LAC C3 Tables

Table 3.1 Definition of structures and variables included in the model

Structure	Variable	Variable's definition
Macrocontext		
Barriers to International trade	Non-tariff barriers based on social concerns	It is the body of official regulations and directives based on social indicators devised for the supply chain, which restrict the trade of agricultural products and services.
	Monitoring protocols and regulations for assuring product traceability and quality certification	It is the body of official regulations and directives relevant to the quality of food and products along the supply chain, with the aim of ensuring their safety to both domestic and foreign customers.
	Non-tariff barriers based on environmental concerns	It is the body of official regulations and directives based on environmental indicators devised for the supply chain, which restrict the trade of agricultural products and services.
	Tariff barriers	It is the body of official regulations and directives intended to protect the trade of domestic agri-business products from external competition.
Competitivity of agricultural business	Competitivity of agricultural business	Ability of LAC agri-business to displace similar products and services from markets by offering products and services at prices and qualities demanded by consumers
	Differentiation of innovative products	Products with increased added value from the use of R+D processes and marketing
	Access to markets of innovative differentiated products	Placement of innovative products with increased added value in international markets
	Information and Communication Technology (ICT) as a tool for facilitating commercial transactions in agri-business	Use of diverse electronic communication resources to reduce transaction costs in the trade of agri-business products.
	Commodities' costs	Production and transaction costs of commodities in agri-business
Demands from final consumers	Demands from final consumers	Demands for diversification of agri-business products from several segments of final consumers.
	Demand for healthy and safe foods	Public's interest in foods harmless to health and nutraceuticals (foods with medicinal effects)
	Consumer information	Free access to product information as suited to the needs of final consumers.
Climate change	Climate change	The effects of increased frequency and intensity of climate phenomena driven by temperature, rainfall, wind, etc. on agricultural activities
Epidemies/food contamination	Diseases, pests and food contamination	Occasional outbreaks of diseases, pests and/or diverse kinds of food contamination in different countries and regions
Advances in knowledge	Advances in biology and biotechnology	Research in biology and biotechnology moves steadily on the discovery of fundamental biological knowledge
	Advances in information technology	Information and Communication Technology (ICT)'s progress on novel modes for the communication and flow of information
	Advances in nanotechnology	Progress on fundamental nanotechnological knowledge
Traditional/indigenous knowledge	Traditional/indigenous knowledge	Dynamic body of knowledge and practices accumulated by traditional/indigenous communities and agricultural production systems as a result from the interaction between the latter and both nature and agricultural practice
Social monitoring of innovation	Public perception of S&T (Science and Technology)	Public trust on the results and conclusions from scientific and technological activities
	Social monitoring of	Involvement of social actors on the aims, planning,

Structure	Variable	Variable's definition
	innovation	implementation, results and impacts of S&T activities
Governance	Governance	A wide and inclusive social compact buttresses the stability of social, economic, environmental and innovation policies in LAC

Table 1: Definition of structures and variables included in the model (cont.)

Policies for development	Integration of policies for innovation and social development	Development is facilitated by the integration of national, sub-national entity and sectorial policies[1]
	Proposal and implementation of agricultural policies	The ability to devise agricultural policies together with the existence of organizations and institutions prepared to implement them
	Biosecurity policies	Policies for reducing the intrinsic risks of foods and agriculture (environmental risks included) These are policies for the security of food, health and the life of plants and animals
	Social development policies	Policies for facilitating the access of vulnerable rural and urban populations to education, credit, health and housing
	Incentive policies for research	Policies for the development of science and technology
Management of regulations and standards	Regulations and standards	The mechanisms that (a) regulate intellectual property rights for the results of scientific research, including the production of living organisms (cultivars) and (b) set the provisions for trading agricultural products in LAC and other world regions
	Implementation of regulations and standards	Set of actions addressing the implementation and monitoring of regulations and directives governing agricultural S&T and agricultural products
Education of PS[2] actors	Education of PS actors	Degree of schooling of productive systems' actors
Urban food security	Access to food security	Ability of urban consumers (particularly the poor ones) for regularly purchasing food in enough quantities for ensuring their well-being
	Access to food security	Ability of urban consumers (particularly the poor ones) for regularly purchasing healthy food in the sense of low risks as to biological contamination, allergenic potential and pollution
Social inequality	Social inequality	Relative access to employment, food security, education and health of different social groups – like e.g. small family-farmers, subsistence farmers, large farmers, wage-earners – involved in agricultural production activities
Environmental sustainability of agriculture	Environmental sustainability of agriculture	Ability of the agro-ecosystem to keep ist productive functionality in future times
R+D systems		
Focus of research	Focus of research	Strategic orientation of the objectives and results from R+D activities to social groups attended by them
	Harmony between R+D organizations and their social environment	Congruence between the mission, objectives and products from R+D organizations and the needs and expectations of their clients, users, beneficiaries and other pertinent stakeholders
	Priorized activities	Strategic choice of topics/problems for developing projects and project portfolios in R+D organizations
	Demands for research	The need of knowledge and technology to take advantage of opportunities or to remove checks on the performance of agricultural production systems
	Survey of future	Systematic evaluation of likely demands for

[1] Sub-national entities (or administrative division) is a generic term for an administrative region within a country or Political division — on an arbitrary level below that of the sovereign state — typically with a local government encompassing multiple municipalities, counties, or provinces with a certain degree of autonomy.
[2] Productive Systems.

	demands for research	research in the future
Incorporation of formal knowledge	Incorporation of formal knowledge	Incorporation of advances in formal knowledge to the R+D process
Incorporation of traditional/indigenous knowledge	Incorporation of traditional/indigenous knowledge	Incorporation of traditional/indigenous knowledge and practices to the formal process of knowledge and technology production
Availability of resources for R+D	Alternative resources for funding R+D	Alternative non-fiscal sources of R+D funding
	Funding for R+D production	Funding necessary for producing the technologies and knowledge demanded by the clients/users of R+D
	Infrastructure for the production of R+D	Facilities and equipment necessary for the production of knowledge and technologies demanded by the clients/users of R+D

Table 1: Definition of structures and variables included in the model (cont.)

