

# The Outlook for Agriculture and Rural Development in the Americas:

A Perspective on Latin America and the Caribbean

## 2011 - 2012





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A perspective on Latin America  
and the Caribbean

**2011-2012**

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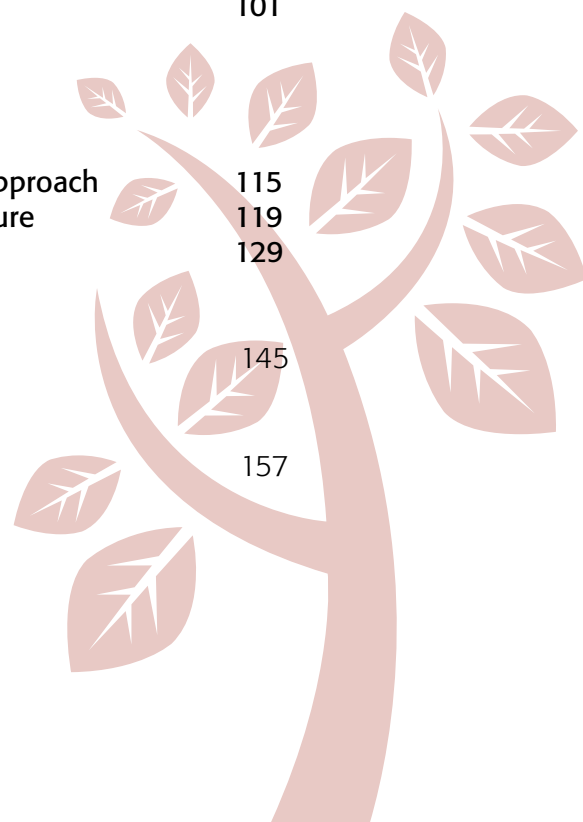
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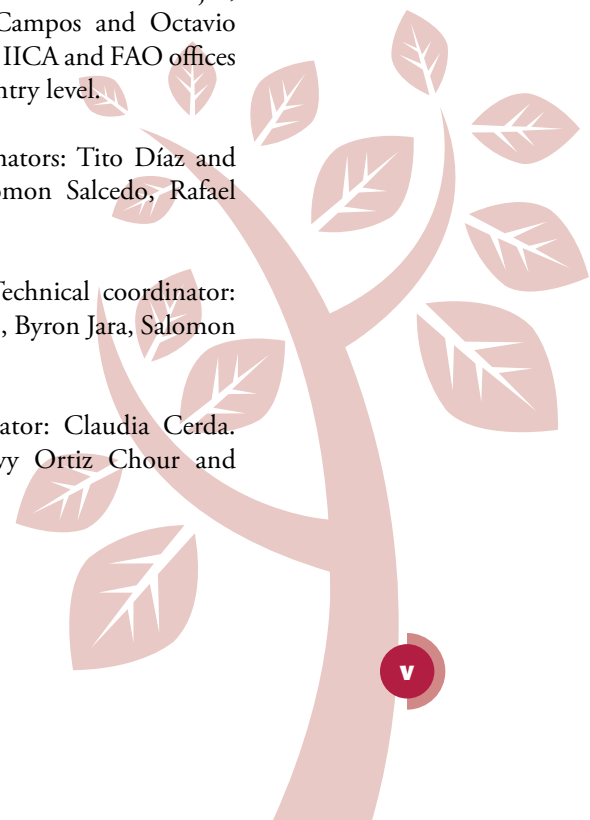


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# ACRONYMS

<b>AHFS</b>	Agricultural Health and Food Safety
<b>APL</b>	Clean production agreements
<b>AVA</b>	Agricultural Value Added
<b>BCH</b>	Biosafety Clearing House
<b>BDP</b>	Banco de Desarrollo Productivo
<b>BPG</b>	Good Livestock Practices
<b>CAC</b>	Central American Agricultural Council
<b>CARICOM</b>	Caribbean Community
<b>CAS</b>	Southern Agricultural Council
<b>CCB</b>	Certificados para la Conservación del Bosque
<b>COMTRADE</b>	United Nations Commodity Statistics Database
<b>CONAMA</b>	Comisión Nacional del Medio Ambiente
<b>CONFIDE</b>	Corporación Financiera de Desarrollo
<b>COP 16</b>	XVI International Conference on Climate Change
<b>CPI</b>	Consumer Price Index
<b>ECADERT</b>	Central American Strategy for Territorial Rural Development
<b>ECLAC</b>	Economic Commission for Latin America and the Caribbean
<b>EG</b>	E-government,
<b>EGDI</b>	E-government Development Index
<b>EMBRAPA</b>	Brazilian Agricultural Research Enterprise
<b>ERAS</b>	Regional Agro-environmental and Health Strategy
<b>EU</b>	European Union
<b>FAO</b>	Food and Agriculture Organization of the United Nations
<b>FAPRI</b>	Food and Agricultural Policy Research Institute
<b>FDA</b>	Food and Drug Administration
<b>FONAFIFO</b>	National Forestry Financing Fund
<b>G20</b>	Group of 20 Most Industrialized Countries
<b>G8</b>	Group of 8 Most Industrialized Countries
<b>GPS</b>	Global Positioning System
<b>HACCP</b>	Hazard Analysis and Critical Control Points
<b>IDB</b>	Inter-American Development Bank
<b>IFPRI</b>	International Food Policy Research Institute
<b>IICA</b>	Inter-American Institute for Cooperation on Agriculture
<b>ILO</b>	International Labour Organization
<b>IMAS</b>	Joint Institute for Social Aid





<b>IMF</b>	International Monetary Fund
<b>INDAP</b>	Instituto de Desarrollo Agropecuario
<b>INTA</b>	National Institute for Agricultural Technology
<b>IPCVA</b>	Instituto de Promoción de la Carne Vacuna Argentina
<b>IPEA</b>	Institute of Applied Economic Research
<b>ITCs</b>	Information and Communication Technologies
<b>LAC</b>	Latin America and the Caribbean
<b>MDS</b>	Ministry of Social Development and Hunger Alleviation
<b>MoA</b>	Ministry of Agriculture
<b>NGOs</b>	Non-governmental Organizations
<b>OECD</b>	Organization for Economic Cooperation and Development
<b>OIE</b>	Organization for Animal Health
<b>PA</b>	Precision Agriculture
<b>PAA</b>	Program for Procurement of Food Produced through Family Agricultural
<b>PACA</b>	Central American Agricultural Policy
<b>PNMC</b>	National Climate Change Plan
<b>PNSAN</b>	National Food and Nutrition Security Policy
<b>PROCI</b>	The Cooperative Programs for Research and the Transfer of Agricultural Technology
<b>PRONAF</b>	National Program for Strengthening Family Agricultural
<b>R&amp;D</b>	Research and Development
<b>R+D+i</b>	Research & Development and innovation
<b>RAA</b>	Aquaculture Network of the Americas
<b>REDD+</b>	Reducing Emissions from Deforestation and Forest Degradation
<b>REDIBEC</b>	Red Iberoamericana de Economía Ecológica
<b>RNAA</b>	Rural Non-agricultural Activities
<b>RSS</b>	Really Simple Syndication
<b>SENAPAN</b>	National Secretariat for the Nutritional Food Plan
<b>SIMA</b>	Agricultural Market Information System
<b>SIPO</b>	Target Population Identification System
<b>SIRA</b>	Animal Information and Registry System
<b>SISAN</b>	National System for Food and Nutritional Security
<b>SNASPE</b>	National Protected Areas System
<b>UN</b>	United Nations
<b>US\$</b>	US dollar
<b>USA</b>	United States
<b>USDA</b>	United States Department of Agriculture
<b>VoIP</b>	Voice over Internet Protocol
<b>WTO</b>	World Trade Organization

# FOREWORD

Since late 2010 and continuing into 2011, price volatility, in relation to basic agricultural commodities, has occupied centre stage on the agendas of decision makers. An additional concern has been uncertainty about a new global economic crisis in the wake of the macro-economic difficulties experienced in the economies of several European countries and the United States. In recent months, this situation has been compounded by the food crisis in the Horn of Africa --a reminder of the extremely vulnerable conditions under which broad segments of the world population continue to live.

This third edition of *Outlook for Agriculture and Rural Development in the Americas: a Perspective on Latin America and the Caribbean* is an informational and analytical tool that is intended to promote a better understanding of these phenomena and their effects for purposes of regional public policy-making.

The document was prepared jointly by the Economic Commission for Latin America and the Caribbean (ECLAC), the Regional Office for Latin America and the Caribbean of the United Nations Food and Agriculture Organization (FAO) and the Inter-American Institute for Cooperation on Agriculture (IICA).

The report underscores the need for the countries to adopt **differentiated policy instruments to mitigate the effects of severe price volatility** (including exchange rates) on society, production and the macro-economic context. It also suggests the need to institute comprehensive policies to address the effects of acute climate variability in agriculture, since in a context of climate change, it becomes an additional contributing factor in escalating agricultural price volatility.

The long-term trend of higher agricultural commodity prices affords Latin America and the Caribbean an opportunity for its agriculture, given the region's availability of land, which can be incorporated into production, and its relative abundance of water, biodiversity and human resources on which it could capitalize.

The report recommends exploiting this potential through productive development policies aimed at **promoting food production, increasing the role of family agriculture in the process and fostering the sustainable use of natural resources**. The objective must be to improve the contribution made by agriculture and its related activities to income generation and job creation. It further recommends promoting ranching, aquaculture, and community forest development in the context of family agriculture by designing alternative schemes that guarantee sustainable food production and contribute to food and nutritional security.

The report emphasizes that countries benefiting from rising agricultural commodity prices should seize the moment to **promote structural change as a means of diversifying the productive structure of the economies**. It further recognizes that bridging the technological gaps that persist in the region in the agricultural arena will release the significant potential it has to enhance productive performance and, thereby, food production. Additional resource allocation for research, development and innovation and an improved investment climate for agriculture and related activities are therefore considered to be of the essence.

We consider the reduction of price volatility and the prevention of recurring food crises to be an issue that engages global responsibility. Certain decisions must be taken in international fora. Examples are the proposed establishment of a world emergency reserve and a virtual reserve, which have not been addressed up to now. Similarly, the response to the proposal to regulate the basic commodities market and cushion the effect of speculation on food price increases has been slow.

The World Trade Organization (WTO) has recommended a Special Safeguard Mechanism for developing countries to enable them to address situations where there are sudden downturns in agricultural prices or substantial rises in imports, which have a negative impact on rural development. Discussion of this mechanism is, however, at a standstill. It is extremely important to **avoid punishing food importing countries by aggravating their vulnerability or introducing major distortions on world food markets**. The countries of the region should ensure more coordinated participation in international fora and act in unison with respect to initiatives that integrate policy tools for regional benefit.

As in the two previous editions, the document includes a special report. The special report in this edition covers the use of information and communication technologies in agriculture. To enhance their impact, the countries should increase rural connectivity and promote access to these technologies and their use in their national institutional framework (e-government, digital agenda, etc.). These measures are essential in bringing down the costs of the technologies and attenuating the resistance of rural agents to introducing them in agribusiness management and production. The document maintains that **enhancing the potential of information and communication technologies to narrow the technological gap and improve operating working conditions, production and market access in the rural milieu** must also be an imperative in public policies aimed at shoring up the development of agriculture and furthering its contribution to the development of the countries of the region.



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# Executive Summary

Just as the world economy was showing signs of a recovery, a new global recession and a financial crisis in Europe are looming on the horizon. The economies of the great majority of countries grew in 2010, albeit at different speeds. While growth in the most developed countries was sluggish and in Latin America and the Caribbean (LAC) averaged a little over 4%, the production of the developing economies rose by more than 6.5%, with China and India, the new engines of the world economy, leading the way.

Paradoxically, the specter of recession has appeared when the global economy is also showing growing inflationary pressure, fueled by the behavior of the emerging economies, in which food and energy weigh more heavily on consumption. A rise in the cost of the food basket has once again turned the spotlight on the problem of food security and highlighted the climate of instability in the markets, reflected in the volatility of commodity prices.

These conclusions are based on the macroeconomic and sectoral contexts presented in the first part of the latest report prepared jointly by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC), the Regional Office for Latin America and the Caribbean of the United Nations Food and Agriculture Organization (FAO) and the Inter-American Institute for Cooperation on Agriculture (IICA) for 2011, entitled *The Outlook for Agriculture and Rural Development in the Americas: a Perspective on Latin America and the Caribbean*. The report is divided into four sections, comprised of 11 chapters and a statistical annex.

## Section I. Macroeconomic Context

This section contains an analysis of the interactions among the volatility of agricultural prices, the financial and macroeconomic conditions of the international context and the performance of the region's economies.

International food prices began to rise again during the second half of 2010 and this upward trend continued in the first half of 2011. Following sharp increases in 2007-08, prices stabilized in 2009, due to the combination of the economic downturn and the financial crisis that affected the global economy during the second half of 2008 and in 2009.

The analysis considers the factors responsible for the fluctuations in agricultural prices and highlights the importance of governments being able to respond more quickly and with more suitable policies to any future price spikes. It concludes that variations in prices are due to a complex set of variables, some related to structural determinants of supply and demand, but also to cyclical factors. Furthermore, the behavior of domestic macroeconomic variables, responding to specific policies, affects the evolution of international prices. Some examples of this are the pressure on the real and financial demand created by expansionist monetary policies, and the stimulation of the region's imports as a result of the devaluation of the dollar.

The analysis concludes that the relationship is two-way, with the behavior of the macroeconomic variables impacting the evolution of international prices, and vice versa.

Other issues analyzed in this section are: a) the channels via which volatility is transmitted, in order to understand the manner and speed of the transmission of international commodity prices to domestic prices; b) the differences between countries (depending on whether they are net food importers or exporters, or their level of dependence on imports); c) the influence of the structure of production and policies; and, d) the impact of international price shocks on the macroeconomy, specifically on inflation levels. Based on the results of the analysis, it is recommended that the outlook for commodity markets be included explicitly in the formulation of macroeconomic policies, as a way to reduce speculation and help combat inflation.

The analysis presented in this section suggests that the volatility of international commodity prices impacts the stability of the countries' exchange rates due to two factors: a) variations in the value of exports and imports; and b) the effect on the capital account and the expectations of the financial agents, which discourage investment. The effects are felt by not only the sectors impacted directly by changes in prices, but also by the production structure as a whole and the long-term objectives of social policies and policies designed to develop production.

## Section II. Sectoral Analysis

**Sectoral context.** This section focuses on the growth of agricultural activities in LAC in an international environment characterized by rising, cyclical and volatile prices. The data on Agricultural Value Added (AVA), adjusted to reflect better the growth of the real income of the factors of production, shows that there were cycles during the last decade in which real income grew much more strongly than production volumes. Real agricultural income in LAC grew by 13.3% in 2002, 10.2% in 2003, 10.9% in 2007 and 10.1% in 2008, while growth in the volume of production never topped 5% in those years.

The rate of adjusted AVA has varied in different parts of the region. While the Southern Cone has experienced annual average rates of growth of

4.5%, the rate in the other sub-regions has not exceeded 2.5% (2.5% in Central America, 2.4% in the Caribbean, 2.3% in the Andean Region and 2.2% in the Northern Region).

In recent years, the trend in real agricultural income in LAC has largely mirrored that of international prices. It is predicted that agricultural prices will continue to rise in the long term, but with major fluctuations in the medium term and great volatility in the short term. The biggest cause of price variations and volatility are the cycles or fluctuations around the trend, suggesting that the most important challenge is to establish countercyclical policies to cushion the negative effects when prices fall (or rise for buyers) and reduce the costs associated with the uncertainty of not knowing in which direction prices are headed in the short term.

The chapter concludes by recommending that the countries endeavor to gain a better grasp of the structural and cyclical factors that restrict the growth of the supply, so they can adopt better policies to tackle the challenges posed by a structural increase in the demand for agricultural products, and take advantage of the opportunities that arise. The report also recommends analyzing the confluence of the demand and supply factors responsible for the trends, cycles and volatility of agricultural prices, with a view to designing much more strategic public policies, with differentiated actions for the short, medium and long terms, and for comprehensive risk management.

**Agriculture.** The report notes that agricultural production in LAC was higher in 2010 than in 2009 and that, in general, the results were quite good. Cereals performed the best, with production up more than 7% over 2009. The factors chiefly responsible for the variations in production were changes in climatic conditions, followed by changes in the area under cultivation and in prices.

Agricultural production is expected to grow in 2011, with cereals leading the way, but **measures to improve the performance of agriculture will be needed in the long term.** Some of the most important predictions are that: a) energy and

food prices will rise in real terms over the long run; b) China will continue to be one of LAC's most important partners, demanding more food products, which will help revive agricultural trade flows; c) the need to achieve food security will make it necessary to produce more good-quality food and to do so competitively; and, d) the development and improvement of research, innovation and information in the countries will continue.

The report concludes that the agricultural sectors of LAC should view the long-term trend of higher agricultural commodity prices as an opportunity, because some countries have land available that could be incorporated into production and the region possesses a relative abundance of water, biodiversity and human resources. However, it also highlights the continued existence of major technological gaps, which – if overcome – would raise yields and thereby increase food production significantly.

**Livestock.** The report states that global meat consumption rose by 2.5% in 2010, with poultry and pork consumption up 4.2% and 2.7%, respectively, and beef consumption down -0.2%. Milk production varied significantly in the different geographical areas: while in North America, Oceania and Europe it grew at below average rates, in South America (especially in Brazil, Chile, Colombia and Venezuela) and in Asia growth was much stronger. The outlook for 2011 is good, especially because the industrial meat and milk sectors have achieved significant horizontal integration.

Thanks to the growing demand for meat and milk, the outlook for the livestock sector in the years ahead is one of great opportunities. However, given the increasing use of biofuels, it is predicted that there will be continued pressure on the prices of some inputs, especially grains. In addition, the biggest challenge that the commercial, intensive livestock sector will face will be to achieve greater efficiency and a better balance between the financial benefits for companies and the social benefits for consumers and communities. The strengthening of family livestock production and its integration into markets would appear to be an important strategy

for improving the supply of protein foods and enhancing food security programs in vulnerable communities. The promotion of innovation, free competition and training for human resources will be of key importance for this sector. Two other challenges for the sector in the years ahead, related to the environment, will be climate change and natural resources management.

**Fisheries and aquaculture.** Commercial fishing has reached its maximum sustainable production level in LAC, with falls in the catches of some species suggesting that overfishing is occurring. Strong growth is one of the reasons why aquaculture has become increasingly important over the years. Despite the fact that the rate of growth in Latin America and the Caribbean fell from 13.3% per year in 1999-2004 to 6.3% in 2004-2009, it remains the fastest-growing activity in the food production sector.

South America continues to be the regional leader in commercial fishing and aquaculture. The latter activity is still developing at a moderate rate in many countries of the region and diseases remain a threat, especially in Chile and Mexico, where epizootics have affected production and employment.

The LAC countries need to take a fresh look at small-scale producers in the fisheries sector and create a new institutional architecture to improve sectoral governance. The chapter emphasizes the need to gain a better understanding of the species exploited by the fisheries sector, and of the dynamics of the populations involved. Therefore, it is recommended that scientific and technological development focus on production activities that are adaptable to climate change. It is also recommended that the countries make renewed efforts to promote their domestic markets, in order to formulate national strategies to encourage the consumption of fishery and aquaculture products; increase and improve sectoral information; and strengthen regional support structures in order to reduce the risk associated with aquaculture.

**Forestry.** According to data produced by FAO, 23.6% of the world's forests are to be found in

LAC, with the countries that have planted the most forests in the region being Brazil, Mexico, Chile, Peru and Uruguay.

The loss of forest cover between 2005 and 2010 was slightly less than during the period 2000-2005, when up to 4.8 million hectares were lost each year. Forestry's contribution to the region's GDP has increased steadily, rising from US\$30 billion to US\$40 billion, and accounting for 6% of the world total. On the other hand, the total carbon stored in the forest biomass fell during the period 1990-2010 and official information about non-timber forest products (NTFPs) continues to be in short supply. The problems faced by countries in the region include soil degradation and changes in land use, while the limited amount of water available is a serious problem in the Andes and on some Caribbean islands.

Some of the public policy options recommended are as follows: a) encourage, as part of the region's forest development strategies, investment by the private sector in the establishment of forest plantations; b) further develop mechanisms for payments for environmental services that benefit rural communities; and, c) promote the management of forest resources by rural communities. Actions of this kind would help reduce poverty rates in the region.

### Section III. Rural well-being and the institutional framework

**Rural well-being.** This section of the report contains an analysis of the effects of the 2008-09 economic crisis on the rural milieu, which concludes that the negative impact was less than expected. Also highlighted is the fact that the trend in the rural poverty rate is similar to that of the evolution of agricultural production and the economy in general.

The analysis shows that while both urban and rural poverty fell between 2000 and 2007, thanks to the growth of the region's economy and agriculture,

the crisis caused it to rise again. However, in 2009 poverty in the LAC region as a whole rose by only 0.1% and extreme poverty by 0.4%. The increase was slightly higher in rural areas than in urban areas. What the crisis did highlight was a general trend towards a downturn in the job market.

The impact on poverty was limited for a number of reasons, including: a) the strategies implemented by households, which combined agricultural and non-agricultural income, to cope better with the crisis; b) the positive trend in income from non-agricultural work, which partly offset the fall in income from agricultural work, income from self-employment and, in some countries, the remittances received from abroad; and, c) income from transfers under public programs.

The chapter concludes with a series of policy recommendations. One issue that is highlighted is the need for the region to include in its political agenda a debate on the situation of the rural labor market and the creation of decent employment, to help reduce rural poverty.

**Institutional framework.** During 2009-2010, nearly all the LAC countries, to varying degrees, promoted general, sectoral and social policies to address the volatility of commodity prices, including fossil fuels and other related aspects such as climate change and the financial crises of the most important economic centers. In general, the increase in social assistance programs and conditional cash transfers made it possible to offset the impact of the global economic crisis in 2009 and reverse the trend in the growth of poverty from 2010 onwards.

It is worth noting that both net importing and net exporting countries opted for defensive policies designed to guarantee their citizens sufficient income to meet their consumption needs; and that nearly all the policies implemented to promote production consisted only of stopgap measures.

Furthermore, the measures adopted by the countries to guarantee producers income and promote food production included purchases by the State,

guaranteed prices, direct payments, arrangements within chains, stabilization funds and the re-establishment of extension systems. However, most countries made only limited efforts to enhance the institutional framework and assign more financial resources for that purpose. Consequently, many of the actions implemented will not be sustainable unless there are improvements in those areas.

The region weathered the 2009 crisis with good results and if the hoped-for economic recovery materializes in 2011, it will help consolidate the region's long-term growth. Nevertheless, there is an urgent need to reverse the inequalities within and among countries in the region **in order to provide solutions to the needs, not only of rural inhabitants, but also of the population as a whole.**

With the region expected to continue to be a major supplier of food and raw materials, it is anticipated that the countries will gradually recognize agriculture's true importance as an engine for development. That should be reflected in greater public investment and more efficient public spending, and in the definition of the medium- and long-term policies required to enable the sector to realize its potential.

It is recommended that the countries strengthen the legal frameworks for the public agricultural institutional framework, to facilitate the implementation of policies; gradually develop State policies rather than purely sectoral ones for agriculture, with a medium- and long-term vision; incorporate climate change into their policies; and increase investment in agriculture following the logic of development objectives.

## **Section IV: Use of ICTs in agriculture and rural development**

The Special Report, which on this occasion focuses on the use of information and communication technologies (ICTs) in agriculture and rural development (chapters IX, X and XI), analyzes

the role that ICTs can play in tackling the new challenges of agricultural development in LAC. It is argued that, as in every other area of society, ICTs have the potential to transform the relationships among the stakeholders in agriculture and the rural milieu. The incorporation of ICTs into agrifood chains would enable those who produce, process and market agricultural products to better monitor and forecast harvests; reduce risks related to climatic conditions, price volatility and the spread of diseases; create and strengthen small family businesses; facilitate transactions; and spur the development of innovations throughout the chain. Similarly, the adoption of ICTs by institutions working in the agricultural sector and the rural milieu could make the processes of those institutions more transparent, increase their geographical coverage, save human and economic resources, and expand the range of products offered.

Although positive results have already been achieved with regard to both production and institutions, efforts to increase access to and the use of ICTs in agriculture and the rural milieu in LAC are still at an embryonic stage. While most of the stakeholders in agrifood chains use ICTs for communication and basic searches for information on the Internet, ICTs have largely been used by the public institutions with responsibility for agriculture to facilitate their internal administrative and budgetary management processes, with little importance being attached to the use of such tools for technical assistance or extension activities, or to enable their clients to process documentation.

If the LAC countries wish to increase the impact of ICTs in agriculture and the rural milieu, they must endeavor to increase connectivity in rural areas, and devise and implement public policies to promote access to such technologies and increase their use throughout the national institutional frameworks (e-government, digital agenda, etc.). Actions of this kind are essential to laying the groundwork for subsequent efforts to reduce the cost of technology, increase the usefulness of the content available on line, and reduce the reluctance of rural agents to adopt new production and business management technologies, among others.





A stylized tree graphic with a thick brown trunk and several branches. The leaves are dark red with white vein patterns. The tree is positioned on the right side of the page, with its trunk extending from the bottom towards the top. The background is split into a dark red upper half and a light gray lower half, separated by a white dotted line.

**Section I:  
Macroeconomic  
Context**





## Macroeconomic context

Price volatility: from agricultural markets to the performance of the regional economies

*Increasing exchange-rate instability, compounded by the volatility of international commodity prices, tends to discourage investment and is affecting the productive structure.*

### Facts

- The world economy has been showing signs of an uneven recovery: the projected global growth rate of 4.5% for 2011 and 2012 conceals disparities between the advanced economies (2.5% growth) and developing countries (6.5%) (IMF, 2011).
- ECLAC (2011) forecasts that the region will grow by 4.7% in 2011 and about 4.1% in 2012. As has been the case over the last few years, the fastest-growing economies in 2011 are in the South American subregion (5.1%), followed by Central America (4.3%) and lastly the Caribbean (1.9%).
- Nearly three years after the outbreak of the economic-financial crisis of 2008, many advanced economies continue to display high rates of unemployment and unhealthy financial and sovereign debt figures. In Latin America and the Caribbean, in contrast, Sustained economic growth is also enhancing the economies' job-creation capacities, and the unemployment rate is expected to fall again in 2011, to between 6.7% and 7% —below pre-crisis levels (ECLAC, 2011).
- The world economy has been under increasing inflationary pressure, which could strengthen further in 2011, driven mainly by the behavior of the emerging economies, in which food and energy products account for a larger share of the consumption basket (IMF, 2011).
- Data from the Economic Commission for Latin America and the Caribbean (ECLAC) for 22 countries show that, in May 2010, year-on-year price increases among food products in the region were running slightly ahead of the general inflation rate (6.7%, compared to 6.1%), but in May 2011, the difference was greater (9.5%, compared to 8.1%). Nonetheless, considering the first five months of 2011 alone, food price inflation in the region has been slightly lower than overall inflation (2.6%, compared to 2.8%).
- In response to the global concern about the rise in food prices over the last few years, and its impact on food security, the G-20 countries recently prepared a Plan of Action (G-20, 2011). One of the points addressed is the need to manage risk and volatility on agricultural markets by creating an agricultural market information system and implementing counter-cyclical policies with private-sector participation.

- **Price volatility and the macroeconomic context**

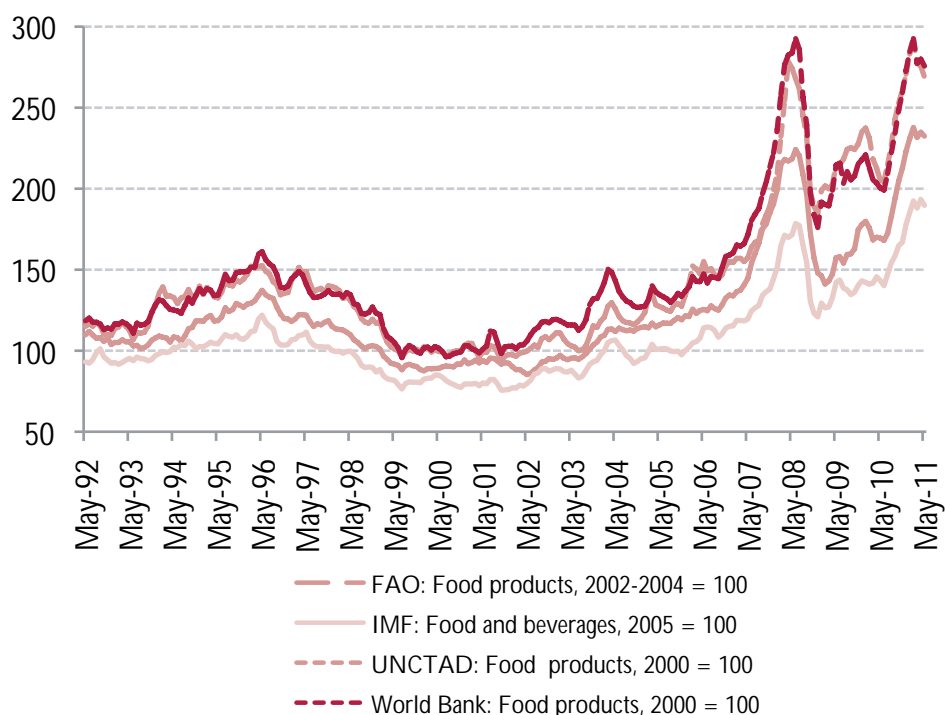
The sharp increase in international food prices that occurred in the second half of 2010 has been a source of concern for governments, international organizations and non-governmental organizations (NGOs), both in Latin America and the Caribbean and in many other countries.

The food prices index estimated by various international organizations, jumped by about 30% in nominal terms between June and December 2010 (see figure 1). The rising trend persisted in the first few months of 2011 when the food price index calculated by the Food and Agriculture Organization of the United Nations (FAO) posted an all-time high.

The rise in 2010 and the first few months of 2011 can be seen as the resumption of the behavior of food prices between 2007 and 2008, following the hiatus in commodity-market trends caused by the global economic-financial crisis. It is worth noting that the sharp price hikes seen in 2007-2008 was neither the first nor the most intense episode of price increases among food and other basic products over the last 60 years.

In the 1950s, during the Korean War, and again in the mid-1970s, during the oil crisis, the rise in prices was also preceded by several years of sustained economic growth and expansionary macroeconomic policies, which stimulated the global demand for commodities, including food products. Nonetheless, the most recent rise in commodity prices has been unprecedented in terms of the duration of the rise and the number of

**Figure 1.** Commodity price indices (March 1992-March 2011)



**Source:** World Bank (online database <http://bit.ly/aLWjPo>), FAO (Available at <http://bit.ly/o3SjWK>), IFM (Available at <http://bit.ly/nLjNDZ>), UNCTAD (Available at <http://bit.ly/lYdyli>).

products affected in the three commodity groups: energy, metals, and food. These characteristics, in conjunction with the greater complexity of commodity markets today, make the present surge a challenge for policymakers in various countries.

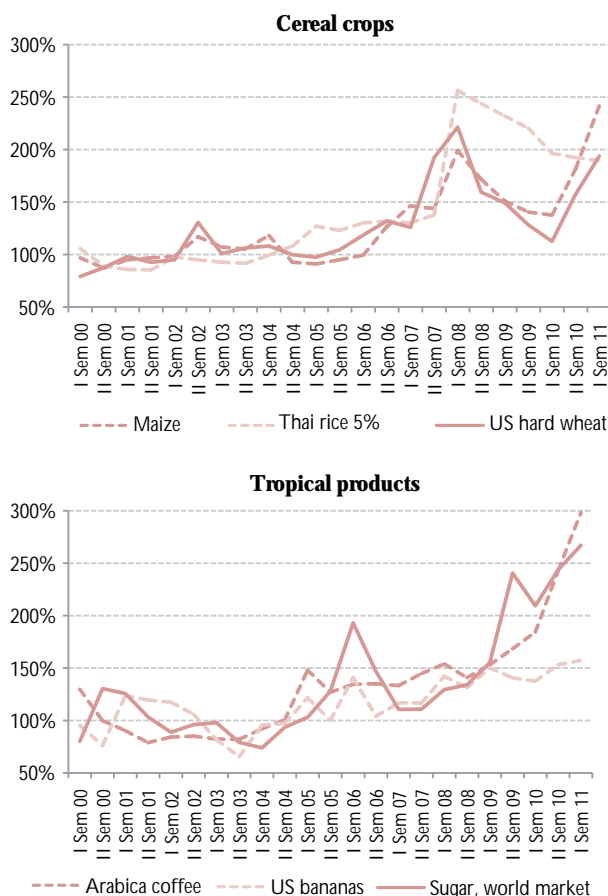
After slowing down in the period immediately following the global economic crisis, international commodity prices have resumed their upward trend. In the second half of 2010, the most significant price increases were those of wheat and maize, given their importance as basic food products for a large sector of the world's population.

Between June 2010 and April 2011, the price of wheat increased by 120% in real terms, while

the price of maize rose by 115%. Other products experiencing substantial price rises include sugar (76%), Arabica coffee (30%), soya and palm oils (54%) and soybeans (34%). Among non-food agricultural products, there were sharp rises in the prices of cotton (81%) and rubber (33%). Apart from cotton, the cases of wheat, maize, coffee and sugar (see figure 2) stand out because of the acceleration in their price trends (compared to the first half of the 2000s), and the high level of volatility shown over the last few months.

Those trends have served as a wake-up call to the international community, revealing the need for a better understanding of the factors that determine recent fluctuations in agricultural prices and

**Figure 2.** Real agricultural product prices (Deviation from the 2000-2005 average)



**Source:** Prepared by the authors, on the basis of World Bank. Available at <http://bit.ly/aLWjPo>.

**Note:** The prices are expressed in United States dollars at constant 2000 prices.

for an improvement in government capacity to respond in good time to potential and significant price rises in the future. Variations in the prices of foodstuffs and other commodities depend on a complex set of variables that include the structural determinants of supply and demand, along with circumstantial factors linked to the formation of price cycles. Many of those topics will be discussed in detail in this document in the chapter on the sectoral context.

Apart from the sector determinants, a number of macroeconomic variables also affect the behavior of commodity prices. Over the last few years, the expansionary monetary policies implemented in various advanced countries, in response to the global economic-financial crisis, fuelled commodity demand (both real and financial). In addition, the devaluation of the United States dollar has stimulated commodity imports, since the international prices of those products are expressed in that currency. Some studies conclude that the current tendency of commodity prices to move in coordinated fashion, is due precisely to the crosscutting and simultaneous effect of macroeconomic variables on the corresponding markets.

The behavior of commodity prices also has effects on macroeconomic variables, particularly in situations of high volatility which have prevailed over the last few years. This chapter focuses on the analysis of those effects, given their importance for the economies of Latin America and the Caribbean.

In the macroeconomic domain, price surges contribute to accelerating inflation and exchange-rate volatility, in both commodity-importing and commodity-exporting countries. In the latter, there is a tendency to concentrate production and exports in commodities, thereby further aggravating the vulnerability of those countries to international price fluctuations. Other effects noted include a loss of productive efficiency, greater variability of the trade balance, less availability of fiscal resources, reduced food and

nutritional security, and the possibility of political and social instability.

- **Transmission of agricultural-market volatility to the economies**

In the absence of policies capable of counteracting its effects, the increased volatility of international agricultural commodity prices could have serious macroeconomic implications for the region's economies, initially affecting not only the trade balance, but also domestic inflation and the behavior of the exchange rate.

Given the primary importance of controlling inflation among the policy objectives of the region's economies, it is not surprising to see countries reacting to the threat of higher international commodity prices (fuels, minerals and agricultural products) with policy packages that combine traditional and heterodox economic stabilization mechanisms.

The intensity and range of the measures adopted has varied from country to country, according to their perception of the threat — the expected impact of the rise in international prices on the local economy — and the mechanisms available to national institutions to manage economic policy.

Net exporters and importers of agricultural commodities display major differences, but also similarities in the way they react to the expected impact of an increase in the level and volatility of international prices on domestic economic variables.

Initially, given the differentiated impacts on the trade balance and, possibly also on the exchange rate, those countries face apparently opposing challenges: importing countries experience growing pressure on the financial account of the balance of payments (given the need to finance the likely trade

deficit), whereas the exporting countries receive a larger inflow of foreign exchange.

In the medium and long terms, however, one of the main challenges, in commodity-importing and commodity-exporting countries alike, is to maintain domestic price stability. Both groups of countries face changes in international prices (which are sometimes abrupt), and they have to decide the extent to which those variations should be allowed to pass through to domestic markets (Lustig 2008).

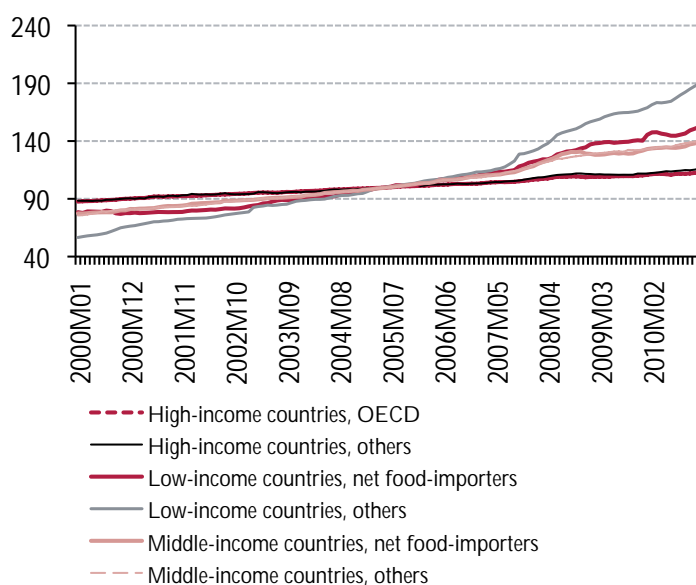
Although the exporting countries may have producers and traders who gain from the rise in prices — given the change produced in relative prices — those gains can be cancelled out socially

if the effects of the initial shock are transmitted to the rest of the economy, resulting in a rise in the overall price index that elicit policy responses which usually have a negative impact on potential economic growth.

The rise in consumer prices in 2005-2010 affected both net food-importing countries and net food-exporting countries (see figures 3 and 4).

In some cases, such as Latin America and the Caribbean, this acceleration has actually been more intensive among countries that are net exporters of cereals and oilseeds and therefore import less of those products, such as the members of MERCOSUR plus the Plurinational State of Bolivia.

**Figure 3.** Median levels of the adjusted consumer price index (2005=100) (Monthly data, 2000-2010)

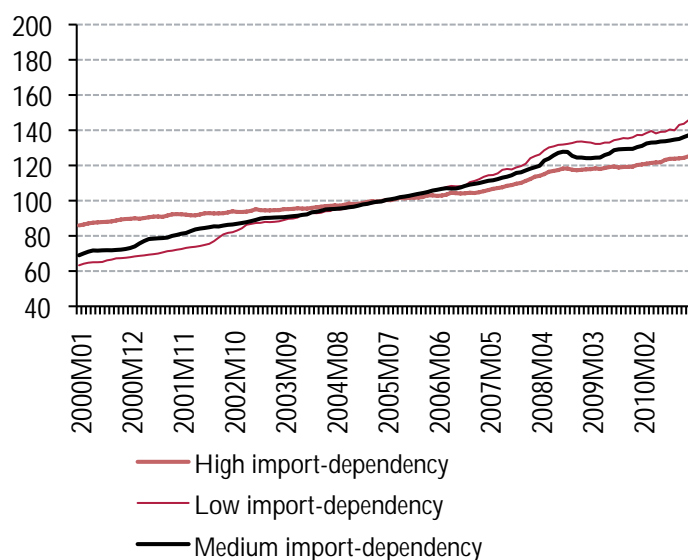


**Source:** Prepared by the authors, on the basis of World Bank. Available at (<http://bit.ly/aLWjPo>).

**Note:** The countries were classified by income level (World Bank classification) and the level of reliance on food imports (FAO classification).



**Figure 4.** Latin America and the Caribbean  
(Median levels of the adjusted consumer price index; 2005=100)



**Source:** Prepared by the authors, on the basis of World Bank . Available at <http://bit.ly/aLWjPo>.

**Note:** The Latin American countries were classified according to the trade balance of those countries in two categories: Cereal crops and oilseeds. The smaller the balance, the greater the reliance on imports.

The various channels through which the surge in international commodity prices are transmitted to local macroeconomic indicators has been the subject of much research in recent years. The aim has been to attempt to understand the mode and speed of the transmission, analyze differences among countries, and propose suitable policies. The following paragraphs summarize the main conclusions of some of this research.

When analyzing variations in international commodity prices, it needs to be remembered that final consumers do not pay those prices directly, for the simple reason that they do not consume commodities — crude oil or wheat grain — as such. Instead they buy processed goods that use commodities as inputs (Hobijn 2009). Thus the prices quoted internationally, and their behavior, are just one of the variables that compose the national consumer price index.

- **International commodity prices impact local consumer price indices**

The effect of international prices on domestic prices depends not only on the share of commodities in the composition of final goods (shown in the input-output matrix), but also on the productive structure (the degree of concentration of suppliers and processing firms, for example), together with other factors that affect the transmission of international prices to local prices, such as trade barriers and policies to support production and consumption (see box 1).

Products such as fuels or metals intervene in cost formation in a very wide range of production and service sectors, either directly or indirectly, through transport and construction costs, for example. In the case of agricultural products, variations in international prices can also affect national price indices either directly, in particular through food

price inflation, or indirectly, such as in the formation of expectations and workers' wage demands, which are subsequently passed through as adjustments to prices to final consumers in a very wide variety of sectors (Cheung and others, 2008; Plosser 2009).

Several recent studies (Cheung and others, 2008; IMF 2008; Lustig 2008) have shown that the extent to which agricultural commodity prices are passed through to national price indices tends to be greater in less developed countries, owing to the importance of those products in the domestic shopping basket. Less developed countries also have less capacity (financial and institutional) to adopt policies capable of insulating domestic markets from the volatility of international prices.

The International Monetary Fund (IMF 2008) has estimated a 0.37% increase in the general price index for every 1% increase in food price inflation in countries not belonging to the Organization for Economic Cooperation and Development (OECD).

A 13-country study published by the Inter-American Development Bank (IDB) (Lora and others, 2011) finds that the degree to which international price changes are reflected in the general price index is greater in the case of food products than oil. The authors conclude that in four countries (the Dominican Republic, El Salvador, Guatemala and the Plurinational State of Bolivia), the domestic consumer price index (CPI) rose by over 0.1% for every 1% increase in international prices, with a six-month lag, and between 0.05% and 0.1%, in six other countries (Bahamas, Colombia, Ecuador, Honduras, Panama and Peru). The weakest impacts have been in Brazil and Mexico.

Other studies show that, even in countries where food products account for a small share of overall consumption, if the magnitude and duration of the changes in international prices are sufficiently significant they can still affect domestic inflation indices. In the United States, for example, it is estimated that the rise in agricultural product prices between 2006 and 2008 contributed roughly 0.4 percentage points to the consumer price index (3.2% per year in the period).

The fact that the movement of international prices may or may not be coordinated, with respect to various basic commodities, at one and the same time, is not an immaterial matter since, if it is, the impact on the domestic CPI will be greater. In the case of food products, a coordinated price movement makes it harder to adopt consumption substitution strategies, for example. Moreover, the effect of a rise in the prices of various products on general



### **Box 1.** Pass-through of international prices to local agricultural markets: evidence for developing countries

Despite the international backdrop of volatile and rising international prices driven by multiple factors, the pass-through to domestic markets is neither complete nor rapid. A study for 76 countries (Hoyos and Medvedev, quoted by De Janvry and Sadoulet 2010) finds that on average just 18% of the rise in international prices during the 2007-2008 crisis fed through to domestic markets. Another study for the region (Dutoit and others, 2010) finds that of 19 products and markets analyzed, only five display conclusive evidence of price pass-through.

The pass-through of prices to domestic markets is heterogeneous, owing to sharp differences between countries in terms of the characteristics of product supply (whether the country is self-sufficient, a net exporter or a net importer), the existence of domestic-market distortions (monopolies in production, distribution, or processing), the existence of substitute products on domestic markets, the application of tariffs and other restrictions on imports or exports, exchange-rate distortions, and other factors (ECLAC, FAO and IICA, 2011).

The impact of international prices on domestic consumer prices also varies according to the agricultural production chain. The extent to which prices are transmitted to the final consumer is highly variable and depends on the nature of the product, the structure of the productive chain, and the relative weight of the commodity in the final product.

inflation also tends to be more direct, since different productive chains face a cost increase simultaneously, which has a more widespread impact on inflationary expectations among businesses and consumers.

Over the last few years, the diversity of product lines affected within the three main categories (energy, metals and agricultural products) was unprecedented. Apart from the impact that a simultaneous rise in prices in these three product categories has on the economies in question, there can also be a feedback effect among them. Lombardi and others, (2010) show that individual commodities within a given category tend to move together, with the behavior of some commodities predominating over others. In some cases, it is also possible to identify joint movements among products in different categories.

In the case of the recent price hikes, the authors found that the joint behavior of food prices is determined by movements in the prices of maize, cocoa and wheat, whereas increases in the prices of metals generally also influences food prices. It has also been found that oil prices are decisive for the behavior of sugar prices, but not for the prices of other food products, mainly owing to sugar's links with the energy sector through biofuels.

- **Commodity-price shocks have a wide-ranging macroeconomic effect**

According to Ocampo (2011), the typical price fluctuations seen on international commodity markets make macroeconomic policy management in natural-resource-based economies particularly challenging. The volatile behavior of commodity prices in the medium and long terms, in conjunction with shocks characterized by sharp changes in the prices of those products in the short term, can affect fundamental macroeconomic variables such as inflation, the level of economic activity, the exchange rate and financial stability.

As an important variable in the composition of inflation indices (or in the formation of expectations), the behavior of international commodity prices affects monetary and fiscal policy responses, and even financial regulation.

Akram (2008) considers the effect of fluctuations in oil and food prices on global economic activity (proxied by OECD-member countries, the real short-term interest rate in United States and the real effective exchange rate in that country). The results of that study show that the variable most affected by changes in international prices is economic activity, with variations in oil prices being more important than changes in food prices in this regard. Nonetheless, despite having a gentler global effect, variations in food prices are more important for the behavior of the real interest rate than variations in the oil price are, possibly owing to their potential impact on inflation.

Lombardi and others (2010) also consider global data and find that changes in non-energy commodity prices only have a minor effect on fundamental macroeconomic variables; but they do not rule out the possibility of a greater effect in countries that are producers or major importers of commodities.

Fluctuations in international commodity prices also have direct impacts on foreign-exchange flows, and can be decisive for the exchange rate. For example, in commodity-exporting countries, exchange-rate appreciation is a natural consequence of the adoption of a flexible exchange-rate policy when international prices are rising. In this case, currency appreciation generally helps to keep domestic prices under control, by making internationally tradable goods cheaper; but it can also have longer-term impacts on export competitiveness. A second-order effect relates to the inflow of foreign financial capital attracted by the expectation of a rise in interest rates and the potential gains from exchange-rate appreciation.

In countries that have less flexible exchange-rate policies and that thus lack the exchange-rate weapons needed to help combat crises and price surges, the acceleration of inflation over the last few years seems to have been even stronger (Habermeier and others, 2009; Lora and others, 2011). The low interest-rate policy implemented in the United States and other central economies makes it difficult for those countries to raise interest rates in the proportion needed to combat the rise in prices, owing to the risk of attracting even more foreign capital.

Financial flows, generally short-run, bring volatility to the economies and put additional pressure on domestic prices: the currency appreciation induced by capital bonanza periods generates gains that boost aggregate demand, whereas devaluation during crises generate capital losses, with recessionary effects (Ocampo 2011). Those flows thus tend to be pro-cyclical and generate similarly pro-cyclical policy responses, particularly monetary and exchange-rate policies. In other words, capital flows create pressure for the monetary authorities to lower interest rates (or alternatively, allow currency appreciation) during cyclical upswings and to raise them (or devalue the exchange rate) in times of crisis.

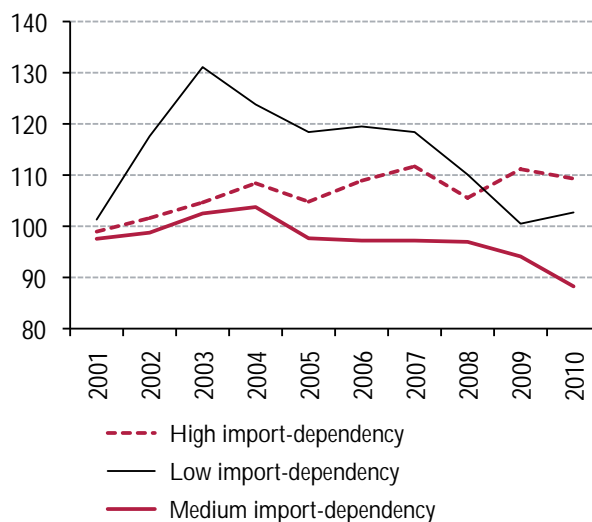
The pro-cyclical impact of capital flows on the economies is not unrelated to the variation in international commodity prices or the position that commodity-exporting countries have in the respective markets. In fact, there is greater volatility in the real effective exchange rate of countries that export cereal crops and oilseeds in the region, together with greater appreciation of their currencies in years of rising prices (see figure 5).

Since the mid-1990s, the capital and financial account balances of those countries have also been much more volatile (see figure 6).

