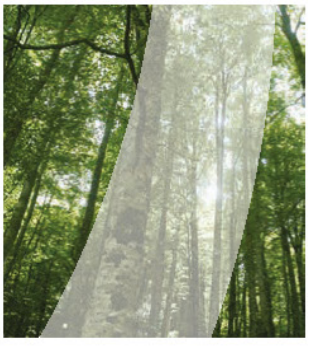
The Outlook for Agriculture and Rural Development in the Americas:

A Perspective on Latin America and the Caribbean

2017-2018



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Contents

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Foreword

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) are pleased to share the seventh edition of the document "Outlook for Agriculture and Rural Development in the Americas".

This document analyzes the main changes that have taken place in agriculture and the rural milieu during the 2016-2017 period. It also considers the prospects and main trends in the region, in a context characterized by a slow and uneven global economic recovery in 2016, but with signs of an economic upturn in 2017, and by a continuous reduction in poverty, the poverty gap and income inequality, most likely driven by recent social policies and political efforts to promote economic development. In addition, the 2030 Agenda and its 17 Sustainable Development Goals have provided a new framework for action for the implementation of policies focused on economic growth, environmental protection and social inclusion.

This document examines the macroeconomic and sectoral context and the trends and outlook for crops, livestock, fisheries, forests and rural well-being, as well as the public policies and institutional framework for these sectors. Based on an analysis of the trends and prospects, each chapter offers a series of recommendations for the consideration of decision-makers, in an effort to help address the challenges posed by the global economic dynamics and to take advantage of opportunities. This edition also includes a special chapter on the Sustainable Development Goals of Agenda 2030, with the aim of providing guidance to decision-makers for the development of policies and tools that will strengthen the contribution of agriculture and rural areas to the achievement of those objectives from a comprehensive and systemic perspective.

During 2017, the Latin American and Caribbean (LAC) region's position in the international agricultural markets improved, despite an overall decline in its agricultural exports, although this was less significant than that suffered by its main competitors. Mexico and the Central American countries showed the best performance in terms of their agricultural trade, thanks to their close commercial ties with the United States, whose economy experienced a significant recovery in 2016. By contrast, the fall in the Southern region's agrifood exports, due mainly to the decline in exports of oilseeds and grains (rice and maize), resulted in this region being responsible for 93 % of the fall in the LAC's agrifood exports (i.e. 7.15 % of the total decrease of 7.7 % in LAC).

In general terms, production and exports of most of LAC's crops and livestock products are expected to recover rapidly in the coming years, although prospects vary from one product to another. Commodities will continue to contend with low price levels, and therefore the region's competitive ranking in those items will depend in large measure on their ability to compete based on prices. However, the outlook is very positive for LAC's fruit and vegetable producing

and exporting countries, due mainly to the consolidation and increase in world demand for those products. With respect to the livestock sector, international demand for animal products will continue to grow rapidly, and the Latin American countries - particularly Brazil, Argentina, Uruguay and, on a smaller scale, Colombia and Mexico - will continue to consolidate themselves as major providers of food of animal origin. However, they will face challenges in developing sustainable livestock production systems that reduce the impacts of livestock production on the environment and natural resources.

The forestry sector, for its part, will continue to encounter environmental and socioeconomic problems stemming from deforestation; therefore the LAC countries must make a particular effort to combat the vulnerability of rural areas. With respect to fisheries and aquaculture production, the region is expected to maintain growth rate above the average rates of other regions of the world, which will provide an opportunity to contribute to the food and nutritional security of thousands of communities throughout the extensive coasts and vast river basins of Central and South America.

With regard to social aspects, despite the notable decline in the number of rural households, these continue to be an integral part of the regional economy. It is hoped that the growth of agriculture, the development of new and more inclusive markets and the implementation of social protection policies in rural areas will have a major impact on reducing poverty and achieving food and nutritional security in the region.