Performance of R+D systems	Products and services generated by R+D	Portfolio of products and services generated by R+D organizations for their clients
	Effectiveness of R+D	Products are delivered according to consumer, client, and whole society needs
	Efficiency of R+D	Ability of R+D organizations to generate lowest-cost products and services
Management of R+D	System for project planning, monitoring and evaluation (PME) in R+D organizations	The systematic process for setting objectives/goals, procuring and distributing resources, implementing projects and programs, and adjusting the implementation and evaluation of projects and final services obtained from R+D organizations
	Project portfolio	Collection of projects intended to solve a large national or regional strategic problem
	Projects	Management tool with goals clearly defined by: the nature of a problem; a particular request; particular favourable conditions for meeting some goals; or the interest of groups that seek translating ideas into concrete results in a prestablished period of time and at a known cost
	Management of research teams.	Mechanisms of planning, monitoring, evaluation and organization of R+D work
	Multidisciplinary approach	Interaction, synergism and interfacing among diverse fields of knowledge
	Reward systems	Processes for valuing or approving (or both) the results of research work in R+D organizations by means of both material and immaterial rewards
Relative spaces of public and private R+D	Relative spaces of public and private R+D	Fields covered by each of public and private research organizations
	Public-private alliances	Agreements between public and private organizations with the aim of complementing resources for projects in which there is a common research interest
	Competition between agricultural R+D organizations	Strategies of public and private R+D organizations to predominate in markets for agricultural industry technologies
	Privatization of the R+D system	Complete transfer of public R+D infrastructure and activities to the national or international private sector
Social involvement in the management of R+D	Social involvement in the management of R+D	Social groups are involved in the decision making and implementation of R+D activities
Proper technologies for agricultural activities	Proper technologies for agricultural activities	The degree with which the technologies generated by R+D systems support sustainable development and also are suitable to the culture, resources and conditions of the agricultural production systems

Agricultural production systems

Incorporation of knowledge to productive systems	Support to the incorporation of knowledge	Operation of mechanisms for giving technical assistance (public or private) to productive systems for adopting appropriate technologies
	Incorporation of knowledge to productive systems	Choice and adoption of appropriate technologies by productive systems
Attended markets	Integration of production chains	Degree of connectivity with and participation of productive systems in established production chains
	Attended markets	These are the markets agricultural production systems send their produce
Social organization of vulnerable production systems	Social organization of vulnerable production systems	It is a mechanism for attaining economies of scale in production, negotiation capacity, and improvements in the management and trade of agricultural productive systems goods and services
	Social movements focalized on the most vulnerable production systems	Social mobilization as an instrument for accessing resources and empowering production systems
Availability of resources for agriculture	Availability of resources for agriculture	Access of production systems to credit, land, water and knowledge

Table 1: Definition of structures and variables included in the model (cont.)

Performance of agricultural productive systems	Efficiency	Relationship between costs of production and returns in productive systems
	Quality of products and processes	Sustainability of agricultural products and processes, and the degree of agreement between them and consumer needs
	Products, sub products and waste	Characteristics of the products, sub products and waste in regard to their effect on the environment
Rent inequality in agriculture	Rent inequality in agriculture	Relative access to rent by diverse social groups involved in agricultural production, like family farmers, salaried employees, subsistence farmers, large producers, etc.)

Table 2. Subjects used for scenario building

Approach in relation to the management of environmental services	Approach in relation to governability and economic development		
	Globalized	Mixed	Regionalized
Reactive	Global symphony		Order from strength
Mixed		Life as it is	
Pro-active	Techno-garden		Adaptive Mosaic

