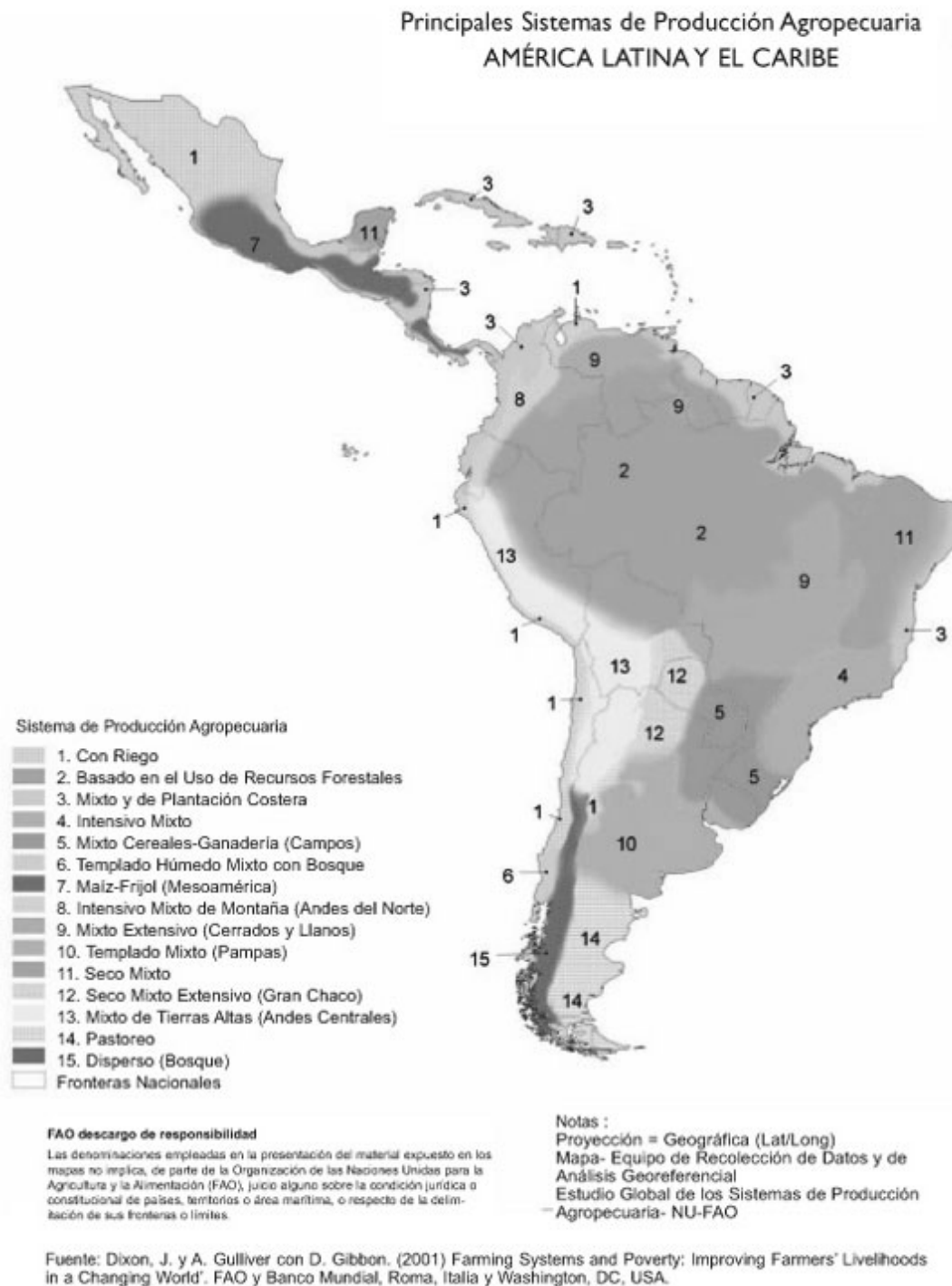


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3 **REGIONAL CLIMATE IMPACTS – EL NIÑO PHENOMENON**

- 4 **CENTRAL AMERICA:** Excessive rainfall on the Caribbean Slope (Costa Rica, Honduras, Guatemala)
- 5 and the Yucatan Peninsula. Droughts on the Pacific Slope of all countries.
- 6 **COLOMBIA, VENEZUELA, GUYANA, SURINAME, FRENCH GUIANA.** Decreased rainfall during
- 7 most of the year, except in the months of March-June, which apparently are not affected, and the Pacific
- 8 coast of Colombia, which experiences heavy rainfall in the summer.
- 9 **ECUADOR, PERU, BOLIVIA AND CHILE:** Heavy rainfall during the summer months on the western
- 10 coast of South America, which affect the coasts of Ecuador and northern Peru. Droughts during the
- 11 summer months in the Andean regions of Ecuador, Peru and Bolivia. Heavy rainfall over the central and
- 12 southern regions of Chile during the winter.