The volatility of international prices and, consequently, the exchange rate, tend to have negative effects on levels of investment, productivity and innovation, given the greater uncertainty perceived by economic agents. In line with what happens with the pro-cyclical trend of policies, market incentives also tend to increase the economies' specialization in commodity-producing sectors, which have benefited from rising prices, thus reproducing previous inefficiencies and supporting a form of growth that is usually unsustainable.

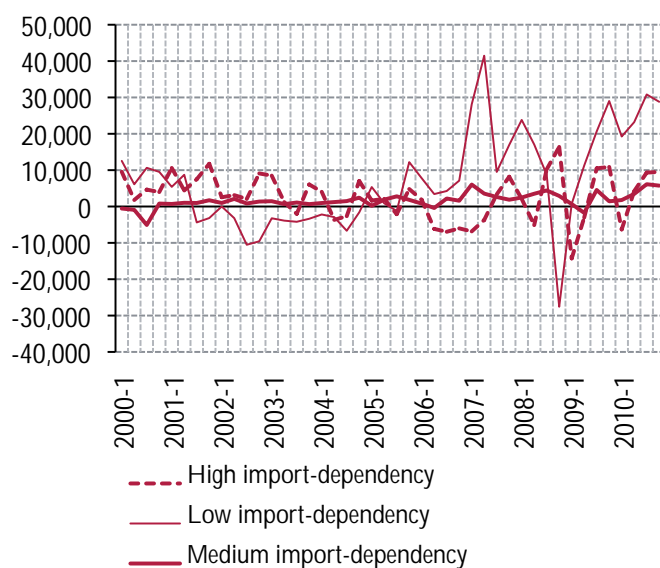
The diversity of variables potentially affected by price behavior requires a wider variety of policy tools to maintain economic stability in situations of high volatility on international markets, as seen in recent years. The central idea of operating with a broad policy package is to reduce the volatility of business cycles through active counter-cyclical macroeconomic policies.

**Figure 5.** Latin America and the Caribbean  
(Median levels of the real effective exchange rate index, 2000=100)



**Source:** Prepared by the authors, on the basis of figures provided by ECLAC. Available at <http://bit.ly/gXfhOp>  
**Note:** See the note to figure 3.

**Figure 6.** Latin America and the Caribbean: capital and financial account balance (Quarterly data in US\$ million)



**Source:** Prepared by the authors, on the basis of figures provided by ECLAC. Available at <http://bit.ly/gXfhOp>

**Note:** See the note to figure 3.

According to Ocampo (2011), several non-traditional instruments are gradually being included in the range of policies used by Latin American countries to cope with international price and capital-flow pressures, including active management of international reserves, regulation of capital flows, and the use of prudential regulation instruments. The region's economic policymakers are using that toolbox for counter-cyclical purposes, particularly to mitigate the impact of capital flows on the exchange rate and inflation.

- **Taking account of commodity-market prospects when formulating macroeconomic policy could reduce speculation and help combat inflation**

There is evidence that financial-market trends have a growing influence on commodity prices in real-sector markets. Close monitoring of the behavior of commodity markets could, therefore, allow for

anticipatory macroeconomic policy responses and thus prevent speculative bubbles developing on those markets.

A review of possible misalignments in commodity financial markets, and the appropriate policy response, could act directly on one of the main current sources of price volatility and, at the same time, discourage financial speculation and improve economic agents' expectations regarding the seriousness and effectiveness of macroeconomic policy to combat inflation (Wadhvani 2008, Cheung and others, 2008, Krichene 2008, Plosser 2009).

Given the global scope of capital markets, to be really able to reduce speculation and thus act on one of the sources of pressure on commodity prices, a coordinated international effort would be needed to share key information, with a view to understanding the behavior of those markets and improving the transparency of the macroeconomic-policy responses adopted.

The economic authorities, and the economies, in general, stand to benefit from a better appreciation of the behavior of currency markets, particularly if they are factored into medium- and long-term macroeconomic policy-making. It would therefore be possible to produce more accurate projections of expected price fluctuations, given the contribution of those variables to the trend not only of inflation generally, but also core inflation, which excludes fuel and food prices (Lee 2009, Krichene 2008). Secondly, an additional advantage of reacting early to potential misalignments of prices on commodity markets is the possibility of reducing business-cycle fluctuations and the normally pro-cyclical nature of macroeconomic policy through greater control of volatility and speculation. This would make it possible to achieve a broader range of macroeconomic policy goals, as is needed in the current scenario.

## ● **Conclusions**

The key importance of the fight against inflation in the region's economies reflects the high social cost paid in many Latin American countries in previous decades, when inflation spiraled out of control.

As argued in the foregoing paragraphs, the volatility of international commodity prices has an impact on exchange-rate stability. The effect may either be direct, through greater fluctuations in the value of exports and imports of the products affected by the price changes; or indirect, through an increase in speculative capital flows and financial agents' expectations of the future trend of the economy. Growing exchange-rate instability, in conjunction with price volatility, also tends to discourage investment, both in production for export and in import-substituting industries.

The volatility of international commodity prices has secondary effects on productive variables — investment, productivity and innovation — not only in the sectors directly affected by the price changes, but also more generally, on the entire productive structure. The incentives generated in periods of rising commodity prices — for markets and for the pro-cyclical policies that are the most frequent government responses to those rises — put long-term policy goals at risk, particularly those relating to the productive and social development of the economies concerned.



A stylized tree graphic with a thick brown trunk and several branches extending upwards and outwards. The leaves are depicted in a dark red color with white vein patterns. The tree is positioned on the right side of the page, with its trunk extending from the bottom edge towards the top. The background is split into a dark red upper half and a light gray lower half, separated by a white dotted line.

## **Section II: Sectoral Analysis**







## The agricultural sector in context

### Higher, more volatile prices and their impact on the growth of the sector

*Policies adopted to meet the challenges of increased demand for agricultural products, and tap the opportunities they create, could be more effective if decision-makers had a clearer understanding of the structural and short-term factors that prevent agricultural production from increasing as fast as needed to satisfy that growing demand. For this to happen, the different factors related to the demand and supply of agricultural products that explained the trends, cycles and volatility in prices, must be analyzed as a necessary step for the comprehensive management of risks and the design of much more strategic public policies that call for the implementation of differentiated actions in the short, medium and long term.*

#### Facts

- In times of economic crisis or recession agriculture serves as a buffer for the economy, not only because it absorbs many of the unemployed in other sectors, but also because its level of activity remains fairly constant while that of other sectors declines (ECLAC, FAO and IICA 2009).

#### Trends

##### ***Growth of agricultural GDP in the region***

In the last decade, real agricultural value added (AVA) in Latin America and the Caribbean (LAC) grew at an average annual rate of 3.2%, helped along by a positive trend in agricultural commodity prices. However, this growth was not without its ups and downs, as manifested in the 4% drop in 2009, after a 4.8% increase in 2008. See figure 7.

Even though the AVA refers only to changes in the physical value of production (volume), whether it rises or falls depends on what happens with prices; high prices were a stimulus for farmers to increase production (and vice versa).

However, increases in the volumes produced did not always lead to an increase in real income in the sector. When the AVA is deflated by a price index which reflects the costs of all the goods and services of the economy (the GDP implicit price deflator), it revealed that agricultural income did not follow the same growth path as real AVA. See figure 8.

Unlike the real AVA, the adjusted AVA depends on the evolution of agricultural commodity prices vs. prices in the rest of the economy (Paz et al. 2009).

Like the real AVA, the trend in the adjusted AVA is also positive, but it is growing at a faster pace (an annual average of 3.8%). The most important difference between the two indicators is the fact that the positive cycles were significantly higher in terms of income than in terms of volumes produced. Indeed, in constant terms, income grew significantly in 2002 (13.3%), 2003 (10.2%), 2007 (10.9%) and 2008 (10.1%); by comparison, the increases in volumes produced never exceeded 5%.

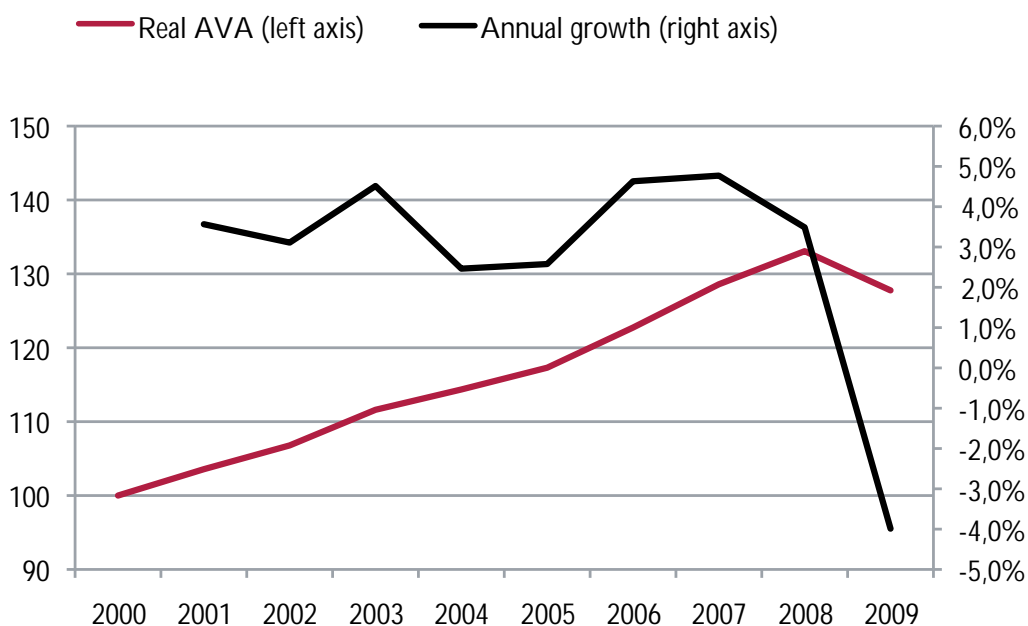
Although, on average, the adjusted AVA grew more than the real AVA, such growth was not equal for the entire region. While in the Southern Cone the adjusted AVA grew at a rate of 4.5%, the rate reported in the other regions never rose above 2.5% (2.5% in Central

America, 2.4% in the Caribbean region, 2.3% in the Andean region and 2.2% in the Northern region).

The year 2009 was particularly difficult due to a decline of 5.8% in real income, attributed mostly to the decline in the Southern region (9.6%).

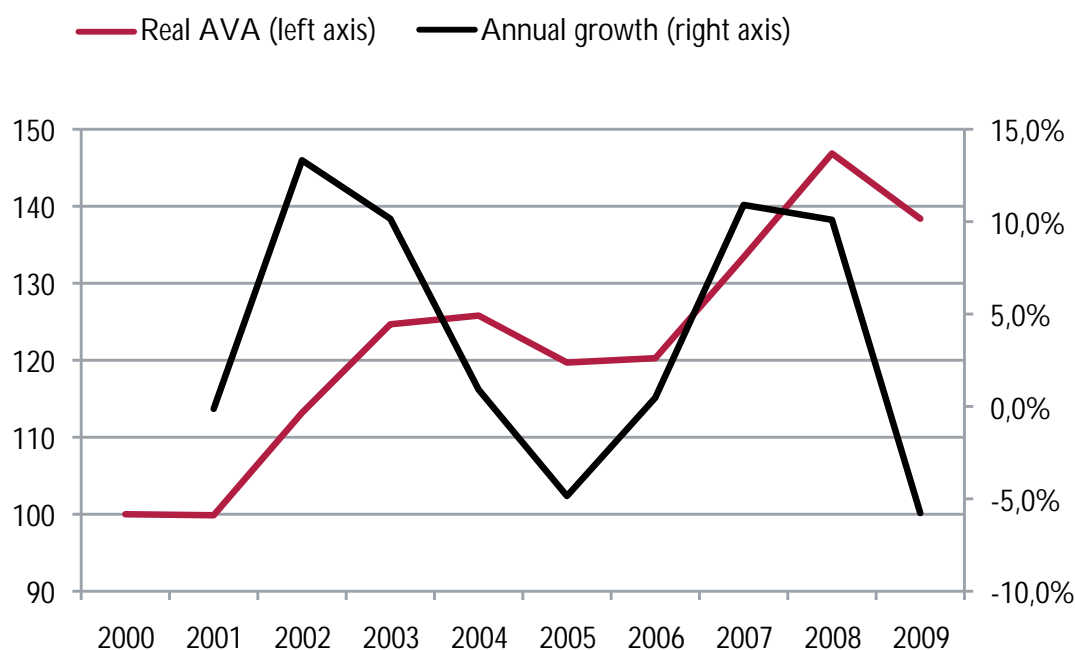
In the last five years, the highest growth in the region (13.9%) was reported in 2007. Some growth was reported in all the sub-regions, except the Caribbean, where extreme weather took a heavy toll on production.

**Figure 7.** Real Agricultural Value Added for LAC (2000 = 100)



**Source:** Prepared by author with data from the World Bank 2011. Available at <http://bit.ly/c5JuED>

**Figure 8.** Adjusted Agricultural Value Added for LAC  
(2000 = 100)



**Source:** Prepared by author with data from the World Bank 2011. Available at <http://bit.ly/c5JuED>

### ***Evolution of prices and the origin of price variations***

Investment, production and market decisions would be more judicious if those making them had a better understanding of the origin of price variations. The ability to understand and anticipate how prices behave is also fundamental in designing policies for the short, medium and long term.

The path they follow over time consists of four principal components:

The first is the *long-term trend*, explained by structural factors (on both the supply and demand sides) which require public-private actions over the long term, to take advantage of opportunities it offers and meet challenges it poses.

*Cycles or swings* (ups and downs) constitute the second component of variation in prices around the long-term trend, caused by short-term factors that lead to deficits or surpluses of supply for relatively short periods of time. Even though they are short term in nature, these cycles or swings can last for more than a year, depending on the agricultural activity involved and in the economic context.

The third component is *seasonality*, which refers to the pattern of regular movements over the course of a year. In general, seasonality is due to the fact that the harvest season lasts for only a few months, while consumption is stable throughout the year.

Lastly, the fourth component comprises *irregular variations*, which refer to very short-term, random changes which do not follow a seasonal or cyclical

pattern. The magnitude of and speed with which these irregular changes, up or down, take place are what is known as volatility. However, when cycles and seasonality are unstable, and therefore difficult to anticipate, they also affect volatility, as will be shown later.

The importance of differentiating among the above-mentioned components is that policy

measures and private decisions must be very different, when what is at issue is a response to long-term trends or cycles or to very short-term variations in prices.

Figure 9 shows the four components for the FAO food price index, which we will look at separately. Econometric methods must be applied to properly isolate each component.

**Figure 9.** FAO food price index and components of variation (2002-2004 = 100)



**Source:** Prepared by author with data from FAO 2011f. Available at <http://bit.ly/gC6TGF>

In recent years, increases in agricultural commodity prices have outnumbered declines. In May 2011, the FAO food index revealed an increase of 134.8% over the average for 2002-2004. This increase exceeded even the peak achieved in June 2008, when it had grown 124.1% in comparison with that period.

Agricultural prices are not only rising, but have been rising faster in recent years. Adding up monthly positive and negative changes in prices during stipulated five-year periods, it is clear that the accumulated gains increased from 25% in 2000-2004 to 61.6% in the last five-year period (60 months ending in May 2011). See table 1.

**Table 1.** Trend of the FAO food prices index (Jan. 1998 to May 2011)

Five-year periods ending:	Accumulated gains/losses <sup>1</sup>	
	Total foods <sup>2</sup>	Trend <sup>3</sup>
Dec. 02	-19.59%	-17.87%
Dec. 04	25.84%	18.86%
Dec. 06	37.58%	47.48%
Dec. 08	34.06%	53.28%
Dec. 10	60.80%	48.32%
May 11	61.63%	47.72%

<sup>1</sup> Accumulated sum of monthly logarithmic changes in moving five year-periods

<sup>2</sup> Takes into account variations in trend, cycles, seasonality and irregular variations.

<sup>3</sup> Eliminates cycles, seasonality and irregular variations. The Hodrick-Prescott filter was applied to the series related to trend and cycle obtained from the X12-ARIMA procedure (Census Bureau of the United States).

If only the prices trend is taken into account (ignoring cycles, seasonality and irregular variations), the accumulated gains over five-year periods are lower, and remain relatively stable: from 47.5% in December 2006 to 47.7% in May 2011. This suggests that, at the time this study was carried out, prices were way above their long-term trend and, therefore, the market would take advantage of the gains, forcing prices down.

A more detailed analysis by groups of products shows that all agricultural prices follow a similar long-term path. Of particular note are the accumulated gains over the last five-year period for sugar (81.2%), oils and fats (60.11%), cereals (52.9%) and tropical products (53.33%) There were increases for meats and seafood, but they were less significant than they were for the overall food index.

## Box 2. Factors related to demand that account for the long-term trend in agricultural prices

First of all, population growth will increase demand for food, at the same time the quantity of natural resources available per capita to produce that food will diminish quickly. By 2050, the world population will be more than nine billion, with most growth occurring in developing countries. In addition, the percentage of people living in urban areas will have reached 70% by then, compared with 49% in 2009, and 70% more food will have to be produced than in 2005-2007 (FAO 2009c).

Secondly, incomes will rise considerably in emerging countries (three times more than in advanced countries and two times more than in rich countries). As a result, per capita consumption of food will increase and eating habits will change as consumers purchase products with greater value added and higher animal protein content. The consumption of food will increase rapidly because in the developing countries, where low levels of income prevail, both income and price elasticities of demand for are much greater than in the developed countries, where per capita income is much higher.

Thirdly, higher incomes will lead to greater consumption of protein and, since more than half of the cereals produced worldwide are used for animal feed, their production will have to increase by nearly 50% if meat consumption increases to 52 kg in 2050 as expected, compared with 37.4 kg per person in 2000.

Lastly, greater demand for bio-fuels will make it necessary to increase agricultural production and will heighten competition for land for food production. The OECD and FAO (2011) predict that, by 2020, 13% of grains, 15% of vegetable oils and 30% of sugar will be used to produce bio-fuels (OECD, FAO 2011).

The rise in prices over the long term is, on the one hand, the result of structural factors that will result in greater food consumption and increased demand for agricultural raw materials. See box 2. On the other hand, the factors that prevent agricultural production from increasing as fast as needed to satisfy that growing demand will create pressure for prices to rise. See box 3.

## Box 3. Supply factors that explained the long-term trend in agricultural prices

The following will continue to be the major limiting factors that prevent agriculture from growing as fast as needed to satisfy increased demand:

- According to Nellemann et al. (2009), the lack of water will hinder efforts to increase food production more than any other, and the demand for water will have tripled by 2050, especially if a scenario of eradication of poverty and hunger is considered.
- In future it will be more difficult to increase production by expanding the area under cultivation. The agricultural lands currently used for crop cultivation total approximately 1.6 billion hectares (WRI). Even though there are another 2.7 billion hectares with the potential to produce, available mostly in Sub-Saharan Africa and LAC, most are limited in their ability to produce the foods the population requires.
- The degradation of soils will be another limiting factor.
- The negative effects of climate change in some countries will be severe enough to wipe out any increases in yields achieved through the use of new technologies, CO<sub>2</sub>, fertilization and other factors (Lobell et al. 2011). In addition, the impact is expected to be more severe in tropical areas than in temperate areas.
- Lastly, the current global context, characterized by high levels of risk and uncertainty, has a negative impact on decisions regarding investment and production in the sector. Risk will be viewed by companies as an additional cost, which will cause a decline in production and profit levels in agriculture (ECLAC, FAO and IICA 2011).

- **Outlook**

***Agricultural prices on the rise in the long term***

According to projections from the leading organizations in the field (OECD, FAO, USDA and IFPRI among others), the trend toward higher agricultural prices will continue in the medium and long terms.

It is estimated that by 2020, the prices of butter, chicken and vegetable oils will increase by 40% or more over the average for 2001-2010; those of sugar, corn, rice, pork, fish, cheese and skim and whole milk, by 30% to 40%; those of soy pellets and beef by 20% and 30%. The price of wheat is expected to drop by close to 20%, attributable to a predicted drop in per capita consumption (OECD and FAO 2011).

Increased demand for or use of agricultural products and the maintenance of the reserves of those products, or a reduction, are trends that will appear in most agricultural markets. It is projected, for example, that by 2025, the stock-to-use ratio of corn will be 13.7%, which is below historic levels (FAPRI 2011). In 2011 and 2012, in the case of cotton, that ratio will reach the lowest levels reported in the last 10 and 22 years in the United States and China, respectively. In the case of rice, the average ratio in the last five-year period is 20%, almost half of what it was at the beginning of the last decade.

In addition to the increase in the use of agricultural products and the reduction in stocks, per capita food production will go down. It is expected that, as was the case of per capita cereal production, which dropped from approximately 380 kg per capita in the 1980s to an average of 340 kg in more recent years (Nellermann et al. 2009), population growth and the impossibility of expanding the agricultural frontier will reduce the quantity of food produced per inhabitant, which evidently will contribute to the trend toward higher food prices.

***Price cycles and the effect of short-term factors***

The cyclical factor is the most important component in the recent trend in agricultural prices. However, the challenges entailed are, however, difficult to surmount, given the fact that these cycles are increasingly unstable, recur with greater frequency and vary in terms of duration, magnitude and rates of growth.

Before the crisis of 2007-2008, the amplitude of the cycles in agricultural prices was on the scale of less than 10%. Since that time, there have been positive and negative cycles of differing lengths and amplitudes. For example, in June 2008, prices rose 29.1%, above the long-term trend, and then fell to 18.6% in February 2009, to climb again to 27.8% in February 2011. (See table 2 and figure 9).

**Table 2.** Cycles in the FAO index of international food prices (January 1998 to May 2011).

Five-year periods to :	Cycle <sup>1</sup>	
	Maximum	Minimum
Dic. 02	6.03%	-6.05%
Dic. 04	7.05%	-5.63%
Dic. 06	7.05%	-9.29%
Dic. 08	29.12%	-13.78%
Dic. 10	29.12%	-18.62%
Mayo 11	29.12%	-18.62%

<sup>1</sup> The X12-ARIMA tool and the Hodrick-Prescott process were used to separate the components of trend, cycle, seasonality and irregularities.



The analysis by sub-groups shows that the extent of the positive cycles is greater than 30% for oils and fats, milks, cereals and sugar. The other products show smaller positive cycles: agricultural raw materials (12%), tropical products —coffee, cacao, banana, orange juice— (15%) and sea food (15%).

One important characteristic of the cycles in periods of crisis is that they can be significantly correlated to similar cycles in other markets; moreover, there are common factors causing these swings, such as the depreciation of the dollar, low rates of interest and the global situation of greater risk and uncertainty. (Frankel; Byrne et al. 2011).

Similar cycles for end products and for raw materials and inputs especially affect the sector's profit margin, which depends directly on the level of technology involved and on efficiency in the use of inputs and natural resources (ECLAC, FAO and IICA, 2011).

The unstable and uncertain nature of the cycles makes decision-making particularly difficult, especially for economic agents with planning horizons that exceed one month, which is the case for most agricultural producers. The price cycles raise the cost of access to food, create uncertainty with respect to the cost of inputs and raw materials for the livestock sector and for agro-industry, and discourage medium and long-term investment decisions.

The fact that cycles have such a significant effect on prices means that anti-cyclical policies should be adopted to soften the negative effects when prices fall (or increase for the consumers), and to decrease the cost of uncertainty caused by the inability to anticipate the direction in which prices will go in the short term.

#### **Box 4.** Current economic factors responsible for price cycles and volatility

Firstly, frequent extreme climatic events give rise to recurrent periods of scarcity and abundance of products on the market, which are responsible for hikes in the price of food. Recently, for example, there were droughts in Russia and snowstorms in the United States that affected the price of corn; there were droughts in Argentina that affected the production of oil seeds; there was flooding in Australia and droughts in Russia, Pakistan and Ukraine which affected the price of wheat; floods in Australia and droughts in Brazil which affected the price of sugar and droughts in Colombia and Brazil which affected the price of coffee.

Secondly, the close linking of agriculture to capital and energy markets is a source of short-term variation in prices (Irwin et al. 2009). For example, recurrent changes in optimism in the international currency markets, which created a trend towards the buying of Euros and the sale of dollars, thereby stimulating the commodities market. However, this trend was, however, reversed with the buying of dollars and the sale of the euro, which in turn produced the opposite effect of a fall in prices.

Thirdly, public policies can at times become factors that distort the markets. It is estimated that more than a third of the increases observed in the price of rice during the 2005-2008 period (127%), as well as a quarter of the increase in the price of wheat (114%), can be explained by changes in the policies of the countries which were trying to isolate themselves from the effects of the increase in world prices (Martin and Anderson, 2010).

Fourthly, and directly related to the limited amount of timely information, to the difficulty in accessing information and to the lack of transparency in the markets, at times caused decisions relating to purchasing and selling to be based on emotions associated with the cycles of optimism, enthusiasm, and euphoria. Subsequently, these, emotions gave way to anxiety, panic and depression in the markets. These cycles are compounded by the current conditions of greater risk and uncertainty.

### ***High price volatility***

Volatility, in the strictest sense of the term, is the speed at which changes in prices occur, after the trends, cycles and seasonality components are discounted, (irregular component). This means that the factors that cause volatility are random and consequently impossible to predict.

Price volatility has been increasing from one five-year-period to the next, moving from 0.69% in 1990-1994 to 1.21% in the last five-year period up to May 2011. This increase applies not only to agricultural markets, but also to raw materials, metals, energy and industrial markets (OECD and FAO, 2011). It remains to be seen whether these

very clear cycles and price volatility will return to their “normal” pre-crisis behavior once the world financial and economic crisis is over. This is likely, given their high correlation with cycles of recession and world economic growth, which are, at the same time, associated with the behavior of interest rates and exchange rates and conditions of greater uncertainty.

The volatility experienced over the past few years was due mainly to the effects of the cyclical component (See Table 3). Although total monthly “volatility” of the food price index was 3.9% in the last 5-year period ending May 2011, if this volatility were to be calculated only on the basis of the cyclical component, it would triple to 13%.

**Table 3.** Components of volatility<sup>1</sup> in the FAO international food price index.

<b>Five-year periods up to:</b>	<b>Total food<sup>2</sup></b>	<b>Trend<sup>3</sup></b>	<b>Cycle</b>	<b>Seasonal</b>	<b>Irregular</b>
Dec. 02	1.68%	0.48%	3.33%	0.56%	0.76%
Dec. 04	1.55%	0.41%	3.40%	0.52%	0.69%
Dec. 06	1.60%	0.29%	4.14%	0.49%	0.73%
Dec. 08	3.36%	0.30%	10.40%	0.57%	0.90%
Dec. 10	3.87%	0.36%	12.55%	0.72%	1.23%
May 11	3.89%	0.35%	12.96%	0.80%	1.21%

<sup>1</sup> Standard deviation of monthly logarithmic changes over a moveable period of five years.

<sup>2</sup> Volatility that takes into account all the variations by trend, cycle, seasonality and irregularity.

<sup>3</sup> Eliminates cycles, seasonality and irregular movements. The Hodrick-Prescott filter is applied to the series of trend and cycle obtained from the X12-ARIMA process (United States Census Bureau).

### • **Conclusions**

In order to strengthen the processes of formulation, implementation and follow-up of public policies for agriculture, better understanding is required of the behavior of prices for agricultural products, as well as the structural and short-term factors that impede

growth in supply at the rate required to satisfy the growing demand for agricultural products.

In the medium and short term, the increase in price volatility in agricultural markets, as well as in the metals and energy markets, will continue to be one of the main challenges to be overcome.

This is why it is necessary to analyze the various factors associated with the demand and supply of agricultural products that explain the trends, cycles and price volatility.

To reduce the impact of these cycles and act in advance of the random factors that cause price volatility is the main shortcomings of public policies within the sector.

Now more than ever, the State must promote the integrated management of risks in agriculture, including market risks, production risks and financial risks. This will allow public policies to be formulated in a much more strategic manner, taking into account differentiated actions for the short, medium and long terms.



## Agriculture

Latin America is capable of contributing to food security worldwide

*The need to guarantee food security worldwide and the upward trend in real prices for agricultural commodities provide a great opportunity for agriculture in Latin America and the Caribbean (LAC), thanks to the availability of land, the relative abundance of water, the rich biodiversity and the human resources in the region. If the countries of LAC are to seize this opportunity, they must produce more on the same amount of land, especially in those countries where the possibility of expanding the agricultural frontier is limited, and narrow the technological gaps that exist throughout the region, which will require greater investment in research, development and innovation (R+D+i).*

*The volatility of commodity prices creates uncertainty. In response, governments must avoid pressures to adopt restrictive trade policies that will further distort international trade. Rather, they should push for a conclusion to the Doha Round of multilateral negotiations.*



### Facts

- Agriculture in LAC weathered the global crisis well and is driving the recovery of the economies there and in two important countries of the Americas: The United States and Canada (Neuman 2010 and Agri-food Canada 2011).
- Increased demand worldwide for agricultural raw materials, especially from Asia (particularly China) will create pressure to increase the production of food and agricultural raw materials for non-food purposes.
- A food crisis similar to the one in 2007-2008 could occur in the future, considering that the world population grows by some 78 million persons per year, and generally speaking, has greater purchasing power, that food production is not keeping pace with consumption and that natural resources are becoming increasingly scarce.
- Latin America has great potential for increasing agricultural production, thanks to the availability of land in several countries (Brazil, Argentina, Colombia and Venezuela) and, to a lesser degree, in Peru, Paraguay, Ecuador, Bolivia, Belize and Uruguay.
- The rise in prices experienced since August 2010 is more widespread than it was in the 2007-2008 crisis and covers tropical products (sugar, coffee, cacao, dairy products and meat), also benefiting producers in regions that do not have a temperate climate also.
- The effects of climate change are already resulting in lower yields for some crops (Lobell et al. 2011, Ramirez et al. 2010).

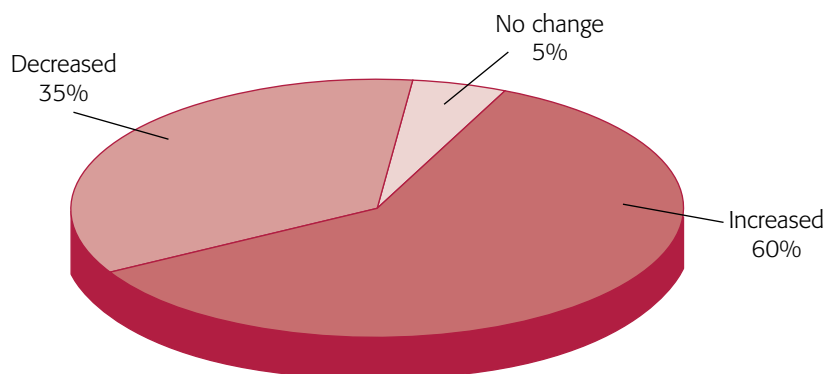
- **Recent trends**

***With exceptions, production is rising***

Despite highly volatile agricultural commodity prices and heavy crop losses due to adverse climatic conditions in different parts of LAC, in 2010, agriculture performed well, according to preliminary data from the countries and the results of a survey conducted by IICA.<sup>1</sup>

According to the survey, most of the countries (60%) reported that agricultural production in 2010 exceeded 2009 levels. Nonetheless, 35% of the countries, including Bolivia, Costa Rica, El Salvador, Guatemala, Nicaragua and Venezuela, reported a decline in production in 2010, while 5% reported no change. See figure 10.

**Figure 10.** How did agricultural production levels vary from 2009 to 2010 in your country?



**Source:** Prepared by authors, based on Agricultural Outlook 2011 questionnaires.

This opinion coincides with the preliminary 2011 data from FAO for the main groups of products. For example, production of cereals in LAC grew by 7.1% in 2010, over 2009. This growth may be attributed to increased production of coarse grains and wheat, including record wheat harvests in Argentina and Brazil, and bountiful maize

harvests in Argentina, Mexico and Brazil, which compensated for the decline in rice production in the region.

Data on cereal production in Central America and Mexico reflect either a decline or no change, except in the case of coarse grains, with Mexico reporting

<sup>1</sup> At the regional level, key informants were consulted regarding their perception of the evolution of agriculture in general and the performance of the three most important products of each country. Three key informants were interviewed in each of 20 countries: one representative of the ministry of agriculture, one representative of sector trade associations, and one from an international organization operating in the respective country.

significant growth. The situation in the countries of the Caribbean (maize and beans was generally satisfactory), despite the drier climate, except in Haiti and Cuba, where production levels for 2010 fell below those in 2009.

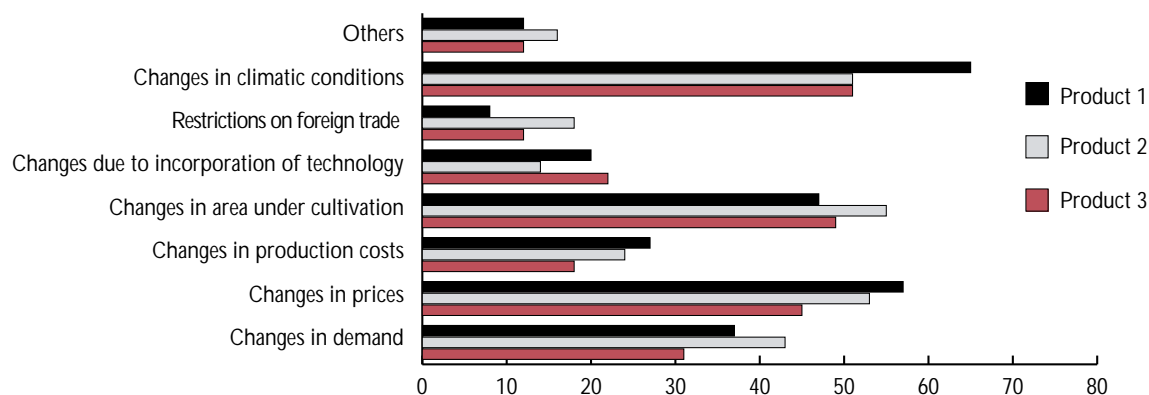
The situation in LAC contrasts with that of the United States and Canada, where cereal and wheat production declined by approximately 5%.

According to most of the experts consulted, the factors that have the greatest impact on production of the three most important agricultural products of each country in 2011, compared with 2010, are changes in climatic conditions, in the area under cultivation and in prices. They are of the opinion that changes in technology, restrictions on foreign

trade and variations in production costs have less of an impact. See figure 11.

These opinions would appear to be corroborated by the fact that the countries of LAC have experienced adverse climatic conditions that impacted agricultural production: floods in Panama, some Andean countries and Brazil; droughts in Uruguay, Argentina and Chile and frost in Mexico, among others. Added to this are the effects of other natural disasters such the earthquakes in Haiti (January 2010) and Chile (February 2010). All such events have a deleterious effect on factors associated with agriculture - land, buildings, livestock, storage facilities and transportation- and usually make re-planting necessary, for which funding is not always available.

**Figure 11.** Which factors contributed to the trend in agricultural production? (% of total responses)



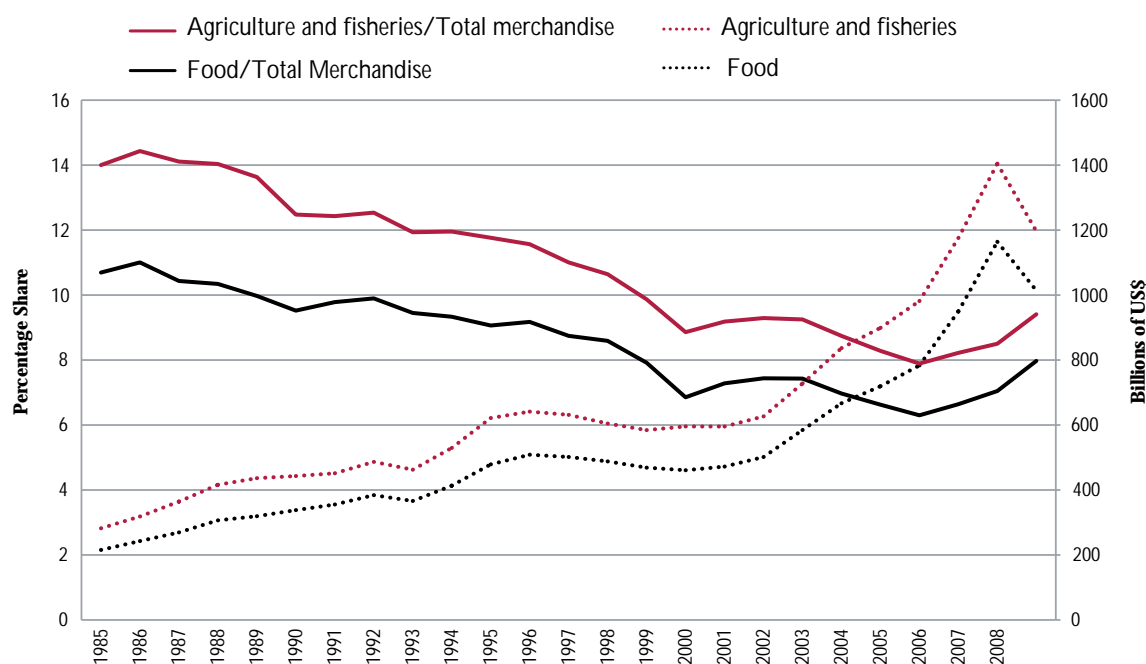
**Source:** Prepared by authors, based on Agricultural Outlook 2011 questionnaires

### *Satisfactory growth in agrifood trade*

The evolution of agricultural commodity prices reversed the trend observed since the mid-1960s, in which the share of agrifood trade in the total value of merchandise trade systematically declined. In

2006 this share began to increase, and held steady even when the value of trade showed a decline as a result of the global contraction caused by the crisis and the recession after 2008. See figure 12.

**Figure 12.** Value of agri-food trade and its share in total world merchandise trade



**Source:** IICA, with data from the World Trade Organization.

**Note:** Value of world merchandise trade is based on import data.

The recovery of agricultural production in LAC, especially in the South, has been tied to the recovery of economies around the globe, in particular those of China and other nations of Southeast Asia. The latter became important buyers of agricultural commodities from LAC, which resulted in the recovery in 2010 of the agrifood trade in this region, especially trade in cereals and maize.

With respect to maize, it is important to point out that LAC moved from being a net importing region, with a deficit of 1.3 million tons in 2009-2010, to being a net exporter, with a surplus of 3.7 million tons in 2010-2011.

Mexico, the countries of Central America, those of the Caribbean and some of the Andean countries, which are more dependent on trade with the United

States and the European Union (EU), are feeling the impact of decreased growth in those economies.

***Growth in the agrifood trade: more than higher prices***

In times of high prices, the value, but not necessarily the volume (quantum), of trade flows can be expected to increase since, for example, the same quantity may be exported, but at a higher price. An analysis of trade flows in 2007 reveals that the agrifood trade (exports and imports) in LAC grew substantially, both in volume and value (12.1% and 6.4%, respectively), while growth in exports in 2008 depended basically on the movement of international prices, given that the quantities exported remained unchanged. The same was not

true in the case of agrifood imports, which grew both in volume and value, with the latter increasing substantially thanks to international prices, which hit record levels. See figures 13 and 14.

In 2009, agrifood trade in LAC contracted in comparison with 2008, both in volume and value.

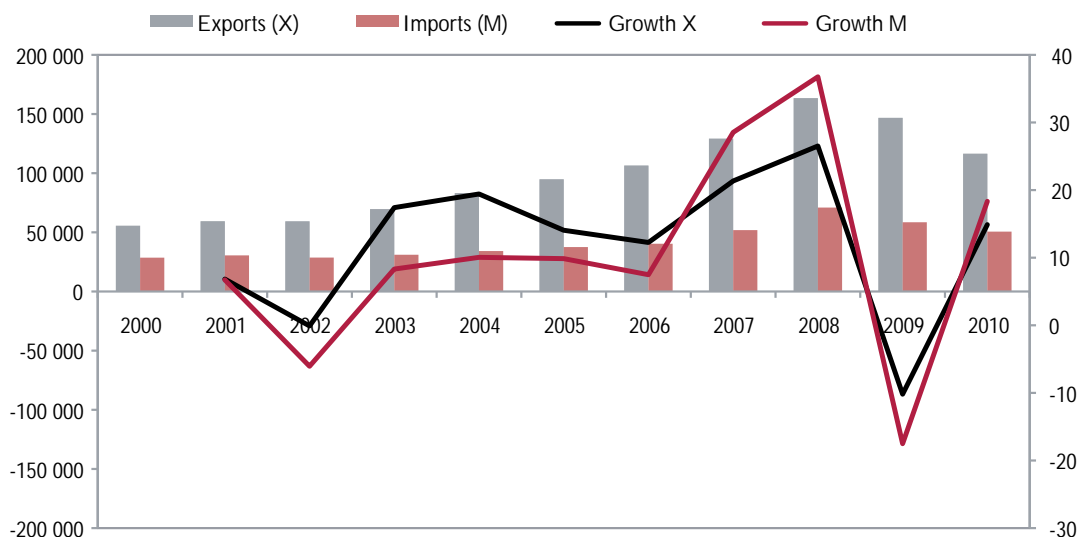
According to the partial results (for only 16 countries) from 2010, agrifood exports and imports in LAC recovered in terms of both volume and value. Greater growth occurred in imports, with an increase in volume equivalent to 24.9%, more than three times the rate observed for exports (8%).

One aspect worth underscoring is the increase in agricultural trade between China and LAC

in 2010. According to data in the United Nations Commodity Trade Statistics Database (COMTRADE), in that year, imports of agricultural products from LAC into China increased by 3.4%, to a total of slightly more than US\$19.9 billion. Exports of agricultural products from China to LAC grew more rapidly (24% in comparison with 2009), but only accounted for US\$1.539 billion, almost twelve times less than the amount imported, which leaves a significant balance in favor of this region.

LAC has become one of the main sources of agricultural products for China, providing 31% of that country's imports of such products. China's principal trading partners in the region were Brazil, Argentina, Peru, Chile, Uruguay and Mexico.

**Figure 13.** LAC: evolution (rate of growth) of agricultural trade in terms of value (millions of US\$)

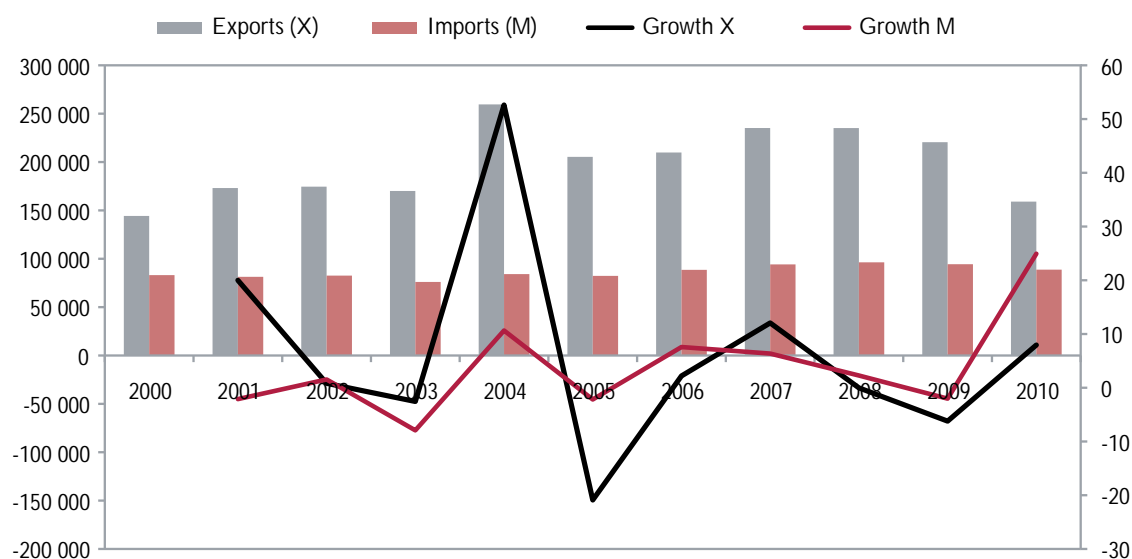


**Source:** prepared with United Nations data (COMTRADE).

**Note:** for 2010, preliminary data for only 16 countries.



**Figure 14.** LAC: evolution (rate of growth) of agricultural trade in terms of volume (millions of kg.)



**Source:** prepared with United Nations data (COMTRADE).

**Note:** for 2010, preliminary data for only 16 countries.

In 2010 also, there was increased interest on the part of the EU in Latin America. Indeed, the new strategy known as Europe 2020 advocates the creation of an interregional partnership based on a model compatible with that used by the World Trade Organization (WTO) for dealing with the region. The EU has become the second most important trading partner of LAC and the most important trading partner for the expanded MERCOSUR.

The object of a resolution approved on October 21, 2010, is to form a bi-regional strategic partnership between the EU and LAC for the purpose of improving trade relations between the two regions and creating more jobs. One of the factors that has led to closer relations between the two regions has been the conclusion of negotiations on the Association Agreement between the EU and Central America in May 2010, the first such agreement between two regions. Added to this is

the finalization of the Multi-party Trade Agreement between the EU and Colombia and Peru, which includes the possibility of signing an association agreement with all the member countries of the Andean Community in the future.

### ***Emerging challenges in agricultural health and food safety***

The emergence or re-emergence of several pests and diseases has made the strengthening of national agricultural health and food safety (AHFS) services more urgent. Plant health has been impacted by the spread of different exotic pests, in particular, citrus greening disease (or huanglongbing), which has already been detected in a number of countries of the hemisphere. Citrus fruit production<sup>2</sup> worldwide is seriously threatened by this difficult-to-control pest, and some countries in the Americas are the largest producers of citrus fruit in the world.

<sup>2</sup> For example, Brazil is the largest producer and exporter of orange juice in the world, with the states of Florida and California, in the United States, also being major producers. Even in small countries such as Costa Rica citrus production is a relevant sector of the economy.

## Box 5. Citrus disease: state of and outlook for its management in LAC

Huanglongbing (HBL) is a disease that attacks citrus fruit. Originally from Asia, it easily mimics mineral deficiencies and spreads rapidly before its symptoms appear on a large scale. The greatest cause for concern is its ability to devastate even entire plantations in a very short time. The management of HBL is very costly and, since it spreads throughout the tree so rapidly, most countermeasures are ineffective. In Brazil, the average cost per hectare is US\$403, which can prove to be very costly for small- and medium-scale farmers.

HBL was detected in the region for the first time in 2004 in Sao Paulo, Brazil, and later in the United States, Cuba, Dominican Republic, Honduras, Belize, Mexico, Guatemala, Nicaragua, Costa Rica and Jamaica.

Given the absence of a comprehensive regional program to combat the pandemic of HBL in LAC, in June 2011, the FAO Regional Office for Latin America and the Caribbean conducted a regional consultation on the status of HBL and the outlook for managing it in the region. The consultation produced a regional plan of action to manage HBL, which calls for the application of tools intended to combat the pandemic and prevent its spread, such as protocols, information systems, standardized procedures, risk analysis and early warning systems, forecast models, networks of diagnostic laboratories, and international standards for phytosanitary measures. FAO considers this disease to be an emergency and is mobilizing resources to implement a regional strategy to control it, and to lay the groundwork for implementing the Emergency Prevention System (EMPRES) for Transboundary Plant and Animal Pests and Diseases.

In the Caribbean basin, black sigatoka has resurfaced, and diseases such as the red palm mite, the Giant African Snail and other mollusks are spreading.

### *Insufficient research and development (R&D)*

The countries of LAC invest little in R&D in agriculture. Those in the Southern Region and Mexico invest the most, while the countries of the Central Region and the Caribbean invest less than 1% (Stads and Beintema 2009). Uruguay invests close to 2%, as a percentage of agricultural GDP, a figure that experts feel is acceptable for developing countries. Brazil invests a little less than 2%, and only five countries exceed the regional average of approximately 1%.

Even though in the last two years the same amounts have been allocated in the region for research, development and innovation (R+D+i) in agriculture, measured as a percentage of GDP, the topics of climate change and food security are now being included on research and innovation agendas. This is true not only in national agricultural research institutions, but also in regional mechanisms for the integration of technology such as the cooperative programs for research and the transfer of agricultural technology known as PROCIs.

In more specific terms, many countries began or expanded genetic breeding programs aimed at creating drought-resistant varieties, are using more technologies and better practices in order to make more efficient and sustainable use of irrigation water, and are promoting the implementation of real-time climate forecasting systems. In addition, the production of advanced varieties of transgenic maize has now started in some countries.

The cultivation of transgenic crops is advancing in some countries, but it should be pointed out that the biotechnological tools being used are not limited to genetically modified (GM) crops. For example,

the biotechnological control of pests (biocontrol), the application of in vitro cultivation techniques and the use of bio-inputs (bio-fertilizers, biocides) for soil preparation or maintenance continue to be important in agriculture in LAC. In addition, there are initiatives, albeit incipient, underway in the areas of genomics and bio-informatics of cultivated species or microorganisms associated with agriculture.

### **Box 6. Genetically modified (GM) crops in LAC**

In 2010, GM crops occupied 148 million hectares in 29 countries, including 13 in the Americas, worked by some 14.4 million farmers with plots averaging 0.6 hectares (James 2010).

It should be noted that the area planted in GM crops in Brazil grew by four million hectares. In addition, Mexico conducted trials of GM maize and approved requests for its release into the environment.

However, the use of GM crops is being opposed in countries such as Bolivia and Peru.