Table 3. Selected indicators: current situation of variables

Variable	Current situation	Source
Context variables for AKST systems and agricultural production systems		
Tariff barriers	In LAC there are lower import tariffs, and no subsidies to exports and production of goods compared to the both the World and rich countries	Anderson y Valenzuela, 2006
Non-tariff barriers	Agricultural exports are the most likely to be penalized with non-tariff barriers. This effect is less in LAC than in the Middle East, North Africa, Europe, USA, Canada and Japan. . Agricultural exports are the most likely to be penalized with non-tariff barriers. This effect is less in LAC than in the Middle East, North Africa, europe, USA, Canada and Japan.	Bora et al., 2002
Market competitivity	Agricultural products: net-exporting countries: Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Uruguay, Costa Rica, Guatemala, Honduras, Nicaragua; net-importing countries: Peru, the Bolivarian Republic of Venezuela, El Salvador, Mexico, Panama, Cuba, the Dominican Republic, Haiti, Jamaica and Trinidad and Tobago. Foods: net-exporting countries: Argentina, Bolivia, Brazil, Paraguay, Uruguay, Nicaragua; net-importing countries of foods and agricultural products: Peru, the Bolivarian Republic of Venezuela, El Salvador, Mexico, Panama, Cuba, the Dominican Republic, Haiti, Jamaica and Trinidad and Tobago	de Ferranti et al., 2005
Demands from final consumers	Consumers increasingly demand better quality in foods. According to Renard (1999) quality – in its manifold dimensions and meanings - is the factor that binds together consumers, wholesalers, industry and farm production	Renard, 1999
Epidemies/food contamination	In developed countries many episodes of transboundary diseases have been recorded since the 1980s	Jaffee et al., 2005
	In LAC the foot-and-mouth disease and the avian flu are epizootics of much concern because of their impacts on important sources of work and earnings for rural communities. The capacity to quickly and effectively react to transboundary diseases' outbreaks would expose institutional weaknesses in many LAC countries as well as agencies responsible for monitoring, prevention and sanitary control of those kinds of diseases. The diverse agricultural production methods in use decrease the effectiveness of international monitoring and harmonization of public programmes for preventing and fighting transboundary diseases.	CEPAL, 2006
	In regards to avian flu a team from the Inter-American Development Bank assessed the integration of agricultural and health measures before an outbreak of that kind of disease. It is shown that the degree of that integration is greater in the Southern Cone than in other regions of LAC (Central America, Andean countries and Latin Caribbean). The countries in the Southern Cone show some differences in the degree of integration among themselves. In regard to poultry consumption, it accounts for 35% of meat consumption in LAC, 42% in Central America and 45% in the Latin Caribbean. These relatively high percentages point to the existence of a food insecurity risk in the event of an	Schneider et al., 2007

Variable	Current situation	Source
	outbreak of avian flu.	
	If the following three indicators – i.e. units for veterinary practice, available personnel, and economic resources – were taken in account for combating foot-and-mouth disease on an area basis in South America, each of Bolivia, Chile, Guyana and Peru has two out of those three indicators with lower values than in the rest of the continent. Brazil, Ecuador, Paraguay and Uruguay are the less vulnerable countries.	PANAFTOSA, 2005
Climate change	Parameters related to agriculture. Severe environmental restrictions to dry land farming in LAC 1961-1990: Central America and the Caribbean, 51% (mostly arid lands); South America, 61.9% (poor soils). Lands without restrictions: 10% of LAC. Average yield potential 1961-1990 (Mtons/year): Central America, 101; South America, 543; developed countries, 0.002815.	Fischer et al., 2005
Governance and policies in LAC	Political stability. Positive values for Chile, Costa Rica, Uruguay, Cuba and the Dominican Republic; negative values for the rest of the countries, and particularly small values for Haiti, the Bolivarian Republic of Venezuela, Bolivia, Ecuador, Colombia, Guatemala and Peru. Government effectiveness: Positive values for Chile, Trinidad and Tobago, Costa Rica, Uruguay, and Panamá; negative values for the rest of the countries, and smaller values for Haiti, Ecuador, Cuba, the Bolivarian Republic of Venezuela, Paraguay and Bolivia. Regulatory Quality: Positive values for Colombia, Brasil, Peru, El Salvador, Panamá, Uruguay, México, Costa Rica, Trinidad and Tobago and Chile; negative values for the rest of the countries, and smaller values for Cuba, Haiti, the Bolivarian Republic of Venezuela, and Ecuador. For all three indicators, positive values were given to Uruguay, Costa Rica, and Chile, and negative ones to the Bolivarian Republic of Venezuela, Ecuador, Paraguay, Argentina, Bolivia, Honduras, Guyana, and Nicaragua	Kaufmann et al., 2006
	Education: Education quality is assessed by the average number of students with mathematical skills in three education levels: basic, primary an secondary. There is a correlation between the quality values measured in urban and in rural students, but in no case average values are greater in the rural students. Country-wise Cuba shows high skill scores in both student populations (greater than 90%); Brasil, Chile and Argentina reach 80% skill in urban students; the Bolivarian Republic of Venezuela Paraguay, México, and Colombia show skill values ranging from 50% to 70% for both urban and rural students. The rest of the countries — Perú, Bolivia, Honduras, and the Dominican Republic — show values below 60% for both the urban and rural students.	de Ferranti et al., 2005
Advances in formal knowledge	The private sector invests annually more than USD 1.5 billion in biotechnology in a large part of developed countries; public organizations doing agricultural research in developing countries invest USD 100-150 million per year; the CGIAR centers invest about USD 25 million per year; and	Byerlee and Fischer, 2000