- 13 **NORTHERN BRAZIL:** Moderate to severe droughts in the northern and eastern parts of the Amazon
- 14 Region. Increased probability of forest fires, especially in areas xxxx?
- 15 **NORTHEASTERN BRAZIL:** Droughts of varying severity during the rainy season (February-May) in
- 16 the North. No significant changes in the South or the West.
- 17 **CENTRAL/WESTERN BRAZIL:** No evidence of pronounced effects on rainfall in this region.
- 18 **SOUTHEASTERN BRAZIL:** Moderate to large increase in median temperatures. No characteristic
- 19 pattern of change in rainfall.
- 20 **SOUTHERN BRAZIL:** Abundant rainfall, mainly in spring, and heavy rains from May-July. Increase in
- 21 the median temperature.

1 **Figure 4: Main agricultural production systems in Latin America and the Caribbean**



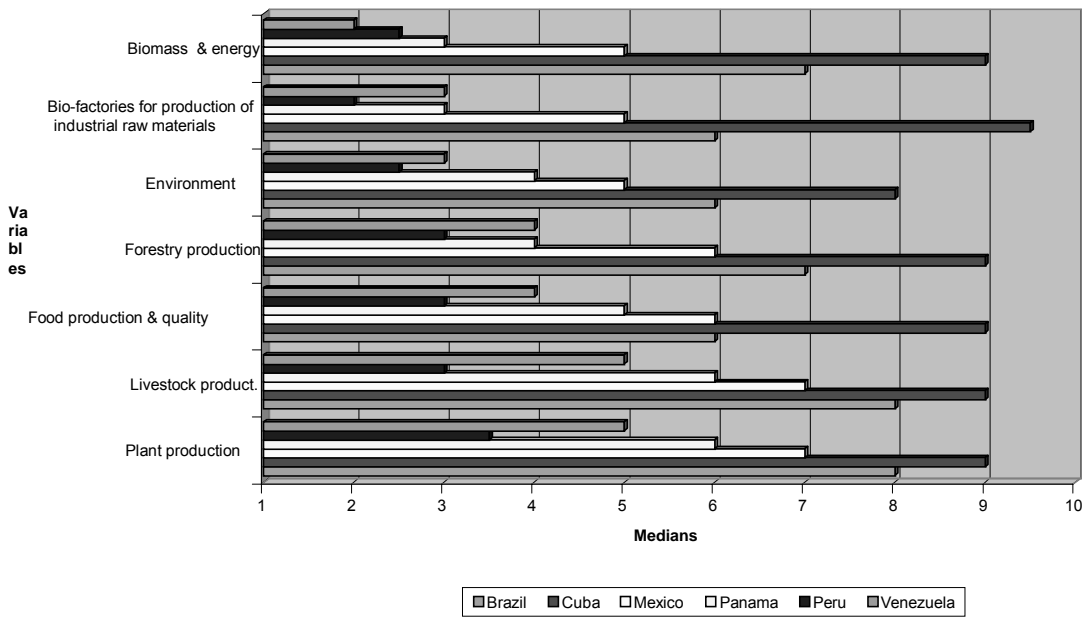
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3 Source: Dixon, J. Gulliver, A. Gibbon, D. (2001)