Regardless of their position regarding GM crops, the countries of LAC continue to develop and implement biosafety regulatory frameworks (BCH 2010).

In LAC, precision agriculture is also becoming more widespread and machinery that uses sensors to measure yield and apply inputs, especially fertilizers, is being used increasingly in countries that are large producers of grains.

### ***Pressures related to land ownership***

While the issues of land ownership and the land market are not new, beginning with the food crisis of 2008, pressure has increased from companies in certain countries to acquire lands with clear agricultural potential. This topic, which was thought to be a concern for African countries only, is also a concern today for the countries of LAC, where countries seeking to ensure a steady supply of basic products, such as China and some oil-producing countries, are attempting to acquire more land.

The purchase of land by foreign countries has reached significant levels in LAC. For example, it is estimated that as much as 10% of the land in Argentina is owned by foreigners (Valente 2011), and that in Uruguay from 20% to 30% is in foreign hands. In response to this situation, some countries such as Brazil, Uruguay and, more recently, Argentina, are implementing policies that limit the amount of land that can be acquired by foreign investors, and even by national companies with foreign capital.

### **• Outlook**

#### ***Agricultural production will grow in the short term***

With regard to the outlook for 2011, according to a survey conducted by IICA, 70% of those interviewed indicated that agricultural production was expected to grow, compared to 2010. Those surveyed in the Southern region, except Brazil, have the greatest expectations of growth in production. The outlook is promising for most of the Andean and Central American countries, but agricultural production will stall in Mexico. See figure 15.



## Box 7. Change in the agricultural landscape of the countries

Changes in the use of agricultural land in LAC, insufficiently documented until now, have taken place in the medium term in response to the opening of the economies of the countries and to their greater involvement in the international market.

Nonetheless, as a result of the recent movement of international prices and significant variations in relative profits, due to both changes in prices and the policies adopted to encourage the production of crops for specific purposes (for example, corn for biofuel), such changes are occurring more quickly; in the case of some crops, from harvest to harvest.

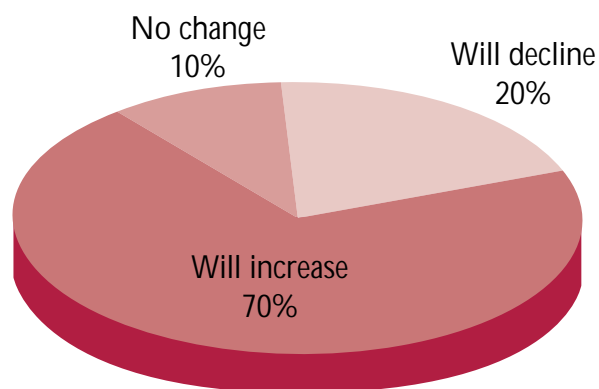
For example, during 2011, higher prices for cotton in the United States have motivated producers in southern states to grow more of it than corn,

soybean or wheat, the production of which had increased in previous years in response to high prices (USDA, 2011b). In addition, in the rest of the country, the total area planted in corn, vs. soybeans and wheat, has increased (USDA, 2011d).

In Brazil, Argentina and Paraguay, more soy is being produced than wheat and other coarse grains, whereas in Central America the reduction of the total area planted in coffee has been offset by the increased cultivation of fruits, vegetables, flowers and foliage for export.

Sugar which, for some time, had been losing ground in the region due to low international prices, except in Brazil where incentives have existed to produce ethanol, is again demanding high prices, which could change the outlook for the sector.

**Figure 15.** What is the expectation in your country regarding agricultural production in 2011 compared with 2010?



**Source:** Prepared by authors, based on Agricultural Outlook 2011 questionnaires.

According to data from FAO, cereal production in LAC will grow in 2010-2011. In the case of rice, the expected increase in LAC will be 9.2%, based on strong growth in production in the countries of the Southern Cone, while the countries of the Central Region and the Caribbean will see a modest growth of 1%. A significant drop in rice production is expected only in Mexico, which will be similar to that forecast for the United States. In some countries of the Caribbean, for example, the Dominican Republic and Cuba, larger rice harvests are expected.

As regards coarse grains, production in LAC will decline slightly due primarily to a drop in maize production in Mexico and Argentina caused by a lack of rainfall.

As for wheat production, even though climatic conditions in the South are favorable, a reduction in the total area planted in wheat in Brazil will result in a slight reduction of total wheat production in LAC, despite a slight increase expected in Mexico.

### ***Agriculture must perform better***

As economies worldwide recover, the demand for agricultural products will increase, because a growing population and higher incomes will put pressure on agriculture to produce more food to guarantee food security. LAC can make an important contribution in this direction.

It is estimated that developing countries will be the new engines driving global growth, that by 2050 their population will have increased by almost 50% over current levels and that the rate of growth of their GDP will be nearly three times greater than those of the developed countries. If the countries of LAC are to benefit from this situation, they must strengthen trade relations with and encourage investment by the fastest growing developing countries.

### ***Energy and food prices are heading in the same direction***

Inasmuch as the sources of fossil fuels are increasingly limited and the demand for them is on the rise as a result of the economic recovery, oil prices will begin to climb again. This is particularly true for the short and medium terms due to political problems in the oil-exporting countries of the Middle East; the consequences of the earthquake in Japan (March 2011), especially the ensuing nuclear crisis; and recent policy statements issued by Germany calling for the suspension of plans to build more nuclear power plants.

To the extent that oil prices surpass US\$100 per barrel and national regulations that dictate the mixture of fuels remain in effect, interest in the production of bioenergy will grow, which will increase demand for agricultural raw materials to produce ethanol and biodiesel.

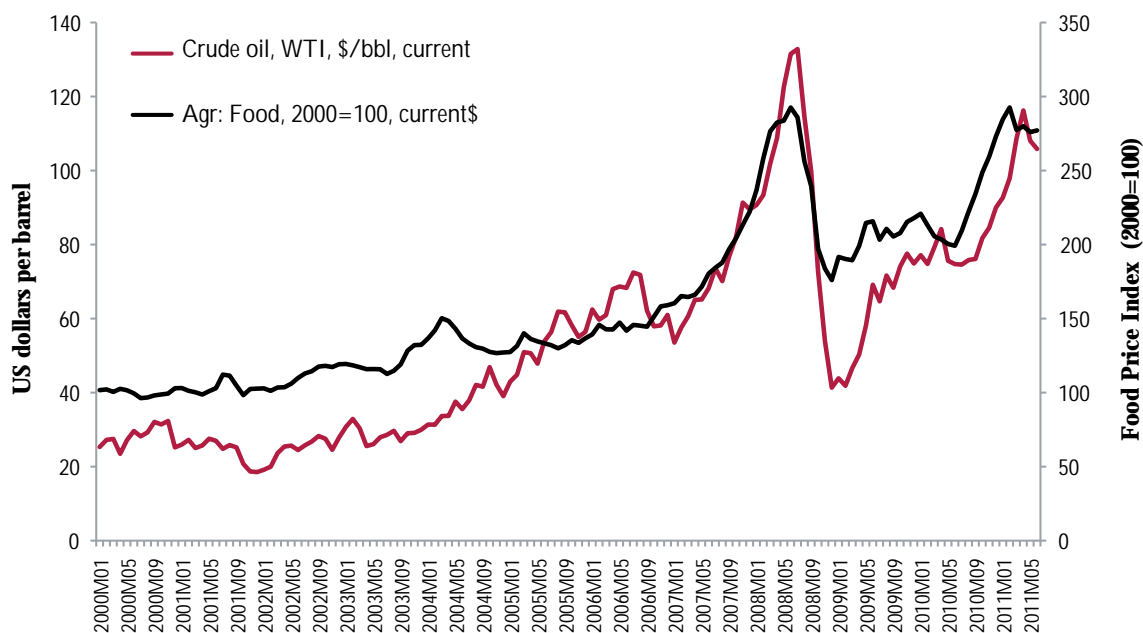
Experience in recent years shows that there is a strong or positive correlation between the price of oil and the price of food, as shown in the following figure. The price of oil will therefore continue to be a factor contributing to high, volatile food prices in the future. See figure 16.

### ***Some countries will not benefit from the long-term trend toward higher prices***

The rise in food prices will create opportunities for exporting countries and problems for net importing countries. The sectors that will benefit most are those that produce grains, oilseeds, dairy products, meat and, in general, those that produce raw materials, although in the tropical countries, the prices of some of their important export products, such as coffee, cacao and sugar, are on the rise.

China will continue to be one of most important trading partners for LAC, requiring greater and greater quantities of agricultural products. At the

**Figure 16.** Food and Fuel Trends



**Source:** IICA, based on official World Bank data base (Global Economic Monitor Commodities, GEM).

regional level, South America will benefit greatly from the demand for commodities. The countries of Central America, as well as the Caribbean and Mexico, will not fare as well because they are not as actively involved in Asian markets as they are in the market of the United States, where the recovery is weak, added to the fact that the devaluation of the US\$ gives their exports a competitive advantage. In addition, the countries of Central America and the Caribbean are hurt by the fact that they are not major producers of agricultural raw materials, and that their small size prevents them from producing on a larger scale.

However, trade relations between China and the countries of the Americas will continue to improve. For example, in April 2010, Costa Rica signed a free trade agreement with China which includes

preferential tariffs for a long list of agricultural products. This is the third agreement of this type that China has signed with a Latin American country, following Chile and Peru. Other countries of the region will probably do likewise because they cannot pass up the chance of trading with the second strongest economy in the world. A challenge for the countries of LAC is to increase the value of the products they sell to China, which currently demands mostly raw materials for its secondary industries.

### *Quality as a factor in competitiveness*

The revival of agricultural trade flows and the challenges related to guaranteeing food security will demand increased production of higher quality

and more competitive agricultural commodities. Quality refers not only to products known for their appearance, durability and organoleptic qualities, but also to their nutritional value. This latter point is becoming a relevant factor in food policies of the developed countries, especially the United States and the EU. For example, in the EU a new law is under discussion calling for food labels to contain information relevant to their nutritional content (fat label). This poses a new challenge for governments and companies and creates the need to invest more in science, technology and innovation.

Increased trade will also pose challenges related to sanitary threats. The spread of the citrus disease in the region, mentioned above, and the recent crisis in Europe caused by a new strain of E-coli which broke out in Germany, and in a week had been detected in 12 countries, illustrate the need to continue to modernize AHFS systems, especially as regards early warning systems.

### ***Research, innovation and information are being strengthened***

The development of national agrifood innovation systems is expected to continue in the countries. The restructuring of the agricultural extension systems of many countries has begun, and in some there are renewed efforts to strengthen national agricultural research and technology institutes. It is hoped that research, the application of biological inputs, the bio-fortification of agricultural products and nanotechnology will be strengthened in coming years. The Brazilian Agricultural Research Corporation (EMBRAPA) and the National Agricultural Technology Institute of Argentina (INTA), have already launched such programs.

The challenges posed by climate change will increase the demand for information on how agriculture can adapt to the changes in climate that are affecting current production patterns.

There are factors behind the change in land ownership, as yet unmeasured, which are leading to changes in the use of agricultural lands. As a result of

the expansion of crop cultivation on a commercial scale, a new urban agribusiness operator has emerged, one who is not necessarily a landowner, but rather rents out land to small-scale owners, thus increasing the scale of production. In addition, large international and state-run enterprises from other countries are buying land. It is to be expected that in the coming years this will be the subject of public policy since it not only affects the capacity of the countries to guarantee food security, but also is related to their national sovereignty.

## • **Recommendations on policies**

### ***To promote innovation***

LAC has the potential to increase agricultural production because it does not face the limitations of land and water found in other regions of the world. However, efforts need to be redoubled to promote agricultural research, technology transfer and innovation. The fact that empirical evidence indicates that the rate of return on public investment in agricultural research and innovation is high is a plus (World Bank 2011a). There are a variety of technologies currently available, but they must be adapted or developed in accordance with the needs of each country. Research and a number of related activities, such as the development of necessary human resources, the acquisition of financial resources and the creation of incentives for investors and academics to get involved, are therefore, fundamental.

### ***To encourage investment***

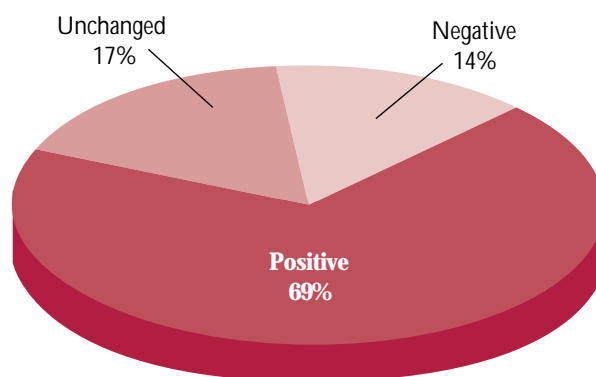
To reverse the trend toward underinvestment in agriculture and earmark more resources for research on innovation, it is necessary to redirect the allocation of public resources to the agricultural sector, most of which today are focused on subsidies of different types (World Bank 2011a), and to encourage private investment.

To take advantage of the opportunities that exist in the agrifood markets and incorporate small-

scale farmers into the markets and value chains more needs to be invested in agriculture. The time is right because, according to most of those consulted by IICA (69%) in the survey; a favorable climate for investment in agriculture exists in their

countries. See figure 17. Only those surveyed in Central America, except Panama and El Salvador, say that the environment for investment in their countries is unfavorable or that no change is expected in 2011-2012.

**Figure 17.** How do you view the climate for investment in the agricultural sector of your country in 2011-2012?



**Source:** Prepared by authors, based on Agricultural Outlook 2011 questionnaires.

***To intensify efforts to modernize AHFS services***

In light of the approval of the new Food Safety Law of the United States, it is more urgent than ever to modernize the official services in LAC responsible for ensuring the safety of products so that they can be approved by the Food and Drug Administration (FDA) of that country. Training will be required if their personnel are to be qualified to certify the safety of exports; otherwise, exporters will have to turn to costly private-sector services to certify their processes and shipments.

***To push for a conclusion to the Doha Round***

The countries of LAC must do all they can to ensure resumption of the process of concluding the

Doha Round because agriculture continues to be the engine driving development and an important source of employment in the region. The existence of clear and equitable rules for trade will make the sector more competitive.

***To address problems related to exchange rate appreciation***

The exchange rate appreciation experienced by most of the Latin American currencies against the US\$ is having a negative effect on the competitiveness of the LAC exports; indeed, in some cases it is even causing the displacement of regional products on international and local markets.

The causes of exchange rate appreciation are unrelated to agriculture. However, monetary authorities and leaders from the agricultural sectors



must engage in a constructive dialogue on ways to counteract the negative effects of the appreciation of currencies on regional exports.

### *To face the challenges posed by climate change*

The effects of global warming and variations in precipitation patterns are already affecting certain crops, both in the tropics and in temperate zones. Changes in climate occur over the long term, but action must be taken in the short term to head off their impacts. As a result, it is necessary to conduct research and generate information that will be helpful in taking short-term measures that will enable agriculture to adapt to new climatic conditions.

### • **Conclusions**

Pressure to guarantee food security worldwide and the tendency of the real prices of agricultural commodities to rise in the long term provide an excellent opportunity for the agricultural sectors of LAC, thanks to the availability of land, the relative abundance of water, the rich biodiversity and the human resources in the region, all of which can be tapped to increase production in the region.

Not all the countries of LAC are able to expand their agricultural frontiers by incorporating additional lands. Some countries such as those in Central America and the Caribbean have serious constraints, and the technological gaps that exist in all the countries make it difficult for them to increase production by increasing yields, which means that the countries of LAC must endeavor to allocate more resources for R+D+i.

Added to this is the challenge of combating the effects of climate change, and the need for agriculture to adapt to and mitigate the impact of such effects on the environment.

The volatility of commodity prices creates uncertainty by increasing risks that make investment-related decisions more difficult. In response, governments must avoid pressures to adopt restrictive trade policies that will further distort international trade. Rather, they should push for a conclusion to the Doha Round of multilateral negotiations.

This would improve the access of the countries of the region to the markets of more developed countries and provide them with instruments for reducing risks and improving the climate for investment, which would make agriculture more attractive as a business.

**Table 4.** Evolution of agricultural trade in LAC based on volume commercialized

Year	Millions of kg			Growth rate	
	Exports (X)	Imports (M)	Net X	Exports (X)	Imports (M)
2000	144277	83101	61176		
2001	173127	81345	91782	20.0	-2.1
2002	174547	82599	91948	0.8	1.5
2003	170087	76051	94036	-2.6	-7.9
2004	259581	84151	175430	52.6	10.7
2005	205355	82316	123039	-20.9	-2.2
2006	209867	88551	121316	2.2	7.6
2007	235176	94181	140996	12.1	6.4
2008	235128	96325	138803	0.0	2.3
2009	220521	94375	126147	-6.2	-2.0
Average for period	202767	86299	116467	6.4	1.6

**Source:** Prepared with United Nations data (COMTRADE).

**Table 5.** Evolution of agricultural trade in LAC

Year	Millions of US\$			Growth rate	
	Exports (X)	Imports (M)	Net X	Exports (X)	Imports (M)
2000	55546	28598	26948		
2001	59343	30522	28821	6.8	6.7
2002	59287	28674	30613	-0.1	-6.1
2003	69608	31058	38549	17.4	8.3
2004	83128	34180	48947	19.4	10.1
2005	94814	37551	57263	14.1	9.9
2006	106429	40361	66068	12.3	7.5
2007	129148	51878	77271	21.3	28.5
2008	163400	70946	92454	26.5	36.8
2009	146751	58521	88230	-10.2	-17.5
Average for period	96745	41229	55516	12.0	9.4

Source: Prepared with United Nations data (COMTRADE).

**Table 6.** Agricultural trade in LAC by country in 2010

Countries	Millions of US\$			Net trade	
	Exports (X)	Imports (M)	Net X	2000/05	2005/09
Barbados	92	301	-209	NET M	NET M
Bolivia (Plurinational State of)	1065	442	623	NET X	NET X
Brazil	63751	8968	54783	NET X	NET X
Colombia	5770	4249	1521	NET X	NET X
Costa Rica	3341	1309	2032	NET X	NET X
Dominican Republic	1256	2110	-854	NET M	NET M
Ecuador	5882	1831	4051	NET X	NET X
El Salvador	974	1497	-523	NET M	NET M
Guatemala	3724	1952	1773	NET X	NET X
Guyana	403	217	186	NET X	NET X
Mexico	18190	21457	-3266	NET M	NET M
Nicaragua	1447	695	751	NET X	NET X
Panama	800	1370	-569	NET X	NET X
Paraguay	3963	775	3188	NET X	NET X
Peru	5740	3351	2389	NET X	NET X
Saint Vincent and the Grenadines	29	85	-56	NET M	NET M
Latin America and Caribbean (16)	116428	50606	65821		

Source: Prepared with United Nations data (COMTRADE).





## Livestock

Development of the region's livestock sector will be dictated by the need to innovate and the possibility of increasing production in family agriculture

*In coming years, the livestock sector will offer great opportunities due to the growing global demand for meat and milk. Those countries that take advantage and capitalize on these opportunities will be in a position to increase their productivity in a sustainable manner and better respond to the preferences of consumers. The opportunity will also arise to enhance the production of livestock in family farming.*



### Facts

- Today, livestock accounts for 46.6% of the gross agricultural product of the region and by 2030 this is expected to rise to 48%.
- The period from 2008 to 2011 has been marked by greater volatility in prices of livestock products, due to low prices and income elasticity in developed countries and to shocks in the supply and demand of these products.
- Between 2005 and 2008, regional milk production increased 10%, reaching almost 76 billion liters. Brazil and Argentina occupied positions 6 and 12, respectively, among the largest producers of milk in the world.
- The performance of the beef sector was weak in the second half of the last decade, growing at annual rates close to 1% which is less than the 4% average rate in the first half of the decade.
- The expansion of poultry production (chicken and turkey) declined from 6% annually in 2000-2005 to 5% in the second half of the decade. Between 2000 and 2008, imports doubled reaching 1.2 million tonnes, while exports tripled reaching 3.6 million tons.
- During the last decade, the production of pork increased at rates close to 2.5%; exports quadrupled, reaching 900,000 tonnes; and imports increased by 50% to almost 700,000 tonnes.

### Trends

#### ***Global consumption of meat has increased but beef consumption has fallen***

In 2010, the global consumption of meat rose by 2.5% due to the expansion of poultry (4.2%)

and pork (2.7%) consumption, although this was partially offset by a slight decrease in beef consumption (-0.2%).

The latter was mainly due to a significant fall in per capita consumption in Argentina (IPCVA 2011), which fell almost to the same level as 90 years ago.

The causes of the decline were shrinking inventories and rising prices. The policy of price ceilings (and export quotas) established in Argentina to contain inflation and the replacement of animal husbandry by more profitable crops have reduced the supply of beef, causing these historical minimum levels of consumption.

In the rest of the countries of Latin America and the Caribbean (LAC), consumption remained steady or grew slightly (1% to 2%) in relation to the previous year. This trend is expected to continue in 2011, with meat consumption rising between 1% and 1.5%, mainly due to an increase in the demand for poultry and pork (Table 7).

In 2010, total meat production followed the same trend, growing 2.8% due to an increase in pork (2.8%) and poultry (4.7%) production partially offset by a decline in beef production (0.1%). In general, demand growth in LAC is similar to the world average, and the decrease in the production of beef is attributable to the situation in Argentina, as explained in the second paragraph of this section.

On a positive note, meat exports grew 3.2% in 2010, much higher than the increase in production, which has consolidated LAC, in particular, the Southern Cone, as one of the world's main meat-exporting regions. In the case of beef, the region includes important exporters, such as Brazil (largest exporter in the world), Uruguay, Paraguay and Argentina. Some others are net exporters, such as Bolivia, Costa Rica, Nicaragua and Panama. Most of the other LAC countries are net importers and, while some have made efforts to export (Chile, Guatemala and Mexico), they are far from reversing this situation. As for pork, the region has produced a net surplus since 2002, with two major exporting countries, Brazil and Chile, and other nations that have developed their export potential, such as Costa Rica, El Salvador, Guatemala, Mexico and Paraguay. This surplus situation has also occurred in the poultry sector, with four exporters (Brazil, Argentina, Chile and Uruguay) and some net importing countries such as Cuba, Mexico, Panama, Dominican Republic, Trinidad and Tobago and Venezuela.

**Table 7.** World consumption of beef, pork and poultry by year  
(Thousands of tonnes)

	2006	2007	2008	2009	2010	2011 (projected)	Variation 2010-2011	
							USDA	FAO
Beef	56,994	58,133	57,975	56,668	56,544	56,493	-0.1%	0.2%
Pork	95,109	93,849	97,853	100,268	102,953	104,392	1.4%	0.7%
Poultry	69,251	73,325	76,124	76,779	79,975	82,226	2.8%	2.3%
Total	221,354	225,307	231,952	233,715	239,472	243,111	1.5%	1.1%
Annual variation		1.8%	2.9%	0.8%	2.5%	1.5%		

**Sources:** USDA 2011e, FAO 2011e.

In May 2011, meat prices hit a new record, increasing almost 20% compared to a year earlier, largely due to demand and supply conditions. The largest price increase affected lamb (38%), while pork saw the

smallest increase. All meat prices exceeded the historical record set in 2008. This trend is expected to continue for all meats in the near future, but the increase in prices of inputs will limit profitability (FAO 2011j).

### ***Important variations in dairy production by geographical area***

In the last decade, global consumption of milk rose from 95 kg per capita to 102 kg. In 2010, global milk production stood at 710 million tonnes, with an average annual growth of 2.2%, which contrasted with a fall of 0.4% in 2009 compared to 2008. The drop that year could have been even higher since the European Union and the United States intervened, removing large amounts of milk from markets. In addition to the financial crisis, contamination of the product with melamine in China undermined the confidence of consumers. However, so far, in 2011, world milk production has increased 1.9% (FAO 2011e). Dairy production in North America, Oceania and, above all, in Europe has grown at rates below the world average, while South America (notably Brazil, Chile, Colombia and Venezuela) and Asia have shown significant levels of growth.

Dairy production expectations for 2011 are good due to the economic recovery and better weather conditions. In particular, Argentina saw 16% growth in the first quarter of the year, while in Uruguay better conditions have allowed it to reverse the 2008 contraction, with projected growth of more than 10% this year.

Strong investments by US and Brazilian companies should give new impetus to the export sector. However, in the case of Brazil high internal prices could lead to a trade balance deficit as occurred in 2010. In the medium term, development of the export sector will depend on its ability to solve problems related to productivity, transportation, industrialization and the internal market. Nevertheless, Brazil has made much progress in terms of product quality, achieving standards in some states that are similar to the EU.

The list of traditional milk exporters in LAC (Argentina, Costa Rica and Uruguay) should also include Colombia. Other countries are emerging exporters (Bolivia, Brazil, Chile, Ecuador, Nicaragua and Paraguay), and a few should soon generate exportable surpluses (Honduras and Peru). Global trade in milk is expected to increase by 4.5%

in 2011 and in the following years will continue increasing at a higher rate than production, due to the gap between supply and demand.

Monthly international prices for dairy products have risen, returning to the trend seen in the early 2000s. Through May 2011, the price index of the United Nations Organization for Food and Agriculture Organization (FAO) was 231, nearly twice that observed at the beginning of 2009 and slightly below the peak in 2008 (FAO 2011j). The factors that have contributed to the strengthening of the prices of these products are solid demand from Asia (in particular, China), Russia and some oil-exporting countries, and, more recently, the weakening of the dollar against other currencies. In the EU and the United States, a more favorable relationship between the price of milk and concentrates has favored more intensive use of the latter and higher production compared to last year (FAO 2011j).

### ***Horizontal integration of the industrial sector has increased***

The trend of horizontal integration continues in the region, especially in the beef sector, due to mergers, acquisitions or expansions in the meat and milk industries, and the formation of large production units for primary production. Examples of this are the Brazilian multinationals JBS and BRF, which have taken advantage of trading opportunities in the agribusiness sector and have expanded and diversified their portfolio of products for export. Other processors, such as Grupo Marfrig, have not lagged behind, making significant effort to attract capital, which has allowed them to increase their production significantly (Brown 2010).

The dairy industry is also showing vigorous growth, as reflected in greater economies of scale and in the diversification and specialization of production. For example, in 2002 Nestlé and Fonterra established an agreement to implement strategic alliances in the dairy sector in the Americas, called Dairy Partners Americas, which allowed Fonterra to complement its capacity for receiving and processing milk with Nestlé's experience in the production and marketing

of food products. In 2009, the Mexican group Lala purchased several processing facilities in the United States, allowing it to become one of the largest milk processing companies in the world with sales close to \$5 billion. Meanwhile, the Brazilian company Bom Gosto announced at the beginning of 2011 the installation of a dairy plant in Uruguay.

### ***Grazing on less productive lands has increased***

Although the pressure to use grazing land for more profitable crops has pushed livestock production into more marginal areas, it has had no impact on stocks, except in Argentina (Fielder 2010) where high soybean prices have pushed livestock into less productive areas. A similar situation may be occurring in Chile due to the expansion of orchards growing fruit such as berries.

In Argentina, the cattle population has dropped from 54 million to 49 million head in recent years, and although 69% of livestock is still in the country's Pampa region, there is a growing shift of cattle to other regions, which leads to increased environmental risk. Meanwhile, the agricultural area doubled from 15 million hectares to 30 million hectares between 1998 and 2009, and the number of livestock farms fell 11.4% between 2005 and 2010 (FAO 2010c). It is important to study the impact that the above has had - and will have - on the supply side, meat production costs and the environment.

### ***Animal diseases pose systemic risks***

Animal diseases pose systemic risks that should be faced. As long as new pathogens continue to emerge, policy instruments must be strengthened to ensure animal health and food safety and reduce the risk of transmission of animal diseases to humans.

Animal health institutions must strive to link the productive sector to the fight against cross-border animal diseases and also to improve the access of small-scale producers to their services, rather than to

restrict the development of their productive systems (FAO 2009a).

The management of risks associated with animal, environmental and public health, as well as the effective response to emergencies in the livestock sector, requires enormous effort in the area of technical cooperation. These should be designed to strengthen national animal health systems and promote policies and strategies for sustainable livestock development, national information systems, risk analysis, prevention and emergency response.

In this context, innovative mechanisms are needed to provide technical support and mobilize international resources in order to strengthen risk analysis strategies in the production and animal health areas, and to deal with natural disasters that impact the livestock sector, the environment and public health in countries of the region.

Organizations such as FAO and IICA help countries to comply with international health regulations and the standards of the World Organization for Animal Health (OIE), with particular emphasis on combating diseases that affect trade.

Measures to ensure quality include good livestock practices, hazard analysis and critical control points (HACCP), clean production agreements and biosafety programs.

### **• Prospects**

#### ***Continuing pressure on input prices***

Policies that promote the production and use of renewable fuels (biofuels) will continue to pressure the prices of grains, which means that intensive systems (poultry, pork, and grain-based milk production) will lose competitiveness, which will boost the development of pastoral livestock production systems. In South America, the production of meat and bovine milk should continue to grow strongly, especially in Brazil, Uruguay, Paraguay and Argentina, followed by Chile and Colombia if they are able to achieve significant export volumes.

**Table 8.** Projected meat consumption by type

Type of meat	Region	Consumption (1000 t)		Growth (%)	
		Average (2007-2009)	2019	2000-2009	2010-2019
Beef and veal	World	64,231	73,547	1.23	1.53
	LAC	14,943	17,527	1.93	1.53
Pork	World	102,455	126,404	1.81	1.75
	LAC	6,212	7,317	2.39	1.66
Poultry	World	90,769	116,045	3.22	2.30
	LAC	18,218	24,361	5.12	2.34
Lamb	World	12,392	15,284	1.85	2.13
	LAC	394	442	-0.14	1.15

Source: FAPRI 2010.

### *Slower growth in meat consumption*

The projected increase in meat consumption in LAC through 2019 is slower than in the previous decade.

Poultry consumption will be the most affected, given higher projected prices compared to prices for other meats.

The only exception is lamb consumption, which is expected to increase by 1.15% annually in this decade after falling in the previous decade.

Population growth, rising incomes and urbanization continue to drive growth in the global consumption of meat (FAO 2009a).

The OECD and FAO (2010c) indicate that between 2010 and 2019 world meat production will increase 23.2%, reaching 334.54 billion tonnes. In the case of LAC, the increase will be close to 29.8%, reaching 58.28 billion tonnes, representing 17.4% of world production. However, 59% of the increase will come from Brazilian production, which accounts for 54% of regional production. The three most important meats produced in LAC (pork, poultry and beef) will increase their global share, especially

beef which will reach 2.3% of world production at the end of the decade.

According to the Food and Agricultural Policy Research Institute (FAPRI 2010) and the OECD and FAO (2010c), real meat prices are expected to exceed those of the previous decade in 2019 as a result of the economic recovery. Beef price are expected to peak in 2014, reaching US\$3.90/kg and end the decade (2019) slightly above US\$3.80/kg, which means a 22% increase over the average for the period 1999-2009. Pork, meanwhile, is expected to reach US\$1.18/kg in 2019 with a maximum of US\$1.23/kg. As for poultry, average growth of 1.80% per annum is expected for the decade, reaching US\$2.00/kg in 2019. These higher prices can be explained by an increase in the demand for this type of meat, as well as an increase in the price of livestock inputs, in particular of grains and fertilizers.

### *Increased dairy production in the next decade*

According to the OECD and FAO (2010c), during the next decade the production of milk will expand 2.2% annually, with a higher increase in countries



that are not members of the OECD (3.1%) than in member countries (0.8%). FAPRI projections also suggest an expansion of 2.1% in global milk production, while in the LAC region growth will be about 3%.

For example, Mexico and Brazil are projected to increase annual production by 2.8%, Argentina by 2.5% and Peru by about 3%. It should be noted, however, that despite the increase in Mexico it will not be enough to cover domestic demand.

In addition, Brazil is projected to be the third largest world producer of cheese in 2019 (but still far behind the United States and EU) and of whole milk powder (with the same amount of production as New Zealand).

In general, LAC milk-exporting countries are optimistic and expect to significantly increase their production in this decade. According to specialists from Argentina's National Institute of Agricultural Technology (INTA), by 2020 production in that country could reach 18 billion liters of milk, with 21.8 liters per day per animal and a population of 2.3 million dairy cows, compared to 16.9 liters per day per animal and 1.7 million dairy cows currently. In addition, by the end of this decade Argentina will export 45% of its milk production compared

to 25% currently. In Chile, the situation is similar since production should increase by 7% annually, reaching 4 billion liters in 2020, with more than 750,000 dairy cows and a production of 16 liters per day per animal. Uruguay also hopes to double its production in a decade.

This optimism is based on the estimation of some experts who believe that the world currently has a shortfall of 30 billion liters of milk, which must be made up in coming years. This deficit is due to the reduction of European subsidies for the dairy sector, climate impacts in Oceania and competition for corn used in ethanol production.

The increase in incomes in developing countries will boost domestic consumption, continuing the trend of recent years. Considering that major producers in South America have costs similar to those in Oceania and less than those in the northern hemisphere, one can expect an increase in the exportable supply in the medium term but this will depend largely on the capacity of the industry to offer prices that are attractive to producers. FAPRI (2010) projections, however, are conservative (Table 9). Of the countries surveyed, only Peru could increase its milk production significantly, which would increase its export potential, while only modest growth is expected in other countries.

**Table 9.** Production of milk by country in the LAC region

	Production (thousand liters/year)			Growth (%/year)	
	2000	2010	2019	2000-2010	2010-2019
Argentina	9,800	10,361	12,899	0.6	2.7
Brazil	20,354	27,981	36,942	3.7	3.6
Colombia	6,148	7,377	8,765	2.0	2.1
Mexico	9,591	11,398	14,724	1.9	3.2
Peru	1,100	2,008	3,649	8.3	9.1
Uruguay	1,422	1,695	1,894	1.9	1.3
Venezuela	1,314	1,580	1,815	2.0	1.7

Source: FAPRI 2010.

### ***Social challenges in the commercial and intensive livestock sector***

Some experts have proposed actions that would not only improve the profit margin of companies, but also add value to society (shared value). These proposals include: a) promoting a new public perception of products (e.g., healthier foods); b) rethinking the operation of value chains, particularly when it comes to the use of resources (for example, reducing the water and energy consumption); and c) stimulating international cooperation designed to achieve both these goals. To this end policies are needed to strengthen partnerships within the sector and the development of suppliers, with a view to extending the benefits to the farming sector, for example.

### ***Environmental issues must be addressed***

Evidence suggests that the livestock sector should address environmental problems associated with production growth. Currently, the major environmental challenges are addressing climate change, promoting appropriate water management, and protecting biodiversity and soils. In many LAC countries, livestock is making an important contribution to meeting these challenges.

But there are two negative externalities which will exert greater pressure on the sector in the next decade and that, as a result, should be taken into account in the decision-making processes of livestock companies: carbon emissions and water consumption.

There is significant evidence and consensus that the climate is changing at a global level. Livestock plays a dual role with regard to this problem: it is a cause of climate change, but at the same time it is a victim of it. Given the importance of this issue in coming years, it is likely that the market will establish new requirements for the livestock sector so that it can contribute to mitigating the effects of climate change. At the same time, countries will be forced to promote sustainable livestock production, which means reforming institutions, generating capacities and designing new strategies.

In addition, many people believe that water will be the main theme of the environmental movement in coming years. This is because awareness has increased that water is not an infinite or renewable resource, which means it will be necessary to use it more efficiently in the immediate future.

### ***Animal health and food safety***

Early warning systems and the monitoring of disease outbreaks should be reinforced to avoid emerging animal diseases associated with climate change or to detect them in a timely manner. Measures should also be taken to ensure swift control or the eradication of these outbreaks.

Biosafety measures and good sanitary practices on farms should also be implemented in order to reduce animal disease outbreaks and the risks they entail for human health. It is also imperative that biosafety in family production and small-scale livestock systems be improved and access of farmers to veterinary services be facilitated.

### ***Continuing risk of price volatility***

According to FAO estimates, the volatility of food price indices has increased sharply since 2008-2009, when the prices of these products first experienced a strong boom and then a sudden drop, as a result of the global financial and economic crisis. For products such as beef and lamb, this high volatility occurred again in the first half of 2011 (ECLAC, FAO and IICA 2011), although in both cases the price variations have been linked to a longer term upward trend.

#### **• Policy recommendations**

### ***Strengthen policies for the development of family livestock farming***

The livestock sector, particularly in the subsector of small family producers, could make an important

contribution to economic and social development in LAC, not only because it produces products that add value to the economy, but also because it offers rural households a livelihood that helps them to fight poverty and food insecurity.

However, policies and programs aimed specifically at this important socio-economic sector are urgently required. Small-scale producers, who generally are located in environmentally fragile areas and who are the most vulnerable to climate change, require institutional support to enable them to recover the productive capacities of degraded soils, implement sustainable management and animal feeding practices, improve the quality and safety of their products and facilitate their access to markets.

### ***Promote innovation***

There is general consensus that economic progress is mainly achieved through the development and application of knowledge. As a result, public policies are needed to support innovation within the value chain of livestock products.

*Financing Research, Development and Innovation (RDI) projects:* The financing of RDI projects in the area of sustainable livestock farming should be maintained and strengthened, incorporating lines of credit and policies aimed specifically at small-scale livestock producers.

*Support for livestock companies:* Instruments that promote innovative practices within livestock companies, such as venture capital funds and projects to improve these practices, should be created and strengthened.

*Provision of information services:* Better market and business opportunities accelerate innovation processes. As a result, information services should be provided that help producers understand market trends and the opportunities that arise from them.

### ***Promote competition***

The livestock industry is already highly competitive. However, measures to promote greater competition, such as the strengthening of antitrust courts and consumer rights associations, should be taken. These provide better tools for consumers, which allow them to better defend their interests (Engel and Navia 2009).

### ***Invest in human capital***

Given that knowledge is a company's greatest asset, human capital is essential. Therefore, in order to strengthen their capacities, livestock companies should invest in training their workers, especially the most vulnerable. In addition, innovation should be promoted in the livestock sector to develop human resource skills, create a system of accreditation for training entities and emphasize knowledge transfer to promote both the sustainability of the sector and the identification of business opportunities.

### ***Address the challenge of climate change and natural resource management***

*Carbon emissions and climate change:* The sector should move towards livestock farming that generates lower levels of carbon, especially since this type of farming is more sustainable and competitive. Climate change adaptation measures also need to be instituted, with a view to reducing its negative effects on livestock production.

Strategies need to be put in place to optimize the use, management and harvesting of natural resources. Extensive livestock systems should shorten their productive cycles while improving productivity and diet quality, which means increased grazing and the correct use of supplements. Management systems should be instituted to control purine levels, which is compatible with the goal of reducing emissions, and also to promote the use of silvo-pastoral systems aimed at achieving sustainability.

To encourage adaptation to climate change, it is important to improve biosafety and promote the development of risk management skills. Investment in technology, access to new markets, payment for environmental services, agro-tourism, ecotourism and the development of green markets should also be encouraged.

*Natural resource management:* The large area of degraded lands and the projected expansion of livestock production are a warning sign to governments and other public and private actors about the need to set in motion policies and programs that promote sustainable agricultural development in the region.

The recovery of pastures and degraded lands must be achieved through public policies, investment and the use of new technologies. This will bring a huge social, economic and environmental benefit to the region and is essential for the achievement of the Millennium Development Goals.

Water is an essential resource for the sustainable management of livestock production, but glaciers are shrinking in the region and this will have an impact on water availability in the long term. Agriculture is the sector which consumes the most water in Latin America, between 68% and 75% of total consumption. Growth of the land area under irrigation has been slow, and in the future will be limited by the shortage of this resource in many countries of the region (ECLAC 2010c).

Livestock farming in the region mainly occurs in rain-fed systems, which means models are needed to promote the optimization of water use, including efficient systems for the collection, storage and utilization of water in intensive livestock systems.

Countries should also continue to implement strategies aimed at the protection of river basins, the evaluation of water requirements and the genetic improvement of forage species tolerant to drought.

One of the factors that explain the high value of the water footprint is the low efficiency of its utilization in the agricultural and livestock sectors, aggravated by the fact that both use water intensively. Although there is enough water in the world to meet the needs of the current and future population, consumption and production levels should be sustainable. In this regard, efforts are needed to raise awareness by positioning the subject in the national debate. The development of technologies that improve the product/quantity relationship of water consumption should also be promoted, as well as the growth of green markets.

## • Conclusions

In the coming years there will be great opportunities in the livestock sector given the growing global demand for meat and milk. To meet this demand, countries in the region must mitigate the consequences of climate change and improve the sustainable management of their natural resources.

The countries that take advantage of these opportunities and capitalize on them will be those that increase productivity in a sustainable manner through innovation, while responding more effectively to consumer demands and preferences.

There is also an important opportunity to promote livestock farming in family agriculture, which links increased livestock production (by improving their productivity) to poverty reduction and sustainable resource management.





## Fishing and Aquaculture

### Towards better governance and sustainability

*The region's fisheries and aquaculture sector is undergoing a transition from a small-scale model to one that is technology intensive, export-oriented and more focused on environmental sustainability than ever before. In this scenario it is important to create the conditions for better sectoral governance throughout the region, to end "assistencialism" in programs that support small-scale fisheries, to design alternative mechanisms that ensure the productive and economic sustainability of local communities and, finally, to achieve greater "visibility" and political support for aquaculture.*



#### Facts

- In almost all wild fisheries of Latin America and the Caribbean (LAC), the maximum sustainable catch limit has been reached and, occasionally, exceeded. As a result, in most countries catch levels can only be increased in a sustainable manner through better utilization of fish discards (bycatch), improvement in the administration of fisheries and the harvesting of underexploited species, such as krill and giant squid from the Southern Ocean.
- Aquaculture continues to be the food production sector with the highest growth globally and it has excellent potential for development in LAC.
- The contribution of fish to the average diet of the population in LAC continues to be modest (9-11 kg per person per year), well below the international average (17 kg per person per year).
- Fishing and aquaculture directly employ 1.3 to 1.4 million people in the region, many of whom are in rural areas where employment options other than traditional agriculture are scarce.
- Commercial fishing in the region, which is mainly marine-based (96.8% in 2007-2009), included 458 species in 2009, while only 76 species were farmed, mainly of marine origin (72.2% in 2007-2009).
- In 2010 the Aquaculture Network of the Americas (RAA) was created and many countries in the region have joined. This institution, formed with FAO's assistance, aims to become the main forum for the exchange of knowledge and experiences in aquaculture in the Americas. The Executive Secretariat will be based in Brazil for a period of four years.
- Commercial fisheries and aquaculture activities in most LAC countries are poorly regulated and tend to lack long-term goals needed to guide producers and other actors in the sector.

- **Trends**

### ***Reduced commercial fishing activity***

Commercial fishing has reached its maximum level of production in LAC. In the period 2007-2009, this activity accounted for 89.7% of the landings in the region, a percentage that has been gradually declining over the past 40 years due to the sustained growth of aquaculture.

If the annual average growth rates for the period 1999-2009 are maintained (-1.7% in commercial fishing and 9.8% in aquaculture), total landings for the period 2009-2020 will increase from 17.2 million tonnes to just 17.9 million tonnes, which implies that the availability of fish per person would fall from 37.3 kg to 33.7 kg a year.

As a result of the likely decline in the per capita availability of fish products in LAC through 2020, export surpluses are expected to decrease, while domestic prices will rise. Meanwhile, the share of aquaculture in regional landings will increase significantly, exceeding 20% probably and more than doubling current levels.

### ***Greater importance of aquaculture but slower growth***

The annual average growth rate of aquaculture in LAC dropped from 13.3% in 1999-2004 to 6.3% in 2004-2009. Notwithstanding, from 2004 to 2009 LAC's aquaculture growth rate was exceeded only by Africa, which had reaching an annual average of 12.1%.

The loss in the momentum of regional aquaculture growth is mainly explained by the relatively low growth in marine harvests (15.7% annually in 1999-2004 and 4.4% in 2004-2009), as opposed to the increasing growth rate observed in freshwater production (7.8% and 11.1%, respectively).

The prevalence of diseases and increasing difficulties in obtaining marine licenses also contributed to

the lower growth rate in marine production, while technological improvements and the growing interest in freshwater fish explains the more vigorous growth in this area of great importance to rural producers.

The sluggish performance of marine aquaculture in the last decade is most noticeable in South America where average annual growth fell from 15.2% to 3.6%, and in Central America where it fell from 18.7% to 10%. In the Caribbean, however, the negative variation in 1999-2004 (-2.3% annually) was reversed to show an average increase of 16.3% annually between 2004 and 2009. Freshwater fish production, meanwhile, is also growing in the Caribbean (up from -5.4% to 3.3% annually) and in South America (up from 8.2% to 14% annually), but growth slowed in Central America from 17.9% to 0.8% per year.

Due to fish farming growth, in 2007-2009, aquaculture accounted for 56.3% of the regional production of crustaceans, almost 100% of diadromous fish, 50% of freshwater fish and 15.3% of mollusks. However, aquaculture still plays a relatively small role in the production of marine fish (less than 0.05%), because of the relative difficulty in farming these species, long gestation periods and high investment requirements.

### ***South America is the regional leader in commercial fisheries and aquaculture***

With a total catch of 14.7 million tonnes in 2009, 86.2% of wild catches and 83.6% of aquaculture production, South America continues to lead the region in fisheries production. In fact, Peru and Chile occupy third and eighth place among the major fishing countries of the world (2007-2009). Commercial fishing is dominated by pelagic fish species, in particular anchovy, jack mackerel, sardine, Spanish mackerel and giant squid. Fish farming, on the other hand, is dominated by Pacific white shrimp, Atlantic salmon, rainbow trout, mussels and tilapia. Chile and Brazil stand out as aquaculture producers, with 65% of the regional harvest in 2007 -2009. Combined with Ecuador

and Mexico, these four countries were responsible for 83% of the region's aquaculture production.

In Chile, aquaculture is mainly in the hands of medium-sized and large companies that farm salmon, trout and mussels in a marine environment, in contrast to Brazil which is dominated by small and medium-sized producers of freshwater fish.

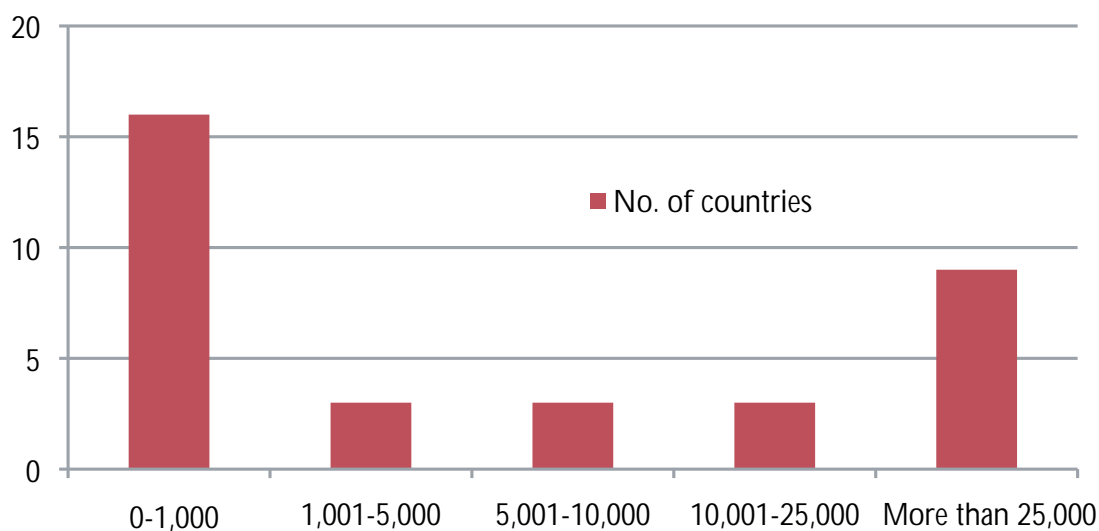
Brazil, with over 8,000 km of coastline, has practically no marine aquaculture beyond shrimp and some mussel and oyster farming. Argentina, also with a long coastline, is another country without significant marine aquaculture. However, the opportunity offered by the coastlines of these countries, as well as South America's potential to increase its harvest of

freshwater fish, mollusks and other species and the likelihood that production will increase significantly in countries like Chile, Colombia, Ecuador and Peru, means that South America will continue to lead the Americas in aquaculture.

***Aquaculture is poorly developed in many countries of the region***

Most (16) of the 34 LAC countries with aquaculture production harvested less than 1,000 tonnes per year of fish between 2007 and 2009, and only a few (9) harvested more than 25,000 tonnes per year in the same period (see figure 18).

**Figure 18.** Average annual aquaculture production in countries of the Region 2007-2009 (tonnes)



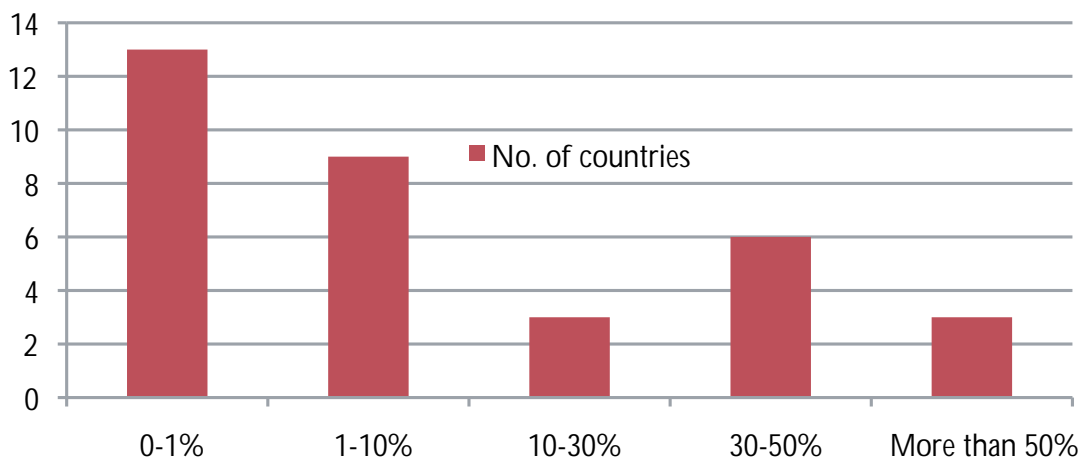
Source: FAO 2010f.