All the analyses conducted for the preparation of this document reveal that the main challenge for the future of agriculture and rural life in LAC will be to improve agricultural productivity in a sustainable manner, while at the same time ensuring the inclusive distribution of the economic benefits among all stakeholders in rural areas, taking advantage of the opportunities afforded by Agenda 2030 and its SDGs.

We hope that this report will contribute to strengthening agriculture in the countries of the Americas and that it will help improve the living standards of our farmers and rural dwellers.

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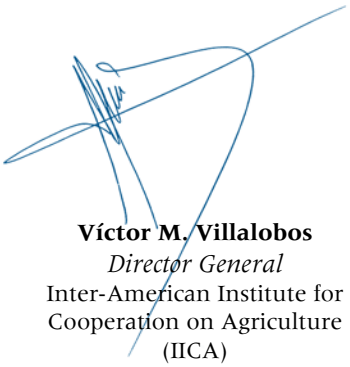

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Executive summary

Executive summary

As in previous reports, this edition of "Outlook for Agriculture and Rural Development in the Americas 2017-2018" is divided into five basic chapters. This edition, however, includes an additional chapter on the potential contribution of agrifood systems to the achievement of the Sustainable Development Goals (SDGs) established in the 2030 Agenda for Sustainable Development (2030 Agenda).

Chapter I. Macroeconomic Context: This chapter analyzes the evolution and outlook for financial and macroeconomic markets, which determine the conditions in which agriculture in the Americas will have to operate.

Chapter II. Context of the Agricultural Sector: The chapter begins with an analysis of the region's main agricultural aggregates (sectoral context), followed by the trends and prospects for the various subsectors (crops, livestock, fisheries, and forests).

C***hapter III. Rural Well-being:*** Based on the household survey data of twelve Latin American and Caribbean (LAC) countries, this chapter discusses the trends of rural well-being before and after the global financial crisis, focusing on poverty, income inequality, and non-monetary indicators of well-being.

Chapter IV. Policies and the Institutional Framework: This section reviews the trends in agricultural policies in the LAC region and among its main trading partners, emphasizing the main support received by the sector.

A synopsis of each chapter of the document is presented below:

Chapter I: Macroeconomic Context

The growth of the world economy appears to be accelerating. Following the weak results of 2016, projections suggest that global economic activity will rebound in 2017 and 2018, bringing widespread improvements to countries. However, growth will continue to present weaknesses and uncertainties, especially in some advanced economies and in countries that export raw materials.

During the first half of 2016, the global economy plummeted: the annual growth rate was one of the lowest in the post-crisis period. However, during the second half of the year, global gross domestic product (GDP) gained some traction, largely due to an upturn in advanced economies. According to the International Monetary Fund (IMF), in 2016 world growth rate was 3.1%, with a declining trend compared to previous years, but a significant and hopeful acceleration during the final months of the year.

The situation in emerging and developing economies, however, is less promising, mainly due to falling prices of raw materials over the past few years as well as the slowdown in the Chinese economy. In addition to low prices for raw materials, Latin America has faced a number of other factors, such as the emergence of internal political crises in various countries of the region, uncertainty over U.S. trade policy and the need for longer fiscal adjustments as a result of the reduction in fiscal revenues from trade in raw materials. In fact, between 2014 and 2016, the performance of Latin America and the Caribbean (LAC) was well below that of the group of emerging economies, China and India. The region's weak economic

performance in 2016 was primarily due to a contraction in investments and consumption in South American countries.

Trade growth in 2015-2016 was less than the growth of global GDP (almost unprecedented in recent decades), although it began to rebound at the end of 2016 due to higher investments. In particular, exporters of raw materials experienced a drastic contraction in investment and imports throughout 2016, a pattern similar to that observed in 2015. The weak growth of global trade in recent years has had a direct impact on trade in LAC, which in 2015-2016 had its worst performance in eight decades (ECLAC 2016b). The deceleration of the decline in commodity prices in 2016, as well as the improvements expected in 2017, should positively impact the terms of trade in the region.