Variable	Current situation	Source
	the Rockefeller Foundation and other non-profit organizations annually invest about USD 40-50 million.	
	Brazil, Argentina, Mexico and Chile are the LAC countries with more firms, publications and patents in biotechnology	Niosi y Reid, 2007
	The largest investments in nanotechnology in 2004 were made in Europe (USD 1.32 billion), North America (USD 1.28 billion) and Asia (USD 1.16 billion); in LAC biotechnology as a whole received USD 16.2 million from only three countries: Mexico (61.7%), Brazil (35.8%) and Argentina (2.5%)	Simonis y Schilthuizen, 2006
Traditional/indigenous knowledge	This knowledge is in steady progress. The following features distinguishes it from occidental scientific knowledge: (1) it is verbally recorded and transmitted; (2) it is nourished by observation and experience; (3) its cosmology is rooted in the view that Nature is instilled with spirituality; (4) it is intuitive; (5) it is qualitative; (6) it is based on data generated by its users and (7) it is grounded in a social context which sees the world through multiple social and spiritual relationships among all forms of life.	Dutfield, 2001
	The intellectual property of traditional knowledge of biodiversity, phyto-genetic resources, and products derived from natural principles fund in wild species by indigenous communities and peoples is still an unsettled question.	WIPO, 2001
Variables of AKST systems		
Focus of research	There presently are three processes highly relevant for R+D in LAC and running in six countries (Brazil, Cuba, Mexico, Panamá, Peru and the Bolivarian Republic of Venezuela). Those are concerned with high productivity; increase of resistance to pests and diseases; and biological control of pests and diseases. The management of water quality and use; survey and conservation in situ and ex situ of germplasm; and management, zoning and conservationist agriculture are the best assessed environmental subjects in LAC. The applications of biotechnology, livestock and plant production were considered of greatest relevance nowadays	Castro et al., 2005; Lima et al., 2005; Santamaría G. et al., 2005; Ramirez-Gastón R. et al., 2007, Saldaña et al., 2006
Focalized social segments	In most countries in LAC — except Cuba — R+D is better informed on the supply-chain segments represented by big and medium producers, agri-business, wholesalers, and retailers than on subsistence producers and indigenous communities.	Castro et al., 2005; Lima et al., 2005; Santamaría G. et al., 2005; Ramirez-Gastón R. et al., 2007, Saldaña et al., 2006
Capacity in R+D	There is a `specialization index´ which equals `1´ for the case of all researchers with completed tertiary (university) education, and is `3´ for all researchers with a doctorate. For Brazil, the Bolivarian Republic of Venezuela and Trinidad and Tobago, the value of the index is `2´; for Costa Rica, Bolivia and Colombia, the average index is above `1.5´ and for the rest of the countries, it is above `1´. Countries with the lowest formation level (most of researchers with a	RICYT, 2007.

Variable	Current situation	Source
	licentiate degree) are Ecuador, Paraguay and Uruguay. There are no data for Cuba.	
Investment in agricultural R+D	The countries which invest more in terms of average GDP (1990-2004) are Brazil (0.9%), Cuba, Chile (about 0.6%), Argentina, Mexico, and Panamá (about 0.4%); the rest of the countries invest less than 0.3%, and some below 0.1% (Ecuador, El Salvador, Honduras, Jamaica, Nicaragua and Paraguay)	RICYT, 2007
Performance	Technologies that because of their relevance are presently considered `leading technologies´ for most of countries are those addressing the following changes in agricultural production systems: (a) Increase in agricultural and silvicultural productivities; (b) reduction of agricultural and silvicultural production costs; (c) improvement of product quality in production chains; (d) food security; and (e) improvement process quality in agricultural and silvicultural production chains. These technologies are more suitable for medium and big producers, but less so for agri-business.	Castro et al., 2005; Lima et al., 2005; Santamaría G. et al., 2005; Ramirez-Gastón R. et al., 2007, Saldaña et al., 2006
Relative spaces of public and private R+D	In Latin America a scenario is emerging such that the private sector is becoming keener to invest in R+D activities, particularly in the improvement of cultivars of crops like corn (and increasingly soybean) which would readily produce profits. In Brazil it is also observed a growing participation of the private sector — the national one mostly — in R+D.	Castro et al., 2005; Lima et al., 2005; Castro et al., 2006
	There are evidences that in Argentina the transnational private sector invests in biotechnology about six times the amount invested by the public sector.	Varela y Bisang, 2006
Variables for agricultural production systems		
Incorporation of knowledge to agriculture	The countries which invest more in terms of average GDP (1990-2004) are Brazil (0.9%), Cuba, Chile (about 0.6%), Argentina, Mexico, and Panamá (about 0.4%); the rest of the countries invest less than 0.3%, and some below 0.1% (Ecuador, El Salvador, Honduras, Jamaica, Nicaragua and Paraguay)	RICYT, 2007
Resources for agriculture	Expenses per rural inhabitant (1991-2001). >USD 1,000: Uruguay; >USD 150 & <USD 300: Mexico, Argentina, Brazil, and Chile; >USD 75 & <USD 150: Panamá, Nicaragua, Costa Rica, Dominican Republic, and the Bolivarian Republic of Venezuela; <USD 75: Honduras, Guatemala, El Salvador, Paraguay, Jamaica, Peru, Ecuador, Bolivia, and Colombia.	de Ferranti et al., 2005
	Agricultural and rural public expenses as percent of agricultural GDP. Average for 1990-2001 was 12.8%. Countries where those expenses were: (a) above the average: Uruguay, Panama, Dominican Republic, Mexico, Nicaragua and Chile; (b) equal to the average: Guatemala and Honduras and (c) below the average: Bolivia, Ecuador, Costa Rica, Jamaica, Peru, Brazil, the Bolivarian Republic of Venezuela, Argentina, Paraguay and Colombia.	Kjöllerström, 2004
Performance of agricultural systems in LAC[3]	Agricultural GDP (USD million in 1995) for 2002. (a) Greater than 60,000: Brazil; (b) 10,000-20,000: Mexico, Argentina and Colombia: (c)	RLC-FAO, 2004

[3] See also competitivity indicators in the same table.