In 13 LAC countries aquaculture accounted for less than 1% of their total production (2007-2009), and only in three cases (Cuba, Costa Rica and Honduras) did aquaculture account for more than 50% of the total fish landings (see figure 19).

Except for Asia and a few countries that have a well-developed aquaculture sector, these figures reflect the relative youth of this industry in the world and the region. However, they also predict a promising future if the sector manages to acquire greater political importance and is able to overcome some other limitations.



**Figure 19.** Aquaculture production as a share of the total catch in each country of the Region (2007-2009)



Source: FAO 2010f.

### *Diseases continue to threaten aquaculture*

Diseases in Chile, Mexico and other countries, have reached epidemic proportions, affecting fish production and, as a result, employment. The emergence of these diseases can be attributed, in general, to inadequate production practices – a reflection of the sector’s youth – as well as the lack of commitment by some producers to protecting the environment and the existence of regulatory loopholes.

Governments and producers alike must learn to control disease outbreaks, use responsible production systems, avoid exceeding the environmental capacity and establish health and biosafety practices that guarantee the sustainability of the industry and minimize negative externalities.

Several LAC countries lack trained professionals in these areas, which is why technical assistance among these countries is an area with ample opportunity for development.

### • Prospects

#### *The region’s fisheries will become more dependent on aquaculture*

Higher expectations of an increase in fisheries production in the region will continue to be linked to aquaculture since no major advances in commercial fisheries are expected.

There is significant scope for the development of aquaculture in the region. If this occurs, aquaculture’s share of total catches will probably increase from 10.3% (2007-2009) to over 20% by 2020 for the following reasons: (i) the introduction of this activity in new countries or territories, (ii) an increase in production and productivity in fish farming countries, (iii) the cultivation of new species, (iv) technological improvements, and (v) better trained entrepreneurs and aquaculture workers.

Given that local markets in LAC show low to moderate growth, aquaculture in the region should

be based on an export model. However, efforts to increase the domestic supply of fish products, in particular in those countries that are net importers of these products, should not be excluded.

### ***Conflicts and uncertainty regarding production models in commercial fishing and aquaculture continue***

At a global level, aquaculture development has been more or less unaffected by the relative importance of the diverse groups of farmed species, while in LAC the industry's development has been marked by important structural changes.

In the 1950s, aquaculture was based on the cultivation of mollusks and freshwater fish, and was mainly dominated by small-scale farmers who supplied fish to local communities. This situation has changed gradually and aquaculture has shifted to the farming of diadromous fish (salmon) and crustaceans (whiteleg shrimp), as well as the production of large quantities of freshwater fish and mollusks (mainly mussels).

The shift in emphasis in farmed species has allowed LAC to excel in producing high-value species, surpassed just recently in this regard by Oceania only. Although this orientation limits the consumption of these products in low-income local populations, it has favored the emergence of a thriving aquaculture export sector that generates highly desired foreign exchange surpluses in several nations.

This export model is also associated with productive structures that are increasingly technology-intensive and dominated by large and highly competitive companies able to compete with the most sophisticated ventures in any part of the world.

For their part, small-scale commercial fisheries, which usually supply most of the demand in local markets for fresh products, are facing a decline in biological resources with little economic incentive to improve their technology and quality. This is mainly due to poor market transparency and a lack

of consumer education, which means consumers are not usually willing to pay more for better quality products.

The dependence of artisanal fishermen on intermediaries, who capture a significant proportion of the price paid by consumers, as well as the lack of incentives to improve technologies and quality, limited requirements by local consumers, and the usual instability and poor economic performance of this activity are not new in this sector: they form part of a reality that has prevailed for decades in the region. Lately, however, this situation seems to have reached unsustainable levels in different parts of the continent and is forcing many fishermen to abandon their traditional occupation.

The small-scale producer also faces the challenge of globalization which implies numerous and sophisticated demands from consumers in foreign countries, in addition to increased competition from imports in their own markets.

In the case of small-scale aquaculture, the dependence on third parties for the provision of juvenile fish, seed and post-larvae should be added to this list, as well as the difficulty for small-scale producers to make themselves attractive to consumers in large urban centers and in the eyes of exporters.

Thus, we must “rethink” the productive models of small-scale fishing and aquaculture in the region in order to generate sustainable structures. In commercial fishing, the medium-term solution could be to reduce the number of operators and vessels, while in aquaculture, economies of scale, technology, economic efficiency and demand oriented activities should be reviewed.

The reality of the small-scale producer should also be reviewed, vis à vis medium and large-scale production to devise formulas that enable the long-term coexistence of all players.

The shortage of fish stocks, which will be increasingly felt in coastal areas in the future, will cause many artisanal fishermen to lose their source

of employment in the medium and long-term. As a result, it is important to identify aquaculture production models that can accommodate some of those small-scale operators.

### ***Other challenges to the stability of aquaculture and small-scale fishing***

Increases in the prices of fish products, which have reached historical levels in almost all countries (FAO 2011a), has allowed larger producers to compensate for the rise in the price of inputs. However, higher input prices could jeopardize the livelihoods of small-scale fishers and farmers.

To this should be added other weaknesses of traditional aquaculture, many of which are structural and relate to the scale of production, management, dependence on third parties (provision of technology and financing), the ability to adhere to government regulations and increasingly complex markets and standards imposed by globalization.

### ***Good commercial opportunities in the medium-term***

The internal demand for fish products in the region is expected to increase moderately. In Central America per capita consumption of fish products is expected to grow strongly through 2030, while in South America growth will be moderate. Higher incomes and a growing population will be the main engines driving local demand, although a seafood trade deficit in several countries will also have an impact.

As a result, human consumption of fish products in the region could reach 6.8 million tonnes by 2015, with an average of 10.7 kg per person per year (whole fish weight). Similarly, it is estimated that the increase in world demand for fish products for human consumption between 2015 and 2030 will reach 49.7 million tonnes. Around 60% of this demand will come from Asia, while in this period the region could increase domestic demand by about 3.5 million tonnes.

The current strength of several local currencies against the dollar is a problem for exports of fish products from the region and makes imports more attractive. However, in the medium to long-term the opportunities for exporting aquaculture products to developed countries or countries with a deficit in fish availability or higher purchasing power should increase. LAC has natural conditions and other characteristics that favor the practice of aquaculture in all environments.

The development of regional aquaculture, which is based mainly on increasing exports, means adhering to demanding productive, technological, quality and health requirements. Under these conditions it is a challenge for each country to come up with schemes to support and sustain growth among small producers.

### ***Competition for coastal lands and inland water resources will increase***

Conflicts over the use of coastal areas and freshwater sources will continue in the region, delaying the development of new fish species and making fish farming more expensive. This will impact small-scale producers most.

Increasing pressure on these resources will result in rising levels of water pollution, which will interfere with or threaten fish farming and commercial fishing. In addition, the value of land near freshwater sources and the sea is expected to increase.

Due to these and other considerations, medium and large-scale aquaculture producers are developing alternative technologies for marine species. While these technologies still need to be fine-tuned, they will enable producers to face these challenges. These are offshore or land-based technologies that operate by pumping water with or without recirculation. In the first case, species are placed in floating or submersible structures capable of withstanding winds and swells on the open sea. These technologies, currently being developed, are still used on an experimental basis in many countries and have not yet been widely

disseminated, except for specific projects in Panama and Puerto Rico as well as tests in Brazil, Chile and a few other places. The technological complexity and higher quality requirements in the juveniles/seed used for farming suggest that this type of aquaculture would be better adapted to large-scale projects and that it will also require significant investment and qualified personnel.

Projects using seawater pumped to land, especially those using recirculating aquaculture systems, are appropriate for medium-scale production (1,000 to 3,000 tonnes per year) and also require significant investment.

It is therefore likely that small-scale marine aquaculture will be concentrated in areas near the coast which is easily accessible and where producers can use more conventional technologies.

It is also likely that in future, disputes between aquaculture producers and fishermen in coastal areas will continue since it is common for fishermen to complain about farmers working in their traditional fishing grounds.

As knowledge improves, however, activities that combine aquaculture and fishing will begin to receive more attention in LAC. For example, wild juveniles could be caught by fishermen to complete their growth in captivity, or ad hoc laboratories could be used to produce juveniles/seed that would later be released into nature. They could therefore grow without artificial feed, the expectation being that a reasonable portion of them can be recaptured in their adult stage. In Chile, juveniles of flatfish species as well as seed of sea urchins and some mollusks have been released in coastal habits, in an attempt to supplement and rehabilitate artisanal fisheries or make them more viable, while in Mexico and Costa Rica, juvenile tuna fish have been caught and further fed until they reach attractive market sizes.

There is no doubt that the increase in productive activity and in human coastal settlements makes it absolutely necessary to improve planning in the use of coastal areas as well as land areas near large bodies of water. The most widely held principle of national

authorities is to assign areas suitable for aquaculture and, in more evolved cases, to do so by estimating their “carrying capacity” or the level of sustainable production.

### ***New diversification options***

In recent years, commercial fisheries have only rarely experimented with the capture of new species or the adoption of dramatically new technologies. However, this is not the case with aquaculture in the region where several countries have shown an interest in developing new production options that are especially focused on native species.

To date, most of the aquaculture in LAC has used introduced species such as salmon and trout, shrimp, tilapia, African catfish, carp, etc. Diversification based on native species is particularly attractive to small-scale fish farmers who, with the appropriate technologies, could produce limited quantities of freshwater fish, algae and marine shellfish for subsistence and for sale at the local level. The cycle of technological development for these species is shorter than it is for marine species and, in addition, their farming requires technology and tools that are easier for small- and medium-sized producers or individuals to access and use.

If environmental safeguards are duly considered, future farming activities could also be based on introduced species that already have well-developed technologies and markets, as is being done in Puerto Rico, Panama and other countries with pangasius, panga or basa (*Pangasius hypophthalmus*) and, in Chile, with the European scallop, hirame, Arctic char, halibut and Japanese sea cucumber, among other species.

### **• Policy recommendations**

#### ***A “new look” at the small-scale producer in the fisheries sector***

The “assistencialism” that is typical of past periods was unsuccessful because of the difficulty of

sustaining its effects, which tended to fade once aid programs ended. This resulted in a waste of public resources and much frustration among producers and local communities.

Similarly, the work systems used in these programs have restricted small-scale aquaculture producers in the region to primary production activities and made them highly dependent on third parties due to their lack of economies of scale and level of organization. As a result, these types of producers have been unable to influence market prices, attract funding or ensure job stability for the family group.

Governments, therefore, should propose new production models, and design and implement policies that encourage the “self-sustainability” of small-scale aquaculture producers beyond short-term aid programs. In addition to technical-productive parameters, these programs should cover organizational, financial, logistical and commercial aspects that allow for more direct access to markets and a larger share in commercial margins.

Finally, the new assistance programs must be proven on a “pilot” scale before being widely disseminated so as to ensure their effectiveness in supporting the establishment of self-sustaining productive activities.

### ***Implement mechanisms to improve fisheries and aquaculture governance***

Of all the variables that affect the development prospects of fisheries and aquaculture in the region, good governance is perhaps the most important.

Current deficiencies in fisheries and aquaculture regulations need to be analyzed in detail in all countries so as to make improvements that facilitate the sustainable development of the sector.

Failure to enforce regulations such as fishing bans, site permits and the importation of disease-free genetic material, as well as neglect in relation to offshore and other productive alternatives are all too common in the region.

In addition, in many countries there are no regulations to recognize the operational and financial limitations of small-scale aquaculture, a situation that must be corrected. While large companies have the financial capacity to wait for long bureaucratic licensing processes to run their course, small-scale producers rarely know the rules or comply with them. Since application procedures can be costly and time-consuming, some producers work illegally and are thus exposed to abuses and become ineligible for State loans, grants or assistance. For these reasons, limited-resource aquaculture production must be properly defined so as to come up with regulations that help producers effectively deal with their “competitive disadvantages”.

Governments also need to maintain a fluent dialogue with representatives of productive chains and NGOs. To do so, producers and other actors that represent their base must organize to serve as valid interlocutors. If these organizations do not exist or are not representative, effort must be deployed to facilitate their creation or upgrading.

Finally, LAC has failed to formulate long-term plans to set national objectives for the sector and propose strategies for achieving them. State policies should therefore be developed with a timeframe of 10 or 15 years to transcend political mandates. In addition short-term strategies that are tailored to the vision of current governments need to be designed.

Improved sectoral governance must also involve renewed efforts to train as many workers as possible in bureaucratic institutions in this sector throughout the region.

### ***Scientific and technological development should be focused on productive aspects and climate change adaptation***

Fisheries authorities in the region need to further their scientific knowledge of commercially exploited fish populations and their dynamics. LAC currently invests little in this regard. The result is uncertainty and exposure to cyclical crises such as

those that have beset pelagic fisheries in Chile, Peru and Mexico; lobster in the Caribbean and Central America; and mollusks and sea urchins in various parts of the region.

Similarly, new aquaculture production models should be created and become alternative sources of employment for displaced artisanal fishermen, and, specifically, for small-scale aquaculture. New efforts towards productive diversification (species, environment, etc.) must be based on scientific and technological advances developed in the region or adapted to it, given that today, unlike the past, there is a greater emphasis on farming native species.

Research and development (R&D) in the region should be redirected towards increased support for productive efforts. This means reviewing policies and strategies used by various competitive funds and sources of financing for science and technology throughout the region.

Efforts should focus on a limited number of technologies and species to develop a critical area of research and promote effective results in the shortest possible period. It is also important to study the effects of climate change on fishing and aquaculture in the region, and design policies that enable producers to adapt, particularly in rural areas.

### ***Promote the growth of domestic markets***

National strategies are needed to promote the consumption of fisheries and aquaculture products in domestic markets. The health benefits of fish are the best stimulus to introduce fish into the diet of the population.

It should be acknowledged, however, that fish products are relatively expensive and that the region, especially South America, has a deeply rooted tradition of consuming beef, poultry and pork. As a result, mechanisms are needed to standardize fish products, improve their quality, lower prices and ensure the regularity of supply. Only in this way, and through promotional campaigns based on these “new attributes”, can local fish consumption be increased.

### ***Provide more and better information***

The lack of adequate and timely information about fish markets can be costly for society, and adversely affects the small-scale producer who is often unaware of what is going on with supply, demand and prices. Consumption is also adversely affected because imperfect competition makes it difficult to lower prices.

More and better statistics about fish production, trade, productive capacity and employment are therefore a must if policies and strategies for the sustainable development of aquaculture and fishing are to be adopted.

Also needed are studies to identify and support areas in which each country should specialize in order to generate competitive and high-quality products sought in the market, consistent with existing capacity and available options.

### ***Reduce the risk associated with aquaculture***

Aquaculture is a relatively new activity on the continent and is therefore still perceived as “high-risk” by the business community (and even the authorities). This situation must be corrected based on the following specific strategies:

- (i) Establish pilot or semi-commercial projects so that actors in the sector can directly appreciate the benefits and risks of new production systems. Such projects should cover all activities along the supply chain, including manufacturing and commercialization of products.
- (ii) Stimulate students of aquaculture to study in developed countries in order to narrow the technological gap with those countries.
- (iii) Increase travel of foreign experts to the region to share their knowledge.

- (iv) Acquire and adapt technology systems already proven in other regions to expedite and streamline the productive development of native species and – depending on the risk analysis – to incorporate exotic species in the region.
- (v) Promote technological visits to innovative projects in other countries.
- (vi) Promote multinational projects that encourage investment in LAC and help meet demand in developed countries, which is in the best interest of all participants.

In other words, in addition to promoting the development of an insurance industry that offers greater coverage and competition, each country or territory in the region should develop mechanisms, such as those listed above, to increase confidence in aquaculture and reduce its “risky” perception.

### ***Strengthen regional support structures***

The Aquaculture Network of the Americas (RAA) which now exists provides an institutional framework

that the member countries ARE advised to use to facilitate an exchange of information on the sector. It is also recommended that they expand technology transfer networks in areas relating to statutory and legal matters, job training and education, sanitary, quality control and other issues, so as to reap benefit from available capabilities in LAC.

### ● **Conclusions**

Based on the foregoing, the LAC region should place emphasis on efforts to improve the management and governance of the fisheries and aquaculture sector.

“Assistencialism” needs to be eradicated from programs that support small-scale production. This will require the design of alternative mechanisms to ensure the productive and economic sustainability of local communities.

Finally, aquaculture in LAC needs more “visibility” to ensure that governments give it political support, especially when one considers that it constitutes a new productive axis around which fish availability in the region will increasingly rotate.



## Forests

### Sustainable forest management: Current situation and future outlook

*There is increased concern in LAC countries about sustainable forestry management. However, the forestry industry in the region must present a “new face” that emphasizes its contribution to society in areas such as the following: the provision of products and services, rural job creation and enhanced social integration. New guidelines developed by FAO and the World Bank can help countries in the region to evaluate the management of their forest resources, and this will be a major incentive for these countries to participate in climate change mitigation plans.*



#### Facts

- The United Nations General Assembly has designated 2011 as International Year of Forests due to the importance of forest ecosystems in providing environmental services, mitigating climate change and conserving biodiversity.
- The area of forest used for productive purposes in Southern Cone countries has increased.
- The Caribbean has maintained its primary forest area.
- The Caribbean has shown an overall gain in forest biomass carbon stocks, but net losses have been recorded in Central and South America.
- Brazil, Costa Rica and Mexico have clear strategies to mitigate the effects of climate change.

#### • Recent trends <sup>3</sup>

##### *The forests of LAC represent 23.6% of the total cover of the world's forests*

Natural and planted forests in Latin America and the Caribbean (LAC) cover 955.6 million ha, that is to say, 23.6% of the total cover of the world's forests (FAO 2010d). Planted forests account for 1.9% of the world's total area of natural and planted forests (FAO 2010b) (see table 10).

The countries with the most planted forests are Brazil (7.4 million ha), Mexico (3.2 million ha), Chile (2.4 million ha), Uruguay (980,000 ha) and Peru (900,000 ha) (FAO 2010d).

In 2010, forests covered 47.4% of the land in the region (see table 11).

<sup>3</sup> The sub-regions included in this analysis are:

**Caribbean:** Antigua & Barbuda, Aruba, Bahamas, Barbados, Cuba, Dominica, Granada, Haiti, Jamaica, Dominican Republic, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Saint Lucia, Trinidad & Tobago.

**Central America and Mexico:** Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama and Mexico.

**South America:** Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, French Guyana, Paraguay, Peru, Suriname, Uruguay and Venezuela.



### *Slower rate of forest cover loss*

The loss of forest cover during the period 2005-2010 was slightly less than in the period 2000-2005, when an average 4.8 million ha was lost annually (FAO 2010d). LAC's loss of forest cover represents 71% of the annual loss of global forest cover.

The eight LAC countries with the highest annual variation in forest cover during the period 2005-2010 were Brazil (-2.2 million ha); Bolivia and Venezuela (-300,000 ha each); Argentina, Ecuador and Paraguay (-200,000 ha each); and Mexico and Peru (-100,000 ha each) (FAO 2010d). In the same period, the Caribbean recovered forest cover at a rate of 41,000 ha annually (see table 12).

### *LAC is important in the production and commercialization of forest products*

Production of roundwood, which includes wood for fuel and industrial purposes, reached 481 million cubic meters in LAC, that is to say, 15% of world production (FAO 2009b). The production

of roundwood in Central America, the Caribbean, Mexico and South America account for 9.4%, 9.2%, 1.3% and 80.1%, respectively, of total regional production. The countries with the highest production of roundwood are Brazil, Chile, Mexico, Guatemala, Argentina and Paraguay.

In 2009, the production of firewood was 283 million cubic meters, in others words 15.3% of world production and 59% of the roundwood produced in the region (FAO 2009b).

The main forest products produced in 2009 were sawnwood (40 million cubic meters) and boards (15 million cubic meters), which account for 11.6% and 14% of world production, respectively. Production of pulp and paper reached 22 million tons.

In 2009, imports of forest products in the region totaled approximately US\$11 billion and exports US\$12 billion, representing 6% and 7%, respectively, of world trade in forest products. The countries that import the most products in the region are Mexico, Brazil, Argentina, Colombia, Venezuela, Peru and Chile, while the main exporters are Brazil, Chile, Uruguay, Argentina, Mexico, and Colombia.

**Table 10:** Forest cover in LAC (2010)

LAC	Area of natural and planted forests (million ha)	Area of planted forests (million ha)
Mexico	64.8	3.2
Central America	19.5	0.5
Caribbean	6.9	0.5
South America	864.3	13.8
Total region	955.6	18.0
Total world	4033.1	

Source: FAO 2010d.

**Table 11:** Forest cover as a percentage of total land area in LAC (2010)

LAC	Area of land <sup>1</sup> (million ha)	Area of natural and planted forests (million ha)	Percentage of land covered in planted forests (%)
Mexico	194.4	64.8	33.3
Central America	51.1	19.5	38.2
Caribbean	22.9	6.9	30.3
South America	1745.1	864.3	49.5
Total region	2013.4	955.6	47.4

<sup>1</sup> Total area excluding areas covered by continental waters.

Source: FAO 2010d.

**Table 12:** Annual variation in forest cover (2005-2010)

LAC	Area of natural and planted forests in 2005 (million ha)	Area of natural and planted forests in 2010 (million ha)	Annual variation in forest cover (000s of ha/year)
Mexico	65.6	64.8	-155
Central America	20.7	19.5	-249
Caribbean	6.7	6.9	+41
South America	882.3	864.3	-3581
Regional variation	975.3	955.6	-3944
World variation	4060.9	4033	-5581

Source: FAO 2010d.

### *The contribution of the forestry sector to the region's GDP is rising steadily*

Since 1990, the contribution of forestry to the region's Gross Domestic Product (GDP) has been rising steadily, increasing from US\$30 billion to US\$40 billion. This growth has also resulted in higher employment in the forestry sector which, in 2006, employed over 1.5 million people in the region (FAO 2009d) <sup>4</sup>.

### *Forest biomass carbon stocks fell between 1990 and 2010*

The total amount of carbon stored in forest biomass in LAC totals 104 billion tonnes. In the period 1990-2010, this amount was reduced by 424 million tonnes. In the Caribbean, there was an overall gain of forest biomass, while net losses were recorded in Central and South America.

<sup>4</sup> This figure does not include subsistence or informal employment which has not been quantified, meaning the total contribution is greater. In the region, however, information on NWFP is still poor, despite the local -and sometimes international - importance of these products

### ***Statistics on non-timber forest products are lacking***

In South America, the value of non-timber forest products (NTFPs) in 2005 was approximately US\$500 million (FAO 2011a)<sup>5</sup>, while in North America and Central America the value was US\$1.7 billion (FAO 2011a).

#### **Box 8. Categories of Non-Timber Forest Products (NTFPs)**

- Ornamental plants
- Medicinal plants
- Edible plants
- Fungi
- Plants for aromas and coloring
- Plants for construction, crafts and tools
- Fibers
- Exudate, resins, latex, oils
- Fruits
- Condiments
- Tannins
- Honey and beeswax
- Seeds
- Wild animals, meats, skins and leather
- Bark, cork

#### **• Prospects**

#### ***Non-timber forest products are fundamental for the quality of life in rural communities***

Available information on the production of NTFPs in LAC shows their growing importance in domestic and international markets. They are equally important for the subsistence of the many

local communities and indigenous peoples who depend on them (FAO 2010b, 2010d and 2011k).

Projections based on current figures show that NTFPs will become an increasing priority in national strategies and programs aimed at promoting poverty reduction, food security, rural development and forest conservation.

However, the task is difficult because the units used to quantify NTFPs vary widely and it is therefore not always possible to calculate total production in the region. In addition, many types of NTFPs are collected and used for subsistence or commercial purposes, and it is projected that the number of products of this type will continue to grow.

NTFP-producing countries are continuing to work towards improving official statistics. For example, FAO (2010d) notes that, due to the difficulty of obtaining quantitative data on domestic production of NTFPs, countries have developed lists of major products ranked in order of importance.

#### ***Sustainable forest development is essential to mitigate climate change***

Global deforestation and forest degradation are responsible for almost 20% of global greenhouse gas emissions, a higher percentage than the emissions generated by the transport sector and second only to the energy sector. The majority of these emissions occur in developing countries.

In this scenario, World Bank studies indicate that an efficient plan to avoid deforestation and uncontrolled growth of agricultural land would help the region to reduce emissions, and bring other immediate benefits such as preventing landslides, reducing the intensity of floods and curbing the increase in illegal population settlements.

<sup>5</sup> In the region, however, information on NTFP is still poor, despite the local -and sometimes international - importance of these products.

Sustainable management, rehabilitation and tree planting can help retain or increase deposits of carbon in forests while deforestation, degradation and poor forest management can reduce them.

### ***A guiding framework for improving forest management***

The FAO and the World Bank propose a new guiding framework that can help countries in LAC evaluate the management of their forest resources. The capacity to demonstrate good governance in this sector is increasingly important for countries wishing to participate in the new plans for climate change mitigation (FAO 2011). The forestry framework proposed by these organizations provides a checklist that can be used by countries to identify and address problems in the management of their forest resources and to help ensure that efforts to reduce greenhouse gas emissions caused by deforestation and forest degradation in developing countries are properly managed.

Millions of people in rural areas who depend on forests and trees for their livelihood and their family's food security would benefit from more equitable policies and better forest management. The sector also has great potential for carbon sequestration and the reduction of greenhouse gas emissions.

In this regard, the United Nations Framework Convention on Climate Change has developed an initiative known as Reducing Emissions from

Deforestation and Forest Degradation (REDD+), which also addresses the role of conservation, sustainable forest management and increasing carbon deposits. REDD+ proposes offering developing countries incentives to reduce emissions due to deforestation and increasing carbon retention through the planting of new forests, conservation, sustainable management and the improvement of forest carbon stocks.

North-South financial flows aimed at the reduction of greenhouse gas emissions through REDD+ could reach up to US\$30 billion per year, which would provide a considerable boost to rural development. But the REDD+ initiative presents some significant challenges. Potential problems in local communities include fraud, inefficiency, corruption and the misappropriation of funds. Although the implementation of REDD+ is a huge challenge for countries with weak institutional capacity, it also creates new incentives and paves the way for increased support for improved forest management.

The XVI International Conference on Climate Change (COP 16) was held in Cancun between November 29 and December 10, 2010. One of the results of this meeting was a list of recommendations that should serve as a basis for national governments to define public policies and actions to reduce carbon emissions. The participants also recommended creating a system whereby all countries are accountable for their reductions.

Various countries in the region have already formulated strategies to mitigate climate change such as Brazil, Costa Rica, and Mexico.

## **Box 9.** Strategies to mitigate climate change in LAC

### **Brazil:**

The National Climate Plan aims to reduce illegal deforestation and has created the Amazon Fund, which is designed to promote reforestation and the monitoring and enforcement of forest laws. In Brazil, whoever owns land use rights, including individuals and indigenous groups, also owns the rights to the carbon stored on the land. This is expected to promote the development of an organized carbon market and clarify the rights of landowners (Chiagas 2010).

### **Costa Rica:**

The National Forestry Financing Fund (FONAFIFO) issues certificates for forest conservation to landowners, which determine the payment for services provided by their ecosystems (Costenbader 2009). Under the auspices of FONAFIFO, the government signs contracts with private landowners to manage carbon sequestration, which in turn gives them the right to sell the carbon in the future. The government can then bundle these carbon credits and offer them to international investors.

### **Mexico:**

Private contracts are considered an alternative means of regulating the interests of all parties. To reduce transaction costs, potential buyers of carbon credits are encouraged to invest in projects covering a wide forest area, which involves agreements between local landowners (FAO 2011k).

## *Efforts to conserve biological diversity continue*

The World Bank (2011b) has supported projects aimed at conserving biodiversity and its sustainable use in several countries of the region, many of which are executed in places considered of vital global importance because of the rich biodiversity of their natural systems. An example of this is the support provided by the World Bank to strengthen the protected areas system in Brazil, where it helped to double the area of the Amazon under protection from 12 million ha at the beginning of the project in the 1990s to 25 million ha on its completion in 2008.

In addition, efforts are underway in Brazil to increase the area of land earmarked for biodiversity conservation and to improve the quality of life of forest dwellers (World Bank 2011b). The World Bank also plans to strengthen its support for projects aimed at biodiversity conservation.

## *The rate of soil degradation in LAC is alarming*

An estimated US\$13 billion is needed to restore the degraded lands of LAC. The deterioration of natural resources in Latin America's arid zones has aggravated the conditions of rural poverty as the reduction, and sometimes complete exhaustion, of the productive potential of ecosystems limits the ability of producers to sustain their livelihoods (PNUNA 2010).

LAC has a total area of 20.2 million km<sup>2</sup>. This includes 5.3 million km<sup>2</sup> of drylands, 70% of which are vulnerable and show advanced degrees of desertification. Although the majority of countries of the region do not have a significant area of drylands, Argentina, Bolivia, Brazil, Chile and Peru have extensive dry areas and face severe drought problems. In addition, all countries of the region have serious problems of land degradation that mainly affect the segment of the population that is mired in conditions of poverty and extreme marginality (UNEP 2003).

There has been a significant increase in desertification and land degradation in LAC as shown in the following information. Firstly, desertification affects 250 million ha in South America and 63 million ha in Mesoamerica. Soil erosion affects 68% of the total land degraded in South America and 88% in Mesoamerica. In South America 100 million ha have been degraded by deforestation and 70 million ha by overgrazing. In the Caribbean, rapid urbanization has contributed to the loss of arable land, with a negative impact on the protection of river basins and biodiversity conservation. In addition, land degradation has caused members of vulnerable groups (in particular, women and children) to migrate to cities in search of new opportunities.

### ***A severe water shortage is affecting the Andes and the Caribbean***

Prospects for maintaining and improving river basins depend on changes in land use. But the future looks bleak in view of the high rate of deforestation. The water shortage affecting the region is particularly acute in the Andes and on some Caribbean islands.

The region has been a pioneer in the implementation of payment for river basin management. The widespread adoption of these systems, which can be improved, depends on overcoming obstacles such as the inadequate definition of property rights, farmers' concerns about the potential expropriation of their resources, mistrust of water supply privatization and inadequate technical information about how the use of land in the upper basin and bring benefits in the lower basin (Dillaha et al. 2007).

To date, most of the payment systems for management of river basins in the region are managed by intermediary organizations, often government agencies responsible for managing irrigation and facilities for residential water supply, which channel funds from water users to the landowners.

### ***Payment mechanisms for environmental services are important for poverty alleviation***

LAC was the first region in the world to adopt a market-based approach to payments for

environmental services, even though other means such as policies and legislation have been the main tools used by governments for environmental conservation (FAO 2009d).

The region is also a pioneer in instituting a system of payments for river basin services (FAO 2009d) and the payment mechanisms for environmental services are expected to improve in the short term based on existing experience.

Some studies indicate that, as instruments for the protection of forest and environmental resources, environmental services markets will contribute to poverty alleviation (see Pagiola et al. 2005, Grieg-Gran et al. 2005).

The value of forest systems is traditionally calculated exclusively on the basis of the productive assets they provide, mainly those derived from timber. However, this simplistic approach to the value of forests is not in harmony with new prospects for sustainability based on the multi-functionality of ecosystems.

Environmental services provided by natural systems as well as the importance of these services for human quality of life should therefore be reflected in the visions of society. This would serve as a basic contribution to the establishment of payment mechanisms for environmental services, which would be effective in the short run.

In order to make the productive use of ecosystems compatible with their conservation, information is urgently needed on the economic value of the goods and environmental services they provide given the fact that these services are not traded in conventional markets and, therefore, are not tracked by traditional economic indicators. As a result, it is difficult to incorporate into economic valuation processes the environmental services provided by the use and conservation of ecosystems (Cerda et al. 2007, Cerda et al. 2010 REDIBEC 2011).

New methodologies for evaluating the ecosystem services of forests, specifically those for which there is no formal market, have emerged in the field of

environmental economics and natural resources. Countries in LAC have already tested evaluation methods by applying these methodologies, enabling a better understanding of the options for using these ecosystems and a better estimation of their importance for society. For example, Chile estimated the annual value of the benefits of its entire National Protected Areas System (SNASPE), including those resulting from services that are not directly traded in the market, at approximately \$2.5 billion (CONAMA 2010).

### ***LAC countries could benefit from the environmental services provided by forests***

The region could benefit substantially from the increase in the demand for environmental services provided by forests, particularly carbon capture and storage. However, this requires an improvement in regulatory and institutional frameworks, including those aimed at promoting the conservation and improvement of river basins, which require changes in land use.

### ***The participation of local communities is key for the management of forest resources***

Many organizations have highlighted the importance of involving local communities in forest management, including the FAO with its concept of “community forestry development” and the World Bank. In this context, the “Framework for Assessing and Monitoring Forest Governance” developed by FAO, and the Program on Forests (PROFOR), managed by the World Bank, provide guidelines to facilitate the incorporation of communities in forest management, with an emphasis on the key components or “pillars” of forest governance: political, legal, institutional and regulatory frameworks; planning and decision-making processes; and strategies for implementation, monitoring and evaluation.

In the past two decades, some countries in the region have also granted forest lands to indigenous communities including Bolivia (12 million ha),

Brazil (103 million ha), Colombia (27 million ha), Ecuador (4.5 million ha) and Guyana (1.4 million ha), as reported by the World Bank (2011b).

In addition, the World Bank has provided support to 109 community projects in recent years. For example, Bolivia’s Sustainability of Protected Areas Project is a good example of how communities can be incorporated into forest management using a co-management model. Within the framework of this project, the bank has provided funding to cover the operating costs of the Kaa-Iya National Park, Bolivia’s largest protected area, with an area of 3.5 million ha (World Bank 2011b).

### **• Policy recommendations**

#### ***Attract private investment in new forest plantations***

Private-sector investment can significantly increase opportunities for increasing rural livelihood and strengthening natural resource management. Forestry companies, for example, can serve as engines for development insofar as the employment and income they generate can have positive multiplier effects in rural economies.

However, in some countries private investment is still inadequate; hence the need for governments and international organizations to create a climate that is more conducive to forestry companies. This means that rules regulating access to natural resources must be defined, forest tenure systems that provide legal security need to be established; processes relating to exports and the registration of new enterprises must be simplified and the harmonization of tax and financial systems should be promoted.

#### ***Promote payment mechanisms for environmental services that benefit rural communities***

Information on the economic importance of the benefits of environmental services provided by forests

should be introduced in discussions of forestry policies in LAC. This would lay a more solid foundation for the establishment of payment mechanisms for environmental services and contribute to a better understanding of how communities relate to forest systems. In this regard, human capital with the requisite experience and knowledge is needed to factor in the intangible value of forests when it comes to determining their economic importance.

### ***Promote the participation of rural communities in natural resource management***

Public resources should be used to promote the participation of rural communities in the management of forestry resources, which is key for environmental sustainability.

Small forest enterprises, especially producers of non-renewable forest products, are acquiring ever greater importance in the region, although many work in the informal sector and are not legal. These enterprises play a positive role in the control of forest fires and the promotion of agro-tourism and ethno-tourism. However, they need to be better integrated into productive chains to provide employment for local communities and contribute to social integration (Macqueen 2008).

It is also important that sources of traditional knowledge form part and parcel of forest management. Recent advances in the fields of science and technology offer new opportunities for research and exploration of the possible applications of traditional knowledge in the areas of healthcare, agriculture and biotechnology. Traditional knowledge is increasingly used to address challenges such as adaptation to climate change, water management and sustainable forest management.

### ***Improve the quality of information about NTFPs in the region***

NTFPs should be given higher priority in programs aimed at reducing poverty and in forest conservation

strategies, which means better information is needed. In addition, the units used to quantify the production of NTFPs should be standardized, which would allow for a more accurate estimate of their total production.

In general, legislation and policies related to NTFPs should be clearer, more consistent and coordinated. This means that the formulation of new regulations must be preceded by a systematic assessment of the opportunities and threats associated with different species, ecosystems and livelihoods.

### ***Remove barriers to the local management of forest resources***

The launch of public-sector reform programs to reduce the power of central government may be appropriate in some cases. More generally, regulatory and institutional reforms are needed in the region to promote the decentralization of forest management.

This is necessary to increase efficiency and accountability in the provision of forest services. Responsibility for the use and management of forests should be transferred, where possible, to lower level institutions such as local governments, traditional institutions and local communities.

Political changes in the region could lead to regulatory and institutional reforms in forest governance that support decentralized forest management. Countries should also promote mechanisms for marketing forestry products and the legalization of small and medium-sized forestry enterprises in order to reduce illegal logging. The mechanisms used in some countries to extract forest products legally are so complex that it is often easier for enterprises to pay the fines.

### ***Improve forest governance***

LAC countries have great potential to reduce greenhouse gas emissions. However, this will require serious effort in the area of forest conservation given



the fact that loss of vegetation reduces the capacity of forests to absorb carbon.

In recent years, forest activities have become a crucial part of climate change programs in LAC countries. However, the long-term sustainability of forestry activities in the region depends on a number of factors such as effective governance, better management of carbon stored in forests, the equitable sharing of its benefits and the inclusion of climate change adaptation measures in related policies and projects.

### • **Conclusions**

The importance of services provided by forest ecosystems to local communities and society in general is receiving increased attention in LAC countries. These services include carbon fixation and storage, protection of river basins, preservation of scenic beauty and biodiversity conservation.

FAO and the World Bank have established guidelines that can help LAC countries to evaluate the management of their forest resources and urge them to implement climate change mitigation plans.

In several countries of the region there are examples of measures instituted to address climate change. These include Brazil's National Climate Change Plan (PNMC), which promotes the reduction of illegal deforestation, and Costa Rica, where landowners can negotiate the right to sell or manage the carbon fixed and stored in their forests and enjoy the benefits.

With regard to non-timber forest products (NTFPs), progress has been made by the FAO in obtaining better statistics about their production. However, this information is still inadequate at a regional level and requires greater effort in the area of standardization.

There is a tendency in the region towards sustainable forest management, which is reflected in greater legal protection for forests. In addition, government investment in the forestry sector should be analyzed and the positive cases highlighted.

Finally, the forestry industry must present a “new face” to society, one that promotes the products and services provided by forests as well as the industry's contribution in terms of rural employment and social integration.

**Table 13.** Roundwood, Firewood, Sawnwood, Wood-based panels, Pulp and recovered paper production, Year 2009

Countries	Roundwood Production <sup>1</sup> (1.000m <sup>3</sup> )	Firewood Production <sup>2</sup> (1.000 m <sup>3</sup> )	Sawnwood Production (1.000 m <sup>3</sup> )	Wood-based panels production <sup>3</sup> (1.000 m <sup>3</sup> )	Pulp and recovered paper production <sup>4</sup> (1.000 t)
Antigua and Barbuda					
Argentina	13,536	4,652	955	1,444	860
Bahamas	50	33	1		
Barbados	11	5			
Belize	167	126	35		
Bolivia (Plurinational State of)	3,239	2,329	461	41	
Brazil	264,149	141,989	24,987	8,296	13,861
Canada	107,266	2,158	32,820	11,034	17,225
Chile	51,499	15,098	5,836	2,373	5,166
Colombia	11,216	8,826	481	324	207
Costa Rica	4,681	3,387	524	69	3
Cuba	2,034	1,273	171	149	
Dominica	8	8			
Dominican Republic	914	904	47		
Ecuador	6,030	4,090	417	997	2
El Salvador	4,905	4,223	16		
Grenada					
Guatemala	18,139	17,685	366	57	
Guyana	1,309	851	73	19	
Haiti	2,272	2,033	14		
Honduras	9,119	8,595	277	5	7
Jamaica	826	549	66		
Mexico	45,177	38,752	2,814	398	320
Nicaragua	6,118	6,064	52	8	
Panama	1,313	1,143	9	9	
Paraguay	10,510	6,466	550	161	
Peru	8,690	7,343	626	68	
Saint Kitts and Nevis					
Saint Lucia	10	10			
Saint Vincent and the Grenadines	8	8			
Suriname	255	47	74	1	
Trinidad and Tobago	80	33	30	2	
United States	344,835	40,437	61,998	29,097	47,702
Uruguay	8,400	2,210	264	143	1,066
Venezuela (Bolivarian Rep. of)	6,359	4,011	950	680	74

**Source:** FAO, 2011. Yearbook of Forest Products 2009.

<sup>1</sup> It represents the sum of: wood fuel, including wood for charcoal; sawlogs and veneer logs; pulpwood, round and split; and other industrial roundwood.

<sup>2</sup> It includes: wood harvested from main stems, branches and other parts of trees (where these are harvested for fuel) and wood that will be used for charcoal production.

<sup>3</sup> It represents the sum of: veneer sheets, plywood, particle board, and fibreboard.

<sup>4</sup> It represents the sum of: mechanical wood pulp; semi-chemical wood pulp; chemical wood pulp; and dissolving wood pulp; paper and paperboard that has been used for its original purpose and residues from paper and paperboard production

**Table 14.** Imports and Exports of Forests Products, Year 2009

Countries	Imports of forest products (1.000 US\$)	Exports of forest products (1.000US\$)
Antigua and Barbuda	4,604	
Argentina	719,839	513,876
Bahamas	25,543	1,164
Barbados	34,518	4,913
Belize	8,108	19,791
Bolivia (Plurinational State of)	79,700	63,614
Brazil	1,211,454	5,774,497
Canada	4,319,037	16,513,271
Chile	461,371	3,702,247
Colombia	663,161	263,545
Costa Rica	177,795	36,197
Cuba	47,739	9,808
Dominica	10,527	1,131
Dominican Republic	206,548	5,874
Ecuador	219,717	176,068
El Salvador	249,351	26,820
Grenada	5,167	
Guatemala	285,142	48,791
Guyana	5,848	42,307
Haiti	22,390	
Honduras	94,786	28,967
Jamaica	85,710	
Mexico	4,701,507	405,441
Nicaragua	37,348	9,648
Panama	110,489	29,033
Paraguay	106,410	80,134
Peru	533,684	91,954
Saint Kitts and Nevis	1,797	
Saint Lucia	19,249	
Saint Vincent and the Grenadines	8,355	
Suriname	14,807	5,867
Trinidad and Tobago	115,371	6,593
United States	16,991,052	19,923,431
Uruguay	115,734	823,264
Venezuela (Bolivarian Rep. of)	656,038	12,370

Source: FAO, 2011. Yearbook of Forest Products 2009.

A stylized tree graphic in a dark red color, positioned on the right side of the page. The tree has a thick trunk and several branches with leaves. The leaves are simple, rounded shapes with a central vein and smaller side veins. The tree is partially obscured by a red horizontal band that contains the section header.

## **Section III: Rural well-being and Institutional Framework**





## Rural well-being

### Effects of the 2008-2009 economic crises in the rural sector

*The impact of the 2008-2009 economic crisis on poverty and rural income-trends in Latin America and the Caribbean was less than expected. The direction of change in rural poverty in the region reflects the trend in the agriculture sector and the economy generally.*



#### Facts

- In Latin America and the Caribbean, poverty and indigence rates remain considerably higher in rural areas; and urban-rural disparities have not decreased significantly (in some countries they have actually widened).
- Access to core services in rural areas has improved over the last decade. Nonetheless, deficits remain in relation to urban areas.
- In countries where rural poverty levels are high, poverty tends to be greater in households whose labor incomes are obtained exclusively from agriculture, and less in non-agricultural households (ECLAC, FAO and IICA, 2010).
- In countries where rural poverty levels are lower, poverty tends to be greater in households that rely exclusively on income from transfers, and less in households that combine agricultural and non-agricultural labor incomes (ECLAC, FAO and IICA, 2010).
- Over the past decade, non-agricultural employment continued to gain ground in nearly all countries; agricultural employment among urban residents increased, and the employment of women in non-agricultural activities also increased (Rodríguez and Meneses 2010).
- The output growth during the region's "agricultural boom" over the last decade was concentrated in certain regions and specific products, and is linked to producers serving external markets (Silva and others, 2009).
- Progress towards achieving the Millennium Development Goals on poverty reduction has been slower in rural areas than in urban ones. Countries that have made little progress in reducing rural poverty have also made little progress nationally; whereas countries that have achieved more in terms of reducing extreme poverty nationally are also those that have made most progress in reducing poverty in rural areas. Lastly, countries that have already attained the poverty reduction goal or that are close to doing so, display similar progress in both urban and rural areas (ECLAC, 2009).

• **Context**

This chapter focuses mainly on the analysis of rural employment and income during the 2008-2009 crisis, using data obtained from the 2008 and 2009 household surveys for ten Latin American countries<sup>6</sup>. Rural households are divided by income source into four categories: (i) agricultural households (all employed household members engaged in agriculture); (ii) non-agricultural households (all employed household members engaged in non-agricultural sectors); (iii) mixed or multi-activity households (at least two household members employed: at least one in the agriculture sector and another in a non-agricultural activity); and (iv) transfer-dependent households (no household member employed). The analysis makes it possible to deepen the study made for the previous report (ECLAC, FAO and IICA, 2010).

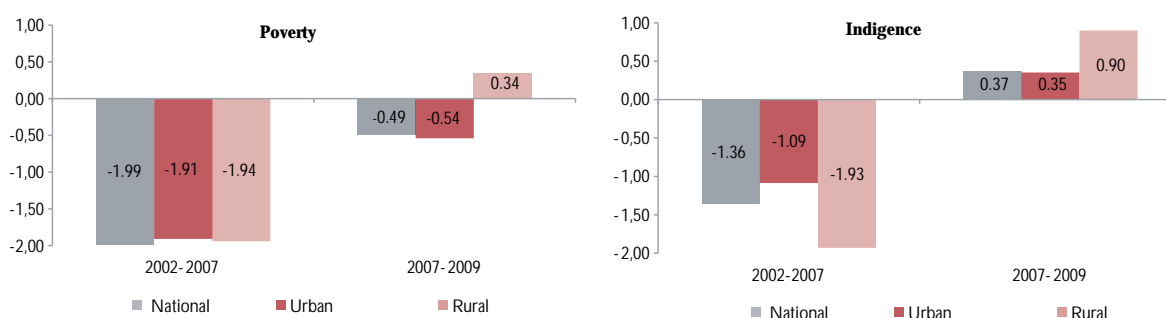
An analysis was also conducted on the trend of rural incomes between 2008 and 2009, both for the income-earners (wages, own-account income and

income as an employer) and for the households, distinguishing between agricultural and non-agricultural incomes and transfers and capital income. Incomes in 2009 were deflated by the price index implicit in the cost of the shopping basket used to define poverty. Employer incomes are presented in aggregate, because in some countries the survey has few observations, particularly in the case of non-agricultural employers.

Based on those figures and other data from ECLAC (2010e), an overview is presented below of the recent trend of rural poverty in the region (figures 20 and 21), and of the incidence of poverty in different rural household groups (see table 15 at the end of this chapter).

The following sections analyze three sets of factors related to the trend of rural poverty: (i) the performance of the economy and the agriculture sector; (ii) the situation on the rural labor market; and (iii) the behavior of average incomes, both labor income and transfers. The chapter concludes by identifying relevant issues for public policies in the rural sector.

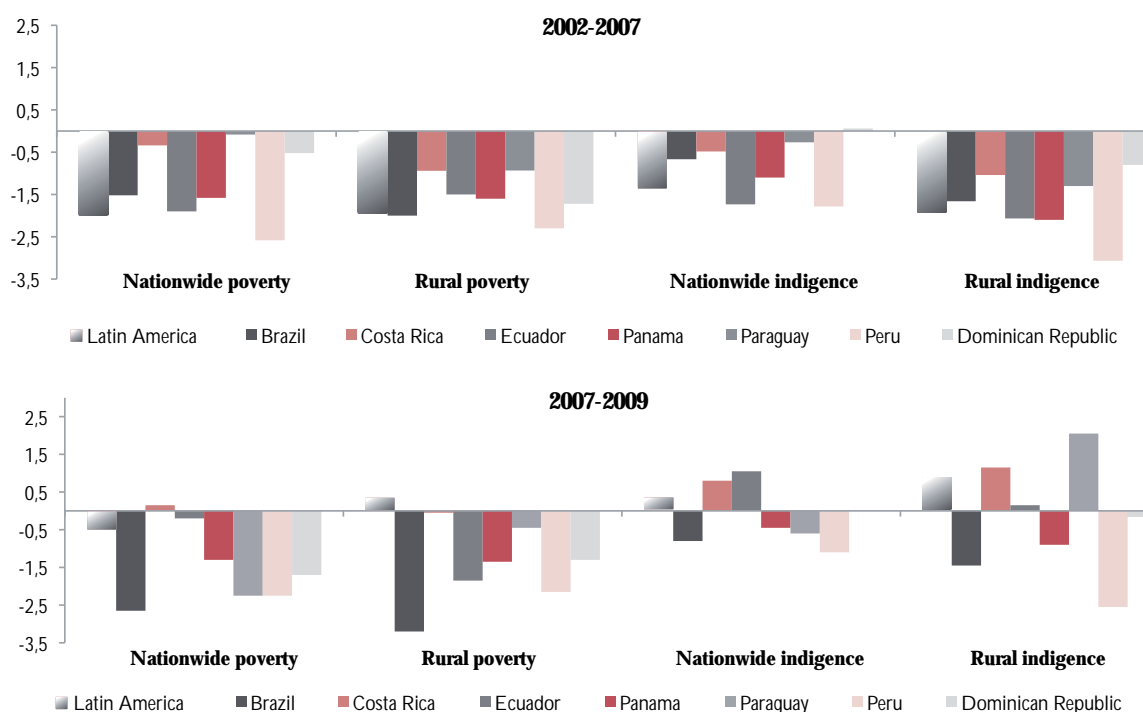
**Figure 20.** Latin America and the Caribbean (18 Countries): changes in poverty and indigence rates (total, urban and rural), 2002-2007 vs. 2007-2009 (Annual average in percentage points)



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of special tabulations of household surveys.