The growth prospects of the global economy have been adjusted slightly upward, thanks to the recovery of investment, prices of raw materials, and activity in the manufacturing sector. World economic growth, which was 3.1% in 2016, is expected to increase to 3.5% in 2017 and to 3.6% in 2018. In LAC, recovery in regional activity is expected to be weaker than at the end of 2016, with expected growth of 1.1% in 2017 and 2.0% in 2018, albeit with marked differences between countries. International trade is expected to grow again, but recent protectionist trends have generated new uncertainties and risks regarding the future of the world economy.

Chapter II: Sectoral Analysis

i. Context of the Agricultural Sector

An important group of countries (including Chile, Colombia, Guyana, Peru and the Dominican Republic) has shown sustained growth in the volume of production and real agricultural income over a ten-year period. On the other hand, production rose while real income fell in the countries that are the main agro-exporters in South America (Argentina, Brazil, Bolivia, Paraguay and Uruguay), given that these countries specialize in the production of cereals and oilseeds, whose international prices collapsed in the last three years. In another group of countries (mostly in the Caribbean region, including Belize, Bahamas, Barbados, Dominica and St. Kitts and Nevis), growth rates of production volumes and real income were negative, primarily as a result of droughts, diseases and pests.

Preliminary data for 2016, when compared to 2015, suggests that agricultural production grew in several LAC countries. Agricultural value added (AVA, measured in constant local currency) increased by 10%, 7.9%, 5%, 4.5%, 4.1%, and 3% in the Dominican Republic, Saint Lucia, Costa Rica, Brazil, Mexico and Haiti, respectively. These growth percentages contrast with the decline observed in the case of Guyana (0.3%), Colombia (0.5%), and Chile (3.2%), where growth rates were lower in 2016 than in 2015. Furthermore, several Caribbean countries were affected by Hurricane Mathew and the citrus subsector by Pierce's disease (greening).

The projections for changes in AVA in 2017 are conservative; they are estimated at roughly 4.9% for Saint Lucia, 3.5% for Chile, 3.2% for Mexico, 2.3% for Costa Rica, 2.1% for Colombia, 2% for Brazil and 1.9% for Guyana. In other countries, the expectations are less than 1.5%.

Furthermore, international commodity prices (in dollars and adjusted for inflation) are on the rise, except for cereals. Cereal prices have fallen by an average of 6.2%, annualized through February 2017. It is the first time in more than a decade that cereal prices have behaved differently from the prices of other food groups. The majority of prices that rose in constant dollars did so to a lesser degree than those in local currencies.

In 2015, global agrifood exports (chapters 1-24 of the harmonized system) fell 11.2% compared to the previous year; however, in LAC they fell by only 7.7%, which confirms that this region performed better than other parts of the world.

Within LAC, the Central subregion recorded the smallest reduction of its exports (2.6%), partly due to the proximity of these countries to the United States, whose economy is currently recovering. Central America was followed, in descending order, by the Caribbean subregion, whose agrifood exports decreased by 6.3%; the Andean subregion, with a 6.5% rate of decrease; and lastly by the Southern subregion, whose exports decreased 10.5%, mainly as a result of the decline in exports of oilseed products. Due to the relative weight of the Southern subregion's trade, it accounted for 93% of the fall in LAC agrifood exports.

Preliminary data for 2016 show an upturn in the growth of LAC's agrifood exports. According to mirror data from the ITC (2017), global agrifood exports fell 3.58% in 2016. In contrast, official data for 2016 for twelve LAC countries available in the COMTRADE database at the time of writing (UN 2017), suggests that the region's agrifood exports fell by barely 0.04%, which is insignificant compared with the fall in global agrifood exports and in LAC's total exports of goods (-2.55%) during the same period.