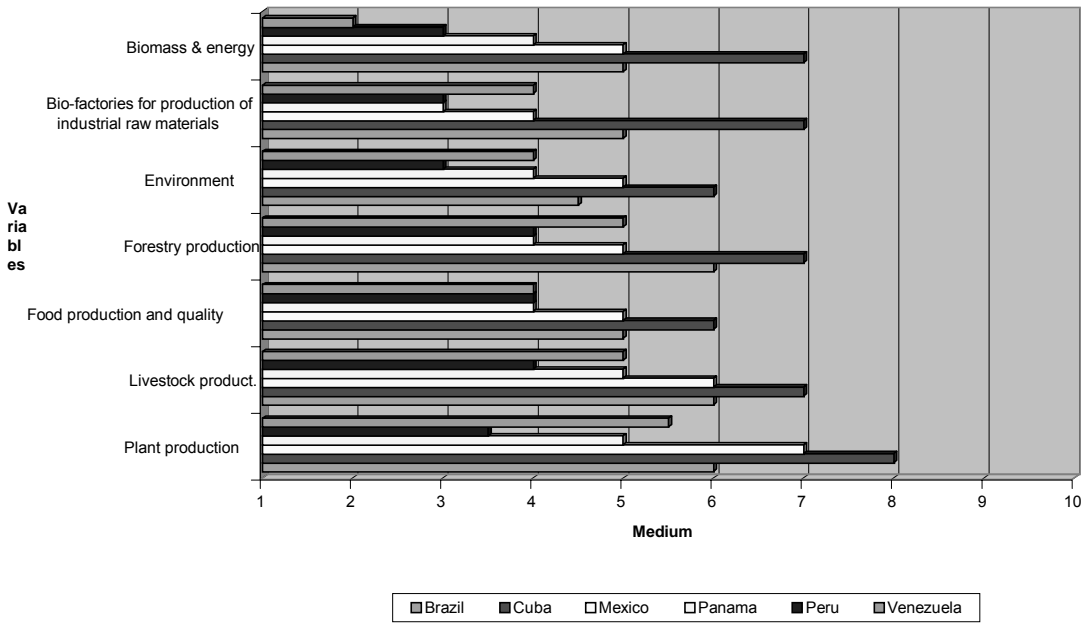
4 1) Irrigated; 2) Forest-based; 3) Coastal Plantation and Mixed; 4) Intensive Mixed; 5) Cereals-  
5 Livestock Mixed; 6) Moist Temperate Mixed Forest-Livestock; 7). Maize-Beans Mesoamerica; 8)  
6 Intensive Highland Mixed (northern Andes; 9) Extensive Mixed Llanos and Cerrados; 10)  
7 Temperate Mixed Pampas; 11) Dryland Mixed; 12) Extensive Dryland Mixed (Gran Chaco); 13)  
8 High Altitude Mixed (Central Andes); 14) Pastoral; 15) Sparse forests

9 National Borders Notes: Geographic Projection (Lat/Long) Map; Data Gathering and Geo-referencing Analysis.  
10 Global Study of Agricultural Production Systems

1 **Figure 5 - Current importance of biotechnology applications for public sector agricultural**  
2 **research**



1     **Figure 6 – Current dominion of biotechnology applications in public sector agricultural**



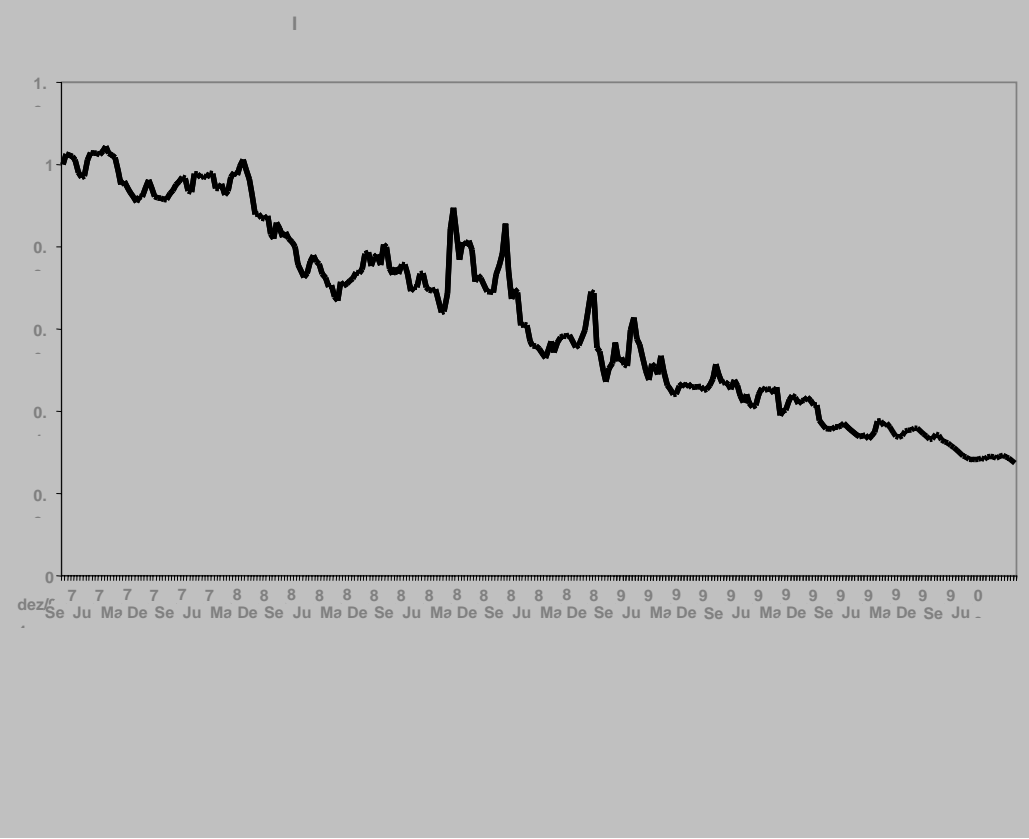
2     **research**

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1

2 **Figure 7 – Historical record of relative prices of the basic food basket in Brazil from 1974**  
3 **to 2000.**



4

5