<sup>6</sup> The countries are Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Panama, Paraguay, Peru and Uruguay.

**Figure 21.** Latin America and the Caribbean: changes in poverty and indigence rates (national and rural) in seven countries, 2002-2007 vs. 2007-2009 (Annual average in percentage points)



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of special tabulations of household surveys.

### *Relation between crisis, rural employment and poverty*

In the period 2002-2007, the economy of Latin America and the Caribbean grew at an average cumulative rate of 5.0% per year, with rates above 3% in most countries. The impact of the crisis, which started to affect the region in the second half of 2008, was felt throughout 2009 and the regional growth rate declined by -1.8% (see statistical appendix).

During the pre-crisis period (2002-2007), agricultural value-added<sup>7</sup> (AVA) basically tracked gross domestic product (GDP). Nonetheless, behavior was more heterogeneous during the crisis, with an average reduction of 0.2%, and falls in several countries (see statistical appendix).

In addition to the drop in production, in 2009 the downward trends in the poverty and indigence rates that had prevailed since the start of the previous decade also went into reverse. Nonetheless, the reductions were not as sharp as in other crisis periods, and both rates are expected to have resumed their downward trend in 2010 (ECLAC, 2010e).

Data for the region as a whole show that the incidence of poverty increased by just 0.1 percentage points (from 33.0% to 33.1% in 2009, while indigence increased by 0.4 percentage points (from 4.9% to 13.3%). The increase in rural areas was slightly greater (0.5%), both in poverty (from 52.3% to 53.8%) and in indigence (from 29.5% to 30.0%).

During the economic upswing of 2002-2007 both national and rural and urban poverty declined by

<sup>7</sup> Also often referred to as agricultural GDP.



an average of almost 2% per year. Nonetheless, in the crisis period (2007-2009) average poverty rates fell throughout the region and in its urban areas, but increased in rural areas. The contrast between the two periods is more accentuated in the case of rural indigence: the extreme poverty rate fell on average by more than the total regional and urban rates between 2002 and 2007, but increased by more than both in the period 2007-2009 (see figure 20).

Between 2008 and 2009, the predominant trend in rural poverty and indigence — in countries where information is available for both years — was downward (see statistical appendix). This was true of poverty in Brazil, Colombia, the Dominican Republic, Ecuador, Panama and Uruguay; and also of indigence in those countries along with Peru. Only in Costa Rica and Paraguay did the poverty and indigence rates both rise between 2008 and 2009.

A comparison between the boom period (2002-2007) and the crisis years (2007-2009) in seven countries studied shows that poverty and rural indigence decreased in the pre-crisis period. In most cases, poverty decreased more in rural zones than in national-average terms.

Between 2007 and 2009, poverty either declined (Brazil, Ecuador, Panama, Paraguay and Peru) or returned to levels similar to those of 2007 (Costa Rica and the Dominican Republic). In the case of indigence, rates were higher in 2009 than in 2007 in Costa Rica, Ecuador and Paraguay (figure 21).

### ***Households that receive both agricultural and non-agricultural incomes were better able to cope with the crisis***

The group in which poverty reduction is most widespread consists of households that combine agricultural and non-agricultural sources of labor income in all countries, except Paraguay.

The trend of poverty in this group of households is notable, because seven of the nine countries

in which poverty declined (Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador and Uruguay) had already achieved lower rates. This is significant, because the diversification of income (agricultural and non-agricultural) is a strategy that rural households can implement to reduce poverty, particularly those with possibilities of doing so either because of their socio-demographic composition (they have more than one income-earner by definition), or because the rural labor market offers non-agricultural job alternatives (ECLAC, FAO and IICA, 2010). Accordingly, in addition to helping reduce poverty, the income diversification strategy seems also to have been appropriate for coping with the crisis.

Between 2008 and 2009, poverty incidence in rural households increased in Costa Rica, Paraguay and Peru, alongside an increase in poverty among individuals (ECLAC, 2010e). These are also the only three countries where poverty in agricultural households increased. In contrast, in the other seven countries (Brazil, Colombia, Dominican Republic, Ecuador, El Salvador, Panama and Uruguay), poverty decreased in terms of total rural households and agricultural rural households (see table 15 at the end of this chapter).

The most favorable situations were in the Dominican Republic, Ecuador and Uruguay, where poverty decreased in all household groups; and to a lesser extent in Brazil, where it increased slightly among transfer-dependent households. In contrast, the increases in poverty that affected most household groups were in Costa Rica (in total rural households, agricultural households and non-agricultural households) and in Paraguay (in total rural, agricultural and mixed households).

These figures corroborate the results of the previous report (ECLAC, FAO and IICA, 2010): the highest incidence of poverty occurs in agricultural households and in those that rely exclusively on transfers. In all cases, poverty in agricultural households is above the average for all rural households and lower in non-

agricultural and mixed households. In seven of the countries (Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador and Uruguay) the lowest incidence of poverty occurs among mixed households. Compared to the average for total rural households, poverty incidence among transfer-dependent households is particularly high in Colombia, Costa Rica, Dominican Republic and Panama (see table 15 at the end of this chapter).

***During the crisis, poverty in rural households reacted to the performance of the economy and the agriculture sector***

Two of the three countries in which poverty increased during the crisis (Costa Rica and Paraguay) experienced a substantial drop in real agricultural value-added. Moreover, although real GDP grew overall, it did so at an average rate of less than 1% per year, considerably below the rates achieved in most other countries.

In contrast, in five of the seven nations in which poverty among rural households decreased, there was an increase both in agricultural value-added and in real GDP, in most cases at rates above 3% (Brazil, Dominican Republic, Ecuador and Panama). The coincidence between the reduction in rural poverty and the growth of agricultural value-added does not necessarily imply causality, however. In fact, as will be seen below, despite the increase in agricultural production in several countries, average labor incomes received by agricultural income-earners decreased, particularly in poor households (see table 17 at the end of this chapter).

This result coincides with studies that have concluded that poverty reduction has not been linked to agricultural growth, but rather to public policies and an increase in non-agricultural incomes (Silva and others, 2009).

Table 16 (at the end of this chapter) shows indicators of the trend of the rural labor market between 2008

and 2009, and of the global performance of the economy and the agriculture sector.

***There is no clear relation between the employment and poverty indicators***

The trend of the rural labor market matches the trend of poverty in Costa Rica and Paraguay only, with poverty increasing in both countries (table 15); the number of persons employed in agriculture decreased (in Costa Rica the number of persons employed in non-agricultural jobs also fell) and unemployment increased, both in absolute terms (the number of people unemployed) and in terms of the open unemployment rate (EAP) (see table 16).

The situation is more varied in the other countries. In some cases where poverty decreased, both agricultural and non-agricultural employment grew (Columbia, Ecuador and Panama), while in others (Dominican Republic and El Salvador, agricultural employment increased, while non-agricultural employment declined. Moreover, the number of unemployed workers increased in the five countries, but in Colombia employment growth offset the increase in unemployment, and the unemployment rate fell back. In contrast, in the Dominican Republic, Ecuador, El Salvador and Panama, employment growth was insufficient to compensate for the rise in unemployment. Accordingly, in these cases, it is important to obtain greater detail on the dynamic of autonomous incomes vis-à-vis capital income and income from transfers, both among the recipients themselves and at the household level.

Lastly, only in Peru and Uruguay did unemployment fall both in absolute terms and as measured by the open unemployment rate, although with different dynamics in terms of the employment trend. In Peru, for example, jobs were created in both the agricultural and the non-agricultural sectors, while unemployment declined; in Uruguay, the main force reducing the unemployment rate was the reduction in unemployment, since agricultural and non-agricultural employment also declined.

***In most countries, the incomes received by agricultural earners decreased, particularly wage income***

Between 2008 and 2009, the average income obtained from agricultural wages decreased in poor households, both in countries where poverty grew (Costa Rica, Paraguay) and in those where it decreased (Brazil, Ecuador, Uruguay). In some cases, the decrease occurred both in the poor household group and also in total rural households. In just three countries (Dominican Republic, El Salvador, Peru) did average income obtained from agricultural wages increase among all rural households.

In half of the countries, average incomes received by agricultural earners in poor households deteriorated, because both average wages and average income earned by own-account workers decreased, including countries where poverty increased and others where it declined.

Of the seven countries in which rural poverty decreased, the incomes received by agricultural earners in rural households, both poor and non-poor, increased only in the Dominican Republic. This provides evidence that in 2009 a deterioration in labor incomes from agriculture the countries of the region on a widespread basis.

Non-agricultural labor incomes have generally behaved more positively, with different trends between own-account income and wages. The latter have grown in poor households in six of the ten countries (Brazil, Colombia, Dominican Republic, El Salvador, Panama and Peru). In contrast, own-account incomes declined generally in countries where poverty increased (Costa Rica, Paraguay and Peru); but they increased, in poor and non-poor households alike, in countries where poverty declined (Dominican Republic, El Salvador, Panama).

***The trend of remittances to rural households from abroad reflects the impact of the crisis***

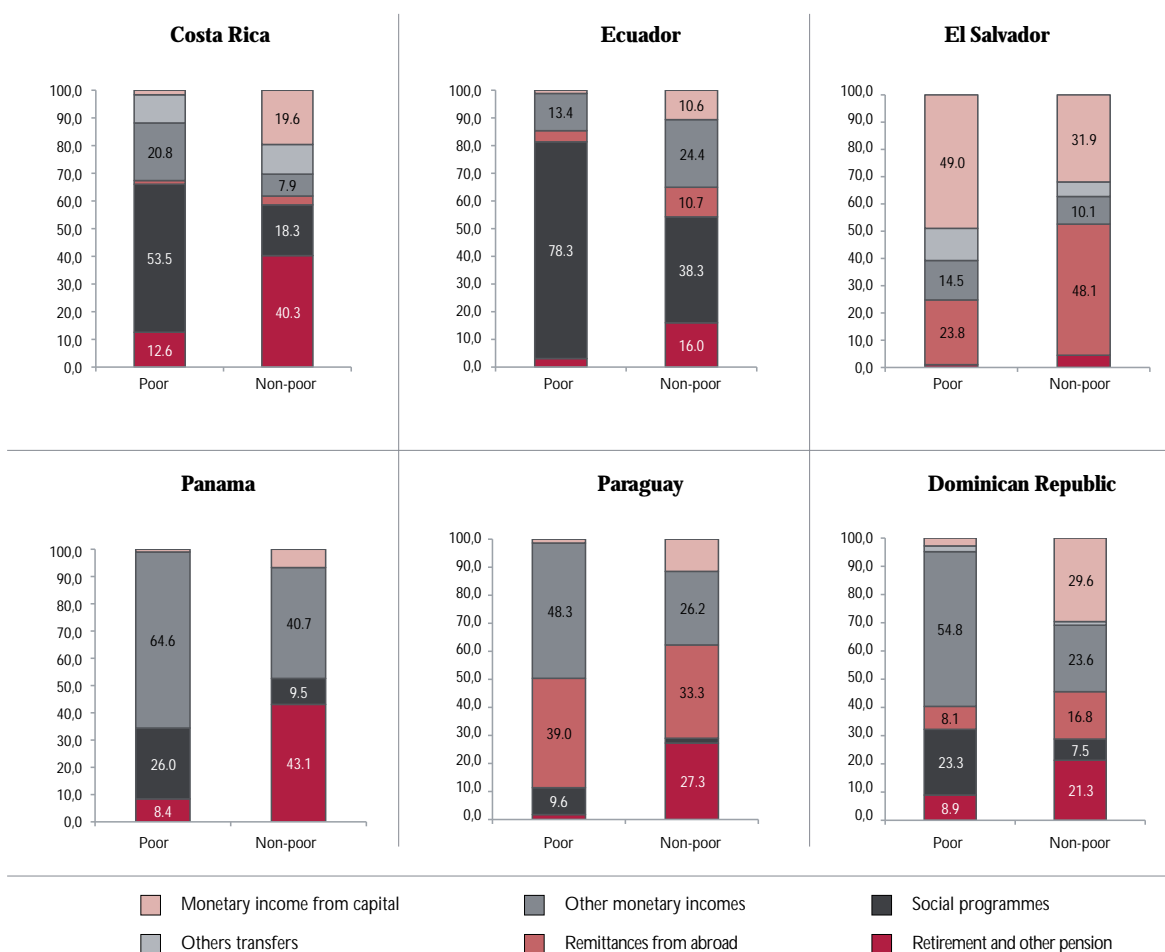
Transfers can be classified according to whether: (a) they are public or private; (b) they are of domestic or foreign origin; and (c) they represent royalties or capital income. Public transfers can consist of retirement or other pensions, or income from public programs of various types. Nonetheless, few comparisons can be made between countries, because, unlike labor incomes, there is no standard classification of transfer incomes. In some cases, the classifications even change from one year to the next, which means situations have to be analyzed on a case-by-case basis (see figure 22).

Remittances from abroad are a component of transfers that are susceptible to the effects of economic crises. The most notable case is El Salvador, where income from remittances — the largest component of transfers — was the only category that decreased in 2009, in poor and in non-poor households alike.

In Ecuador, remittance income was the only component of transfers to decrease in poor households, but this was substantially offset by an increase in income from that country's human development grant (*Bono de Desarrollo Humano*).

Nonetheless, average income from remittances from abroad increased in other countries: Paraguay was the only country in which transfer income increased both in poor and in non-poor households; while in Peru, there was an increase among non-poor households. Remittances also grew in the Dominican Republic, although their contribution to income growth was less significant.

**Figure 22.** Composition of transfer income, by income category, in 2009 (Percentages)



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of data from household surveys conducted in the respective countries.

There is a clear difference between the behavior of remittances sent to El Salvador and Ecuador, on the one hand, and those sent to Peru and Paraguay on the other. In the first two countries, remittances come mainly from the United States and Spain (North-South) which are the main destinations of rural migration abroad. In contrast, in Peru, remittances stem mainly from emigration to Chile

and Argentina and in Paraguay from emigration to Brazil (South-South). Thus, the trend of remittances is likely to reflect the impact of the crisis in their countries of origin: greater effects in the United States and Spain, affecting remittance flows to Ecuador and El Salvador; and smaller effects in the South American countries, favoring remittance flows to Paraguay and Peru.

### ***Income obtained from transfers under public programs offset the fall in household labor incomes***

The trend of household incomes is shown in a breakdown into two large categories: labor income and transfers and capital income. Average incomes of the latter type increased in poor households in nine of the ten countries included in the study (not in Paraguay); and in eight of the ten countries they increased in total rural households (the exceptions in this case are Panama and Paraguay). Accordingly, in most cases income from transfers and capital either helped compensate for the fall in labor incomes, or else boosted their growth.

The role of income from public policies is crucial in situations of economic crisis. In this regard, the most significant case is Ecuador, where transfer incomes compensate for the reduction in labor incomes in both poor and non-poor households. In that country, the component that contributes most to the increase in transfers is income obtained from the human development grant (Bono de Desarrollo Humano). Other similar cases include Costa Rica, the Dominican Republic and Panama, where income from social programs<sup>8</sup> are the transfer components that contribute most to income in poor households.

Retirement incomes are also important, particularly in non-poor households. In Brazil and Costa Rica, this income component accounts for most of the increase in transfers in poor households and in rural households generally.

### ***Income obtained from transfers and agricultural wages are the most important sources of the variation in average income among rural households.***

A further exercise consists of breaking down the rate of variation of average household incomes<sup>9</sup>, to determine the importance of each income source, bearing in mind both the magnitude of its variation and its weight in total household income (see figure 23).

For rural households as a whole, income from transfers and capital made the largest contributions to the variation in average total income, either because they reinforced the growth of aggregate labor incomes (Brazil, Dominican Republic, El Salvador and Uruguay) or the reduction in those incomes (Paraguay), or else because their downward trend is reversed (Colombia, Costa Rica and Ecuador) or the fall is attenuated (Panama).

<sup>8</sup> In **Costa Rica** they include income from transfers provided by IMAS, non-contributory pensions, scholarships, and subsidies. In **Panama** income comes from the Parvis Mejorado programme, housing assistance, the National Secretariat for the Nutritional Food Plan (SENAPAN), the Oportunidades network programme and the distribution of agricultural inputs. In the Dominican Republic they are aggregated under the category of "government assistance".

<sup>9</sup> The variation in total average income of households is broken down as follows. Let  $Y_t^L$  = total household income obtained from labor activity  $L_i$  in period  $t$ ; and  $Y_t^R$  = total income from transfers to households in period  $t$ . Then  $Y_t^L = \sum_i Y_t^{L_i}$  is total labor income in period  $t$ ; and  $Y_t = Y_t^L + Y_t^R$ . The rate of growth of income between the two\*\* is given by,  $\delta_Y = \frac{(Y_t - Y_{t-1})}{Y_{t-1}} = \frac{Y_t^L - Y_{t-1}^L}{Y_{t-1}^L} + \frac{Y_t^R - Y_{t-1}^R}{Y_{t-1}^R}$ . Let:  $\alpha_t^{L_i} = \frac{Y_t^{L_i}}{Y_t}$ , the proportion of household income obtained from labor activity  $i$ ; and  $\alpha_t^R = \frac{Y_t^R}{Y_t}$ , the proportion of household income obtained from transfers. Then  $\sum_i \alpha_t^{L_i} + \alpha_t^R = 1$ . The growth rate of income,  $\delta_Y$ , can be broken down as the sum of the growth rates of the different income categories, weighted by the proportion of each one in total household income during the period  $t-1$ . In other words,  $\delta_Y = \sum_i \alpha_{t-1}^{L_i} \left( \frac{Y_t^{L_i} - Y_{t-1}^{L_i}}{Y_{t-1}^{L_i}} \right) + \alpha_{t-1}^R \frac{(Y_t^R - Y_{t-1}^R)}{Y_{t-1}^R} = \sum_i \alpha_{t-1}^{L_i} \delta_Y^{L_i} + \alpha_{t-1}^R \delta_Y^R$ . The importance of a given source is greater the larger its share of total income or the higher its growth rate.



## **Box 10.** Selected social programs of the joint social assistance institute of Costa Rica

The Joint Institute for Social Aid (IMAS) was created in 1971 through Law 4760, for the main purpose of combating poverty. In 2011, 84% of its budget was spent on services for families living in poverty. The way the IMAS operates has changed from a welfare-assistance model to a social-advancement model. Beneficiaries are selected through the Target Population Identification System (SIPO), for which a social action record card is used. At the present time, it is running about 25 programs, including the following:

- (a) Nutrition with equity, targeting women heads of household.
- (b) Avancemos [Let's make progress], which provides education subsidies to persons under 25 years of age, on the condition that the beneficiaries remain in the education and health systems.
- (c) Housing improvement.
- (d) Productive idea.
- (e) Community households, targeting services for children of working mothers, in which private households look after up to ten children.
- (f) Training subsidy, targeting the adult population, and linked to the Productive Ideas program.
- (g) National Network for Child Care and Development, a flagship program of President Laura Chinchilla, which differs from the community household program in that it also provides psychopedagogic care and food.
- (h) Fideicomiso [Trust fund], a program providing small subsidized loans, with a guarantee fund through the National Bank of Costa Rica.
- (i) Local solidarity funds, which provide transfers to community organizations based on trust.
- (j) Comprehensive family care, in which a diagnostic study is made of the main deficits faced by families, and strategies are defined and applied to enable them to escape poverty.

Further information can be obtained online at <http://www.imas.go.cr>.

Source: J.C. Dengo, Presentation on IMAS at the Central American Dialogue on Price Volatility Policies, San Salvador, 15-16 June 2011.

## Box 11. Social programs in Brazil Income guarantee and social protection policies.

These include minimum wages, social security benefits, the Continuous Benefit Program (provides a minimum wage, on a non-contributory basis, to older adults and disabled persons unable to maintain themselves) and the Bolsa Familiar conditional cash transfer program. The latter is a flagship program under which families receive a subsidy according to their income level; it currently supports 14 million families. A study undertaken by the Institute of Applied Economic Research (IPEA) found that this program has a major impact, accounting for 12% of the reduction in inequality achieved between 2001 and 2008, as measured by the Gini coefficient.

**INSTITUTIONALIZATION OF FOOD AND NUTRITIONAL SECURITY.** In 2006, Law 11.346 was passed, creating the National System for Food and Nutritional Security (SISAN) and a council, with about 2,000 delegates elected from across the country, which meets to set guidelines for the National Food and Nutrition Security Policy (PNSAN). The PNSAN is a multisector policy covering various ministerial programs such as:

- (a) **PROMOTION OF UNIVERSAL ACCESS TO ADEQUATE FOOD;** *Bolsa Familia*, National School Meals Program, the Public Food and Nutrition Equipment Network, the Work for Food program, and the Program to Distribute Food to Specific Groups.
- (b) **PROVISION AND STRUCTURING OF FOOD PRODUCTION, PROCESSING AND DISTRIBUTION SYSTEMS:** Minimum prices and formation of stocks, National Program for Strengthening Family Agricultural (PRONAF), Program for Procurement of Food Produced through Family Agricultural (PAA), Agrarian Reform, Program for the Conservation and Management of Agro-Biodiversity and the Program to Support Fishermen and Acquaculturalists.
- (c) **PROMOTION OF UNIVERSAL ACCESS TO WATER:** Construction of cisterns to store rainwater for human consumption and food production.
- (d) **SUPPORT FOR TRADITIONAL PEOPLES AND COMMUNITIES:** Distribution of food, regularization of land holding.

(e) Support for permanent food and nutritional education processes, integrating actions undertaken by the Ministries of Social Development, Health, and Education.

(f) Strengthening of food and nutrition actions at health care levels, including actions by the Ministry of Health.

**NUTRITIONAL SECURITY ACTIONS UNDERTAKEN BY THE MINISTRY OF SOCIAL DEVELOPMENT AND HUNGER ALLEVIATION (MDS).** Multiple initiatives are promoted for implementation in the production, marketing, and consumption areas.

**BRAZIL WITHOUT MISERY PLAN.** This plan has been launched by the new government of President Dilma Rousseff and is seen as the second generation of the Zero Hunger Plan implemented during the first term of office of President Inacio Lula da Silva. The government's priority is to eradicate extreme poverty, which currently affects 16.2 million people, within four years. The program has three major pillars: (a) income guarantee (expansion of the Bolsa Familia program); (b) productive inclusion (skill development, training, others); and (c) access to public services (health, education, water, others). As part of this Plan, specific programs will be implemented in rural areas on technical assistance, seeds, water for all, procurement of food from family agricultural, and public procurement (school meals). To that end, the government wants to involve supermarkets and the private sector generally.

Further information can be found at <http://www.mda.gov.br>

Source: M. Takagi, Presentation at the Intersectoral policy dialogue to address food price hikes and volatility: challenges and opportunities, Santiago, Chile, 7-8 June 2010.

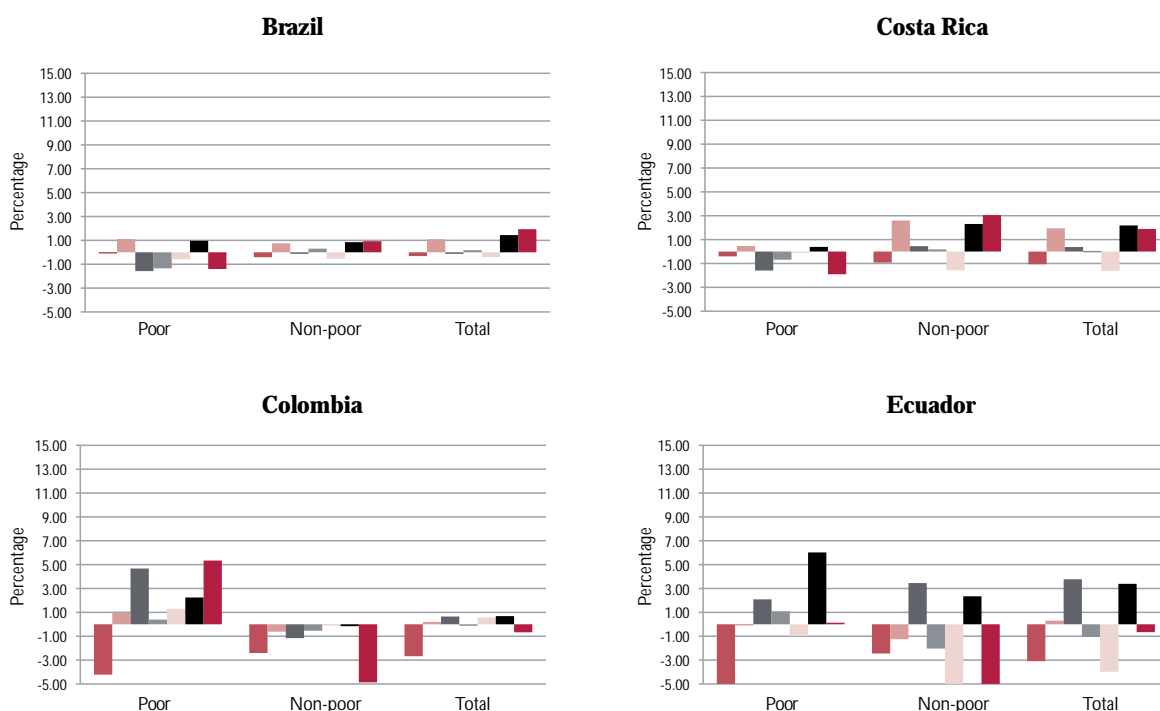
In poor households the effect is similar, because in six of the ten countries, the increase in transfers and capital income helped to reverse the effect of the fall in labor incomes (Brazil, Costa Rica, Ecuador, El Salvador, Paraguay and Uruguay), and in three cases reinforced the increase (Colombia, Dominican Republic, Panama).

Transfers and agricultural wages are the first and second source of the increase in average incomes among all households reporting an increase in their income. In cases where average incomes declined, in total households there is no dominant source, but, in poor households, own-account incomes are the first or second most important source of reduction in all countries.

***Agricultural incomes contribute most to the variation in total income***

Of the different sources of labor income, those contributing most of the variation in average household income are obtained from agricultural sources. Agricultural wages and own-account incomes are the first or second most important labor source contributing to the increase in all countries where average income rises, both in households generally and among poor households. In cases where average incomes decline, there are two major situations: (a) agricultural wages are the most important labor component in total household incomes; and (b) agricultural own-account incomes are the main component of income in poor households.

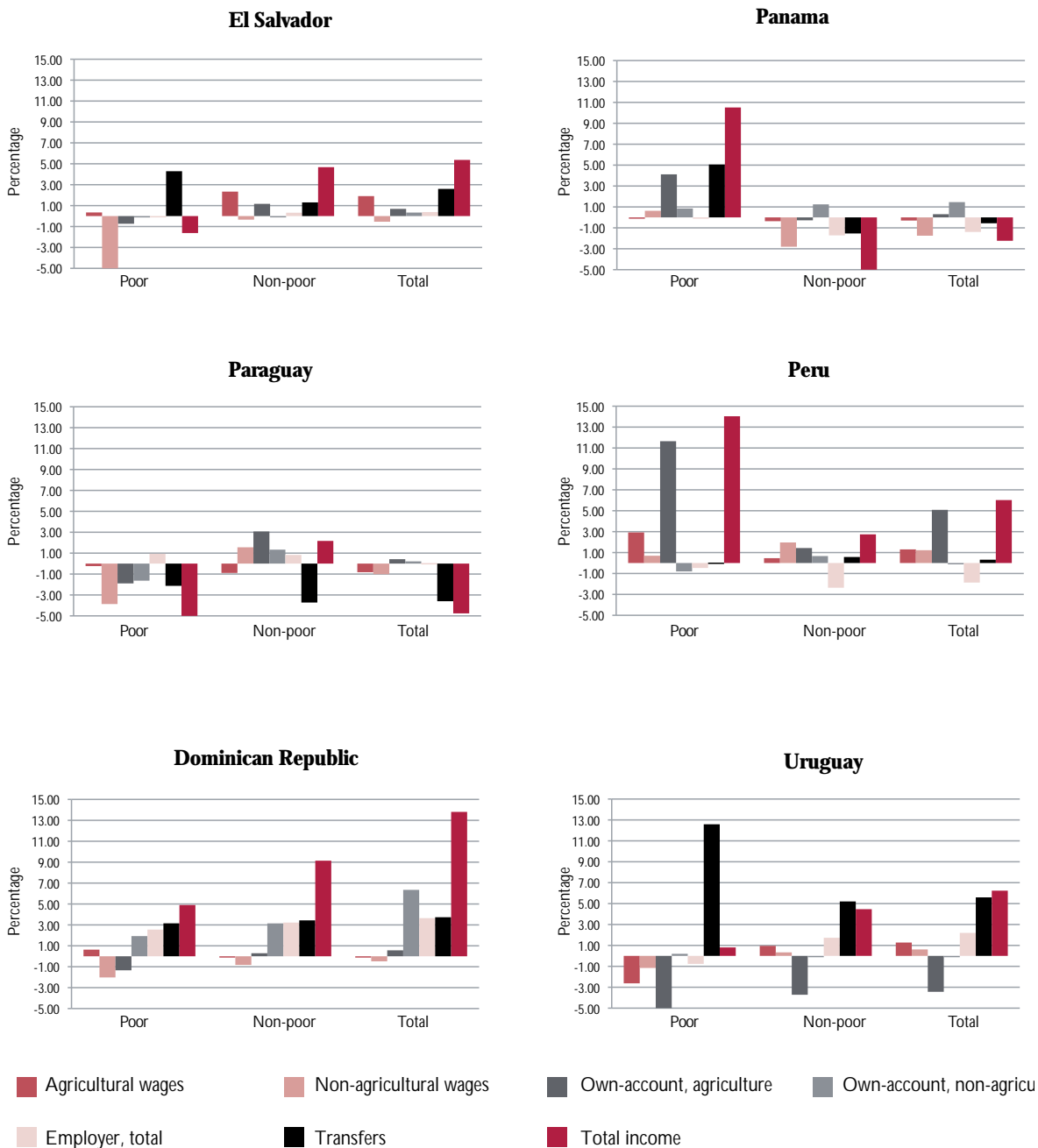
**Figure 23.** Composition of the rate of variation of average household incomes in 2008-2009, by income category (Percentage points)



Continued on page 94



Continuation Figure 23.



**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of data from household surveys conducted in the respective countries.

## *Public-policy implications*

From a regional standpoint, the 2008-2009 economic crisis had a smaller negative impact on the trend of poverty and rural incomes than might have been expected. Nonetheless, countries differ in terms of how the trend of rural poverty relates to: (i) the general macroeconomic environment and performance of the agricultural sector; (ii) the evolution of the rural labor market; and (iii) the trend of average incomes from different sources, both in households and at the level of individual income-earners.

Firstly, the results highlight the fact that—at least in the group of countries analyzed—there is a relation between the direction of change in rural poverty and the trend of the agriculture sector and the economy generally. In two of the three countries in which the agricultural sector shrank during the crisis period and the economy performed weakly overall, rural poverty increased. In contrast, rural poverty declined in countries where the agriculture sector or GDP, or both, grew. This shows that poverty in the rural area is not disconnected from what happens in the macroeconomic domain. A strongly performing economy and agriculture sector are therefore important to prevent rural poverty from increasing.

Rural poverty decreased in most countries during the crisis period, although the labor market generally deteriorated. At least four trend scenarios can be identified: (a) a reduction in rural poverty with an improvement in the labor market, as occurred in Colombia, where the increase in employment offsets the increase in the number of unemployed and the unemployment rate falls; (b) a reduction in poverty in conjunction with improvements in employment, the number of unemployed and the unemployment rate (Uruguay); (c) an increase in poverty, even though employment grows and the number of persons unemployed and the unemployment rate fall (Peru); and (d) an increase in agricultural employment, non-agricultural employment, or both, together with an increase in the number of persons unemployed and the unemployment rate, a situation that occurs in the other seven countries,

and includes both nations in which poverty increases and others where it declines.

The effect of the deterioration of the labor market can be seen most clearly in labor incomes. In five of the seven countries in which the number of unemployed and the unemployment rate both rise, there is also a reduction in average household income obtained from employment, and in average remunerations, particularly among agricultural wage-earners (Brazil, Costa Rica, Ecuador, Panama and Paraguay).

This means that the trend of the labor market is an important determinant of poverty, confirming the findings of studies undertaken by FAO, with support from ECLAC and the International Labour Organization (ILO), on labor-market policies and rural poverty in Latin America (FAO/ILO/ECLA, 2010).

In particular, those studies confirmed that the characteristics of labor-market institutions and employment processes in rural areas partly explain the poverty conditions in which rural dwellers live and work—for example, weaknesses in the design and application of labor-market institutions, the minimum wage, social protection, unionization and labor hiring modes, among others.

Moreover, a number of problems serve to reproduce poverty among rural workers, such as child labor and discrimination against women; and other processes also have an influence, such as internal and international migration, and product labor-certification mechanisms. Although that set of institutions and processes have helped to reproduce high rural poverty rates, they also have the potential to help overcome them, depending on the legal framework, labor-market regulations, and the capacity and will to enforce such legislation.

A third element concerns the behavior of income, particularly the increase in average income obtained from transfers in most countries, which in many instances counteracts or cushions the reduction in labor incomes. Nonetheless, differences in the classification of transfers make it hard to perform

cross-country comparisons. In some cases, a positive role can be identified for income obtained from social programs to cushion the drop in labor incomes in poor households (Costa Rica) or the reduction in remittances from abroad, in both poor and non-poor households.

The results evoke the fundamental principles of the document presented at the thirty-third session of ECLAC entitled “Time for Equality: Closing Gaps, Opening Trails” (ECLAC, 2010f). That document suggests the priority of strengthening national

capacities to achieve productive convergence, reduce structural heterogeneity and close productivity gaps, while also strengthening social protection systems based on sustainable financial mechanisms and integrated solidarity frameworks.

The region’s political agenda therefore needs to promote debate on the situation of the rural labor market, the creation of decent jobs, the contribution thereby made to reducing rural poverty, and the need for public policies that enhance that contribution.

**Table 15.** Latin America (10 countries): incidence of poverty in rural households by typology, 2008 and 2009  
(Percentages of total households in each group)

	Total rural households		Agricultural rural households		Non-agricultural rural households		Multi-activity rural households		Rural households without labor income	
	2008	2009	2008	2009	2008	2009	2008	2009	2008	2009
<b>Brazil</b>	32.2	30.9	38.7	38.1	27.0	24.4	22.9	21.5	29.7	29.8
<b>Colombia</b>	57.8	56.6	59.3	59.2	45.8	47.3	45.3	45.0	76.7	77.4
<b>Costa Rica</b>	14.7	15.8	18.5	19.4	9.9	11.4	6.0	5.8	39.3	38.6
<b>Ecuador</b>	43.7	39.7	52.3	45.9	30.1	28.6	25.5	24.2	55.0	52.4
<b>El Salvador</b>	49.0	46.5	66.6	59.3	35.5	32.2	41.3	32.4	62.7	63.4
<b>Panama</b>	35.6	34.2	55.0	52.1	15.8	14.9	32.1	30.4	46.1	52.2
<b>Paraguay</b>	57.2	60.2	67.8	73.4	44.9	41.3	51.9	54.4	67.1	66.4
<b>Peru</b>	52.4	53.5	59.4	61.7	22.3	21.8	49.2	48.7	35.1	30.1
<b>Dominican Republic</b>	45.1	40.9	52.4	46.6	33.4	29.0	30.3	25.2	85.6	80.9
<b>Uruguay</b>	6.6	4.1	6.3	3.6	8.0	5.7	3.6	2.6	9.1	5.8

**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of data from household surveys conducted in the respective countries.

**Table 16.** Latin America (10 countries): indicators of the dynamic of the rural labor market (2008-2009) and the performance of the economy (2007-2009) (Percentages and rates of variation)

2007-2009		2008-2009						
Average rate of variation		Rate of variation					Percentage of the rural EAP	
							Unemployment rate	
GDP	AVA	EAP	Persons employed in agriculture	Persons employed in non-agricultural activities	Unemployed	2008	2009	
<b>Countries with an increase in poverty in all rural households or in agricultural rural households</b>								
<b>Costa Rica</b>	0,9	-2,4	4,3	-4,9	3,2	64,3	5,1	8,1
<b>Paraguay</b>	0,9	-4,6	7,1	15,0	-5,4	23,5	3,2	3,7
<b>Peru</b>	5,2	4,4	4,2	4,6	4,1	-17,1	1,0	0,8
<b>Countries with a reduction in poverty in all rural households or in agricultural rural households</b>								
<b>Brazil</b>	2,3	0,6	-0,6	-2,5	1,5	27,4	2,5	3,2
<b>Colombia</b>	1,8	-0,5	8,5	7,9	10,6	5,2	8,2	7,9
<b>Ecuador</b>	3,7	3,4	4,7	5,0	2,1	23,8	3,0	3,6
<b>El Salvador</b>	-0,6	2,4	5,9	12,5	-2,3	23,5	6,6	7,6
<b>Panama</b>	6,6	0,3	2,9	1,4	4,1	8,9	3,6	3,8
<b>Dominican Republic</b>	4,4	4,2	0,0	2,2	-3,3	10,8	12,6	14,0
<b>Uruguay</b>	5,7	3,9	-3,0	-3,4	-0,1	-22,1	3,0	2,4

**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of data from household surveys conducted in the respective countries, and BADECOM database [date of reference: 18 May 2011].

**Table 17.** Latin America (10 countries): variation in average income received by income earners and average household income, by country, according to income source  
(Percentages)

	Average labor incomes received by earners					Average income per household		
	Agricultural wages	Agricultural own-account income	Non agricultural wages	Non-agricultural own-account income	Employers	Labor income	Transfers	Total income
<b>Costa Rica</b>								
Poor	-2,5	-3,0	-8,5	-6,3	18,8	-3,2	1,3	-1,9
Non-poor	3,4	16,5	5,8	-4,1	2,1	0,8	26,0	3,1
Total	2,6	13,0	4,8	-4,5	2,0	-0,3	22,6	1,9
<b>Paraguay</b>								
Poor	-8,1	-18,2	-3,9	-2,0	-11,0	-8,0	-13,0	-8,8
Non-poor	-3,1	-1,6	3,6	-18,2	-34,5	6,7	-29,9	2,2
Total	-11,7	-12,5	2,3	-7,3	-33,7	-1,3	-26,8	-4,8
<b>Peru</b>								
Poor	11,5	26,2	7,0	-6,6	-4,3	15,4	0,4	14,0
Non-poor	10,0	4,9	0,5	-2,4	-7,4	2,4	6,9	2,7
Total	8,7	15,2	2,7	-2,9	-7,8	6,2	3,7	6,0
<b>Brazil</b>								
Poor	-3,1	-3,5	5,1	-3,7	-4,9	-3,2	3,7	-1,4
Non-poor	-3,9	3,4	-0,2	4,3	-0,9	0,1	2,1	0,9
Total	-3,4	3,7	1,1	6,2	2,7	0,8	3,7	1,9
<b>Colombia</b>								
Poor	1,2	2,6	1,4	-6,1	12,1	3,3	31,1	5,3
Non-poor	-5,0	-17,3	-0,5	-14,7	-16,4	-5,3	-1,5	-4,9
Total	-1,2	-8,1	-0,9	-10,7	-12,6	-1,5	7,1	-0,7
<b>Ecuador</b>								
Poor	-7,1	-2,7	-0,4	4,2	-13,1	-7,1	35,7	0,1
Non-poor	-1,8	4,8	2,3	-18,2	-25,1	-8,5	22,8	-5,3
Total	-0,9	6,4	2,8	-15,0	-21,7	-4,6	29,1	-0,7
<b>El Salvador</b>								
Poor	10,6	-1,4	3,6	2,9	22,3	-9,5	11,5	-1,7
Non-poor	7,5	51,6	9,3	6,1	28,8	4,7	4,7	4,7
Total	11,9	41,8	10,6	7,0	32,4	4,0	8,5	5,4

Continued on page 99

Continuation Table 17

	Average labor incomes received by earners					Average income per household		
	Agricultural wages	Agricultural own-account income	Non agricultural wages	Non-agricultural own-account income	Employers	Labor income	Transfers	Total income
<b>Panama</b>								
Poor	5,9	25,8	3,4	5,0	24,8	7,7	17,5	10,5
Non-poor	-2,0	-7,1	-2,1	1,5	-16,0	-4,8	-8,6	-5,5
Total	1,0	6,8	-1,8	3,1	-14,0	-2,1	-2,9	-2,2
<b>Dominican Republic</b>								
Poor	8,8	16,0	7,8	8,4	-36,2	2,1	19,0	4,9
Non-poor	9,7	1,3	4,5	5,2	0,3	6,1	50,9	9,1
Total	9,0	10,7	7,9	6,1	-14,5	11,0	44,6	13,8
<b>Uruguay</b>								
Poor	-12,2	-24,8	-9,8	-24,6	--	-18,2	35,5	0,8
Non-poor	-2,0	-7,9	3,1	4,2	-3,8	-0,9	27,5	4,5
Total	-1,2	-6,5	4,0	3,9	-3,6	0,8	29,0	6,2

**Source:** Economic Commission for Latin America and the Caribbean (ECLAC), on the basis of data from household surveys conducted in the respective countries.





## **Public policies and institutional framework**

In the current scenario, the countries need to modernize the institutional framework and public policies with a long-term vision

*Latin America and the Caribbean (LAC) have sufficient resources to produce the amount of food that its population will require in the future, but the institutional framework is in need of meaningful reform if the region is to implement inclusive State policies that offer more than short-term assistance and are designed to achieve sustainable development. Medium and long-term policies that address more than strictly agricultural issues should be the rule rather than the exception and encourage the allocation of resources to the agricultural sector, bearing in mind its key role in the attainment of development objectives and not only its contribution to gross domestic product.*



### **The facts**

- The LAC countries implemented social policies to mitigate the effects of the international economic and financial crisis and help reverse the increase in poverty in 2010. Measures adopted included the expansion of social assistance programs and the promotion of conditional cash transfers (Fiszbein et al. 2009, ECLAC 2010e).
- Expanding trade relations with Asia, and especially with China, has enabled countries like Brazil, Chile, Argentina, Ecuador, Peru and Uruguay to offset the effects of the economic downturn in the United States and Europe.
- The new series of food price hikes that began in August 2010 has created problems for the net food importing countries and consumers the world over, forcing nations to adopt public policies to reduce the impact of the increases. The net food exporting countries, on the other hand, implemented policies designed to take advantage of the opportunities that arose.
- Most LAC countries are currently adopting economic policies with a monetary and financial approach. However, they lack the fiscal capacity to implement them, and face other challenges such as inflation and the appreciation of their currencies.
- In 2010, reforms of the region's institutional regulatory framework were proposed in order to respond more efficiently to issues related to food production and rural development.
- The countries have not made substantive changes in the allocation of resources for the agricultural sector, despite the fact that more duties and responsibilities have been assigned to the ministries of agriculture.



- Over the last two years, free trade agreements in the region have fostered stronger links between agricultural sector institutions and other public and private sector agencies.
- Food security has become an increasingly important issue, as have efforts to assist the population that cannot obtain sufficient food and is vulnerable to the effects of climatic events. Small farmers and other rural dwellers were included in that segment of the population, leading to the creation of programs and coordination mechanisms to meet their needs.
- Many countries in the region made major efforts to reactivate their extension and technical assistance services for small and medium-scale producers, in the area of processing as well as primary production.

### • **Recent trends**

Food price hikes generally have adverse consequences for consumers and create social tensions and pressures that force governments to adopt public policies to offset the negative effects of higher prices on food security, especially among the most vulnerable sectors of the population.

In countries like Honduras, the poorest families spend up to 83.3% of their income on food, while the figure for the highest income families is less than 10%. This highlights the inequality that exists in parts of Latin America and the need for governments to take urgent action to address it. Not all the countries make the connection between this issue and higher food prices in their public policies, however.

During the last financial and food crisis, the fiscal situation of most LAC governments was healthy, following a period of strong economic growth, and that allowed them to adopt a series of countercyclical public policies. In the period 2010-2011, on the other hand, the tight fiscal situation has made it difficult for the countries to continue implementing their programs to combat inequality or to undertake

new initiatives in that area, which in turn is creating new social tensions and political pressures.

Both net importing and exporting countries in the region have been more inclined to adopt defensive policies to deal with the crisis and price volatility than proactive policies that would allow them to take advantage of long-term opportunities. In addition, they have a limited number of tools available for implementing defensive trade policies.

### ***Policies implemented***

The countries implemented a combination of sectoral and social policies, all of which were designed to promote national production in some way. The aim was to protect both consumers and agricultural producers, especially the most vulnerable, by keeping domestic prices stable and preventing job losses.

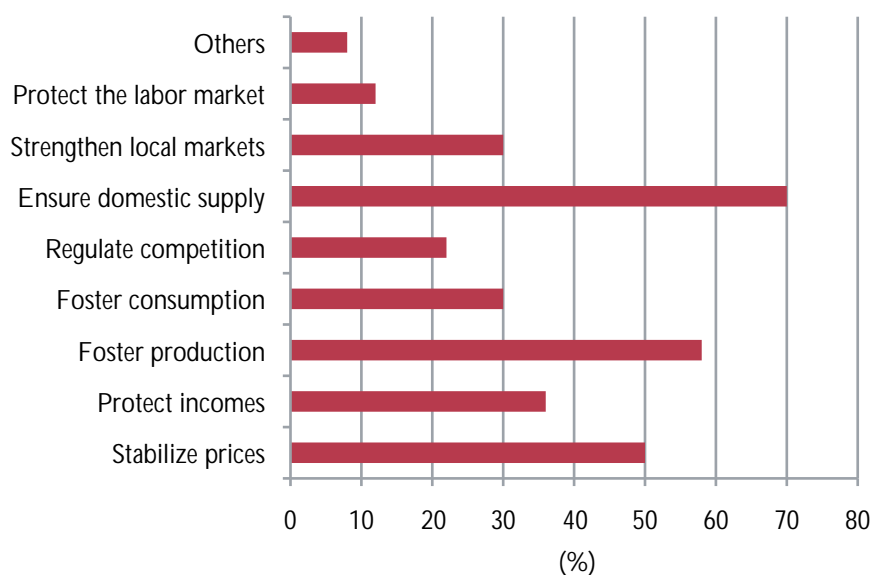
Some countries endeavored to strengthen production chains by creating or strengthening financial institutions and systems to support the agricultural sector. Debts often had to be refinanced and, more recently, the effects of having

an overvalued currency have become a concern in many countries.

According to a survey conducted by IICA in 2011, since 2009 88% of the countries included in a sample of 20 nations have adopted policy measures to address food price hikes and food insecurity. Furthermore, during 2010 and the first half of 2011, 39% of the countries made some kind of substantial

change in their agricultural policies. The principal objectives pursued by the policies implemented during 2010-2011 were: to ensure domestic food supply (70% of the countries), to foster production (58% of the countries) and to stabilize prices (50% of the countries). It is interesting to note that only slightly more than 10% of the countries implemented specific policies to protect the labor market (see figure 24).

**Figure 24.** Objectives of the policies implemented (% of replies)



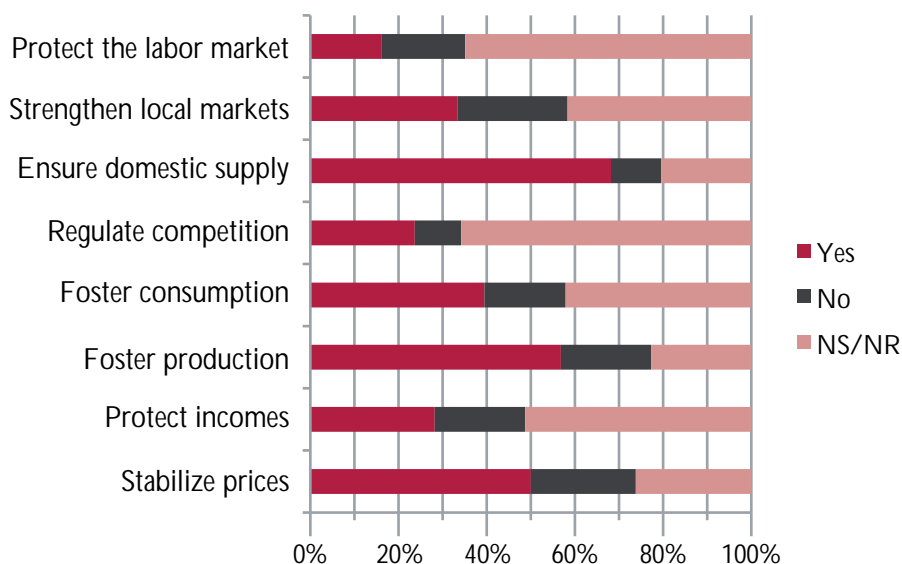
**Source:** Prepared by authors, based on Agricultural Outlook 2011 questionnaires.