ii. Agriculture

The fall in international prices, coupled with unfavorable weather conditions, affected the main cereal and oilseed producers and exporters, who, in 2016, experienced reductions in their production and export levels. This situation greatly contributed to reductions in the production of coarse grains and rice in South America. The decrease in corn production in Brazil was offset many times over by the increase in corn production in Argentina, the United States and Canada and wheat production in Canada, Argentina, and Brazil. On the other hand, in Mexico and most of the Central American and Caribbean countries, cereal production recovered in 2016 after being heavily impacted by El Niño in 2015 and in the first half of 2016. This phenomenon reduced the production of corn and other basic grains (rice and beans) by up to 20% in some countries of the region (Honduras and Nicaragua, for example). Although most Central American countries resorted to imports to recover from the impact of El Niño on domestic prices for staple grains, some countries failed to purchase supplies on the international markets quickly enough, which resulted in temporary shortages and pushed up prices in 2015 and during the first half of 2016.

With respect to tropical crops, changes in climatic conditions and in the performance of international competitors during 2015-2016 enabled some countries in LAC to strengthen their position in the markets. One example is avocado, whose world exports grew at an average annual rate of 15% over the past decade. Mexico has consolidated its standing as the main avocado exporter (accounting for 46% of the global market), as a result of its exports growing at an annual rate of 17%. In addition to avocado, coffee and cocoa have also recovered significantly. With respect to coffee, for instance, the recovery from coffee leaf rust and the improvement of climatic conditions enabled a number of countries including Colombia, Honduras, Peru, Guatemala, Nicaragua and Costa Rica to gain a bigger share of international coffee markets (although Brazil and Mexico experienced significant losses). A similar situation occurred with cocoa. Several LAC countries, such as Ecuador, Peru, the Dominican Republic, and Colombia, recovered lost ground in the world market for this product, thanks to the fact that regional production and export growth rates were greater than the global average (although Ivory Coast, Ghana, Nigeria and Cameroon continue to widely dominate the market). LAC countries experienced quite

the opposite situation in the global banana market. Although LAC continues to be the world's largest banana producer and exporter, continued rapid growth during 2015-2016 is increasing African countries' share of the market.

Climate variability and the intensification of mono cropping during the 2015-2016 period created the conditions for the reappearance of plant pests and diseases in some LAC countries, which significantly reduced the region's agricultural potential.

In the short term, the Southern subregion is expected to see increased production of its most important crops (corn and oilseeds), thanks to the combination of a larger cultivated area and higher yields resulting from favorable climatic conditions and an increase in international prices. Increased production in South America (primarily in Brazil and Argentina) would compensate for potentially lower production in North America (especially wheat production in the U.S. and Canada). This positive performance would enable South America to play a leading role in the growth of world crop exports. By recovering the world's main consumers, South America will be able to increase its participation in global exports of cereals and oilseeds.

A reduction in the growth of the demand for cereals and oilseeds from LAC is expected in the long term, primarily due to a reduction in the population growth rate, a slowdown in the economies of the largest food consumers, and decreased use of crops for fuel, as well as any self-sufficiency policies that could be implemented by the main agricultural powers. At the same time, due to the availability of suitable land for farming, some LAC countries, such as the U.S., Canada, Brazil and Argentina, are expected to increase their participation in the production and export of crops at the global level.

Within this scenario, agricultural production and trade in LAC will face significant challenges, which will force the countries of the region to create policies geared toward increasing productivity, reducing inequity within agrifood chains, increasing resilience, and reducing the environmental impact of its production systems. These actions will play a critical role in agriculture developing its full potential to contribute to the achievement of the goals established in the 2030 Agenda.

iii. Livestock

Livestock production in LAC continues to grow at a rapid pace. Although the countries of the region represent only 9% of the world's population, they produce around a quarter of the world's meat and poultry. Additionally, the region accounts for approximately 10% of the global production of eggs and milk and about 7% of pork production. LAC is clearly emerging as a major world supplier of animal protein. This growth in demand is occurring at a time when, as noted in the 2030 Agenda, concerns about resource scarcity, climate change and the need for more equitable development are becoming increasingly important. In LAC, the rapid growth of livestock production is more the result of higher inventories than the adoption of technologies to improve performance. Currently, there are several related issues affecting the livestock industry in LAC, including political uncertainty, foreign investment in agriculture, technology and animal diseases.