Variable	Current situation	Source
	5,000-9,999: Peru and Chile and (d) 400-4,999: Ecuador, the Bolivarian Republic of Venezuela, Guatemala, Cuba, Paraguay, Dominican Republic, Costar Rica, Uruguay, El Salvador, Bolivia, Honduras, Nicaragua, Panamá, Haiti.	
	Share of agricultural GDP of total GDP (%) in 2002. (a) Greater than 40%: Guyana; (b) 20%-39%: Nicaragua, Paraguay, Ecuador, Belize and Guatemala; (c) 10%-19%: Honduras, Haiti, Dominica, Bolivia, Colombia, Suriname, Dominican Republic, El Salvador and Costa Rica and (d) Lower than 10%: Saint Lucia, Peru, Grenada, Brazil, Uruguay, Panama, Jamaica, Chile, Argentina, the Bolivarian Republic of Venezuela, Cuba, Barbados, Mexico and Trinidad and Tobago.	RLC-FAO, 2004
Interactions between the agricultural production and the AKST systems		
Rent	Rent per capita. More than USD 9,655: Argentina, Brazil, Chile, Uruguay, the Bolivarian Republic of Venezuela, Costa Rica, Mexico, Panama and Trinidad and Tobago; USD 875 – 3,125: Bolivia, Colombia, Ecuador, Paraguay, Peru, El Salvador, Guatemala, Honduras, Dominican Republic, and Jamaica; Less than USD 875: Haiti.	WB, 2003
Rent inequality	Between 1998 and 2005 the difference between the most rich and the most poor — an indicator of social inequality — in some LAC countries shrinked between 8% and 23%; those countries were Argentina, Brazil, Ecuador, El Salvador, Mexico, Panama, Paraguay, Peru and the Bolivarian Republic of Venezuela. The relatively large difference in per cent values was due to an increased participation of the lowest four population deciles as well as a decrease in the participation of the richest population decile. Chile and Costa Rica did not show any change in that indicator. Colombia, Honduras, the Dominican Republic, and Uruguay instead showed increases not greater than 13%. The value of the Gini Index confirms the emerging trend to an improvement in wealth distribution. Brazil, El Salvador, Paraguay and Peru showed a substantial decrease (4% to 7%) in the value of that index: however, Honduras showed a marked increase in the value of the Gini Index. Along the longer period 1990-2005, in Uruguay and Panama urban wealth distributivity markedly increase, as attested by a decrease of about 8% in the Gini Index. Honduras followed the same path, with a decrease of 4% in the value of that index. On the other hand, urban areas in Ecuador and metropolitan Asunción in Paraguay yielded a 10% increase in the value of the Gini Index, which amounts to a sizeable increase in the concentration of wealth. The index also decreased from 4% to 7% for Argentina (Great Buenos Aires area), Costa Rica and the Bolivarian Republic of Venezuela. In 2005 Bolivia, Brazil, Honduras and Colombia showed relatively larges values (ranging from 0.584 to 0.614) of the Gini Index. The lowest value of that range (0.584) was greater than the upper value of the range 0.526 – 0.579 obtained for Nicaragua, the Dominican Republic, Chile,	CEPAL, 2006

Variable	Current situation	Source
	Guatemala, Paraguay, México and Argentina. Inequality (as measured by the Gini Index) was still less (0,470 - 0,513) for Ecuador, Peru, Panama, El Salvador, the Bolivarian Republic of Venezuela and Costa Rica. Uruguay was the only country with a low inequality level: Gini Index of 0,451.	
Social development	Concern with meeting people's basic needs (e.g. assistance to education premises, sanitation, electricity, drinking water, five or more years of schooling, dwelling, avoidance of overcrowding, etc.) as measured by an index running from 0% to 100%. High (equal to or greater than 70%): Panama, Argentina, Chile, Costa Rica, Uruguay and Brazil; medium (50% - 69%): Mexico, Ecuador, Colombia, the Bolivarian Republic of Venezuela and Guatemala; below average (25% - 49%): El Salvador, Paraguay, Peru, Bolivia, Nicaragua and Honduras.	CEPAL, 2005a
Food security	During 1979-2000, daily consumption increased about 10 kcal per capita in Peru, Ecuador, Honduras, Colombia and Brasil, but it decreased or did not change in Haiti, Argentina, Panama, Nicaragua, Guatemala, Cuba y the Bolivarian Republic of Venezuela.	Morón et al., 2005
	Proportion of undernourished population. Greater than 35%: Haiti (improving); 20%-34%: Bolivia (improving), the Dominican Republic, Nicaragua, Honduras (stable), Panama and Guatemala (deteriorating); 10%-19%: Peru (reached the Millenium Goal), Jamaica, Colombia, Paraguay, El Salvador, Trinidad and Tobago and the Bolivarian Republic of Venezuela (improving); 5% - 9%: Brasil and México (improving); 2% - 4%: Cuba, Chile, Ecuador (reached the Millenium Goal), Uruguay and Costa Rica.	RLC-FAO, 2005
Food sustainability	The most serious environmental problems in LAC are: land and forest degradation, deforestation, losses of habitat and biodiversity, pollution/contamination of fresh-water sources, marine coasts and the atmosphere. The amount of global rainfall is enough, but it is unevenly distributed; agriculture is strongly dependent on irrigation in many areas; there has been a marked increase in livestock production and many areas are under water stress. There has been a striking increment in both crop and livestock production. The latter exerts a strong pressure on forest lands, even when the rate of increase in lands under agriculture has decreased. There is a noticeable trend towards soil degradation and contamination because of the intensive use of agri-chemicals, fertilizers and pesticides, salinization and deforestation. Misuse has led to soil degradation in arid, semiarid, sub humid, and dry regions. In the 1990s important advances were made in LAC towards institution-building for environmental management, the creation of a legal framework and specific legislation directed to natural resources and the limitation of polluting/contaminant emissions, and the implementation of tools like environmental impact assessments. Despite differences among countries, total environmental expenses (i.e.	CEPAL, 2005b