The study also sought to determine the respondents' perception of the effectiveness of the policies adopted. The policies designed to ensure domestic food supplies were deemed to have been the most effective (68% of the replies), followed by those aimed at promoting production (57% of the replies). Half of the respondents believed that the objective of stabilizing prices had been achieved effectively. The policies aimed at regulating competition and

protecting the labor market were regarded as the least effective (see figure 25).

One limiting factor identified was the lack of evaluation and monitoring mechanisms, since 60% of the respondents in the 20 countries studied said there were no active systems for performing that task. This means that the replies of the people surveyed were largely a matter of subjective perception.

**Figure 25.** Degree to which the policies implemented achieved their objectives (% of replies)



**Source:** Prepared by authors, based on Agricultural Outlook 2011 questionnaires.

### *Subregional policies*

The public policies adopted in the different countries reflect the specific conditions of each nation and region and the situation of the various stakeholders. The measures adopted can be divided into short and medium/long-term policies, i.e., those intended either to address the effects of the immediate crisis or to create different structural conditions over time.

The crisis and the scenario of high and volatile prices forced governments to adopt different types of policies. Some aimed at offsetting the effects (defensive), were adopted mainly by the net food importing countries, and others designed to take advantage of the opportunities (offensive), as was the case of the net food exporting countries in the Southern Cone. However, the measures adopted

to promote production in most countries were stopgap measures, and few had a medium- and/or long-term vision.

The Southern Agricultural Council (CAS)<sup>10</sup> and the Caribbean countries have taken steps to institute coordinated regional policies. The Central American nations have even adopted a Central American Agricultural Policy (the PACA) for 2008-2017, but there are no similar initiatives in the Southern Cone. In the Andean countries, on the other hand, there are no recent initiatives to coordinate policies at the regional level.

In the Southern Cone, policies have been dominated by the financial problems created by the international crisis. Most of the South American countries have adopted measures to strengthen or expand their public financial sectors (to increase

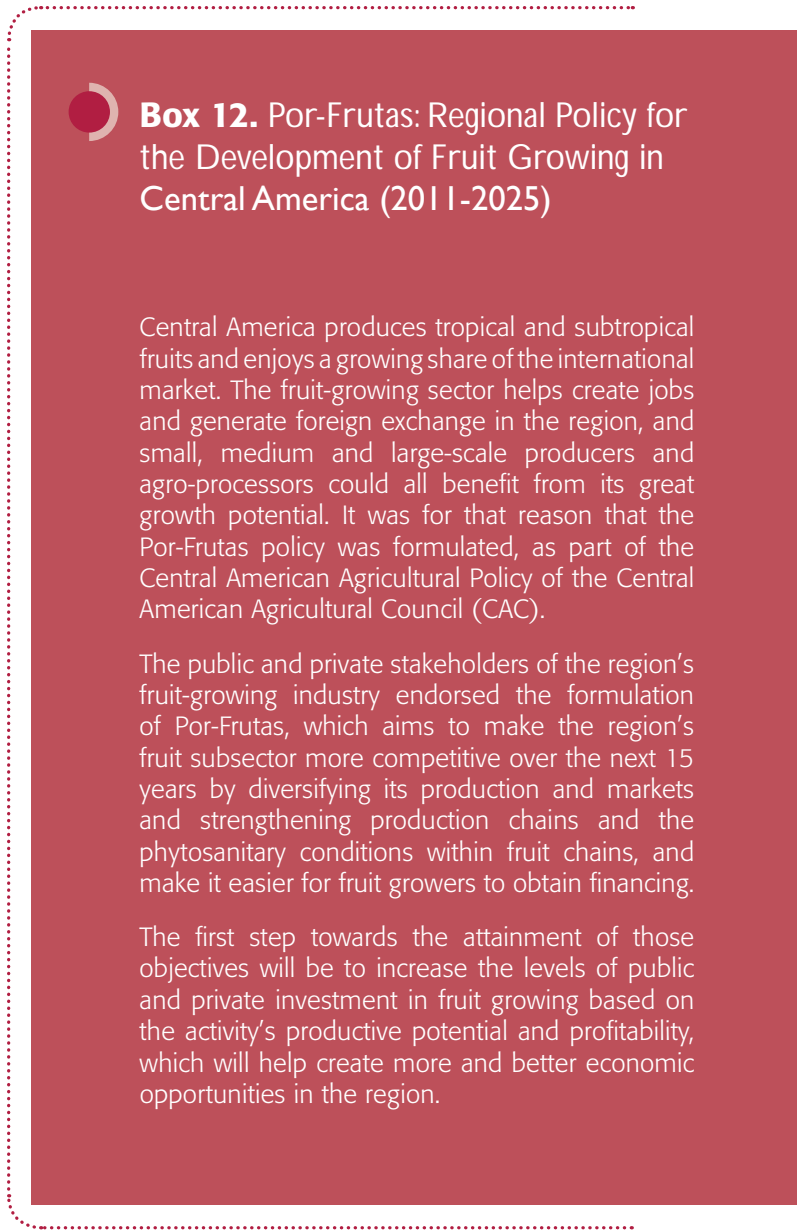
<sup>10</sup> Comprised of Argentina, Bolivia, Brazil, Chile, Paraguay and Uruguay.

the liquidity of the financial system and keep their loan portfolios open with attractive interest rates). Bolivia created the *Banco de Desarrollo Productivo* (BDP) and Paraguay established the *Agencia Financiera de Desarrollo*. A number of financial development institutions have also sought to play a bigger role in the agricultural sector, such as Peru's *Corporación Financiera de Desarrollo* (COFIDE) and Chile's *Instituto de Desarrollo Agropecuario* (INDAP).

In recent years, concern has been expressed about the purchase of large swaths of land by foreign companies and governments, with calls for the situation to be regulated. Land is being bought to ensure future supplies of agricultural products, amid fears that rapidly increasing demand and slowly developing supplies will lead to imbalances in agricultural markets. Uruguay and Argentina have announced measures to regulate the situation.

Central America took firm steps to establish coordinated regional policies and implement national policies aimed at increasing food production. For example, following the adoption of the PACA, which is a medium-term policy (2008-2017), regional strategies have been formulated on cross-cutting issues, including rural development (Central American Strategy for Territorial Rural Development, ECADERT) and agriculture and environment (Regional Agro-environmental and Health Strategy, ERAS). The main axes of the PACA are : a) competitiveness and agribusiness (trade, agricultural health and food safety policies, technology and innovation); and, b) risk financing and management. It also considers three cross-cutting issues: small-scale commercial agriculture, agro-environmental management and institution building.

In the Caribbean, agricultural policy underwent important changes in 2009 and 2010, primarily due to the impact of the financial and food crisis in the region, which is a net importer of foodstuffs. The situation made it necessary to draw up a food security policy, another policy for the development of agribusinesses and, lastly,



**Box 12. Por-Frutas: Regional Policy for the Development of Fruit Growing in Central America (2011-2025)**

Central America produces tropical and subtropical fruits and enjoys a growing share of the international market. The fruit-growing sector helps create jobs and generate foreign exchange in the region, and small, medium and large-scale producers and agro-processors could all benefit from its great growth potential. It was for that reason that the Por-Frutas policy was formulated, as part of the Central American Agricultural Policy of the Central American Agricultural Council (CAC).

The public and private stakeholders of the region's fruit-growing industry endorsed the formulation of Por-Frutas, which aims to make the region's fruit subsector more competitive over the next 15 years by diversifying its production and markets and strengthening production chains and the phytosanitary conditions within fruit chains, and make it easier for fruit growers to obtain financing.

The first step towards the attainment of those objectives will be to increase the levels of public and private investment in fruit growing based on the activity's productive potential and profitability, which will help create more and better economic opportunities in the region.

one aimed at promoting regional agricultural marketing intelligence systems. The United Nations Food and Agriculture Organization (FAO) and the Inter-American Institute for Cooperation on Agriculture (IICA) assisted the Caribbean Community (CARICOM) with the formulation of its strategies.

### ***Types of policies at the national level***

Based on the different objectives they pursue, the public policies adopted in LAC can be divided into four groups: (i) *policies to increase production*, (ii) *policies to guarantee producers income*, (iii) *policies to guarantee domestic consumption* and (iv) *social policies to protect vulnerable populations*.

- *Policies to increase production*

These consist of measures designed to reduce the cost of imported inputs, supply seeds, grant loans on softer terms, etc.

The expansion of non-financial services, specifically the supply of inputs (seeds, fertilizers and tools), the provision of technical assistance (pest management/fertilizers and the use of machinery to prepare land), support for marketing (purchases by the State, definition of prices and input fairs), and the improvement of the infrastructure used to store food are some of the measures included in various programs implemented in LAC to increase production. The programs in question include the Plan to Finance Production in Bolivia, “Más Alimentos” in Brazil, “Casa Rurales” in Honduras, the Program to Reactivate Staple Grain Crops in Costa Rica, and various institutional mechanisms for the supply of seeds and inputs. Among the latter, one of the most original is Chile’s competitive grant program; under which small-scale farmers receive seeds, fertilizers and other inputs.

In various countries of the region, programs have been set up to afford producers access to credit on better terms than those available in the financial market, mainly to facilitate the incorporation of micro and small-scale producers into the domestic market. Some cases in point are loan programs to support bean producers (Central America), wheat producers (Argentina) and milk producers (Chile); the Agro Rural Program in Peru; and the Mais program in Brazil, under which the *Zafra da agricultura familiar* initiative promoted lines of credit on favorable terms.

Other policies implemented were designed to promote access to financing for marketing activities

and strengthen agricultural value chains, in order to increase the demand for agricultural products and reduce the transaction costs of agricultural loans. For example, policies were implemented in Brazil to help cover the transportation costs involved in marketing milk, while in Argentina grants were awarded to cover the cost of managing the credit portfolio of entities that provide agricultural loans.

Some of the issues that have once again become a priority in the region are the promotion of extension systems, agricultural research and innovation for irrigated agriculture (e.g., the regional IICA/FAO initiative in Central America and the Dominican Republic, and in Jamaica); the adoption of technological innovations in agriculture, such as

### **Box 13. Policies for spill-over and distribution of State revenue in South America**

Several LAC countries with large mining industries that have benefited from the high international mineral prices decided to allocate part of the extra resources generated to social investments. For example, Chile decided to earmark a substantial percentage of the profits generated by high copper prices to innovation and education.

Peru implemented the Mining Program for Solidarity with the People, under which programs and projects were carried out related to a number of areas, such as nutrition, the promotion of production chains, primary education, technical training, health, the improvement of basic infrastructure (water), and the development and strengthening of public management capabilities. This program also made it possible to carry out initiatives that have contributed, directly and indirectly, to local agriculture.

those designed to promote the genetic improvement of corn and bean seeds in Central America so that these crops adapt better to climate change; and the control and eradication of pests and diseases, such as the fruit fly in Brazil and Chile.

- *Policies to guarantee producers income*

Some of the measures included in this group are purchases by the State, risk coverage, guaranteed prices, direct payments, arrangements among players within the chains and stabilization funds.

In some countries, policies designed to stimulate production have been accompanied by government purchases of staple foods from the small farmer subsector to improve the latter's access to markets with competitive prices (in Brazil, for example), or policies to mitigate and transfer agricultural risks by broadening the coverage of various public guarantee and insurance tools (in Chile, Brazil, Peru and Costa Rica).

Policies have also been implemented to promote contract agriculture programs. In Chile, for example, industrial tomatoes, sugar beets, tobacco and corn seedlings have benefited from initiatives of this kind. Other policies have promoted the fixing of guaranteed prices. This mechanism, used in Brazil, has enabled producers to maintain a specific income level which, in turn, has stimulated production. Finally, some countries (e.g., Guatemala and Paraguay) have promoted the incorporation of unused land into production, thanks to which small-scale producers have gained access to land and thereby increased food production.

- *Policies to guarantee domestic consumption*

This group of measures includes restrictions on exports and the protection of consumers' incomes, to prevent the contraction of demand.

By and large, bans on exports to guarantee domestic food supplies and lower prices were used as stopgap measures. Only Argentina currently has such a measure in place.

Finally, some Andean countries have adopted measures to encourage the production and consumption of local and traditional products that in some cases are not traded in international markets, such as potato bread in Peru. Measures of this kind are used to reduce dependence on imports.

- *Social policies to protect vulnerable populations*

This set of policies includes measures to promote conditional cash transfers, access to public services, the distribution of bags of food, the strengthening of social networks, etc.

With regard to social policies, measures have been implemented in LAC to maintain and ensure the sustainability of social assistance for poor consumers and producers, especially those living in extreme poverty. Such assistance ranges from grants and conditional cash transfers for education to in-kind food aid.

Although they have been used in LAC for a long time, conditional income transfer programs have been expanded since the onset of the economic and food crisis because they have proven to be very successful. Initiatives of this kind are used in many countries of the region, including the following: Mexico ("Oportunidades" program); Brazil ("Bolsa Familia" program)<sup>11</sup>; Uruguay ("Equidad" program); Argentina ("Familias para la Inclusión" program, bags of food for retirees and, recently, a universal grant); Chile ("Chile Solidario" program); Peru ("Juntos" program and PRONOOA); Ecuador (grant for human development); Colombia ("Familias en Acción" program); Costa Rica ("Superémonos" program); El Salvador (Red Solidaria); Honduras (PRAF); Jamaica (PATH);

<sup>11</sup> Recently, the President of Brazil announced the "Brasil sin Miseria" plan, which aims to eradicate extreme poverty within four years.

Nicaragua (Social Protection Network); and the Dominican Republic (“Solidaridad” and “Comer es primero” programs).

The governments of some countries, such as Uruguay, have sought to establish agreements on prices with the private sector so that when there are sharp rises in the international market, consumers can buy food at affordable prices and the authorities do not have to peg prices.

### ***Institutional changes***

Over the last two years, certain changes have taken place in the institutional framework for agriculture in LAC to strengthen innovation systems and reactivated extension services, which were seriously neglected under the institutional model that held sway in the 1980s and 1990s. Emphasis is now being placed on the provision of better services to small farmers. Programs and mechanisms have also been created to ensure that the agricultural sector is better equipped to cope with climatic phenomena and mitigate their effects.

In 2010, food security was perhaps the issue that had the biggest impact on agricultural sector programs and institutions and the agencies in charge of social policies in the LAC countries. In many cases, the ministries of agriculture were tasked with dealing with the problem, while in others responsibility was assigned to other institutions, inter-institutional coordination mechanisms or special programs created by the Office of the President.

With the negotiations for bilateral and regional trade agreements being stepped up, the countries had to beef up the administrative units of their ministries of agriculture in order to implement what had been agreed and monitor market trends by means of more modern information systems. As a result of the negotiations, food safety and quality services also had to be strengthened or reorganized from the beginning of the agrifood chain to ensure compliance with the international standards that guarantee access to markets.

Furthermore, some countries promoted the

implementation of actions aimed at fostering food security and small-scale agriculture. They also worked on proposals aimed at strengthening and organizing production systems based on the concepts of agro-chains or territories, depending on the political orientation of the government in power at the time that the proposal was formulated. For example, governments of a more liberal persuasion proposed reforms designed to make agro-chains more competitive, promote market access and meet international commitments. The proposals of less liberal governments, on the other hand, focused on the concept of territories and placed emphasis on assistance for the poorest families and on decentralized institutions.

Many countries in the hemisphere have continued to modernize their animal health and agricultural health and food safety (AHFS) services with support from IICA, PAHO, FAO and the OIE. The efforts undertaken in Brazil, Colombia, Costa Rica, Paraguay, Peru and Uruguay are worthy of special mention. In Central America, growing economic integration is having a positive impact on the trend in that field. However, some countries – especially in the Caribbean – have yet to accept the importance of improving their AHFS services. The countries in question, which regard themselves as net importers of food and other agricultural products, appear to underestimate the positive impact of AHFS services on the protection of fauna, flora and consumer health.

### **• Outlook**

An economic recovery is expected in LAC which will help to consolidate economic growth in the long term. It will not, however, solve the problem of inequality, which is one of the main challenges to be tackled. Continued fiscal constraints will hinder the implementation of policies and far-reaching institutional reforms in the short term.

Different approaches to the style of development are likely to be consolidated in LAC as countries continue to debate the role of the State, the value of public policies, the importance of the operation

of the public sector (public management) and the modernization that institutions need to undergo if they are to address issues of public interest effectively.

It is predicted that short-term policies will prevail in the agricultural sectors of most countries of the region, with governments formulating and implementing them during their respective term in office. Some nations, however, will focus on policies with a long-term vision. For example, Costa Rica, Peru, Panama, Argentina and certain other countries are already formulating State policies or strategic plans for agriculture based on Chile's experience, which is regarded as a success, or the examples of the European Union (Common Agricultural Policy) and the United States of America (Farm Bill).

Food security will continue to figure high on the agendas of the countries and in joint initiatives, such as the Group of Eight (G-8) and the Group of Twenty (G-20), since the factors that bear upon food security will remain unchanged. Furthermore, the uncertainty and instability of commodity prices, changes in the cost of inputs and the appreciation of some currencies will continue to affect the competitiveness of production and agrifood trade in the region.

Inflation will affect the food basket and emerge as a new cause for concern, especially for the net food importing countries and lower income groups.

The high prices of the main agricultural commodities and defensive trade policies will make the successful conclusion of the negotiations of the Doha Round for Development an unlikely prospect, even though the developing countries still need an institutional framework and regulations that would guarantee their products access to the markets of the most developed countries. However, progress is expected to be made with regional integration, which would offset the lack of a multilateral trade agreement for the coordination of economic policies.

China will play an increasingly important role in the trade strategies of countries in the region, since it will demand more and more raw materials

from Latin America, which will help spur the economic growth of the net exporting countries. China's investments in LAC will also be important, especially in the large South American countries.

Promoting the reduction of poverty and integrating small-scale producers into markets will be two of the objectives of public policies, not only for ethical and social reasons, but also because the countries will increasingly recognize the potential contribution that these producers can make to domestic food supplies and to the attainment of food security.

Growing climate variability, the impact of extreme climatic events and recognition of the effects of climate change on conditions for agricultural production will lead to the formulation of public policies designed to promote the mitigation of those effects and the adaptation of agriculture to the new climatic conditions. In addition, concern over the emergence of pests and diseases as a result of climate change will lead governments to take preventive, rather than reactive, measures in the area of agricultural health and food safety.

Furthermore, the pressure to make public spending in the agricultural and rural sectors more efficient, and to increase public investment in agriculture, will continue to mount. This will occur as countries gradually realize the true importance of agriculture – not only as a supplier of food but also as a sector that drives social and economic development in general, since its contributions are not limited to the rural and sectoral areas – and governments and the international technical cooperation agencies and financial institutions assign it a higher priority.

In the years ahead, changes are also expected in the model of the institutional framework for agriculture, with weak ministries and agencies being replaced by more balanced institutional models under which the private sector has greater access to the State's services and support.

It is predicted that governments will reassume responsibility for some of the functions they relinquished and left to the private sector in the areas of innovation, extension, the adoption of



safety standards, credit and services related to market and environmental risks. They will do so by strengthening the ministries of agriculture or the decentralized governmental institutions in charge of the areas in question and the respective regulatory frameworks.

In addressing emerging or recurring issues, the countries will resort to measures to regulate markets, as they have done previously.

One development that will have major repercussions for LAC in the years ahead is the United States' recent enactment of the Food Safety Modernization Act. This legislation establishes new requirements for food exports to that country and grants new powers to the national food safety agency (Food and Drug Administration-FDA). One of the requirements that could have a major economic impact on the region is the obligation that exporters certify the safety of their shipments at the point of origin, by means of an FDA-approved certifier.

Governments will again invest in the infrastructure required to manage, preserve and distribute basic products, such as storage silos, facilities for the cold chain and trade fairs. Institutions will be restructured but, given the political difficulties and fiscal constraints involved, the institutional frameworks will continue to be ill-equipped to meet the new challenges.

### • **Public policy recommendations**

To tackle price volatility, reduce poverty and guarantee food security in the years ahead, policies are needed that address more than strictly agricultural issues. The challenges call for policies that are broader in scope and closely coordinated macroeconomic and sectoral policies. To achieve their goals, the countries should consider implementing State policies for agriculture that make it possible to address cross-cutting and multi-sectoral issues.

We have learnt from recent crises that we must recognize the value of public policies, the role that

the State plays in agriculture and in the effective operation of public-sector institutions and in conducting and tackling issues of public interest (public management). There is an urgent need to develop a joint vision that seeks to achieve the objectives for which the policies were designed. Continuity of actions over time must also be a priority.

The governments also need to view agriculture as a priority sector for the attainment of food security. Investment in agriculture must be stepped up and the human, technical and financial resources required for its development allocated. In addition, the countries need to make widespread use of practices for evaluating the results of the policies implemented, develop the monitoring and evaluation mechanisms required, and learn from the good practices that other countries are employing.

Given the volatility of prices and the fact that they are likely to rise in the long term, it is recommended that the countries aim to make their social programs sustainable and improve their capabilities for investing public funds in an efficient, equitable and progressive manner.

It is also recommended that social protection programs in rural areas be expanded – conditional cash transfers, for example, which have achieved good results, as they increase the purchasing power of consumers without affecting the incentives for domestic food production.

The countries should expand the assistance programs designed to improve nutrition levels, especially those of vulnerable groups like children, women and the elderly. Examples are the initiatives currently being implemented in Argentina, Costa Rica, Guatemala, El Salvador, Peru and Brazil.

A number of other actions are highly recommended. The countries, especially those that are major players in international trade, should avoid measures that restrict foreign trade and distort markets even further. They should also bring the Doha Round of the WTO to a successful conclusion as soon as possible, so as to have a global regulatory framework.

Efforts are needed to increase food supplies and help achieve food security, and at the same time contribute to the alleviation of rural poverty. This calls for specific and differentiated policies to encourage the full incorporation of small-scale producers into markets and their integration into value chains, promote technological innovation as a tool for increasing their yields, and foster partnerships, which will increase their negotiating power and allow them to obtain more benefits.

It is also recommended that policies be implemented to encourage farmers to take advantage of LAC's enormous relative potential in terms of arable land, especially in countries with the largest agricultural production, such as Brazil and Argentina, but also in Colombia, Bolivia, Venezuela, Peru, Paraguay, Ecuador and Guyana.

Thanks to the high prices of commodities, the countries that are net exporters of food, minerals and oil are receiving additional financial resources that could be used in several ways: firstly, to compensate the social sectors that are most vulnerable to rising food prices and, secondly, to invest in the agricultural sector and thereby raise productivity and production.

The net importing countries will continue to feel the negative effects of the situation, as the cost of importing both food and inputs will rise. One way to mitigate those effects would be to implement policies aimed at substituting imports and promoting the production and consumption of native foods.

## • Conclusions

LAC has the human and natural – and, in some cases, the technological – resources required to produce the quantity of food that the population of the region and the world will need in the future.

Reforms have yet to be carried out to create an institutional framework that would make it possible to implement inclusive policies that offer more than short-term assistance and that are designed

to achieve sustainable development. Such efforts are needed sooner rather than later if the most vulnerable population groups are to receive the assistance they require.

The situation calls for a decisive leap towards more meaningful reforms that would make it possible to promote, implement and adjust dynamic policies designed to foster agricultural production and rural development. This, in turn, means that the legal framework for the public agricultural institutional fabric needs to be overhauled and strengthened, so that it facilitates the implementation of policy measures.

Medium and long-term State (and not only sectoral) policies should be the rule rather than the exception, underpinned by effective inter-institutional coordination bodies that would make it possible to tailor policies to the needs of each situation.

Resources should be allocated to the agricultural sector based on agriculture's key role in the attainment of development objectives and not only its contribution to national gross domestic product, as has been the case hitherto.

The governments and the international financial organizations should invest their resources intelligently to encourage the responsible management of natural resources, foster social inclusion and promote the competitive production of quality foods. At the same time, efforts should be made to develop and strengthen national capabilities for promoting competitive agribusinesses, managing participatory policy-making processes, implementing projects and programs based on strategic planning, and providing effective services.

Finally, many of the problems that the countries face, such as those associated with climate change and an absence of food security, clearly have a global dimension. Therefore, coordinated efforts involving all the countries are required to address them effectively. Good examples of this are the strategies implemented in Central America as part of the region's integration process and the action plan proposed at the recent G-20 summit in Paris.



A stylized tree graphic with a thick brown trunk and several branches. The leaves are dark red with white vein patterns. The tree is positioned on the right side of the page, with its trunk extending from the bottom edge towards the top. The background is split into a dark red upper half and a light grey lower half, separated by a white dotted line.

## **Section IV: ICT and agriculture**





## ***ICTs and the new challenges for agriculture and rural development in Latin America: a multidimensional approach***

*Information and communication technologies (ICTs) are fundamental for achieving the goals of productivity, sustainability and transparency. Moreover, they have proven effective in securing the social inclusion of rural people. When access to these technologies is either lacking or unreliable, entire regions or generations can be excluded and cut off from opportunities for more rapid and inclusive development.*

The revolution represented by the integration of ICTs into economies and societies has meant the emergence of great challenges and opportunities for agricultural and rural development in Latin America and the Caribbean (LAC).

On one hand are the consequences of ICTs for the production and consumption chain which, directly or indirectly, can affect relations between producers, consumers, suppliers and agricultural institutions. On the other hand, innovations in the forms of communication introduced by ICTs have brought new dynamic growth to rural areas not only in economic terms but also in their social and cultural terms, and have had a generally positive impact on people's welfare.

Among the direct effects of ICTs on productive activities in rural areas the following have been well documented:

- Improvements in the monitoring and forecasting of sowing, harvests and production.
- Reduction of systemic risks related to climatic events, price volatility, and the spread of cross-border plant and animal diseases.
- Creation and strengthening of small family enterprises; and

- Facilitation of transactions and the development of innovations throughout the production chain.

ICTs have also shown great potential for improving employment opportunities in non-farm rural activities such as agri-tourism and other services.

In the broader context of rural living conditions, ICTs represent a tool for social inclusion. In fact, in those rural areas where they have made inroads these technologies have been able to break historical, geographical and physical patterns of isolation and have improved local people's access to communications and services and to basic rights such as education, health and citizen participation. In this respect, the innovations represented by ICTs must be seen as complex processes of social, technical and cultural change in which not only technology itself but also social and political factors play an important role determined by the development of ICTs.

The multiple dimensions of ICTs considered in this chapter suggest an equally broad definition of these technologies. This definition is not limited to hardware, software, networks and the means of collecting, storing, processing, transmitting and presenting information (voice, data, text, images). It also includes technical know-how, products and services, the institutional setting (including firms), operators, suppliers, manufacturers, consumers, public agencies, academic and research institutions,

regulators, other institutions and partners directly involved in or affected by the production, delivery and regulation of ICT products, as well as services (World Bank 2002). This definition provides a framework for better understanding the role of ICTs in agriculture and rural development.

The multiple dimensions of ICTs are also reflected in the unavoidably broad concept of the digital divide, which can refer to a country or region vis-à-vis other countries or regions, to different localities within the same country, or even to different players within the same locality.

ICTs are essential for achieving the goals of productivity, sustainability and transparency. Moreover, they have shown themselves effective in securing the social inclusion of rural people, and where access to them is lacking or unreliable this can leave entire regions or generations cut off from opportunities for more rapid and inclusive development.

At the present time, despite the efforts of LAC countries to move forward in preparing and implementing a digital agenda, the gaps in comparison to developed countries both with respect to accessibility and use of ICTs have grown in many dimensions (ECLAC 2010b). This reveals the nonlinear trend of the digital divide within and between regions in recent years, as technological needs have become increasingly sophisticated. In fact, the costs of purchasing, adapting and learning to use ICTs as well as their impact on the growth and development of economies and societies are tending to increase exponentially, as the technology becomes more complex.

For example, the quality of broadband (and not only the level of access) affects the possibilities for using different ICT-based productive and social technologies. In this respect, if a country or locality

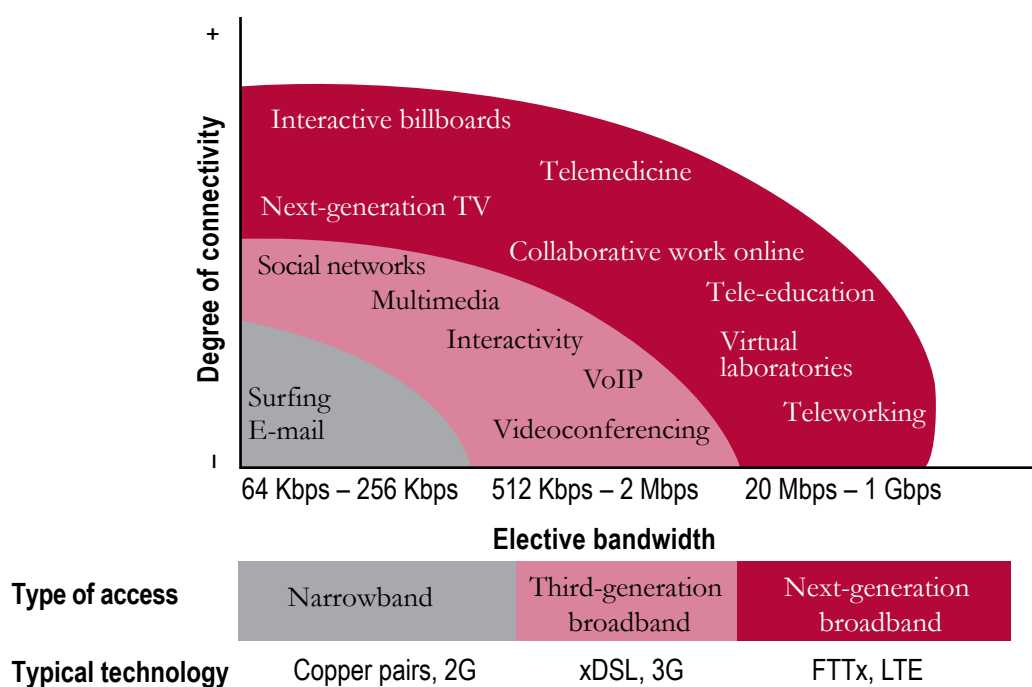
does not have adequate quality in terms of access infrastructure, it is at risk of missing out on the development opportunities generated by ICTs (see figure 26).

Related to the foregoing, the digital divide that separates LAC from the countries of the Organization for Economic Cooperation and Development (OECD) reveals clearly the region's shortcomings and limitations in terms of accessing the greatest growth benefits of ICTs: even though the mobile telephony gap is narrowing, there are now more modern forms of connectivity with greater possibilities for contributing to development, especially fixed and mobile broadband (see figure 27).

In terms of policies, a multidimensional approach to ICTs can help in the design of measures to guarantee more integrated development. This will allow rural people to raise their productive incomes, but will also help to improve their living conditions, to create and disseminate knowledge in these areas, and to generate opportunities for inclusive and participatory growth. Here, it must be recalled that the supply and the quality of connectivity infrastructure are necessary but not sufficient conditions for the rural adoption and use of ICTs. Other important conditions for their use to be effective, and in particular for them to have positive impacts on development, are the skills of their users and a favorable environment, with the availability of ICT-intensive public and private services.

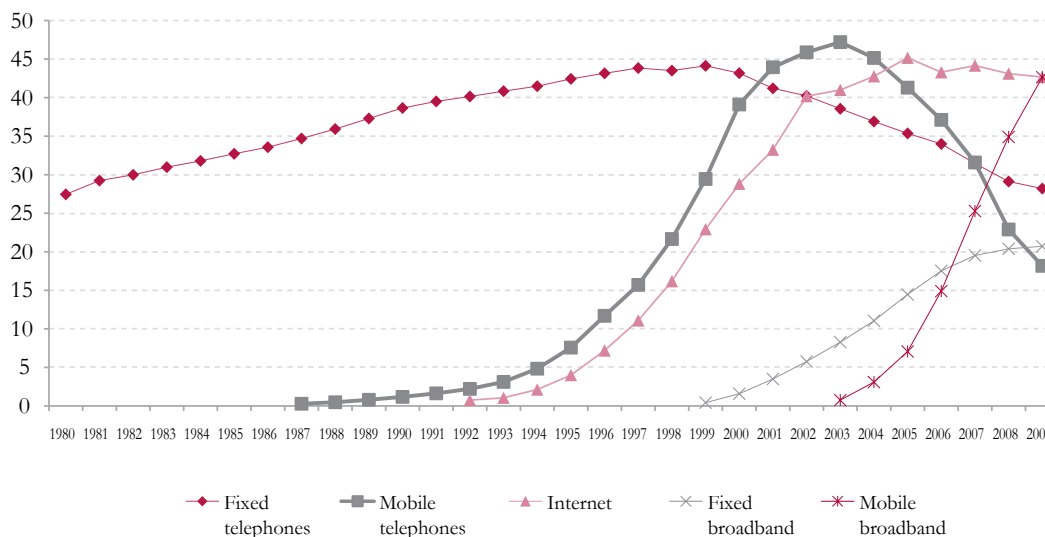
In recent years, countries of the region have placed great emphasis on policies to improve connectivity and to enhance public access to the Internet. Yet a more detailed breakdown of regional progress towards the information society (which does not in fact reflect the situation in the countryside) shows that in overall terms those efforts have failed to make significant headway in closing the infrastructure gap with respect to OECD countries (figure 28).

**Figure 26.** Transmission speed needed for different technologies



Source: ECLAC 2010b.

**Figure 27.** Latin America and the Caribbean: Trend in digital divides compared with OECD countries



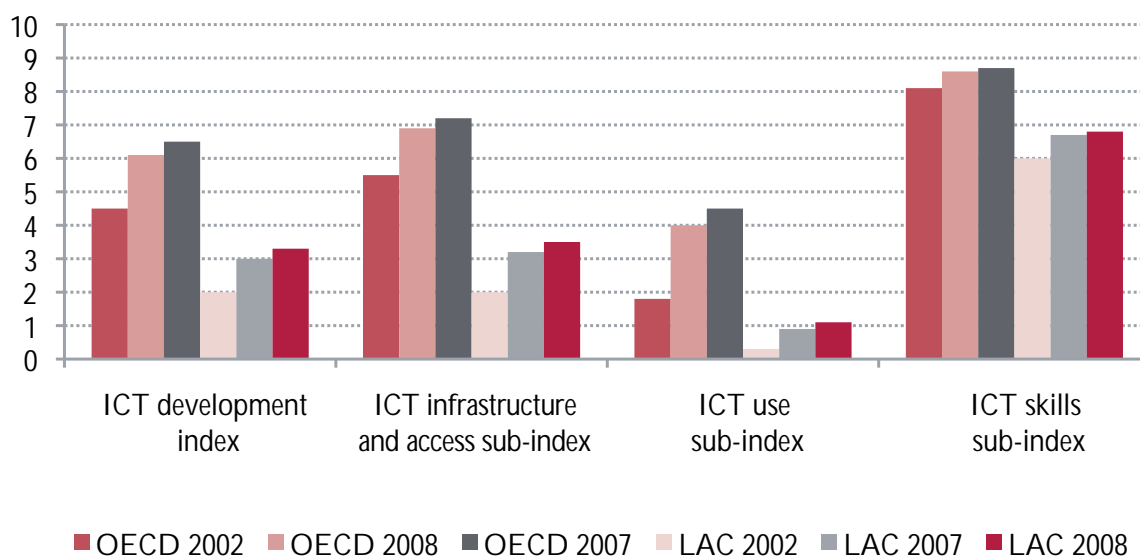
Source: ECLAC 2010b.



Indeed, when it comes to the use of ICTs the gap between developed countries and the region has been widening in recent years. This reflects integrated government policies in OECD countries

to foster ICT use, which has grown apace with the supply and quality of connectivity, user skills and incentives to employ ICTs in the most diverse areas of society.

**Figure 28.** Latin America and the Caribbean: Progress toward the information society, simple average by region, compared with OECD countries



**Source:** ECLAC 2010b.

ICTs are a key element for addressing the multiple dimensions of the challenges facing agriculture: guaranteeing food security, boosting productivity and environmental sustainability, improving market transparency, creating freer and fairer trade, sustaining investment that will boost the supply of food, and integrating the rural development dimension into agricultural policies. All of this must begin with policy mechanisms that consider the diversity of local situations, the specific needs of different sectors and activities and, especially, the situation of the most vulnerable population groups.

Although the importance of ICTs is undeniable, there is very little information not only about

their use in these areas but also about their impact on sector policies and programs and on government institutions in the agricultural area, research institutions, academia, private entities, and civil society.

With a view to generating input for the formulation, implementation and evaluation of strategies for promoting ICTs in the region, the following sections present a preliminary analysis of accessibility, uses and potential impacts of ICTs in productive development and in public institutions relating to agriculture and rural life in LAC.



## **ICTs in the public institutional framework for agriculture**

*Public institutions with responsibility for agriculture that are doing the most to promote the use of ICT-based solutions are those that are implementing national e-government strategies. For the adoption of such technologies to be a success, however, staff need to be given more digital literacy training and intraregional collaboration needs to be stepped up so that less developed countries can benefit from the practical lessons learned and good practices developed in nations that have made more progress in this field, such as Colombia, Mexico, Chile, Brazil and Argentina.*

The public institutions with responsibility for agriculture that have adopted information and communication technologies (ICTs) are already seeing positive results. However, ICTs have great potential impact over the long term. With time, it will be possible not only to improve access to and the use of ICTs in institutions, but also to consolidate and further develop the public policies instituted to promote them.

Organizations with responsibility for agriculture can use such technologies to make their processes more transparent, save human and economic resources, increase their geographic coverage and expand the range of products they offer.

This chapter provides an overview of the factors that will determine the impact of ICTs on the management of public institutions for agriculture, now and in the future. It focuses on the regulatory and institutional framework and the conditions for accessing and using ICTs in public institutions with responsibility for agriculture. Based on the findings of the analysis, a number of policy recommendations are made at the end of the chapter.

Since the public institutional framework for agriculture in Latin America and the Caribbean (LAC) varies from country to country, the authors decided to take the core components of the framework as their unit of analysis, i.e., the

secretariats or ministries of agriculture and related institutions that provide agricultural services (e.g., research, extension, health and veterinary services). The term used to identify the unit of analysis is “MoA.”

- **Regulatory and institutional framework for ICTs**

Unlike the private sector, where the use of ICTs depends mainly on initiatives implemented by companies, the application of such technologies in public sector institutions is subject to the existence and implementation of a regulatory and institutional framework that promotes access to them and their use for all the tasks carried out by the national public institutional framework.

Even if an MoA makes independent efforts to digitize its internal processes or offer services involving the use of ICTs, such actions will not be sustainable or have a long-term impact unless there is an overarching e-government (EG) strategy or digital agenda in place that encourages (and in some cases requires) all State institutions to implement ICTs as part of their activities.

The level of development of regulatory and legal frameworks to promote ICTs varies considerably in

LAC. While most of the Southern Cone countries have made the greatest relative progress with the drafting and implementation of legislation and social agreements for the promotion and regulation of ICTs within society, most of the Central American and Caribbean nations are only now embarking upon the process.

According to the e-government development index (EGDI) produced by the United Nations Department of Economic and Social Affairs (UN 2010), Colombia is the LAC country that has made the greatest effort to consolidate its EG strategy.

The index, which weighs the Web services of governments, the digital literacy skills of their human capital and the national telecommunications infrastructure, ranks Colombia 31st in the world, followed by Chile (34th), Uruguay (36th), Barbados (40th), Argentina (48th), Antigua and Barbuda (55th), Mexico (56th) and Brazil (61st). A number of Central American and Caribbean countries appear much farther down the list, including Honduras (in 107th place), Guatemala (112nd), Nicaragua (118th), Belize (120th), Suriname (127th) and Haiti (169th). These are the region's lowest-ranked countries (figure 29).

The EGDI report highlights the fact that the area in which the greatest gap exists – not only between LAC and the rest of the world, but also between countries in the region – is in the sophistication of the on-line services offered by the different governments.

As ECLAC (2010a) points out, while the on-line services of Colombia, Chile, Uruguay, Mexico and El Salvador are above the average for the developed countries, a large number of countries, mainly in the Caribbean, rank below the regional average (Haiti, Suriname, Dominica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Belize, Guyana, Grenada, Barbados, Jamaica and Bahamas are some of the least developed in this area).

Despite the fact that practically all the governments of the region offer some type of service through their websites, the vast majority do not allow end-users

to interact, much less do paperwork or perform transactions. For example, in Colombia – the LAC country that ranked highest in the most recent EGDI index – only 20% of the operations about which information is provided can be performed on-line. In Chile, the LAC country ranked second highest, barely 10% of operations can be performed on-line (ECLAC 2010a).

In addition to the efforts to offer on-line services and products, make State procurement systems more transparent and lower the cost of the products and services that States must purchase, governments are also in the process of designing and implementing procurement portals. As a result, practically all the governments in the region now have an official portal of this kind, although only half of them permit transactions.

The transactions performed via the procurement portals have resulted in significant savings in time and money, and increased the participation of micro and small businesses in State procurement systems.

For example, the Chilean government's purchases via its [www.chilecompra.cl](http://www.chilecompra.cl) website increased 45% in less than three years. Using its [www.comprasnet.gov.br](http://www.comprasnet.gov.br) website, Brazil managed to save 3800 million reales (some US\$7.6 million) in 2008. In the latter case, the number of microenterprises registered and authorized to sell products or services to the government rose from almost 80,000 in 2007 to nearly 110,000 in 2009 (ECLAC 2010a).

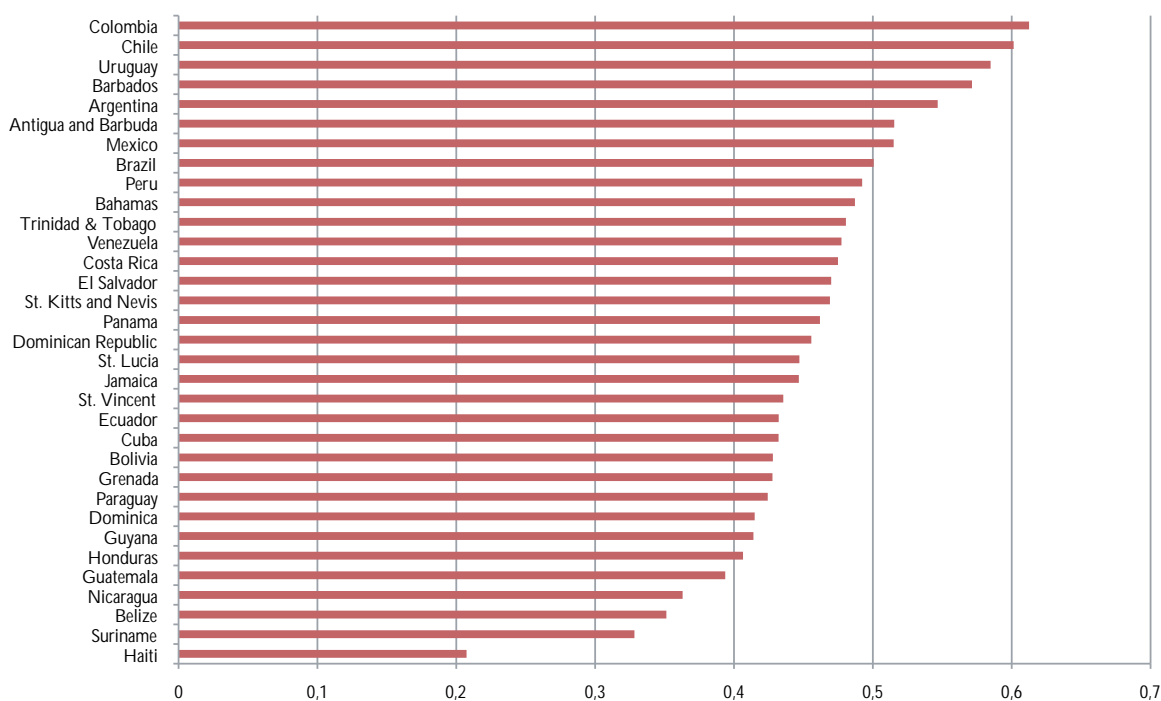
The biggest constraint to the formulation, implementation and consolidation of EG strategies in LAC is the fact that most countries have not adopted the procedures required for e-signatures to be used in State processes. This is the main obstacle to the inclusion of ICTs in government management processes, since e-signatures are essential if users are to be able to do paperwork and request services from public and private institutions on-line.

Although nearly 14 countries in the region have passed laws on e-signatures and three more currently have bills under discussion, only four nations have

a system in place for certifying digital signatures (ECLAC 2010a). This is vitally important, because the certifying authorities are responsible for verifying the identity (or signature) of every individual who requests a certificate before the document is issued

and authenticated for use with third parties, and for confirming the user's identity based on his public password. Without a certifying authority, any other efforts to enact laws for digital signatures or certificates are out of the question.

**Figure 29.**



**Source:** OSILAC, ECLAC with data from UN e-government survey 2010.

Like the delay in creating and setting up certifying authorities, the implementation of EG strategies has been limited by the failure to adopt standards to ensure that all the ICT systems used and the business processes that support them can share information and knowledge (interoperability).

In fact, Argentina, Brazil, Chile, Colombia and Peru are the only LAC countries that have established common standards for the interconnection, security and sharing of information. The other countries have no standards to ensure communication between, or the compatibility of, the systems and platforms adopted and used by government institutions.



## **Box 14.** Importance of national and regional policies in the adoption of ICTs: the case of Extremadura

On November 3, 2002, the Washington Post published an article about a small region in the west of Spain (Extremadura) whose government had launched a campaign to promote the development and use of free software in all the computers of government offices, companies and households. The aim was to develop technological solutions for all the region's citizens, regardless of their location or purchasing power.

Based on the free Linux operating system, the local government and a private company developed an efficient, user-friendly operating system (Linex) that included text processors, spreadsheets and a large number of other applications. Furthermore, based on the specific needs of each sector they developed customized ICT tools for the government, primary and secondary schools and vocational training centers, cultural and health centers, hospitals, private enterprises, and households. So successful was the initiative that very soon other European cities and companies became involved, which increased the amount of economic, and especially technical, resources assigned to the development of free software tools.

As a result of the successful development and adoption of ICT tools in Extremadura, the European Economic Commission promoted the systematization and replication of the model in the rest of the world, enabling great progress to be made in some Latin American countries, including Peru, Panama, Chile and Brazil.

According to those responsible for the initiative, the main reasons for the success of the project in Extremadura were as follows:

- The Spanish government was constructing a national strategy for the development of the information society (including e-government), which established certain ground rules.
- At the time when the initiative was implemented, the government of Extremadura had already upgraded its telecommunications infrastructure, so that all the region's population centers had access to the Internet and, in most cases, cellular telephony.
- The government of Extremadura's commitment to the project fostered the construction of knowledge networks on the issue and encouraged all citizens to become technologically literate.
- The government and local companies ensured that the initiative was seen as a project with a regional identity, and a very high percentage of the inhabitants took part as a result.
- The involvement of private enterprise led to the rapid development of tools for the specific needs of each client (content tailored to the needs and capabilities of the clientele).
- The operating system designed was easy to install and use. As the design was formally similar to the one with which the clients were already familiar (Windows), no extensive training was required in order to switch to Linex.

- **Utilization of ICTs in public institutions with responsibility for agriculture**

Although the LAC countries have made some effort to implement EG procedures in all their public institutions, the reality is that the work is still at an embryonic stage in the region. No MoA in LAC has yet digitized all its processes completely or fully incorporated all the procedures established for EG. This is especially true of the public institutions with responsibility for agriculture located in rural areas, which besides having less ICT equipment per worker, have to work with a telecommunications infrastructure that is less developed than in urban areas (especially with regard to Internet connectivity).

Although the implementation of ICTs in the internal management and technical assistance processes of some MoAs has already helped reduce costs and response times, enhance the quality of services and expand coverage, the potential benefits of providing institutions with access to ICTs are much greater than those observed so far.

In general, based on the level of implementation of EG in the region's MoAs, the LAC countries can be divided into the following groups:

- (i) Countries like Colombia, Chile, Mexico and Brazil, which have made a bit more progress with ICTs. They have established procedures for implementing EG and the MoAs are working hard to incorporate them, although they have yet to implement ICT procedures completely.
- (ii) Countries that have enacted EG legislation but are still developing the procedures or general agreements needed to implement it, such as Costa Rica, Uruguay, Peru, Paraguay and El Salvador, among others. Although the MoAs of these nations are gradually adopting the procedures or agreements that have been approved, there are processes that have yet to be implemented due to factors beyond the control of the MoAs. For example, in most cases the executing units in charge of administering and implementing EG procedures do not have

decision-making powers or the technical and economic resources required.

- (iii) The other countries of the region, which have no EG, have not established the mechanisms for implementing it and have no unit in charge of administering and implementing EG procedures in public institutions. Although most of the MoAs of these countries have ICT equipment, it is of the most basic kind (word processors, spreadsheets, e-mail, etc.) and has little impact on management processes.

- **Limited access to more specialized ICTs in institutions**

Although there are no official figures on the computers, software and other ICT equipment available in the MoAs of LAC, some senior government officials involved in the survey said that most of the staff of the public institutions with responsibility for agriculture have access to the equipment and on-line solutions they need for their day-to-day work, although some of the equipment and software are outdated.