Going forward, the continued growth of the livestock industry in LAC will depend increasingly on improved efficiency resulting from the adoption of new technology and vertical integration. Intensification, sustainability, environmental impacts, climate change and public policies will affect the rate and course of production expansion. Key factors for the continued strong performance of the meat industry in LAC include low grain prices, the intensification of production, higher per capita incomes, continued change

in consumer preferences from beef and lamb to chicken and pork, and policies designed to stimulate production and minimize environmental impacts.

Livestock is one of the fastest growing agricultural sub-sectors in developing countries, but experience shows that rapid growth per se does not necessarily translate into benefits for the poor. In order for growth in the livestock sector to contribute efficiently to poverty alleviation, strategies should primarily focus on eliminating obstacles in the access of rural households to assets, particularly land and capital. As small and medium-scale producers increase their production, the demand for services, inputs, feed and genetic resources is likely to increase, which will require greater involvement of the private sector to complement public sector services.

Animal diseases will represent a constant threat, considering the rapid growth of the livestock industry in LAC. Additionally, climate change will create new problems of disease emergence or resurgence. Countries will continue to strengthen their systems for conducting surveillance and addressing health emergencies at all levels, with the main challenge of extending these services to small-scale livestock producers. Given that many animal diseases cross borders easily, effective multinational cooperation will prove useful in monitoring and controlling diseases. It will also be necessary to strengthen the minimum health standards established by regional, sub-regional and national institutions to address cross-border animal health and food safety crises, as well as improve the efficiency of actions in the early stages of outbreaks (monitoring and preparation).

To meet the challenges associated with the sustainable development of the livestock sector, it is important to implement comprehensive public policy strategies that go beyond the sectoral scope by addressing topics related to investment, financing, innovation, sustainable development and social inclusion.

The sustainable development of the livestock sector involves optimizing its performance while linking aspects related to production, the environment and social justice. This requires the development and implementation of initiatives aimed at contributing to the efficient use of resources, strengthening resilience, guaranteeing equity and social responsibility in livestock activity, strengthening public policy frameworks that favor the development of a sustainable livestock industry, coordinating and harmonizing the institutional capacities of the entities responsible for supervising interactions between livestock producers and the environment, and promoting the adoption of new production technologies for sustainable livestock activity. Consensus among governments and diverse stakeholders in pursuit of a transformative vision of economic, social and environmental sustainability would comply with the SDGs. Family livestock producers are important actors in the development process and play a strategic role in achieving food and nutritional security in rural areas. Greater integration of family producers in markets will not only help to meet future demand for high-quality animal products, but will also create more opportunities for producers to move up the social ladder and, eventually, out of poverty.

iv. Fisheries and aquaculture

Fisheries and aquaculture production in Latin America is growing at an above-average rate compared to other regions of the world. This trend is being driven primarily by aquaculture, since the region has the largest area in the world with potential for aquaculture expansion.

Regional aquaculture is maintaining a steady expansion rate of over 6% in terms of volume, driven by an increase in the production of species traditionally important at an industrial level (salmon in Chile and tilapia in Central America, mainly in Honduras and Costa Rica). The production of cultivated shrimp, however,

has not followed this trend, as demonstrated by its low prices in international markets as a result of the global economic slowdown and an excess of inventories.

Various emerging species, whose production volumes have increased, are gaining ground in markets. Some examples are the Peruvian scallop and some Amazonian species (*paiche*, surubí and pintado) in Brazil. The gradual consolidation of technology for cultivating these species has stimulated greater investment and the expansion of fishing areas.

On the other hand, production by capture fisheries has exhibited a downward trend in recent years, after achieving maximum production levels in the late 1990s. This trend has been influenced by a significant reduction in the Peruvian anchovy catch, one of the most important fisheries, which fell primarily as a result of climate-related effects. Other marine fisheries such as the Chilean jack mackerel, have also shown a contraction in volume, which has forced regulatory authorities to enforce a low catch quota.