Variable	Current situation	Source
	public and private) did not go beyond 1% of GDP, and rarely beyond 3% of total public expenses. The degree of deforestation is very large. Deforestation is mainly due to the conversion of forested lands to other uses, like agriculture, livestock production, urban expansion, road and railway construction, and mining. Other causes of deforestation, which are very important in some areas but are much less widespread than the ones referred to are the harvest of firewood for either household or industrial use and the intensive exploitation of some particular tree species. Fires may also result in large forest losses. Conventional silvicultural approaches to forest management and use, that do not take into account the complexity of the forest ecosystem, its multiple environmental services and its benefits for the communities inhabiting them still are the preferred ones in LAC. Nevertheless there currently is a trend in most of the countries in the region to prepare national forestry plans with the idea contributing to the sustainable development of a country. Eight countries in the region are classed as mega-diverse: Bolivia, Brazil, Colombia, Costa Rica, Ecuador, Mexico, Peru y the Bolivarian Republic of Venezuela. The conservation of biodiversity is considered to be extremely important agriculture and food security. A wide variety of plants and animals make the basis of agricultural biodiversity. However, just 14 mammal and avian species altogether make up 90% of the food from animal sources people eat. And only four plant species — wheat, corn, rice and potato — provide half of the energy Man gets from plants. Latin America is the origin of many crops species relevant for human nutrition, like corn, beans, potato, sweet potato, tomato, cacao, cassava, peanuts and pineapple. In the last 100 years three quarters of agricultural crops' diversity has been lost; this represents a serious threat to both agriculture and food production. Forest cover (1990-2000). Increased: Uruguay and Cuba; invariable: the Dominican Republic and Chile; decreased: (in decreasing order) Guyana, Bolivia, Colombia, Peru, Brazil, the Bolivarian Republic of Venezuela, Paraguay, Costa Rica, Argentina, Trinidad and Tobago, Honduras, Mexico, Ecuador (reduction less than 10%), Jamaica, Panama, Guatemala, Nicaragua (reduction between 10% and 30%), El Salvador and Haití (reduction between 30% and 50%)	
Population and poverty	In LAC there are 432.8 million people, of which 24.2% makes the rural population. There were 170.7 million employed people in 2005. Most of the urban employed (93.9%) perform non-agricultural activities, and about three-fifths (58.8%) of the rural employed are engaged in agricultural activities. The rural population has in general relatively decreased (as a fraction of total population) in most of the LAC countries along the decade	CEPAL, 2005a de Ferranti et al., 2005

Variable	Current situation	Source
	1990-2001, except in Costa Rica, Ecuador, Guatemala, Honduras, Nicaragua, Panama, Paraguay and Peru. During 1994-2000, urban poverty as decreased in most of the countries, except in Argentina, Colombia, Ecuador, Guatemala and Nicaragua. In this same period, rural poverty decreased or remained stable, except in Guatemala, Honduras, Nicaragua and Paraguay; in Peru rural poverty increased. Advances in poverty reduction in LAC (1998-2005). Large (10% - 20%): Ecuador, Mexico and the Bolivarian Republic of Venezuela; intermediate (5% - 10%): Colombia and Honduras; small (1% - 4.9%): %): Brazil, El Salvador and Chile; Increase in poverty: Argentina, Bolivia, Costa Rica, Panama, Peru and the Dominican Republic. Paraguay did not change its poverty level.	CEPAL, 2005a

Table 4: Brief description of the states of component variables in each scenario

Variables	**Global Simphony**	**Order from Strength**	**Life as it is**	**Adaptive Mosaic**	**Techno garden**
Barriers to international trade	Trade barriers are removed, but sanitary and phyto-sanitary barriers are retained	Trade barriers and subsidies proliferate, particularly those intended to prevent bioterrorism	Trade barriers and subsidies proliferate, particularly those intended to prevent bioterrorism	Trade barriers are set, together with environmentally-friendly tariffs and subsidies	There are trade barriers at the outset, but by 2030 only sanitary and phyto/sanitary barriers are retained
Epidemies/food contamination	At the beginning of the period there is an increase in disease and pest outbreaks, which frequency and intensity increase steadily throughout 2030, when their control becomes regional. High risk of food contamination	The frequency and intensity of diseases and pest outbreaks increase. Low risk of food contamination because of strict bromatological control of food to avoid bioterrorism attacks	The frequency and intensity of diseases and pest outbreaks increase. High risk of food contamination	The frequency and intensity of diseases and pest outbreaks increase at the beginning of the scenario, but they decrease towards the end of it (2030) Decreasing risk of food contamination	The frequency and intensity of diseases and pest outbreaks increase at the beginning of the scenario, but they decrease towards the end of it (2030) At this time previously unknown pests and diseases come into the fore. Decreasing risk of food contamination
Competitivityof agricultural business	High. LAC countries are embedded in markets for basic and differentiated products	Low, due to slower development. LAC countries only compete in markets for basic products	High. There is an increased competition for embedding into markets for differentiated products	Low. The competitivity of LAC-countries slacks off. Local markets become more relevant than international ones	High. Competitivity increases because production costs are decreased and differentiated products are preferentially manufactured
Demands form final consumers	Consumer demands become more diversified. There is a stronger request for information on the origin and quality of products	Rich countries demand diversified products; poor countries demand cheap products	Consumer demands become more diversified. There is a definite demand for cheaper products	Consumers preferentially demand local products manufactured with due care for their environmental impacts along the production chain and waste disposal	In general, consumer demands become increasingly more diversified.
Climate change	Mean temperature and the frequency of extreme events increase. Society is not fully aware of climate change impacts. By 2030 countries fully cooperate to implement global mitigation and	Mean temperature and the frequency of extreme events increase. Society is not fully aware of climate change impacts. Countries do not show mitigation and adaptation capabilities.	Mean temperature and the frequency of extreme events increase. Society is not fully aware of climate change impacts. Countries show variable mitigation and adaptation capabilities	Mean temperature and the frequency of extreme events increase. Society becomes fully aware of climate change impacts. Countries increase their mitigation and adaptation capabilities	Mean temperature and the frequency of extreme events decrease. Society is fully aware of climate change impacts. Countries have well developed mitigation and adaptation capabilities