However, there are specialized functions for which equipment is required that is not available in most institutions, including certain specialized programs, voice over Internet protocol (VoIP) equipment and global positioning systems (GPS). The lack of such tools prevents officials from creating new products or services.

- **Utilization of ICTs to facilitate internal processes and improve the supply of services and products**

ICTs have become the main tool of MoAs, not only for improving their internal management processes, but also for increasing their relations with society (paperwork, services, extension, technical assistance and others). Although they have advanced at different speeds, the region's MoAs are making serious efforts to use ICTs in:

- **Internal processes.** ICTs have mainly been used in the MoAs of LAC to facilitate management and budgetary administration. To that end, nearly all the region's MoAs have made efforts to digitize their financial and accounting systems and operations, personnel, inventory and logistics management, among others.

In most countries of the region, the use of ICTs has made it possible to reduce the time and costs involved in carrying out the institutions' processes, and to make them more transparent.

In other countries that are beginning to use ICTs, however, the institutions have become more bureaucratic and had to hire more support staff, which has increased the resources and time required to carry out internal management processes (annual programming and accountability, budgetary matters, requests for supplies, and vacations and sick leave, among others). In many cases, the MoAs internal management procedures are carried out in both physical environments (which are still required) and virtual environments.

- **Services and products offered.** In practically every case studied in LAC, the incorporation of ICTs into the products and services offered has made it possible not only to improve the quality of services but also to expand the geographical area of coverage.

Clearly, the function for which the MoAs most frequently make use of ICTs is to share information and knowledge through their websites, to provide input for production- and market-related decisions.

Although practically all the MoAs in LAC have websites (only four Caribbean countries do not), few of them are geared to the end-user. Most are used to provide information, documentation, statistics or the requirements for processing paperwork or requesting services, and do not facilitate two-way communication with the end-user.

After analyzing the services and products offered by the website of each MoA in the region, the following conclusions were reached:

- **It is not easy for members of the public to find what they are looking for, or they must use their intuition.** The problems stem from the fact that the websites of some MoAs in LAC are organized in accordance with the administrative structure of the institution in question and not the subjects of interest to the user. It is worth noting that the portals of the ministries of agriculture of Colombia, El Salvador, Uruguay and Mexico are easy to navigate. In addition to having thematic menus for the content, they have responsive search engines.
- **Information is incomplete and not updated regularly.** Generally speaking, the websites of the MoAs in LAC are updated with news items about the sector or senior ministry officials. Few MoA websites contain all the latest institutional information, documentation, statistics and regulations. In other words, although practically all the MoAs are continually generating information or knowledge, most of it is not available on their websites.

One of the main reasons why website content is not kept up to date is that most webmasters are not well versed in the technical and administrative issues for which their institutions are responsible. Furthermore, there are no clear procedures in place for technical staff to transfer updated content to the Web.

- **Little use is made of mobile technology.** Only the websites of the MoAs of Mexico and Colombia have a mobile Web version or allow for the possibility of sending information, news or prices to mobile devices.
- **It is impossible to do paperwork on-line.** Although most MoA Web portals have forms for requesting information or services provided by the institution, users are usually required to download forms in PDF format and then send them in by e-mail or fax, or take them to the

institution's offices. At present, only one portal – for Colombia's MoA – allows users to request services on-line after obtaining a username and password.

- **There are very few options for performing transactions on-line.** As in the previous cases, the development of practically all the websites of MoAs in LAC is at the embryonic stage and users are unable to perform transactions on-line (that involve payments). This is because hardly any MoAs use electronic signatures or certificates in their on-line management processes or public administration. The only website that offers anything close to it is that of Colombia's MoA, which permits users to request certificates for some products or processes through the government's on-line portal.
- **Websites fail to take advantage of the possibilities to interact with end-users.** Nearly half of the websites of the MoAs in LAC have ICT tools that end-users can use to learn about the products and services on offer, although only a few permit two-way communication in real time. The social networks (Facebook and Twitter) have become one of the main ICT tools that the MoAs of Colombia, Ecuador, Peru, El Salvador, Guatemala, Honduras, Brazil, Paraguay, Mexico and the Dominican Republic use to communicate. However, hardly any of the countries have taken advantage of the networks to conduct surveys and garner opinions, which are just some of the options available. In addition to the social networks, the MoAs of these and other countries use *Youtube* or *RSS feeds* to keep end-users informed.

In addition to using the Internet to disseminate the knowledge generated, some MoAs in LAC countries are endeavoring to utilize ICTs in their extension and technical assistance processes in the following ways:

- **In some cases, it is now possible for users to do paperwork and obtain services on-line.** MoAs in the region have provided users with more access to their services, which, among

other things, has reduced transfer costs and waiting periods. The MoAs that have been most successful in using ICTs to enable users to do paperwork and obtain services are those of Colombia, Chile, Mexico and Brazil. The mechanisms used to provide on-line services include call centers, service centers and access points, digital forms, and the receipt and sending of digital documentation.

- **Information is disseminated to provide input for production- and market-related decisions.** MoAs in LAC use tools such as instant messaging, e-bulletins, radio programs, and Internet channels to compile and share information and knowledge that can subsequently be used to make decisions related to production (meteorology, production costs, good practices, use of satellite images, GIS and other state-of-the-art technologies, etc.) and markets (international and national prices, inventory levels, predictions of harvests, trade statistics, transportation, etc.).

Cases in point are the information services of the MoAs of Colombia, Mexico, Chile, Peru, El Salvador and Costa Rica, which use text messaging to provide producers with important information (especially about prices and weather) that they need to decide when to plant and harvest their crops or sell their produce. Colombia, Uruguay and Argentina also have georeferencing tools that provide users with information about crops, livestock, temperatures, precipitation and other matters.

- **Emphasis has been placed on the development of human capital.** The MoAs' extension processes have benefited the most from the use of Internet tools and other ICTs.

Some of the region's MoAs use radio programs, collaborative tools (such as *Youtube*, *Flickr*, *Slideshare*, *wikis* and *blogs*), content managers (e.g., *Joomla* and *SharePoint*) or virtual course managers (like *Moodle*) to develop the capabilities of both their staff and their end-clients.



Using ICTs, the MoAs of Argentina, Bolivia, Colombia, Ecuador, Peru, Guatemala, Honduras, Brazil, Uruguay, Chile and Mexico have reduced their training costs significantly and given rural dwellers and staff in rural areas more access to training.

In addition, the MoAs that have made most progress with the use of ICTs (Colombia, Mexico, Chile and Brazil) have enhanced their staff's capabilities

considerably and greatly improved the services they provide to their clients. These MoAs use ICTs to identify, organize, disseminate, diffuse and use knowledge. They do this by means of virtual networks, collaborative working tools, institutional databases and virtual memories, digital libraries and forums of lessons learned, among other mechanisms. In other words, they use ICTs to convert tacit knowledge into explicit knowledge, and vice versa.

### **Box 15.** Construction of a tool to characterize ICTs in the public institutional framework for agriculture: the case of Uruguay

At the start of 2010, IICA began developing a methodology intended to serve two purposes: firstly, to characterize the conditions of access and use of ICTs in the public institutions with responsibility for agriculture and, secondly, to lay the groundwork for the construction of a sectoral strategy on the issue.

The methodology defines the four key issues involved in the successful adoption of ICTs in public institutions with responsibility for agriculture: the regulatory framework, access to ICTs, the use to which they are put and the factors that determine their impact. It then identifies the main critical variables of each issue and defines the possible scenarios for each one in the public institutional frameworks for agriculture of the LAC countries.

The tool is applied in participatory workshops involving officials, counterparts, clients and users of the public institutional framework for agriculture, and is used to ascertain the stakeholders' views regarding the conditions of access, use and impact of ICTs in the public institutions with responsibility for agriculture.

The methodology was validated with great success in Uruguay and will be implemented in Costa Rica (second half of 2011), Paraguay (second half of 2011), Peru (first half of 2012) and Brazil (second half of 2012).

The conclusions reached following the application of the tool in Uruguay were as follows:

Uruguay has enacted legislation on e-government (EG) and has a digital agenda with concrete goals for the implementation of ICTs in public management processes through 2012, but the institutions working in the agricultural sector are largely unaware of this.

As a result, when the tool was implemented in Uruguay the regulatory and institutional framework was identified as the issue on which least progress had been made. As in other countries of the region, the fact that legislation on ICTs exists does not necessarily mean that people are aware of it, much less putting it into practice. There is clearly a need to provide training and coordinate the efforts of the units responsible for implementing EG and institutions in the sector.

Although access to ICTs was ranked second of the four issues in terms of progress made, the people who took part in the exercise felt that further efforts were needed to improve the updating of the software and content of the MoA's Web pages. In fact, one of the critical variables mentioned most frequently was the lack of standards or protocols for the design of the MoA's Web pages and the organization of their content, which makes it difficult for the end-users to find information.

The use of ICTs was ranked third in terms of progress made, only better than the regulatory framework, which was placed last. In general, the stakeholders of the agricultural sector in Uruguay felt that the MoA made little use of ICTs to meet the needs of external users, authenticate documents, develop human capital, interact with other sector stakeholders and contribute to the formulation of public policies. However, they did think that the MoA was using ICTs to facilitate its internal management processes, manage institutional knowledge and, in particular, as an important tool for decisions related to production and markets.

With regard to the factors that determine the impact of ICTs, the biggest weakness identified was the MoA's lack of an institutional policy to promote not only access to and the use of such technologies, but also integrated knowledge management. In addition, the participants emphasized the need to formulate, implement and efficiently administer a strategy for promoting the implementation of ICT tools in the processes of the public institutions with responsibility for agriculture.

### • **Policy recommendations**

As has been stated repeatedly, the successful implementation of ICTs in the management processes of MoAs depends mainly on the existence and execution of public policies that promote access to and the use of ICTs throughout the national institutional framework (EG and digital agenda, among others). Without such policies, the MoAs' efforts to include the use of technologies in their management processes will not be sustainable, either financially or over time.

The level of per capita income or the amount of public resources invested in agriculture may be a factor but the MoAs that do the most to increase the use of ICTs in their processes are those that develop procedures for implementing national EG strategies. This is undoubtedly the single most important variable as far as the extent to which MoAs adopt and implement ICTs is concerned.

Therefore, the first challenge is to consolidate the formulation and implementation of EG strategies in the public institutional framework, bearing in mind the progress that many countries have already achieved. In tandem with the creation of laws and regulatory frameworks, the countries should devise and institute mechanisms for implementing them (e.g., interoperability, e-signatures, on-line services and procurement). Since some countries in the region – Colombia, Mexico, Chile, Brazil and Argentina, among others – have already made significant progress with these tasks, intraregional collaboration would make it possible to share the lessons learned and good practices developed in those countries with less developed nations.

It is vital that MoAs promote the formulation and implementation of institutional policies for the development of knowledge management and digital literacy. In most of the cases analyzed, the principal internal constraints to the use of ICTs in the MoAs' management processes had nothing to do with the number of computers or software available per official, but rather with the failure to establish an ICT culture and the staff's limited capacity to understand, interpret and manage such technologies.

Furthermore, most officials did not possess the ICT skills necessary to improve their performance, which means that knowledge management policies (digital literacy programs) are the main tool at the MoAs' disposal for promoting the adoption of ICTs in their processes and constructing a new culture that would enhance the performance of individuals within the institutions.





## ***ICTs and agricultural and rural development***

*Given the broad impact of information and communication technologies (ICT) on agriculture and on rural non-agricultural activities (RNAA), finding technically and economically feasible and sustainable solutions should be a priority for agricultural and rural development policies in Latin America and the Caribbean (LAC).*

- **Recent trends**

In the age of the information society, economies and production are becoming increasingly knowledge-intensive. The trend is to incorporate ICTs into all economic activities, and it amounts to a paradigm shift in the ways goods and services are produced.

The use of ICTs in a broad range of economic activities means that a significant portion of economic development and production is linked to the evolution of those technologies.

The ICT revolution has benefited productive systems in many ways: it has improved communication within and between firms, it has made logistics more efficient, it has opened up new prospects for the development of productive technologies, and it offers greater access to information and knowledge generation.

ICTs can integrate knowledge that was formerly isolated in different economic systems and they can transform relations between producers, consumers, organizations and institutions.

In the case of agriculture and RNAA, the emergence of ICTs can be viewed from different perspectives, as an exogenous process. On one hand, as in most productive sectors, ICTs were initially introduced as a technology completely foreign to the activity, adapted perhaps to producers' needs, but with little

direct involvement on their part in developing specific tools and applications.

On the other hand, some characteristics of those sectors – such as low education levels, geographic isolation, and a rudimentary state of technological development – made them particularly reluctant to take up with ICTs.

Consequently, to expand the use of ICTs in those sectors there is still a need for external incentives, such as policies and pressure from agriculture and RNAA extension services.

Among the elements of external pressure, market globalization is a decisive factor for expanding the use of ICTs in agriculture, given the new demands in terms of product quality and safety.

Another element of pressure for their adoption in agriculture and RNAA is to be found in the changes that are taking place in the forms of communication, accessibility and transmission of information. This relates not only to changes that affect productive activities directly, but also to those that are transforming commercial, institutional and social relations more generally.

These transformations tend to be mutually self-reinforcing and to generate new needs and demands. Thus, when a rural family has access to the Internet this will likely open the door to

using ICTs for production, whether in agriculture or in RNAA. Moreover, the digital revolution in data processing, gathering, organization and dissemination brings with it the potential to transform learning and innovation. This has a positive impact on the most divergent sectors and territories, including those at a lower level of technological development.

In the case of agriculture, recent decades have seen a wave of technological innovations sparked by ICTs that have changed both the ways in which the productive chain is organized and the techniques by which natural resources are managed.

The spread of these technologies has boosted the productivity and enhanced the environmental sustainability of these activities, it has made rural territories more dynamic and it has reduced regional inequalities, all of which has had a positive impact on the development of economies.

This potential of ICTs to speed the transformation of different productive sectors and territories, including the most traditional ones, makes them a strategic tool for development.

The following sections of this chapter will discuss the contributions of ICTs to productive development in terms of their impact on agriculture and RNAA.

### ***ICT applications in the agricultural value chain and in rural non-agricultural activities***

The actual and potential uses of ICTs in agriculture and RNAA are varied, and range from the more traditional applications such as communication tools to emerging uses that are technologically

advanced and still relatively uncommon, particularly in developing countries.

The analysis offered in this section does not pretend to be exhaustive or to cover all the possibilities for using ICTs in these sectors. On the contrary, it seeks to emphasize the most common uses in LAC and those that for various reasons have the potential to boost agricultural and rural development.

This section organizes technologies for analysis along the lines of the classification used by Rao (2007), who arranges ICTs in two groups: (a) those with the capacity to increase value (and income) generation in the productive chain, and (b) those that help improve the environmental sustainability of agriculture and RNAA (table 18).

In most uses of ICTs, impacts are not restricted to a single dimension. Yet the classification here is somewhat arbitrary, and is based on the principal impacts of the technology in question, or at least on those impacts that are highlighted in the present context. In addition, within each of these categories the different technologies are classified by their level of complexity (table 18).

For this purpose the technologies are organized according to the demands they place on producers in terms of financial investment, prior technological development and knowledge or familiarity with ICTs.

Although this classification explains some of the main distinctions among the different uses of ICTs, it masks the great diversity in the quality and level of adoption of these technologies in agriculture and RNAA. That diversity can be seen between the countries of the region as well as between different types of producers. The following sections refer to some of these differences.

**Table 18.** Principal uses of ICTs in agriculture and RNAA, by complexity of the required technology and principal impacts expected

Uses\principal impacts	Impact on the value generation in the chain	Impact on environmental sustainability
<b>Communication and basic “surfing”</b>	<ul style="list-style-type: none"> <li>• E-mail, calls and basic communications</li> <li>• Networks and virtual communities</li> <li>• Access to online information, market information systems</li> </ul>	<ul style="list-style-type: none"> <li>• Climate and disaster warning systems</li> </ul>
<b>Administrative management</b>	<ul style="list-style-type: none"> <li>• Use of management platforms and systems</li> <li>• Online e-government services</li> </ul>	
<b>Integrated management of productive processes</b>	<ul style="list-style-type: none"> <li>• E-commerce</li> <li>• Traceability</li> <li>• Development of online applications and services</li> </ul>	<ul style="list-style-type: none"> <li>• Geo-referencing</li> <li>• Precision agriculture</li> <li>• Remote diagnosis and technical assistance</li> </ul>

**Source:** Prepared by the author.

### *Communication and basic “surfing”*

This is the most common use of ICTs in rural areas, driven largely by family-based social pressures and communication needs, reflecting the geographic isolation of these areas and their inhabitants’ historically unmet demand for communication services.

In a parallel manner, and with greater force in recent years, this type of use has been driven by the offer of productive services and markets specifically developed for agriculture and RNAA, such as price information and early warning systems that can even operate with mobile telephones.

Perhaps because it has been more widely adopted, in this category a wider variety of ICTs can be used, ranging from fixed telephones and mobile phones with the most basic resources to integrated mobile equipment, based on convergent technologies and supported by web-based applications and servers.

Nevertheless, the level of sophistication of the ICTs used tends to reflect differences in the available infrastructure (speed and quality of connection, for example) and the type of user by level of income (given the costs associated with the more advanced ICTs) and education (given the skills needed to handle those technologies). This in turn determines producers’ possibilities of moving up the scale of complexity in the use of ICTs, from the more basic and passive forms of communication to the more interactive ones, with a growing impact on the generation of value and the environmental sustainability of the production chain.

In the rural areas of LAC, the basic forms of communication, via mobile cellular telephone, represent the dominant use of ICTs. The penetration rate of cellular equipment is slightly over 50% among rural households, reaching close to 70% in some countries (Chile, El Salvador, Uruguay and Paraguay), according to data from household surveys for 2009. By comparison, Internet access in these areas is only 2.9% for the region as a whole (10 countries), with the highest in Uruguay, at 10%.

It will be seen that the differences of access between urban and rural farming families are fairly close to the differences between rural non-farm and farming families. The difference between rural multi-activity and farm families are much less marked (figure 30).

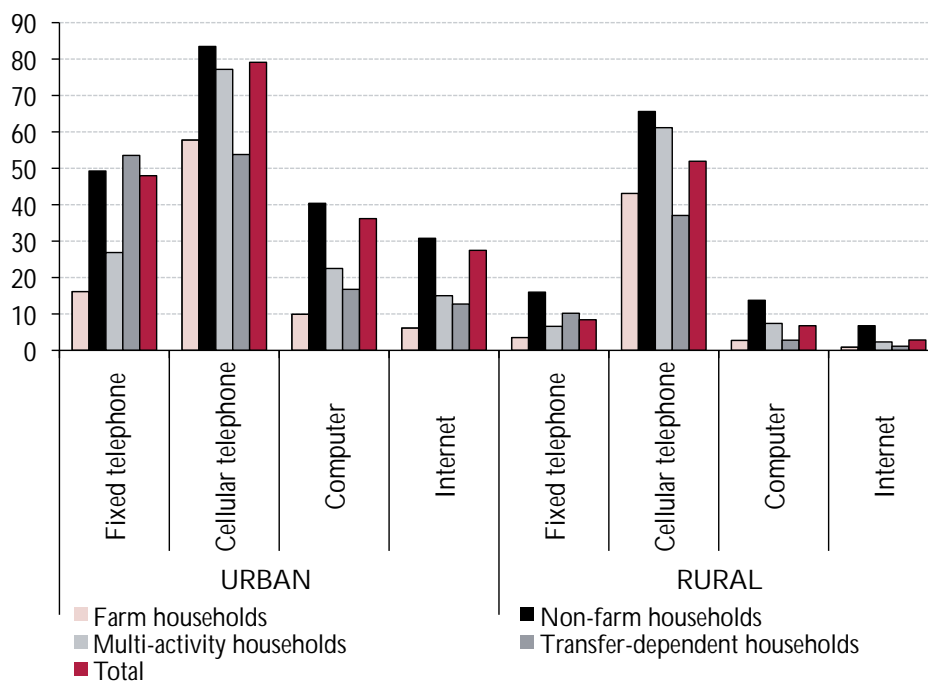
Generally speaking, rural farm families are in the worst situation in terms of access – they are even worse off than rural households that depend entirely on remittances and transfers for their income (the exception being access to cell phones). These data reveal the limitations for the mass adoption of ICTs in the region’s agriculture, recognizing that, at least in the case of small-scale agriculture, household assets are also productive assets. In fact, many farm households which lack access to ICTs already have limited capacities to use these technologies.

Although there has been a large increase in Internet penetration rates in the region, particularly in some countries, this has not been associated with any significant increases in broadband, a fact that has implications for the quality and capacity of service transmission (ECLAC 2010b).

Although no data are available on broadband penetration rates in rural areas, global access differentials in LAC with respect to OECD countries illustrate the limitations in terms of ICT access infrastructure in the region.

In 2009, 27% of the population had fixed broadband access in OECD countries compared with 6% in LAC, while mobile broadband penetration rates were 47% and 4% respectively. Moreover,

**Figure 30.** LAC. ICT penetration by zone and household economic activity



**Source:** Prepared by the authors, on the basis of household surveys conducted in 10 countries of Latin America and the Caribbean.

**Note:** Farm households are those that derive all their income from agriculture; non-farm households derive all their income from non-agricultural activities; multi-activity households derive their income from a combination of agriculture and other activities.

data transmission capacity in OECD countries, measured in kilobytes per second per Internet user, averages nearly 5 times as high as in LAC, and the gap is widening (ECLAC 2010b).

There is a positive correlation in LAC between household incomes and ICT access. The more sophisticated the level of technology (in rising order: cell phone, Internet and broadband), the stronger is the correlation (ECLAC 2010b). This finding can be interpreted, however, in various ways.

It can be argued that the cost of the technology (equipment, maintenance and updating, and connection) remains prohibitive for certain segments of the population.

There are often other limitations, as well, associated with the relationship between educational level, geographical location (urbanization, distance from major centers and access to services) and income.

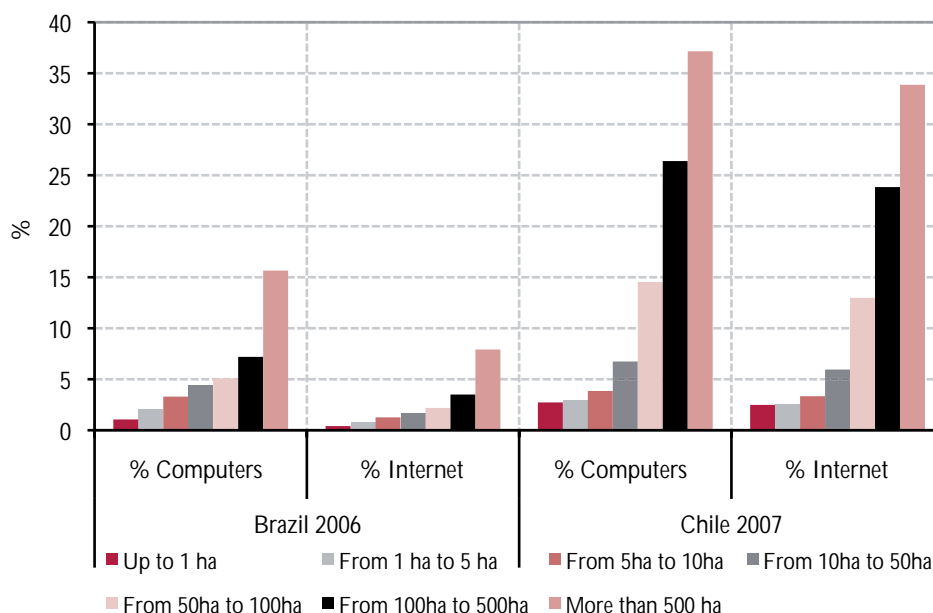
Two of the greatest are cognitive barriers and geographical isolation, which add to the factors restricting service availability and connection.

Lastly, the correlation between income level and ICT access reveals a new dimension of socioeconomic exclusion in the region: digital exclusion.

In an attempt to minimize the adverse effects of connectivity limitations and technology costs, several countries in the region have encouraged strategies of collective access through public telecenters or commercial cyber cafes.

In more than half of the 12 countries for which information is available, these collective points of connection represent the most important option for Internet access, and in some cases (Honduras, Dominican Republic, Ecuador and Peru) well ahead of home access (ECLAC 2010b).

**Figure 31.** Brazil and Chile: ICT penetration by size of farm



**Source:** Prepared by the authors, on the basis of agricultural census micro data.



Although this is an interesting strategy for encouraging mass use of ICTs, particularly in areas where they are now lacking, the quality of service (in terms of speed and availability) tends to be limited, as is the impact on productive activities.

From the viewpoint of productive development, barriers to access to the more sophisticated communication services and to adequate connection infrastructure in rural areas means that the possibilities for mass use of ICTs in productive management and processes are inevitably reduced.

Thus, the more complex uses of ICTs, shown in table 18, are concentrated in a few segments of producers capable of overcoming these barriers. This gives rise to the so-called “productive gap”, which tends to widen as the technology becomes more complex.

Among farming operations, for example, the level of adoption of computers and the Internet appears closely linked to the size of the farm, at least in those countries of LAC for which agricultural census information is available (Chile and Brazil) (figure 31).

This limitation precludes the necessary synergies with other producers and with the rest of the production chain, and the impact of ICTs on the economic development of agriculture and grow areas is accordingly compromised.

### ***Administrative and data management***

The advent of ICTs has opened up a wide variety of new possibilities for business management, through their impact on the processing, presentation and distribution of information and the possibilities they create for remote interaction both with key players within the firm and with other organizations and institutions.

As a result, ICTs offer a more integrated and up-to-date vision of the various activities of firms, as well as greater efficiency in the performance of internal and external processes, in the

communication of objectives, and in the control and monitoring of results.

Although the possibilities for using ICTs in administrative management are indeed broad, this section will focus on the use of software for business management and for handling online procedures.

It should be noted that there is very little specific information available on the use of ICTs in administrative management, especially in the case of agriculture and RNAA. There are only a few, limited studies dealing with the issue.

Global data for Chile and Brazil show that the size of the firm is a decisive factor in the adoption of software for financial administration and planning of institutional resources (ECLAC 2010b). In the case of Chile, the rate of adoption of financial management tools rises from 8% for small firms to 40% for large firms. These figures are low, in any case, in comparison with penetration rates for these tools in OECD countries.

More than simple Internet access, firm size conditions the possibilities for using administrative management software, because of the associated investment costs and differences in business practices.

When it comes to agriculture, there are some niches where significant initiatives have been pursued for the use of software in farm management, with the help of government policies supported by favorable competitive conditions. The case presented in box 16 illustrates some of these initiatives.

Banking and institutional procedures are another important concern for small-scale and family enterprises, especially in rural areas, where distances can be great and travel times (and the associated opportunity costs) significant.

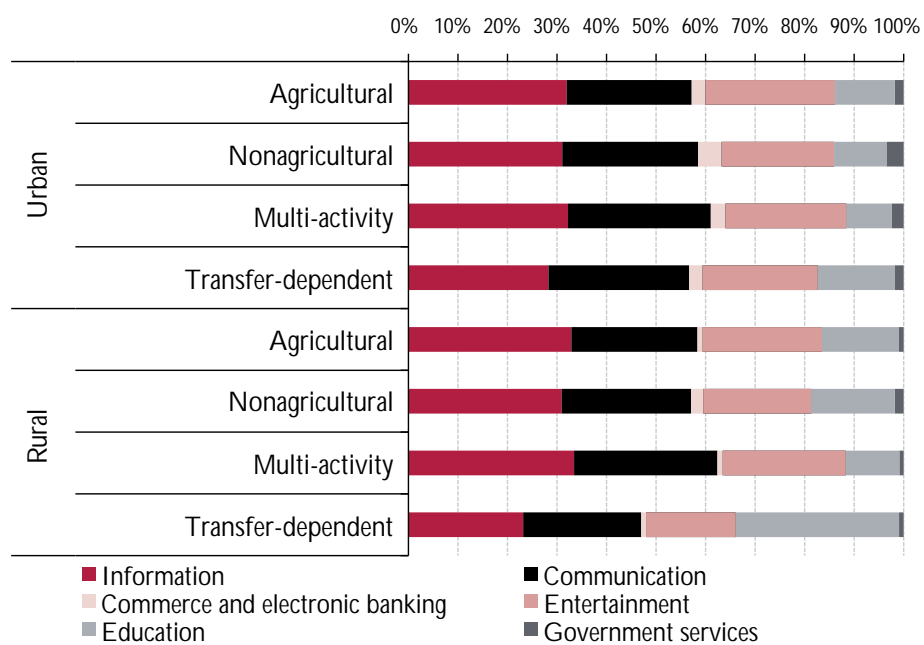
Data on Internet use for electronic banking and e-government services by rural and urban households

alike show that access to online processing is low in LAC. In contrast to OECD countries, where 40% and 45% of Internet users conduct electronic banking and e-government transactions, respectively, in the region the greatest proportion of electronic banking users is 28%, in Costa Rica, while Brazil has the most e-government users, at 18% (ECLAC, 2010b). It must also be recognized that the number

of Internet users is significantly lower in the region than in OECD countries as a whole.

There is a set of six LAC countries for which household surveys provide information on Internet uses. For those countries, figure 32 shows uses by household location (rural/urban) and predominant economic activity.

**Figure 32.** LAC (six countries) uses by location and economic activity of households in 200



**Source:** ECLAC, on the basis of household surveys conducted in six countries of Latin America (Chile, Ecuador, El Salvador, Paraguay, Peru and Uruguay).

There is no great difference among uses by category of household, except for educational applications, which are relatively much more important among rural transfer-dependent families.

Use of commercial applications for electronic banking and government services is particularly low, but not very different from overall levels of use in the majority of countries in the region (ECLAC 2010b).

Among Internet users in LAC there are many factors that affect the level of use of the web for making purchases and conducting banking and government transactions. Some of those factors have to do with the offer of electronic transactions by public and private institutions (an aspect discussed in the section of this chapter on ICTs and institutions), security guarantees for transactions, and mechanisms to encourage

the use of this means instead of traditional channels.

ECLAC data (2010) show significant growth in e-government in the region, with progress in the supply of institutional information as well as in the installation

of online information and processing systems. Nearly all countries of the region have introduced some form of online processing system, even if at a very basic level. In some cases – Chile and Colombia, for example – the increase in online transactions available via the public system has been very significant.

## Box 16. The growth of the agribusiness software industry in Brazil

Studies by the Brazilian Agricultural Research Enterprise (EMBRAPA) reveal that, while the agricultural sector is not a very important client for the country's software industry, there is significant potential for the use of software in the sector's administration and management, in the surveillance of rural processes, livestock production and agricultural crops (Mendes et al., 2009).

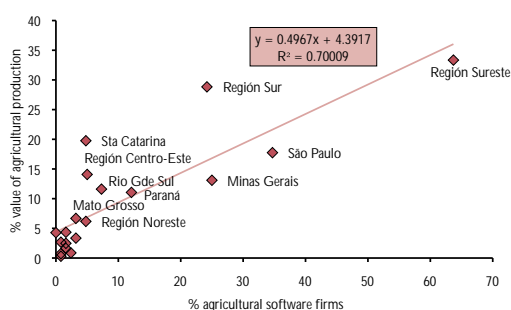
In recent years, the agribusiness market (agriculture, agro-industry and related sectors) has grown by 250%, far outpacing the growth in the overall software market.

Firms that produce software specific to agribusiness represent 2.5% of all firms in the market, a small proportion even in comparison with the share of agriculture and agro-industry in the country's gross domestic product (around 25%).

The regional distribution of agribusiness software firms is heavily correlated with that of Brazilian agriculture: 88% of these firms are in the states of the South East and South, which produce the greatest shares of national agricultural output by value (figure 33).

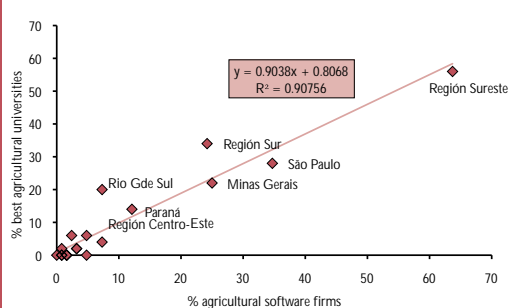
Half of these firms – most of them small enterprises – are concentrated in only 10 municípios, which are also home to large public universities that have agribusiness research and extension programs and business incubators. These results show that there is a correlation between the location of agribusiness software firms and major agricultural research centres (figure 34). These results may assist in the preparation of policies for the development of ICTs applied to agriculture.

**Figure 33.** Brazil: correlation between the location of agribusiness software firms and the value of agricultural production, 2009



**Source:** Brazilian Geographical and Statistical Institute (IBGE), on the basis of special tabulations of the Brazilian agricultural census of 2009

**Figure 34.** Brazil: correlation between the location of agribusiness software firms and the concentration of the best universities with agricultural science courses, 2009



**Source:** Prepared by the authors, on the basis of C. Mendes and others, "Empresas desenvolvedoras de software para o agronegócio: um retrato preliminar", VII Congresso Brasileiro

## ***Integrated management of productive processes***

Beyond the specific features of different items, agricultural production has a heavy local component linked to soil and climate differences that can occur even in close proximity to each other. These specific features make it necessary to adapt some technologies to the particular conditions of each activity or locality. At the same time, there is a growing tendency on the part of consumers and health agencies to monitor the production conditions of specific lots of products.

Some ICTs are perfectly suited to this purpose of recognizing and respecting the local and sectoral variability of agriculture, so as to allow the generation of value (in terms of product quality and safety) and the environmental sustainability of the activity.

Flexible technologies that adapt automatically or readily to different conditions and scales of production, as well as those that take into account local variability in the use of productive resources and that allow for monitoring the conditions of a product at different stages of production, are now in increasing demand and use in the sector.

In fact, these are the principles that guide some of the leading-edge technologies, highly ICT-intensive, that have been gaining ground in regional agriculture. Two classic examples relate to the set of technologies known as “precision agriculture” (PA) and traceability.

PA is based on fine-tuned management of agricultural variability so as to rationalize the use of inputs by recognizing the specific needs of each item in specific localities.

ICTs are widely used in PA systems, prior to seeding (in the mapping of lab tests and the programming of integrated seeding machinery), throughout the production season (in the compilation, organization and comparison of data on the evolution of production and in the automation and differentiation of irrigation processes and

the application of agrochemicals) and during the harvest (in the construction of yield maps).

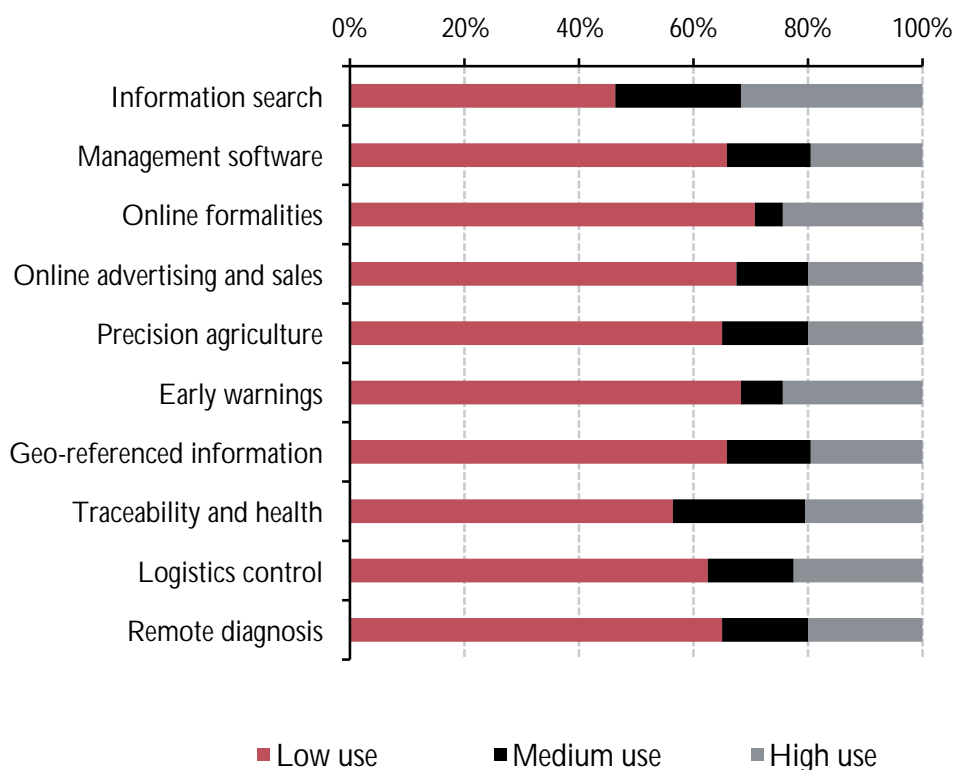
ICTs used in PA systems are highly varied, ranging from geographic positioning systems (GPS) and geographic information systems (GIS) to sensors and computers adapted to farm machinery, and specific software for analyzing the information collected and taking production decisions. It must be recalled, however, not only that PA relies on leading-edge technology but that there are different degrees of technological sophistication applicable to the tasks of monitoring and controlling the variability inherent to agriculture.

In LAC the use of PA is concentrated in extensive farming—wheat, maize, soy and sunflowers—especially in major producing countries such as Argentina and Brazil. There are also projects and initiatives sponsored by agricultural research institutes in the region involving fruits (including in some tropical countries), wines and coffee. There is no information on the number of PA equipment available in the region or on the surface area sown with PA, beyond the data available from the National Institute for Agricultural Technology (INTA) of Argentina (Bragachini et al. 2009; INTA-Manfredi 2008)

Similarly, it is difficult to assess the degree of penetration of traceability in Latin American agriculture. A survey of expert respondents (officials of agriculture ministries and institutions devoted to promoting ICTs in the sector) in nine LAC countries concluded that there was still little use being made of the more complex applications of ICTs, especially the productive ones (figure 35). According to those results, traceability is one of the least widespread uses of ICTs.

What does stand out is the importance of traceability in livestock activities of countries that export to markets such as the United States and the European Union. The idea is that buyers (supermarkets and final consumers) can trace the origin of the meat consumed from the birth of the animal through the various stages of slaughter and processing. The growing health concerns of recent years in this productive chain are no doubt at the origin of the

**Figure 35.** LAC (nine countries): use of ICTs by farmers



**Source:** Prepared by the authors, on the basis of information provided by agricultural officials from the region.

rapid development of this technology in exporting countries.

Uruguay is probably the most advanced country in the region with respect to the penetration of traceability in the livestock industry: it has had a mandatory animal identification system since 2006. Moreover, since 2010 the law requires that all animals born and raised within Uruguayan territory must be registered in the Animal Information and Registry System (SIRA), which records the place of birth, subsequent physical movements between sites, changes of ownership, and death from natural causes or slaughter.

As in the case of PA, traceability involves different types of ICTs, at least in its more advanced version: radio frequency identification devices, electronic

readers, wireless and cellular networks for data transmission, GIS and custom-designed software.

The potential for expanding PA and traceability in the region is linked to LAC's growing participation in global agricultural exports, the ever stricter demands of international markets with respect to product quality and uniformity, and the environmental sustainability of productive processes. The gradual reduction of the costs associated with ICTs and other electronic components is another element that could favor the expansion of these technologies in developing countries.

With respect to the limitations, productive models based on leading-edge technologies such as those described in PA and traceability systems are in general not very compatible with the family

production patterns that predominate in LAC. Certain characteristics of those producers, such as low levels of education and lack of familiarity with ICTs, are additional constraints.

To speed the process of disseminating PA in the region and contribute to the development of technologies specific to the small agriculture sector, attention should be paid to the sector's specific forms and items of production, and emphasis should be placed on mass training, expansion of connectivity to the more remote rural areas, and development of collective technologies for overcoming the scale constraints of family farming.

In the case of RNAA, ICTs have an important potential in the services sector, especially for rural tourism activities. One advantage of RNAA for the incorporation of ICTs in managing productive processes flows from the higher educational level of people engaged in this branch, compared to farm workers. When it comes to rural services, the difference is even greater. According to data from household surveys for the region as a whole (15 countries), the difference in years of schooling for farmers and for rural service workers is 3.3 years.

### ***Productive impacts of ICTs in agriculture and rural areas: the role of knowledge***

The most direct impacts of ICTs in agriculture and other rural productive activities relate to increases in productivity and environmental sustainability, lower costs and greater value generation. To achieve at least one of these objectives is typically the basic criterion for the adoption of ICTs in those activities.

Although studies of the impact of ICTs on agricultural productivity are rare, there is general evidence that investments in these technologies have a clear impact on productivity and that expansion of broadband access affects employment positively (Katz 2010).

At the same time, studies of enterprises in various sectors indicate that the use of ICTs can reduce communication, production and customer contact

costs. They also point to higher profits, operating margins and market share as final outcomes (CCS 2009).

In theory, the increase in agricultural yields through ICTs can come about through improved management of land and inputs and more appropriate responses to the risks inherent in farming activity, whether natural or market-related. In turn, cost reductions will typically flow from more efficient organization strategies that can reduce transaction costs, and from a greater capacity to find information that will lead to good business opportunities.

Finally, the generation of value depends on a more subjective appreciation on the part of consumers, but it can also be enhanced through the use of ICTs in the delivery of more detailed information about products, traceability and online advertising.

More specifically, production and market risks are issues that affect all farmers across the board, because of the very characteristics of agricultural production as well as growing market speculation.

ICTs can be very useful in managing both kinds of risk: not only do they provide timely access to data on prices and climate alerts, but through information and knowledge they also empower farmers. Such empowerment could produce a better balance of forces in a value chain typically concentrated in the stages of input supply and marketing, which would increase the capture of value and reduce the market risk at the agricultural production stage.

Based on the opinion of agricultural officials from the region, the principal impacts from the use of ICTs in the region's agriculture are better communication with other producers, customers, suppliers and institutions, and access to new markets (figure 36).

Lower risks and higher yields, on the other hand, are among the least frequent impacts. It is precisely in these areas where a greater policy effort is needed to ensure that the benefits of using ICTs in agriculture achieve their full potential.

The evolution of productive systems, including agriculture and certain non-farm activities, is currently determined to a large extent by the evolution of the supply of generic technologies, including ICTs. Nevertheless, beyond technology offerings, importance also attaches to the efficiency and effectiveness of their applications in machinery and technical equipment in general, as well as to the organization of the productive chain, investment and marketing activities, institutional relations and even cultural and educational activities.

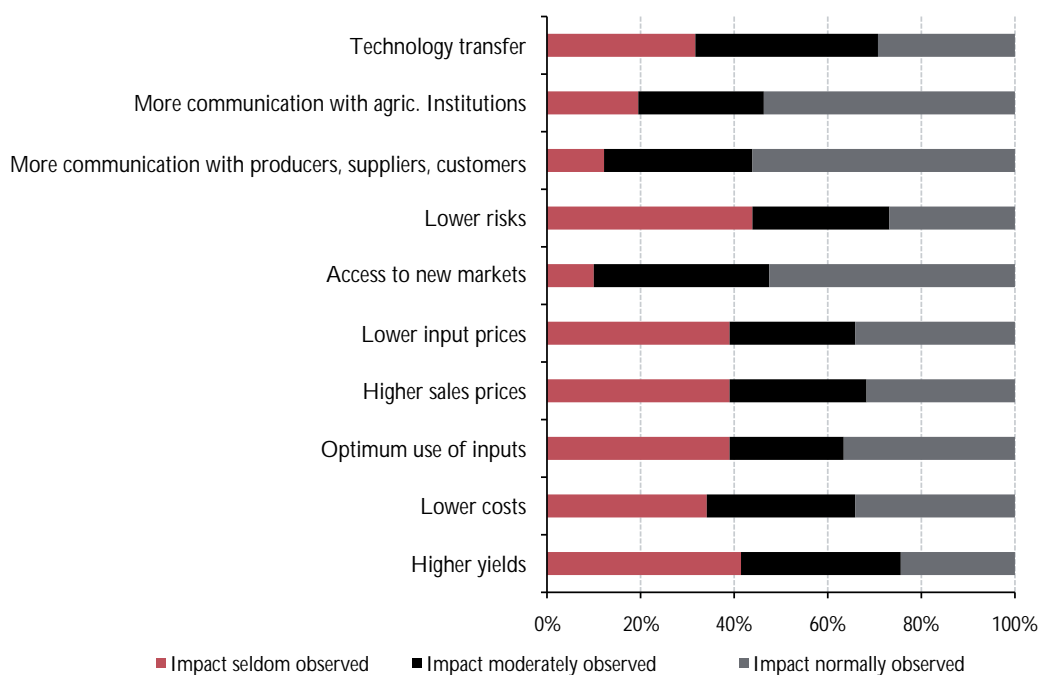
This broad impact of generic technologies, and ICTs in particular, in productive sectors is due to their capacity to affect the evolution of forms of production and at the same time to revolutionize the forms of communication and the innovation process in the most varied economic activities and societies.

The impacts of ICTs in user sectors can indeed be much broader than some of the direct impacts that have been noted so far.

Gago and Rubacalba (2007) have identified at least three dimensions of the role of ICTs in the evolution of technological systems. As they see it, these technologies are agents in the evolution of their own system, drivers in the development of ICT-intensive innovations in other systems, and facilitators of technological evolution in general, to the extent that they make information and knowledge flows more efficient.

According to Perez (2008), traditional sectors, including natural resource-based sectors, have experienced a paradigm shift in their forms of production and organization in recent years, resulting from the introduction of generic technologies such as ICTs and biotechnology. As she describes the situation, the transformations that are taking place in these traditional sectors represent true windows of opportunity for developing countries, given the importance of activities such as farming and mining in those countries. Nevertheless, to take advantage of those opportunities, producing economies must

**Figure 36.** LAC (nine countries): impacts from the use of ICTs in agriculture



**Source:** Prepared by the authors, on the basis of information provided by agricultural officials from the region.

build new capacities in areas of knowledge where their development has historically been low – all of which amounts to building the information society.

Thus, the evolution of traditional sectors is becoming increasingly a process inseparable from building a competitive position in leading-edge sectors. Only in this way can the less-advanced economies take an active role in their own development, not only adapting generic technologies to specific local and sectoral needs and features but also moving toward a longer-term strategy of structural change.

The impact of ICTs is directly related to the characteristics of the productive systems that adopt them and to the capacities of those systems to derive effective benefits from the use of ICTs.

Those capacities, in turn, are linked to the level of development of the areas where the productive systems are located. Shiu and Lam (2008), for example, concluded that ICTs have an important impact in more advanced rural and agricultural areas, while their effect is minor or nil in poor rural areas.

In a study of Latin America, Momentum Research Group (2005) suggests that the benefits of ICTs depend on the degree of maturity of the technological systems and the capacities that enterprises have developed.

In light of the foregoing, an analysis of the limitations and possibilities of ICTs in agriculture and rural areas must consider the social, economic, cultural, political, institutional and environmental factors that go into explaining the degree of development of productive systems. It is those factors that will determine the feasibility of policies and strategies and indicate where there are real possibilities for success.

### ***Limitations on the productive use of ICTs and rural areas***

The main barriers to the adoption of ICTs in rural productive sectors, particularly in developing countries, have been identified in various studies

## **Box 17. Impacts of ICTs in agriculture: evidence for precision agriculture and traceability.**

Lambert and Lowenberg-DeBoer (2000) reviewed more than a hundred articles with simulations or field studies to demonstrate the economic impacts of PA systems. Their conclusion was that, in the majority of cases, there is evidence of economic benefits from the adoption of the technology, in relation to the environmental impacts of PA.

Bongiovanni and Lowenberg-DeBoer (2004) also conducted an extensive review of the available literature and showed that there is a correlation between the adoption of PA systems and the more judicious use of inputs such as agrochemicals and water in agricultural production. The observed benefits range from savings on input costs to a clear reduction in adverse environmental impacts, higher profits, better pest control and, in some cases, increased yields and better harvest forecasting capacity.

When it comes to traceability, several studies (Monteiro and Caswell 2004; Xiaoshuan et al. 2010; Benterle and Stranieri 2008; Loureiro and Umberger 2007) find an effective reduction in transaction costs with the implementation of these technologies. Other observed impacts are the addition of value to products through denominations of origin and other certifications guaranteeing the quality and safety of products, as well as their form of production (organic, fair trade, etc.).

Loureiro and Umberger (2007) also measured the premium that beef consumers in the United States were willing to pay to know the origin of the product they were buying. These outcomes confirm the theoretical rationale for traceability, which is that it serves to differentiate and add value to products by enhancing and making explicit their safety attributes and the advantages derived from their origin and manner of production.



(Bhavnani et al. 2008; Caspary and Connor 2003; GFAR 2008; Jensen 2007; Meera et al. 2004; OECD 2009a and 2009b; Rao and Malhan, 2008; World Bank 2009). Those barriers are essentially of two types:

- On the supply side, these studies conclude that limited connectivity, the high cost of the technology and the doubtful utility of the contents available online reduce the likelihood that farmers and rural dwellers will adopt ICTs.
- On the demand side, these players resistance to incorporating new technologies into their production and business management seems to be correlated primarily to lower education levels and higher average age.