Other fisheries, such as lobster in the Caribbean region and shrimp in the Atlantic region (Mexico, Central America and Colombia) have remained stable, with a ban in all countries on incorporating new fishing boats; this has also been the case for prawns in Argentina.

Production volumes for inland fishing (lakes, ponds and rivers) have, for the most part, increased; however, some important basins such as the Colombian Orinoquía region have experienced drastic reductions. Fishing in these ecosystems continues to be the basis of food security for thousands of families, many of whom are indigenous peoples. Given the broad geographic dispersion of these communities, it is highly likely that official data available significantly underestimates both production and the number of fishermen who depend on this activity in the region.

Both the fisheries and aquaculture subsectors face common challenges in the immediate future, such as the negative effects of climate change and weak institutional frameworks. Illegal fishing and overfishing, in particular, continue to threaten the sustainability of fishery resources, while high prices for production inputs remain a constraint for aquaculture.

The sustained increase in the global demand for fishery and aquaculture products will continue to drive aquaculture expansion in the region; as a result, it is important to promote policies that support small-scale producers, in order to maximize the social benefits of an economy based on national waters, referred to as a blue economy.

v. Forests

The total forest cover in LAC spans 935.5 million hectares, which represents 46% of the region's total land area. Despite this abundance, the region has not yet found a way to take advantage of this important resource in a sustainable manner. Although the rate of forest loss is slowing in the region, and has been cut by almost half in the last quarter century (it is currently equivalent to 0.23% per year), it is still high compared to the global annual rate of 0.13%. By contrast, the region's limited planted forest area, which has increased from 1% to 2% over the same period, is low compared to the global value of 7%. This data aside, the important contribution of forests to sustainable development, as well as the preservation of environmental services, is partly evidenced by the actions that countries in the region have undertaken to promote the conservation and sustainable use of forests. One example is the expansion of the region's protected forest area from 114.6 million hectares in 1990 to 305.4 million hectares in 2015, representing 32.8% of the total forest area. Additionally, around 18% of forests in

the region have been specifically designated as areas for the protection and conservation of biodiversity, and it is estimated that around 147 million hectares of forest in LAC are under an official forest management plan.

Forests make it possible to diversify the income of rural populations, especially those that are most vulnerable. In many cases, however, trade in as well as use and exchange of wood and non-timber forest products, which constitute an important source of income for a large part of the rural population in some countries, are not reflected in national accounts and are categorized as "informal activities." Estimated income from informal wood products (USD 8.98 billion), non-timber forest products (USD 3.64 billion) and environmental services (USD 164 million) corresponds to 26% of the gross value added of the forestry sector to the regional economy (USD 49 billion).

Non-timber forest products (NTFPs) also contribute to the nutrition and health of local populations. It is estimated that around 5.6 million tons of edible NTFPs are consumed annually, which corresponds to 15.7 kcal/person/day in LAC. With respect to health, about 28% of households in LAC use plant-based medicines on a daily basis, many of which come from forests. In LAC, wood energy constitutes 13% of the region's energy matrix, and 16% of households use wood as a primary fuel for cooking. Fuelwood represents 7% of the total fossil fuels supply, which is about the same percentage as hydroelectric power, which accounts for 8% of the total. The region has 36% of global carbon stocks contained in 22% of the world's forest area. At the regional level, it is estimated that 73.4 million people live in houses that use forest products as the main construction material, which corresponds to 12% of the total number of households. With respect to employment, the forestry sector employs 0.5% of the total workforce in the region.

Forests in LAC cover a little less than half of the region's land area. The forests provide products and services that contribute to socioeconomic development and to the protection of the environment. They are essential to the lives of millions of people, mainly those who live in rural areas or in a state of poverty, since they provide food and other non-timber products, energy, medicine, and important ecosystem services, which constitute irreplaceable elements for the sustainability of their means of subsistence and livelihoods. Responsible and sustainable forest management, as well actions aimed at the sustainable development (preservation, restoration, protection and production) of natural resources in forest ecosystems, will be critical to the region's achievement of the SDGs.