Variables	**Global Simphony**	**Order from Strength**	**Life as it is**	**Adaptive Mosaic**	**Techno garden**
Governance	adaptation programmes. Governance reasonably improves but not uniformly across the region. By 2030 problems derived from the biophysical and social environments become serious.	There is a marked worsening of governance	Governance ranges from mediocre to bad	Governance progressively improves across the region until becoming optimal just in some countries by 2030.	Governance is optimal across the region by 2030
Policies for development	Policies are not even across LAC, but show a clear trend to becoming uniform	Widely divergent policies across LAC at the beginning, but they become more uniform by 2030, because of the pressure exerted by countries endowed with (comparatively) abundant resources	Widely divergent policies across LAC, but generally addressing biosecurity issues. Scarce resources are allocated to social policies	Policies are improved and made more consistent across LAC, with emphasis on the development of traditional knowledge and the conservation of the environment and biodiversity	Policies are improved and made more consistent across LAC, with focus education, traditional knowledge and the environment and biodiversity
Management of regulations and standards	It fastly improves throughout	There is an improvement in management because countries endowed with (comparatively) abundant resources press for it, progress is slow –	It does not substantially change, because of lack of consistency across LAC countries	It fastly improves throughout, but not a the same pace across the region	It fastly improves throughout. Quality standards and certification processes become universal across the region
Education of productive system-actors	Strong public and private investments in education	Scarce public and private investments in education	Scarce investments in education at the beginning, but social demand for education makes the private sector to get involved into its improvement by 2030	Scarce investments in education at the beginning; however, resources are substantially increased by 2030	There is a remarkable increase in investments, particularly in private education. This even reaches the most vulnerable population
Social monitoring of innovation	In general, public in LAC has trust in the outcomes of innovation	There is some public distrust of innovation, because its stewardship is in the hands of social elites	The public sector leads in innovation but as it progressively becomes under funded, the space thus relinquished is taken up by the private sector	The social control of innovation becomes the norm, and the focus of research is mostly aimed to solve environmental problems.	There is a growing public trust on the outcomes of innovation
Advances in knowledge	Large investments in R+D are made, particularly in the	There is a growing gap in R+D activities between the	Rich LAC-countries make large investments in	Investments in R+D are mostly directed to environmental	R+D advances at great strides, but close to 2030 there is a

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	richer LAC countries	richer and the poorer countries. LAC imports R+D products	R+D, which makes its development very uneven across the region. However, the region becomes a leader in some some fields of R+D	sustainability and biodiversity conservation	growing social concern for the environmental impacts of many engineered production systems
Traditional/indigenous knowledge	There are few advances, because this knowledge is not valued as such	Almost nil; it is not highly rated by governments, because they are wary of it	Slow advances. There is not much incorporation of it to formal knowledge	There is a growing acknowledgement of the epistemological value traditional/indigenous knowledge and the consequent furtherance of its application	There is a growing acknowledgement of the epistemological value traditional/indigenous knowledge and the consequent furtherance of its application
Focus of research	Improvement of the competitivity of agricultural products and the production of biomass for making biofuels. The needs of indigenous communities and subsistence farmers are not taken into account	Food innocuousness (biosecurity) and economic efficiency of agricultural production	At the beginning, it is food production and its economic efficiency. At the end (2030) the focus is on the most dynamic food production chains, particularly in the larger countries in LAC	For all social groups, the environmental sustainability of production systems, eco-labeling of foods, and mitigation and adaptation to climate change	For all social groups, the competitivity and environmental sustainability of production systems, their adaptation to climate change and the valuation of environmental and ecosystem services, and biodiversity.
Incorporation of formal knowledge	Some countries in LAC strive to keep their capacity for integrating knowledge into new technologies	The capacity to integrate knowledge is rather restricted, and shows a large variability across countries because it depends on national circumstances	The capacity to integrate knowledge is constrained by meager resources, and shows a large variability across countries because it depends on national circumstances	It is conditioned to the putative effects of the incorporated knowledge on the environment and biodiversity	Very intense across the region
Incorporation of traditional/indigenous knowledge	Just isolated initiatives in this regard	None	Fortituous	Growing	Growing
Availability of resources for R+D	They are irregularly distributed across the region. A large part of resources are obtained from international . sources	Their amount is substantially reduced because of decreasing national investments in R+D, which are partly compensated by international	Their amount is substantially reduced because of decreasing national investments in R+D, but differing among countries because of	They are substantially increased, but not enough. They are mostly channelled to R+D on environmental sustainability and biodiversity	There are enough across the whole region