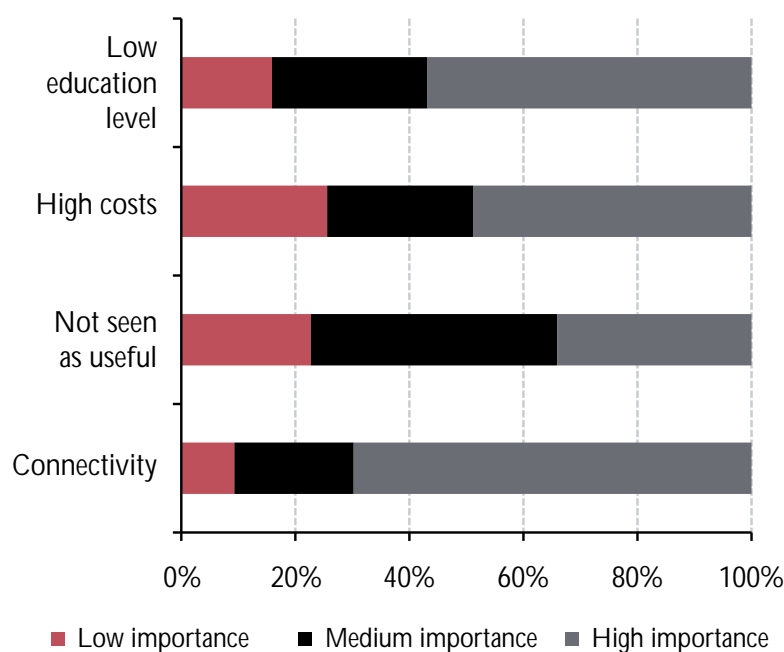
To these two explanations of low ICT use in agriculture and rural areas may be added others,

related to the characteristics of productive systems, the social and cultural environment, and the scope of policies and institutions. The following section examines the most significant aspects of these categories.

The main limitations on the use of ICTs in agriculture in LAC countries consulted through key respondents are the lack or poor quality of connectivity and the low education level of farmers (figure 37). Data on the digital divide presented in a previous section of this chapter show the technical constraints on greater use of ICTs in the region's agriculture and rural areas.

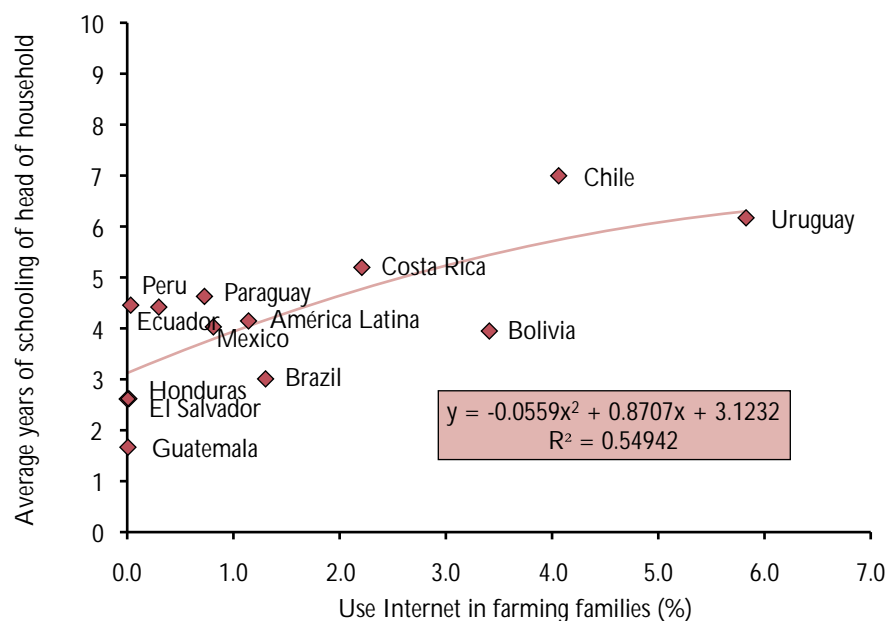
When it comes to education, it may be said that, although years of formal study are not the only determinant of skills for using ICTs, they do constitute an absolute limitation in the case of very low levels of education, as are to be found in rural areas of many Latin American countries.

**Figure 37.** LAC (nine countries). Main limitations on farmers use of computers and Internet



**Source:** Prepared by the authors, on the basis of information provided by agricultural officials from the region.

**Figure 38.** Latin America (twelve countries). Relationship between education level of head of household and Internet use in farming families



**Source:** Prepared by the authors, on the basis of household surveys conducted in 2008.

There is a positive relationship between years of study and Internet use in farming households. Yet that relationship becomes less important beyond a certain basic level of education, which can be set at six years of study (figure 38).

Using information from the last agricultural census of Chile (2007), the probability of Internet use can be calculated on the basis of the characteristics of farming operations – such as technological level, quality of human resources, administrative system and integration into the production chain – and of the producers themselves (education level, sex, age, etc.).

The results of the Logit model show that younger and better-educated producers are more likely to use the Internet in their farming operations. As well, the Internet is more likely to be used on farms producing for export or for agro-industrial processing, those that have an external manager,

those that use organic production or fertigation systems, or those that also engage in agri-tourism.

The main limitations on the adoption of ICTs in agriculture and rural areas appear to lie in the education levels of potential users and the cultural traits of rural communities. Resistance and disincentives may be further reinforced by farmers' suspicions about the usefulness of ICTs and their doubts about their own digital capacities. In addition, and despite the region's progress in this area, connectivity is still a central barrier to the adoption of ICTs.

It is also important to recognize non-technological conditioning factors, in particular the barriers inherent in the lack of incentives (competitive pressures, demands from suppliers and buyers, etc.) to make traditional administrative and productive management systems more ICT-intensive.

- ## Conclusions and policy recommendations

Given the broad impacts of ICTs on agriculture and RNAA, finding technically and economically feasible and sustainable solutions should be a priority for agricultural and rural development policies in Latin America and the Caribbean.

Those solutions will have to take into account the specific features of productive systems, the evolution of technologies and their various interactions with the competitive, institutional and social environment. Because it is a moving target (ECLAC 2010b), the digital divide must be addressed with policies that can evolve from a focus on access to placing the emphasis on the quality of ICTs, for only in this way will it be possible to generate opportunities for the development of more complex technologies and to achieve structural change.

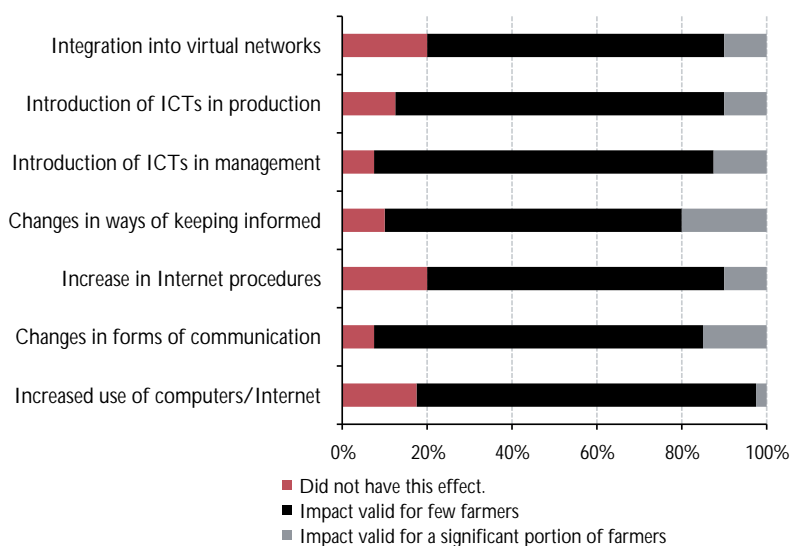
In terms of connectivity, everything seems to indicate that the new mobile broadband technologies and convergent terminals will extend the availability of ICTs to growing numbers of farmers and rural dwellers. This could be associated with strategies

to reduce prices, together with subsidies for lower-income groups.

Yet the provision of connectivity and access points in rural areas will not be enough in itself to guarantee the accessibility and use of ICTs in those areas. Expanding digital technologies in the rural areas of LAC will require motivational and educational strategies to overcome resistance, to demonstrate the usefulness of ICTs, and to develop digital skills. From the viewpoint of agricultural officials of the region, the impact of digital strategies on the use of ICTs in agriculture has so far been rather limited (figure 39).

Lastly, strategies and policies must consider the importance of the social and institutional setting in encouraging the adoption of ICTs in rural areas. Because of the imitation effect, the behavior of family members and peers in terms of adopting and using ICTs can serve as a catalyst for digital development strategies. The same holds for the supply of digital services by public and private institutions that interact with farmers and rural dwellers. These variables constitute a key factor for removing barriers and for encouraging the use of ICTs, and they must be included in the design of digital strategies for the region's rural areas.

**Figure 39.** Latin America and the Caribbean (nine countries). Observed impacts of the digital strategy on the use of ICTs in agriculture



**Source:** Prepared by the authors, on the basis of information provided by agricultural officials from the region.



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# STATISTICAL APPENDIX

**This statistical appendix is a synthesis of a common data base and a series of indicators that are available at [www.agriruralc.org](http://www.agriruralc.org).**

**Table A1.** GLOBAL GROWTH PROJECTIONS  
GDP annual growth rate. By groups of countries

Groups of countries	International Monetary Fund					
	2007	2008	2009	2010	2011	2012
World	5.4	2.9	-0.5	5.0	4.4	4.5
Developed economies	2.7	0.2	-3.4	3.0	2.4	2.6
Euro Zone	2.9	0.4	-4.1	1.7	1.6	1.8
United States	1.9	0.0	-2.6	2.8	2.8	2.9
Emerging and developing economies	8.8	6.1	2.7	7.3	6.5	6.5
Latin America and the Caribbean	5.7	4.3	-1.7	6.1	4.7	4.2
China	14.2	9.6	9.2	10.3	9.6	9.5
Groups of countries	World Bank					
	2007	2008	2009	2010	2011	2012
World (1)	3.9	1.5	-2.2	3.9	3.3	3.6
World (2)	5.0	2.6	-0.8	4.8	4.1	4.4
High-income countries	2.6	0.2	-3.4	2.8	2.4	2.7
Euro Zone	2.7	0.3	-4.1	1.7	1.4	2.0
United States	2.1	0.0	-2.6	2.8	2.8	2.9
Developing economies	8.1	5.7	2.0	7.0	6.0	6.1
Latin America and the Caribbean	5.5	4.0	-2.2	5.7	4.0	4.0
China	13.0	9.6	9.1	10.0	8.7	8.4
Groups of countries	DESA – United Nations					
	2007	2008	2009	2010	2011	2012
World	3.9	1.6	-2.0	3.6	3.1	3.5
Developed economies	2.5	0.1	-3.5	2.3	1.9	2.3
Euro Zone	2.8	0.5	-4.1	1.6	1.3	1.7
United States	1.9	0.0	-2.6	2.6	2.2	2.8
Developing economies	7.6	5.4	2.4	7.1	6.0	6.1
Latin America and the Caribbean	5.6	4.0	-2.1	5.6	4.1	4.3
China	13.0	9.6	9.1	10.1	8.9	9.0

**Source:** International Monetary Fund, Data bases from the World Economic Outlook, April 2011.  
World Bank, Global Economic Prospects 2011.  
Department of Economic and Social Affairs, United Nations, World Economic Situation and Prospects, 2011.  
1. Aggregate by exchange rate.  
2. Aggregate by purchasing power parity.



**Table A2. PROJECTED GROWTH IN THE AMERICAS**  
GDP annual rate by countries

Countries	Rate of growth				Preliminary numbers/Forecasts			
	ECLAC		IMF		ECLAC		IMF	
	2009	2010	2009	2010	2011	2012	2011	2012
Antigua and Barbuda	-10.9	-4.1	-8.9	-4.1	-	-	3.1	2.5
Argentina	0.9	8.4	0.8	9.2	-	-	6.0	4.6
Bahamas	-4.3	0.5	-4.3	0.5	-	-	1.3	2.3
Barbados	-3.6	-1.0	-4.7	-0.5	-	-	2.0	2.5
Belize	0.0	2.0	0.0	2.0	-	-	2.3	2.5
Bolivia (Plurinational State of)	3.4	3.8	3.4	4.2	-	-	4.5	4.5
Brazil	-0.6	7.7	-0.6	7.5	-	-	4.5	4.1
Canada	-	-	-2.5	3.1	-	-	2.8	2.6
Chile	-1.5	5.3	-1.7	5.3	-	-	5.9	4.9
Colombia	0.8	4.0	1.5	4.3	-	-	4.6	4.5
Costa Rica	-1.1	4.0	-1.3	4.2	-	-	4.3	4.4
Cuba	1.4	1.9	-	-	-	-	-	-
Dominica	-0.9	1.4	-0.3	1.0	-	-	1.6	2.5
Dominican Republic	3.5	7.0	3.5	7.8	-	-	5.5	5.5
Ecuador	0.4	3.5	0.4	3.2	-	-	3.2	2.8
El Salvador	-3.5	1.0	-3.5	0.7	-	-	2.5	3.0
Grenada	-8.3	0.8	-7.6	-1.4	-	-	1.0	2.8
Guatemala	0.5	2.5	0.5	2.6	-	-	3.0	3.2
Guyana	3.3	2.8	3.3	3.6	-	-	4.7	5.9
Haiti (1)	2.9	-7.0	2.9	-5.1	-	-	8.6	8.8
Honduras	-1.9	2.5	-2.1	2.8	-	-	3.5	4.0
Jamaica	-2.7	0.0	-3.0	-1.1	-	-	1.6	2.4
Mexico	-6.1	5.3	-6.1	5.5	-	-	4.6	4.0
Nicaragua	-1.5	3.0	-1.5	4.5	-	-	3.5	3.7
Panama	3.2	6.3	3.2	7.5	-	-	7.4	7.2
Paraguay	-3.8	9.7	-3.8	15.3	-	-	5.6	4.5
Peru	0.9	8.6	0.9	8.8	-	-	7.5	5.8
Saint Kitts and Nevis	-11.1	-1.5	-9.6	-1.5	-	-	1.5	1.5
Saint Lucia	-4.6	1.1	-3.6	0.8	-	-	4.2	3.9
Saint Vincent and the Grenadines	-2.8	0.5	-1.1	-2.3	-	-	2.5	2.5
Suriname	2.2	3.0	3.1	4.4	-	-	5.0	5.0
Trinidad & Tobago	-0.9	1.0	-3.5	0.0	-	-	2.2	2.4
United States	-	-	-2.6	2.8	-	-	2.8	2.9
Uruguay	2.9	9.0	2.6	8.5	-	-	5.0	4.2
Venezuela (Bolivarian Rep. of)	-3.3	-1.6	-3.3	-1.9	-	-	1.8	1.6
<b>Latin America and the Caribbean</b>	<b>-1.8</b>	<b>6.0</b>	<b>-1.7</b>	<b>6.1</b>	<b>-</b>	<b>-</b>	<b>4.7</b>	<b>4.2</b>

**Source:** ECLAC, Preliminary Overview of the Economies of Latin America & the Caribbean December 2010; IMF, World Economic Outlook Database, April del 2011.

(1) Growth projections for 2010 contemplate the effects of the January earthquake and are based on the Assessment Report on the Haitian Earthquake Damage, Losses and Reconstruction Needs, prepared by the Government of Haiti with support from the World Bank, the IDB, the United Nations System and the European Union, March 2010.

**Table A3.** INFLATION. BUYING POWER OF EXPORTS & REMITTANCES

Countries	Index of consumer prices <sup>1</sup>						Index of buying power of export of goods & services <sup>1</sup> (2000 = 100)						Remittances from abroad <sup>2</sup>							
	Headline rate			Food			Average inter-annual rate of change						Millions of dollars							
	Average inter-annual rate of change			Average inter-annual rate of change			2000-04		2005-08		2010		2000-04		2005-08		2009		2010	
	2000-04	2005-08	2010	2000-04	2005-08	2010	2000-04	2005-08	2009	2005-08	2009	2010	2000-04	2005-08	2009	2008	2009	2010	2010	
Argentina	8.3	9.5	9.6	10.8	10.3	13.3	5.2	13.4	9.2	9.2	886	955	853	886						
Bahamas	2.0	2.5	0.5	1.8	4.2	- 1.0														
Barbados	1.6	6.2	4.0	3.3	8.6	1.6														
Belize															110	100	100	100		
Bolivia (Plurinational State of)	2.9	8.1	2.0	2.2	12.4	2.7	19.7	15.3	-17.4	15.3	964	1,097	1,023	964						
Brazil	8.7	5.1	4.8	9.2	5.7	5.6	11.7	8.6	-11.1	8.6	4,044	7,200	4,746	4,044						
Chile	2.8	4.9	1.3	1.1	7.7	2.5	12.3	9.1	-6.3	9.1	820	880	756	820						
Colombia	7.3	5.5	2.2	8.0	7.8	1.3	3.6	13.3	-4.2	13.3	4,023	4,842	4,134	4,023						
Costa Rica	10.6	12.0	5.5	10.7	15.9	4.8	1.5	8.2	1.0	8.2	509	624	535	509						
Dominican Republic	20.1	7.1	5.9	21.3	5.8	3.9	-0.8	-0.8	2.6	-0.8	2,908	3,111	2,790	2,908						
Ecuador	31.4	4.0	3.4	32.9	7.2	4.7	8.7	11.4	-13.8	11.4	2,324	2,822	2,495	2,324						
El Salvador	2.9	5.1	0.8	2.6	6.8	0.3	2.9	3.0	-10.9	3.0	3,540	3,788	3,465	3,540						
Guatemala	6.9	8.5	3.7	8.2	11.3	3.2	4.8	3.7	1.4	3.7	4,127	4,315	3,912	4,127						
Guyana											374	415	356	374						
Haiti	20.0	13.1	5.4	21.5	15.3	4.6	-1.9	-1.0	27.9	-1.0	1,971	1,870	1,641	1,971						
Honduras	8.8	8.2	4.1	6.3	10.3	1.0	8.2	-2.7	-6.4	-2.7	2,529	2,701	2,483	2,529						
Jamaica	9.3	-1.2	11.7	7.9	15.8	11.1					1,911	2,033	1,798	1,911						
Mexico	6.0	4.2	3.8	5.5	5.8	3.5	1.3	4.8	-16.7	4.8	21,271	25,145	21,132	21,271						
Nicaragua	7.3	12.4	5.1	6.1	16.4	3.3	7.9	6.1	9.7	6.1	966	1,000	915	966						
Panama	1.2	4.6	3.1	0.5	6.8	2.5	1.2	8.4	10.1	8.4	297	325	291	297						
Paraguay	9.1	8.7	4.3	10.3	13.3	7.8	3.3	22.9	-12.9	22.9	723	700	691	723						
Peru	2.4	2.8	1.5	1.5	3.8	2.5	12.0	9.2	-6.5	9.2	2,534	2,960	2,665	2,534						
Saint Lucia	1.9	4.0	2.1			...														
Suriname	70.9	10.4	5.1			...					109	120	103	109						
Trinidad and Tobago	4.2	8.6	9.9	11.8	22.0	20.6					123	130	116	123						
Uruguay	10.3	6.8	6.4	11.1	9.8	6.5	2.3	8.6	10.0	8.6	120	130	116	120						
Venezuela (Bolivarian Rep. of)	20.8	19.9	27.9	25.1	28.7	34.5	1.6	13.2	-33.6	13.2	756	832	733	756						
<b>Latin America and the Caribbean</b>							4.7	8.1	-13.9	8.1										

**Source:**

<sup>1</sup> ECLAC: Based on official information (Economic Indicators and Statistics BADECON), consulted 31, June 2011.

<sup>2</sup> IDB, Study of Remittances 2009 y FOMIN, 2010. (<http://www.iadb.org/Micamericas/section/detail.cfm?language=Spanish&id=9089&sectionID=STUDY>).

**Table A4. GROSS DOMESTIC PRODUCT AND AGRICULTURAL VALUE ADDED**

Countries	Gross Domestic Product per inhabitant <sup>a</sup>			Agricultural value added as % of GDP			Percentage change in GDP			Percentage change in agricultural value added		
	Constant dollars 2000			Percentage			Median interannual rate			Median interannual rate		
	2000/05	2005/08	2009 <sup>b</sup>	1995/99	2000/05	2009 <sup>b</sup>	2000/05	2005/08	2009 <sup>b</sup>	2000/05	2005/08	2009 <sup>b</sup>
	Antigua and Barbuda	9039.8	10982.6	10216.3	3.4	3.2	3.3	4.2	7.4	-10.9	1.8	3.0
Argentina	7328.4	9015.8	9869.6	4.6	5.0	3.9	2.0	8.0	0.9	1.9	3.2	-15.7
Bahamas	18242.1	18667.0	17357.2	2.2	1.9	1.6	1.2	1.1	-4.3	-3.2	-5.3	-18.9
Barbados	6831.7	7539.0	11012.2	5.4	4.6	1.0	1.3	2.3	-3.6	-0.7	-1.1	1.0
Belize	3594.2	3900.5	3871.2	14.7	15.8	12.6	5.4	3.2	0.0	-5.8	-9.5	-2.2
Bolivia (Plurinational State of)	1025.2	1115.5	1191.9	13.3	13.2	13.6	3.1	5.2	3.4	1.3	2.1	3.7
Brazil	3794.3	4197.7	4416.0	4.6	5.2	5.7	2.8	4.9	-0.2	3.2	5.4	-5.2
Chile	5221.1	5983.8	6106.1	5.0	5.4	6.0	4.2	4.1	-1.5	1.5	2.6	0.5
Colombia	2469.1	2846.2	3087.1	9.4	9.4	7.8	3.9	5.6	0.8	2.1	3.5	-0.4
Costa Rica	4201.6	4913.8	5084.6	9.1	8.2	7.7	4.1	6.4	-1.1	3.1	5.3	-2.5
Cuba	3014.7	3988.1	4426.2	6.7	5.9	4.2	5.0	7.8	1.4	2.2	3.7	3.4
Dominica	3911.5	4544.5	4797.8	16.7	14.7	16.1	0.7	4.9	-0.9	1.3	2.2	5.0
Dominican Republic	2856.2	3406.0	3764.0	7.3	6.7	6.4	3.5	8.1	3.5	1.2	2.0	12.5
Ecuador	1427.2	1655.9	1770.0	9.7	10.5	11.8	5.4	4.3	0.4	2.9	4.9	1.5
El Salvador	2306.8	2560.0	2566.1	10.4	9.3	10.7	2.3	3.8	-3.5	4.6	7.8	-2.2
Grenada	4300.9	4686.9	4368.8	7.6	6.0	6.3	2.2	1.1	-8.3	7.8	13.4	9.4
Guatemala	1548.9	1640.8	1654.4	14.6	14.1	13.9	3.0	5.2	0.5	1.8	3.0	3.8
Guyana	795.2	848.2	1798.2	32.2	31.2	16.9	0.3	4.5	3.3	0.2	0.3	1.3
Haiti	403.0	388.5	393.8	25.7	22.4	20.8	-0.5	2.3	2.9	-0.3	-0.5	5.2
Honduras	1213.0	1389.3	1394.9	14.9	14.0	12.3	4.7	5.6	-1.9	3.3	5.5	-1.7
Jamaica	3561.5	3705.4	3588.9	8.1	6.0	6.3	1.6	1.2	-2.7	0.7	1.2	12.1
Mexico	6435.9	6934.4	6568.0	4.5	1.6	4.5	1.9	3.3	-6.5	2.4	4.0	1.8
Nicaragua	797.8	871.4	869.8	17.9	18.3	18.8	3.2	3.4	-1.5	1.2	2.0	0.0
Panama	4068.5	5031.3	5744.2	6.6	7.2	5.5	4.3	10.4	3.2	2.5	4.2	-7.2
Paraguay	1332.1	1437.6	1437.3	17.0	19.1	20.2	2.6	5.6	-3.8	5.3	9.0	-16.7
Peru	2154.5	2621.5	2915.7	6.9	7.6	7.4	4.2	8.8	0.9	3.7	6.2	1.7
Saint Kitts and Nevis	7343.1	8251.9	7462.1	3.1	2.5	2.5	3.3	4.0	-11.1	0.0	-0.1	-3.3
Saint Lucia	4422.8	4910.5	4709.0	7.8	4.3	3.5	2.0	2.9	-4.6	6.2	10.6	-8.5
Saint Vincent and the Grenadines	3408.3	4150.5	4337.1	10.0	7.9	8.0	3.6	6.3	-2.8	2.5	4.2	5.7
Suriname	1793.0	2036.5	2167.3	11.7	11.2	9.6	4.6	4.4	2.2	1.1	1.8	5.3
Trinidad & Tobago	7597.4	10277.9	10820.2	1.7	1.0	0.5	7.9	7.0	-0.9	1.6	2.6	-1.0
Uruguay	5989.8	7313.3	8238.3	6.6	6.7	6.5	0.9	7.8	2.9	1.6	2.7	2.0
Venezuela (Bolivarian Rep. of)	4589.0	5490.6	5493.2	3.6	4.1	3.8	2.6	7.6	-3.3	2.2	3.8	-0.3
Latin America & the Caribbean	4083.9	4612.5	4789.2	5.3	4.7	5.5	2.6	5.2	-1.9	2.6	4.3	-2.9
Latin America	4123.0	4651.1	4776.4	5.3	4.7	5.5	2.6	5.3	-1.8	2.6	4.4	-3.0
Caribbean	808.2	922.9	5855.3	5.8	4.5	3.4	3.7	3.8	-2.3	-0.2	-0.3	3.7
Centro America	1997.1	2260.2	2354.0	11.4	10.9	10.3	3.5	6.1	-0.4	2.7	4.6	-0.7
Andean Region	2641.4	3123.8	3300.9	6.7	7.2	6.5	3.5	6.9	-0.7	2.5	4.1	0.5
South	4410.8	5033.9	5346.3	4.8	5.3	5.3	2.6	5.7	0.0	2.8	4.6	-7.4

**Source:** ECLAC: Based on official information (Economic Indicators and Statistics BADECON), consulted 29, March 2011.

**Notes:** a/ Corresponds to the average GDP value divided by the average population for the corresponding period. Population figures are midyear for each year. b/ Preliminary numbers.

**Table A5. AGRICULTURAL & RURAL EMPLOYMENT**

Countries	Portion employed in agriculture <sup>1</sup>		Labor insertion of rural, economically active population <sup>2,3,4</sup> (percentages)											
	Percentage of employed population		Employers		Farm wage earners		Non-farm wage earners		Farm self employed		Non-farm self employed			
	2000	2009 <sup>4</sup>	1999/00	2007/09	1999/00	2007/09	1999/00	2007/09	1999/00	2007/09	1999/00	2007/09		
Bolivia (99-07)	36.8	33.2	1.2	3.1	2.7	3.3	6.4	10.2	82.1	73.0	7.5	10.4		
Brazil (99-09)	22.8	16.5	2.0	2.2	15.6	16.8	18.6	23.1	56.4	49.9	7.3	8.0		
Chile (00, 09)	13.0	11.4	2.4	2.8	40.2	34.4	22.9	36.7	22.8	15.5	8.1	10.5		
Colombia (99-09)	22.0	18.3	3.7	5.4	25.9	23.1	21.2	13.4	27.9	37.7	21.2	20.4		
Costa Rica (99-09)	16.9	11.8	8.2	6.6	21.3	16.6	47.9	53.1	9.5	7.2	13.1	16.4		
Dominican Republic (02-09)	15.9	14.7	1.7	4.7	5.5	4.1	31.1	33.1	35.0	26.6	26.7	31.5		
Ecuador (09)	28.5	28.5		3.2		21.9		18.7		45.7		10.5		
El Salvador (99-09)	20.7	21.3	4.1	3.2	20.2	18.8	30.6	28.1	26.3	30.0	18.8	19.9		
Guatemala (98-06)	36.5	30.6	2.0	1.9	26.6	16.0	16.4	21.5	34.8	40.0	20.2	20.6		
Honduras (99-07)	34.0	33.2	3.1	1.3	16.4	18.6	17.0	18.6	41.3	39.9	22.1	21.6		
Mexico (02-09)	17.5	13.2	3.3	6.5	15.7	14.4	37.4	43.6	25.4	18.6	18.9	16.8		
Nicaragua (98-05)	32.4	33.6	3.3	3.3	23.7	19.1	20.0	16.5	39.7	48.4	13.3	12.7		
Panama (02-09)	17.0	18.0	2.0	1.9	14.2	13.3	25.9	29.8	39.3	36.2	18.7	18.8		
Paraguay (99-09)	30.8	27.9	3.4	4.4	7.2	6.5	19.8	21.3	54.0	54.4	15.6	13.4		
Peru (99-09)	32.0	32.8	6.4	5.0	10.9	10.3	8.5	12.4	62.2	59.6	12.0	12.7		
Uruguay (09)		11.2		9.6		33.0		21.5		29.0		6.9		

**Source:**

- 1/ ECLAC, Statistical Yearbook 2010.
- 2/ ECLAC, Social Panorama 2010 (based on special tabulations of household surveys in respective countries).
- 3/ With an EAP minimum reference age of 15 years.
- 4/ By country data refer to the parenthetical indicators in the far right-hand column.
- 5/ Colombia and Nicaragua data correspond to 2005.

**Table A6. POVERTY, EXTREME POVERTY & MEDIAN INCOME**

Countries <sup>1</sup>	Rate of poverty <sup>2</sup> and extreme poverty (18 countries), (percentages)										Median monthly household income (17 countries) (poverty line multiples)					
	Countrywide poverty <sup>3</sup>		Rural poverty		Extreme poverty countrywide <sup>3</sup>		Extreme poverty countrywide		Urban zones		Rural zones					
	2003/05	2007/09	2003/05	2007/09	2003/05	2007/09	2003/05	2007/09	2003/05	2007/09	2003/05	2007/09				
Argentina (04-09 urban zone)	29.4	11.3			11.1	3.8			5.1	9.5						
Bolivia (04-07)	63.9	54.0	80.6	75.8	34.7	31.2	58.8	59.0	3.3	3.8	1.9	2.3				
Brazil (04-09)	37.8	54.9	54.1	39.3	12.2	7.0	24.1	15.2	4.2	5.1	2.8	3.4				
Chile (03-09)	18.7	11.5	20.0	10.4	4.7	3.6	6.2	4.4	7.4	7.7	5.7	6.8				
Colombia (04-09)	51.3	45.7	68.4	64.5	17.1	16.5	29.0	29.2	4.0	4.2	2.3	2.6				
Costa Rica (04-09)	20.5	18.9	23.1	19.5	8.0	6.9	11.0	9.1	6.4	6.3	6.6	6.5				
Dominican Republic (04-09)	54.4	41.1	59.0	44.7	29.0	21.0	34.7	24.3	4.0	5.4	3.2	4.2				
Ecuador (04-09)	51.2	12.2	58.5	46.3	22.3	18.1	30.5	23.3	3.6	4.0	3.0	3.5				
El Salvador (04-09)	47.5	47.9	56.8	57.6	19.0	17.3	26.6	25.2	3.9	3.6	3.3	2.9				
Honduras (03-07)	74.8	68.9	84.8	78.8	53.9	45.6	69.4	61.7	2.5	2.8	1.5	1.7				
Mexico (04-08)	37.0	34.8	44.1	44.6	11.7	11.2	19.3	19.8	4.2	4.0	3.6	3.5				
Nicaragua (05)	61.9		71.5		31.9		46.1		3.1		2.9					
Panama (04-09)	32.9	26.4	52.3	43.9	15.9	11.1	31.6	22.3	6.3	6.3	4.0	4.4				
Paraguay (04-09)	65.9	56.0	74.6	67.1	36.9	30.4	50.2	46.6	2.7	2.8	2.4	3.0				
Peru <sup>4</sup> (04-09)	48.6	34.8	69.8	60.3	17.1	11.5	36.8	27.8	3.0	3.9	1.6	2.2				
Uruguay (09)		10.4		5.9		1.9		1.3	3.8	4.6		5.4				
Venezuela (04-08)	45.4	27.6			19.0	9.9			3.3	3.9						
Latin America <sup>5</sup> (05-09)	39.8	33.1	58.8	52.8	15.4	13.3	32.5	30.0								

**Source:** ECLAC, Social Panorama 2009 (based on special tabulations of household surveys in respective countries).

1/ Data in parentheses refer to the years of the data for each country.

2/ Includes those who live below the indigence line or in a situation of indigence (extreme poverty).

3/ Argentina and Uruguay data correspond to Urban Total.

4/ The medium income figure correspond to 2003.

5/ Estimate for 18 countries of the region plus Haiti.

**Table A7. ANNUAL ACCUMULATED GROWTH IN TRADE, BY SECTOR**

Countries	Crops				Livestock				Fishing				Forestry			
	Exports (%)		Imports (%)		Exports (%)		Imports (%)		Exports (%)		Imports (%)		Exports (%)		Imports (%)	
	2000/05	2005/10	2000/05	2005/10	2000/05	2005/10	2000/05	2005/10	2000/05	2005/10	2000/05	2005/10	2000/05	2005/09	2000/05	2005/09
Antigua and Barbuda																
Argentina	10.7	15.7	-4.1	25.5	18.6	8.6	-14.5	12.6	-1.2	7.4	-6.7	13.4	13.4	0.00	0.00	0.00
Bahamas	-17.9			6.2		-21.3		4.2		-4.6		6.2	6.2	55.16	8.24	-2.57
Barbados	4.5	4.1	5.6	4.4	7.1	-11.7	6.5	3.3	-0.9	-19.4	8.8	-0.1		100.82	-5.39	11.8
Belize	11.5	1.5	1.2	19.3	29.6	-58.1	0.5	6.6	24.0	-22.1	-3.6	-8.8	-8.8	-7.19	72.46	-10.80
Bolivia (Plurinational State of)	10.1	14.8	-1.1	11.2	2.5	9.7	-4.2	5.2		-13.7	-19.6	27.9	27.9	9.69	7.88	3.45
Brazil	17.4	16.1	-3.3	19.5	31.8	12.2	-13.0	20.4	11.1	-10.0	-1.1	24.0	24.0	13.43	4.45	0.84
Canada	7.2	13.1	9.2	9.3	4.7	1.9	2.5	8.6	5.7	-0.1	3.8	5.5	5.5	2.64	-11.73	4.27
Chile	8.8	16.8	6.6	18.1	35.3	7.6	14.5	8.5	10.2	5.4	16.0	10.6	10.6	10.26	10.87	13.46
Colombia	7.1	5.9	6.1	16.4	28.7	-10.9	-11.3	15.5	-1.7	2.6	10.5	15.8	15.8	13.49	13.93	6.51
Costa Rica	5.6	4.8	7.4	12.9	10.3	7.5	1.5	14.0	-0.8	-1.9	9.5	10.6	10.6	8.71	6.57	4.00
Cuba	-10.1		14.5		6.2		14.7		-1.7		6.1			6.54	126.13	3.62
Dominica	-7.2	1.9	0.1	14.1		116.5	1.8	20.4	50.7	-26.5	2.2	6.3	6.3	12.47	1.86	-15.89
Dominican Republic														46.29	18.30	0.38
Ecuador	10.1	13.8	16.4	14.3	-18.8	20.2	16.0	17.6	9.5	11.2	20.1	96.8	24.01	12.26	7.41	1.8
El Salvador	0.3	9.8	8.7	8.8	-0.6	14.2	6.0	12.7	26.8	3.3	39.0	6.3	10.94	23.01	3.12	16.9
Grenada	-9.8	1.8	3.4	9.2	-17.5	57.1	4.3	6.2	-2.3	-4.1	4.2	6.9			0.00	0
Guatemala	2.7	16.7	13.6	12.7	4.3	14.4	10.0	8.5	-3.8	35.3	29.9	16.6	18.42	1.80	7.93	8.0
Guyana	6.3	9.4	6.0	16.4	9.6	7.7	6.0	4.9	2.9	-4.8	-10.9	2.1	2.19	0.45	16.24	1.9
Haiti														0.00	0.67	14.8
Honduras	-1.6		-0.6	20.2	20.9		7.6		32.0		21.5			-19.45	12.86	-2.0
Jamaica	0.0	15.6	6.9	18.1	-1.7	10.2	4.5	2.2	-3.5	-8.7	5.9	5.4	5.4	98.11	42.68	-7.06
Mexico	7.9	8.9	8.7	8.6	6.6	4.4	6.2	4.5	-2.0	4.3	21.2	4.7	8.08	7.15	8.84	6.3
Nicaragua	5.8	17.1	4.1	17.4	13.8	25.9	-4.4	13.5	3.4	6.2	-12.1	8.3	-3.32	-14.31	9.30	7.0
Panama	3.5	10.9		25.5	1.2	-9.5		15.2	11.0	-10.4		12.9	30.00	11.93	5.45	9.5
Paraguay	16.6	24.1	-3.8	19.1	23.3	25.3	-1.8	17.4	27.3	-32.3	-2.3	33.1	-3.61	22.53	14.73	17.5
Peru	16.3	17.4	10.5	16.7	45.2	15.5	3.3	14.3	7.0	9.1	18.7	31.9	9.71	-8.16	12.71	17.8
Saint Kitts and Nevis	-24.5	54.2	-0.2	15.6	-12.4	20.0	4.2	8.1	-4.5	59.7	1.1	15.7	0.00	0.00	0.00	0
Saint Lucia	-0.8		4.8	10.6	140.2		6.5	9.6	-60.5		8.4	9.8			0.00	9.8
Saint Vincent and the Grenadines	-6.1	-0.4	1.9	14.2	16.4	9.9	7.0	5.5	-14.6	7.7	9.4	0.6	0.6	58.49	57.54	-24.38
Suriname														0.52	7.77	19.58
Trinidad & Tobago	3.5	2.3	13.0	12.5	-8.5	10.3	5.4	14.4	-6.6	4.5	22.2	9.5	-8.37	28.89	10.73	-2.3
United States	4.6	13.0	8.4	6.5	-1.8	12.4	5.3	-1.4	6.1	1.0	4.5	2.8	1.50	2.69	5.59	-13.7
Uruguay	11.0	31.4	-5.4	24.1	17.0	11.5	15.0	9.8	5.8	8.1	8.2	27.8	17.90	54.46	-4.79	11.7
Venezuela (Bolivarian Rep. of)	-9.2		1.8	29.2	-30.0		14.8	63.0	-14.8		-3.6	78.9	0.32	-22.27	0.73	16.8

**Source:** IICA, based on official United Nations data base (COMTRADE) and FAO (FAOSTAT).

**Note:** Argentina, Bahamas, Chile, Jamaica, Trinidad & Tobago, Uruguay and Venezuela, the most recent period is 2005/09. To Belize, Dominica, Grenada, Saint Kitts and Nevis y Saint Lucia the most recent period is 2005/08.

**Table A8.** SHARE OF SECTORAL EXPORTS IN TOTAL GOODS EXPORTS

Countries	Crops		Livestock		Fishing		Forest	
	2000/05	2005/10	2000/05	2005/10	2000/05	2005/10	2000/05	2005/09
Antigua and Barbuda								
Argentina	1.5	4.0	8.8	-2.4	-9.4	-3.5	6.71	-9.25
Bahamas		-31.9		-34.6		-20.8		-10.12
Barbados	2.5	7.9	5.0	-8.5	-2.9	-16.4		104.80
Belize	8.9	-8.4	26.6	-62.2	21.1	-29.7	-9.37	68.22
Bolivia (Plurinational State of)	-4.5	-2.0	-11.1	-6.4		-26.3	-4.86	-9.60
Brazil	0.5	6.0	12.8	2.4	-4.9	-17.8	-2.95	-4.28
Canada	1.3	13.8	-1.1	2.5	-0.1	0.5	-2.98	-10.78
Chile	-6.8	7.4	16.0	-1.1	-5.5	-3.1	-5.49	1.99
Colombia	-2.9	-6.3	16.8	-21.1	-10.8	-9.2	2.98	-0.06
Costa Rica	-0.8	-0.6	3.6	1.9	-6.8	-7.0	2.14	-0.82
Cuba	-17.0		-1.9		-9.2		-1.65	
Dominica	-3.2	4.5		122.0	57.2	-24.6	17.27	10.31
Dominican Republic								
Ecuador	-5.2	3.3	-30.1	9.1	-5.7	1.0	6.77	1.23
El Salvador	-4.3	-14.2	-5.2	-10.7	20.9	-19.2	5.81	-7.03
Grenada	9.9	-3.9	0.5	48.3	19.0	-9.5		
Guatemala	-9.2	1.7	-7.7	-0.3	-14.9	17.9	4.79	-12.10
Guyana	4.5	-1.9	7.8	-3.4	1.2	-14.6	0.48	-10.40
Haiti								
Honduras	-3.3		18.7		29.6		-20.90	
Jamaica	-3.5	16.5	-5.1	11.0	-6.9	-8.0	91.19	43.78
Mexico	2.5	4.4	1.3	0.1	-7.0	0.0	2.64	4.06
Nicaragua	-1.4	-2.4	6.0	5.0	-3.7	-11.5	-9.95	-30.95
Panama	0.0	-39.5	-2.3	-50.7	7.2	-51.1	25.53	-44.52
Paraguay	0.9	1.8	6.7	2.8	10.2	-44.5	-16.59	-0.77
Peru	-3.5	4.5	20.5	2.9	-11.2	-2.8	-8.94	-18.28
Saint Kitts and Nevis	-27.2	38.9	-15.5	8.1	-7.9	43.8	-3.54	-9.94
Saint Lucia	-11.9		113.4		-64.9			
Saint Vincent and the Grenadines	-1.1	-3.3	22.6	6.6	-10.1	4.5	66.92	46.46
Suriname								
Trinidad & Tobago	-10.5	0.5	-20.9	8.3	-19.3	2.6	-20.77	26.57
United States	1.4	7.1	-4.9	6.5	2.7	-4.3	-1.69	-2.68
Uruguay	1.4	15.1	6.9	-2.3	-3.4	-5.3	7.67	35.29
Venezuela (Bolivarian Rep. of)	-19.2		-37.7		-24.2		-10.75	

**Source:** IICA based on official United Nations data base (COMTRADE) and FAO (FAOSTAT).

**Note:** Argentina, Bahamas, Chile, Jamaica, Trinidad & Tobago, Uruguay and Venezuela, the most recent period is 2005/09. To Belize, Dominica, Grenada, Saint Kitts and Nevis y Saint Lucia the most recent period is 2005/08.

**Table A9.** ACCUMULATED ANNUAL CHANGE IN PRODUCTION BY SECTOR.  
PERCENTAGES

Countries	Crops		Livestock		Aquaculture <sup>1</sup>		Forest <sup>2</sup>	
	2000-2005	2005-2009	2000-2005	2005-2009	2000-2005	2005-2009	2000-2005	2005-2009
Antigua and Barbuda	-2.03	2.24	-3.64	5.67				
Argentina	3.82	-2.05	-0.67	1.96	0.16	-3.14	10.75	-1.22
Bahamas	-1.75	3.85	2.15	2.52	1.71	-5.37	0.00	24.33
Barbados	-4.42	-6.63	2.13	1.65	-6.80	16.53	11.92	0.00
Belize	-0.20	-2.34	9.96	-0.39	-12.19	-14.34	0.00	-1.61
Bolivia (Plurinational State of)	5.20	4.58	5.36	3.12	2.55	4.36	3.17	1.26
Brazil	5.26	10.29	4.87	3.66	3.32	5.26	1.66	0.60
Canada	3.03	1.80	0.36	0.62	2.36	-4.03	0.87	-14.67
Chile	2.38	-4.88	3.04	1.66	3.25	-3.93	4.22	4.10
Colombia	2.77	0.53	2.60	3.72	-2.54	1.34	-2.69	-0.61
Costa Rica	1.85	1.28	1.61	4.05	0.36	1.56	-2.47	0.06
Cuba	-12.18	3.65	-6.52	11.76	-10.73	6.74	8.55	-6.87
Dominica	-4.71	4.58	-3.53	8.91	-14.60	6.44		0.00
Dominican Republic	2.55	0.10	1.47	6.25	-1.00	6.25	0.15	10.14
Ecuador	2.90	4.45	16.15	3.51	-4.06	4.18	3.28	-1.85
El Salvador	-0.77	5.46	2.41	2.82	32.84	-6.07	-1.69	0.12
Grenada	-0.86	-0.34	0.34	5.07	2.29	5.96		
Guatemala	5.80	-1.47	2.60	1.70	-12.97	7.84	2.11	2.12
Guyana	1.62	-1.42	7.19	2.42	2.39	-6.31	3.31	-1.62
Haiti	1.26	1.51	1.75	4.59	6.33	0.14	0.33	0.36
Honduras	9.00	2.78	4.51	1.88	16.33	-12.15	0.22	-1.33
Jamaica	-4.23	5.26	1.18	3.11	10.28	-2.75	-0.90	-0.45
Mexico	2.04	0.51	1.99	2.16	-0.38	5.45	-0.38	0.34
Nicaragua	4.24	2.45	3.03	5.14	4.48	9.17	0.31	0.35
Panama	1.19	0.08	1.24	3.55	-0.87	-3.30	0.05	-0.89
Paraguay	9.07	1.52	2.16	3.05	-13.97	-29.18	1.01	1.02
Peru	0.77	6.33	4.20	6.82	-1.21	-5.34	-0.04	-1.08
Saint Kitts and Nevis	-6.25	3.19	-0.40	-6.28	-1.41	0.00		
Saint Lucia	-5.18	1.54	8.86	2.80	-6.38	7.90		0.00
Saint Vincent and the Grenadines	2.21	2.64	-2.52	4.01	-45.63	15.11		0.00
Suriname	-3.65	5.82	1.91	0.15	5.78	-3.81	0.42	2.27
Trinidad & Tobago	-17.99	10.61	7.46	-2.24	1.66	-4.68	-2.74	-6.19
United States	1.51	2.48	1.06	1.72	0.94	-3.95	0.27	-7.61
Uruguay	9.12	12.02	2.67	1.33	3.07	-10.21	15.36	12.42
Venezuela (Bolivarian Rep. of)	1.13	0.98	-1.31	7.00	5.03	-6.65	2.72	5.10

**Source:** IICA based on official FAO (FAOSTAT) information.

1/ Total Capture and Aquaculture Production include both capture and aquaculture production taken from inland and marine waters

**Source:** FISGSTAT FAO. Available at: <http://www.fao.org/fishery/topic/16140/en>

2/ It comprises all wood obtained from removals, i.e. the quantities removed from forests and from trees outside the forest, including wood recovered from natural, felling and logging losses during the period, calendar year or forest year.



**Table A10.** USE OF LAND IN THE AMERICAS BY CATEGORY (1,000 HA)

Countries	Total land area*	Total agricultural land (SAT)*	Arable land and permanent crops (CACP)*	% CACP/SAT	Pasture and prairie land (SPP)*	%SPP/SAT	Wooded area*	Protected areas**
Antigua and Barbuda	44	13	9	0.7	4	0.3	10	
Argentina	273,669	132,850	33,000	0.2	99,850	0.8	29,880	
Bahamas	1,001	13	11	0.8	2	0.2	515	
Barbados	43	19	17	0.9	2	0.1	8	21,515***
Belize	2,281	152	102	0.7	50	0.3	1,412	
Bolivia (Plurinational State of)	108,330	36,819	3,819	0.1	33,000	0.9	57,811	
Brazil	845,942	264,500	68,500	0.3	196,000	0.7	523,911	
Canada	909,351	67,600	52,150	0.8	15,450	0.2	310,134	801
Chile	74,353	15,737	1,722	0.1	14,015	0.9	16,156	
Colombia	110,950	42,614	3,461	0.1	39,153	0.9	60,701	17,067
Costa Rica	5,106	1,800	500	0.3	1,300	0.7	2,559	70,530
Cuba	10,644	6,600	3,970	0.6	2,630	0.4	2,801	
Dominica	75	23	21	0.9	2	0.1	45	
Dominican Republic	4,832	2,500	1,300	0.5	1,200	0.5	1,972	3,163.6***
Ecuador	24,836	7,445	2,500	0.3	4,945	0.7	10,260	14,335
El Salvador	2,072	1,552	915	0.6	637	0.4	296	14,509
Grenada	34	12	11	0.9	1	0.1	17	331
Guatemala	10,716	4,218	2,268	0.5	1,950	0.5	3,769	
Guyana	19,685	1,675	445	0.3	1,230	0.7	15,205	
Haiti	2,756	1,790	1,300	0.7	490	0.3	103	42
Honduras	11,189	3,184	1,428	0.4	1,756	0.6	5,432	
Jamaica	1,083	464	235	0.5	229	0.5	338	
Mexico	194,395	102,500	27,500	0.3	75,000	0.7	65,112	
Nicaragua	12,034	5,146	2,130	0.4	3,016	0.6	3,254	3,089
Panama	7,434	2,230	695	0.3	1,535	0.7	3,275	
Paraguay	39,730	20,400	4,300	0.2	16,100	0.8	17,939	
Peru	128,000	21,440	4,440	0.2	17,000	0.8	68,292	
Saint Kitts and Nevis	26	5	4	0.8	1	0.2	11	
Saint Lucia	61	11	10	0.9	1	0.1	47	
Saint Vincent and the Grenadines	39	10	8	0.8	2	0.2	27	
Suriname	15,600	75	56	0.7	19	0.3	14,765	18,700.4
Trinidad & Tobago	513	54	47	0.9	7	0.1	228	
United States	914,742	411,200	173,200	0.4	238,000	0.6	303,256	1,356
Uruguay	17,502	14,864	1,673	0.1	13,191	0.9	1,654	
Venezuela (Bolivarian Rep. of)	88,205	21,350	3,350	0.2	18,000	0.8	46,850	
Americas	3,837,273	1,190,865	395,097	0.3	795,768	0.7	1,568,046	
ALC + Mexico	2,013,180	712,065	169,747	0.2	542,318	0.8	954,655	255,839.4

\* **Source:** FAO, FAOSTAT (year 2008).

\*\* **Source:** ECLAC, CEPALSTAT (year 2007; \*\*\* year 2006).



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