Chapter III. Rural well-being

This chapter presents an analysis of trends and changes related to regional rural well-being between 2002 and 2014 (before and after the global economic crisis), focusing on poverty, women, income inequality, non-monetary measures of well-being, and the SDGs.

The analysis is based on data from rural household surveys administered in twelve LAC countries. The surveys categorize households under five mutually-exclusive types, based on the primary occupation of household heads: 1) wage agricultural, 2) wage non-agricultural, 3) autonomous agricultural, 4) autonomous non-agricultural and 5) inactive.

The data show a stable transition of agriculture toward non-agricultural sectors. Between 2002 and 2014, rural LAC saw its agricultural sectors (wage and autonomous) shrink by more than one-fifth, while the wage non-agricultural sector increased by 50 %. Although this developmental transition halted during the peak of the global financial crisis (2007-2010), the region managed to weather the recession with existing social programs. However, the expansion of the inactive sector indicates that there is a significant skills mismatch between

households leaving agriculture to enter the non-agricultural sector. In particular, skilled jobs in non-agriculture are vacant for three times as long as unskilled jobs; as a result, the region must provide training opportunities to ensure that companies in the non-agricultural sector have a skilled workforce to draw from.

Other important trends related to rural well-being include: a) significant reductions with respect to the poverty rate, poverty gap and income inequality, probably as a result of recent social policies; b) an increase in the number of households headed by women; and c) continued inequality with respect to non-monetary measures of well-being, such as housing quality and level of education. This shows that, although poverty and income inequality have decreased, poor rural households continue to face difficulties due to unmet basic needs.

These results underscore the need for an integrated approach to policies in order to ensure continued economic development, reduced inequality, and gender parity in the short- and long-term. This approach should include, in the first instance, training programs via public-private partnerships that are geared toward reducing the skills mismatch observed throughout the region. These programs would ensure that workers possess the skills required by companies and would also reduce government costs if companies are providing the training. Secondly, the approach should incorporate policies that support women and girls, in order to ensure that women have equal skills, pay, and access to information. This could stem the cycle of gender inequality as women direct resources towards girls' education. Lastly, investments in public housing should be addressed by means of public works programs. This would revert inadequate access to basic housing while also providing work for vulnerable households and providing retraining opportunities to facilitate the transition from agriculture to non-agriculture.

Chapter IV. Policies and the institutional framework

Governments continuously strive to make public spending more effective and efficient, in order to tackle challenges and take advantage of opportunities for the sustainable development of agriculture and rural areas. They also seek to adequately respond to commitments undertaken at global forums and to changes in the global financial and social contexts. This chapter analyzes the most recent innovations in the management of public agricultural policies, while making reference to the goals and targets of the 2030 Agenda.

Across the world, policies are evolving toward a market approach that allows farmers to make better decisions, although this trend is less apparent in LAC countries. In general, despite certain differences between sectors, producer support policies in LAC favor transfers associated with prices and market management (including the input market). This makes them a disincentive to innovation and the improvement of productivity. Countries that make significant efforts to modify the type of support provided to producers allocate more public resources to the provision of general services for producers collectively (rather than direct transfers to individual producers). Such services include research and development (R&D), inspection, marketing, promotion, agricultural education, infrastructure and public storage, with more lasting impacts and multiplier effects.

As direct support for agriculture is reduced and the effects of climate change become more pronounced, integrated risk management policies have been actively promoted in recent years, although in the case of small-scale agriculture they are still at the embryonic stage. The main obstacle to the implementation of these types of policies and their respective instruments is the need to ensure that risk transfer mechanisms are sustainable and viable

for governments (given the limited public funding available) and profitable for the private sector, without undercutting the proactive role that farmers should play in addressing their own risks. This chapter describes the progress achieved in adopting risk management instruments, including methods for protecting farmers from risks posed by variations in prices and income, as well as methods adopted by the State to protect them from catastrophic or systemic risks.