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		sources	national circumstances. Qualified people leave the R+D system.		
Management of R+D	It becomes more complex and also better appreciated by society	There is a loss in management capacity	There is a loss in management capacity	It is much appreciated by society	It is much appreciated by society
Social involvement in the management of R+D	Growing participation	Scarce participation	Scarce participation	Large and very active participation	Growing participation
Performance of R+D systems	Systems are effective and focalized on the market	Systems are efficient but not relevant because protectionism impairs international trade	Systems are effective and focalized on the market	Systems are not very efficient, but they are effective in regard to the environment and biodiversity	Systems are highly effective and efficient: they are focalized on the environment and biodiversity
Relative spaces of public and private R+D	Public-private alliances are made with transnational corporations on strictly commercial terms	Transnational corporations perform R+D activities for profit. Public R+D provides input for private R+D activities and for satisfying social needs	Transnational corporations perform R+D activities for profit. Public R+D provides input for private R+D activities and for satisfying social needs	Public R+D institutions prevail over private R+D, but they collaborate with each other. R+D is strongly focused on environmental sustainability and biodiversity conservation	Public R+D institutions either collaborate through commercial alliances or compete with each other.
Proper technologies for agricultural activities	Technologies are aimed to intensified agriculture: they are not suitable for vulnerable productive systems	Technologies are aimed to the production of few common products. When specific technologies are needed, they are imported	Technologies are aimed to the production of few common products. When specific technologies are needed, they are imported	Technologies are aimed to satisfying the demands from productive systems and are closely adapted to local conditions	Social participation in technology development results in products very much adapted to user's needs
Incorporation of knowledge to productive systems	Is high; it is substantiated through inputs and practices	It is limited; it is substantiated through commercial enterprises	It is limited; it is substantiated through commercial enterprises	It is high and particularly focused on environmental protection and the development of local innovations	It is high, unevenly distributed across the region and mostly commercially oriented
Attended markets	Large productive systems serve domestic and foreign markets. Most of small productive systems remain isolated from those markets, except they can gain niche	These are restricted. Exports are generally restricted and a few countries serve niche markets. The domestic market is little developed	These are restricted. Exports are generally restricted and a few countries serve niche markets. The domestic market is well developed	Mostly local markets. These are served with sustainably produced products of good nutritional value	Both domestic and foreign markets, with sustainably produced products of good nutritional value

Variables	**Global Simphony** markets	**Order from Strength**	**Life as it is**	**Adaptive Mosaic**	**Techno garden**
Social organization of vulnerable production systems	Complete; it is real through production centers or cooperatives	Restricted; it is replaced by assitentialism	Restricted. It is replaced by assistentialism, but its materialization is encouraged by NGOs concerned with the environment, biodiversity and traditional/indigenous knowledge	Complete and strongly localist, but restricted by scarcity of resources	It is connected to production centers and aimed to product qualification
Availability of resources for agriculture	Sufficient. Natural resources are easily got at; knowledge is increasingly available	Large in rich countries ; resources are easily accessed in poor countries. There is some degradation of natural resources , and a restricted access to knowledge	Large in rich countries; resources are easily accessed in poor countries. There is some degradation of natural resources, and free access to knowledge	The use of natural resources is constrained by environmental concerns. There are scarce economic resources. There is free access to available resources and knowledge	The use of natural resources is constrained by environmental concerns. There are ample economic resources, and a ifree access to available resources and knowledge
Performance of agricultural productive systems	Greater efficiency and production quality in big firms. Performance is highly variable among small systems: efficiency and production quality are low, and the most vulnerable emigrate	Better efficiency and production quality in big firms. Performance is highly variable among small systems: efficiency and production quality are low, and the most vulnerable emigrate	Better efficiency and production quality in big firms. Performance is highly variable among small systems: efficiency and production quality are low, and the most vulnerable emigrate Niches of agro-ecological production stay put	Productive processes and their products are more sound and friendly with the environment. Problems emerge in regard to the production of enough quantities of food.	Large efficiency and production quality is attained in all productive systems because they are fully integrated as supply chains
Rent inequality in agriculture	Increases, but unevenly across LAC	Increases because most investments are made by transnational firms and those are not of a social kind	Increases, but unevenly across LAC	Unevenly decreases; deracination of farmers increases inequality	Decreases across LAC
Social inequality	High. Most of the population does not have ample access to education, health and home. There is a statistical reduction in inequality brought about by internal migration from rural to urban areas	High. Most of the population does not have ample access to education, health and home.	High. Most of the population does not have ample access to education, health and home.	Small	Generally small, but large variability across LAC

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Food security	Uneven across LAC, particularly in countries with few resources for ensuring food quality	Food offer is insufficient; low quality foods	Food offer is insufficient; low quality foods	High but food quality is sub-standard	High food security and food quality
Environmental sustainability	Low	Low; particularly in the poorer countries in LAC	Low	High and stable	High, but unstable