This chapter also presents other innovations related to policies for promoting a more intensive and sustainable agriculture. Methods for providing direct support to producers are compared with other more effective measures, such as: a) promotion of access to, and the use of, quality seeds; b) driving of agricultural mechanization to foster greater integration among producers, manufacturers, distributors and suppliers of machinery services; c) a series of private initiatives and public policies for the sustainable management of natural resources, geared toward improving the balance between mandatory, conditional and voluntary programs, although there is limited experience in LAC with respect to environmental conditionality, which should gain importance in the future. Furthermore, the chapter reports on the manner in which markets are evolving toward regulations that promote a more rational use of natural resources in production processes.

A topic that is gaining importance in LAC countries is the implementation of systems for monitoring and evaluating agricultural policies, with a view to enhancing their effectiveness and efficiency, strengthening accountability processes, and responding to the need to monitor progress achieved with respect to international commitments (for example, the 2030 Agenda). The greatest challenge for LAC will be institutionalizing policy evaluation processes so that they form an integral part of the agricultural policy cycle.

Trade negotiations currently underway are shaping a new trade agenda in the Americas that seeks to establish new intraregional economic relations with Asia and Europe. The economic integration agenda in LAC will focus primarily on strengthening the bonds between members of the Pacific Alliance, between the Pacific Alliance and the Southern Common Market (Mercosur), and between Mexico and the rest of LAC; in the two latter cases, these bonds will be strengthened by the renegotiation of the North American Free Trade Agreement.

Lastly, this chapter analyzes the actions that LAC countries have undertaken to actively participate in global agreements on climate change, including the signing and legislative ratification of the Paris Agreement on Climate Change, as well as the inclusion of actions or references to the agricultural sector in their intended and determined contributions, in which the sector is addressed with a focus on adaptation.

In order to advance toward meeting the goals associated with the SDGs, a series of coherent, multi-objective, effective and efficient policies that are managed at various levels of intervention are required. These policies should generate the conditions necessary to enable countries to respond in an adequate and timely manner to market signals; to make the best decisions regarding what, when and how much to produce; to adopt technologies and to create innovations that make it possible for them to compete equally with producers from more advanced regions. Domestic market development policies will also be necessary in order to support regional integration and vice versa. Future integration processes will need to respond to the specific needs of agricultural producers in terms of infrastructure, transportation and services (for example, trade information) and address the complexity of regulations.

Food systems and the 2030 Agenda

This chapter proposes a policymaking methodology aimed at strengthening the food system, which takes the 2030 Agenda as a frame of reference and relies on network analysis.

The analysis in this chapter allows for identifying two major policy areas. The first, sustainable production and consumption, encompasses production, processing and packaging, and consumption activities, the food security function and the SDG target of capacity-building (17.9). The second area, pertaining to food security and social well-being, encompasses the use of and access to food security, the social well-being function and the SDG target of hunger eradication (2.1).

The chapter highlights the importance of policy coordination and linkage between different sectors in order to strengthen the competitiveness, inclusion and sustainability of the food system, primarily between the agricultural sector and the financial and trade, health and education, water and energy, and environmental sectors. This coordination is important within the context of the 2030 Agenda and is particularly relevant for policies relating to food systems.

The targets recognized as priorities can be used to identify relevant policies on food and nutrition, increasing productivity, fostering sustainable production and consumption, promoting the production and consumption of renewable energy, production development, environmental management and climate change, market access, inclusion and social protection, recovery of agricultural and agroindustrial waste, and cooperation for development. The chapter also identifies monitoring challenges and highlights the importance of network analysis to support policymaking that is aligned with the 2030 Agenda.

Chapter 1
Macroeconomic Context

Macroeconomic Context

Trade growth in 2015-2016 was lower than the growth of global GDP (almost unprecedented in recent decades), although it began to rebound at the end of 2016 as a result of higher investments. The growth prospects of the global economy for the upcoming years have been adjusted slightly upward, thanks to the recovery of investment, prices of raw materials, and activity in the manufacturing sector.

Facts

- The growth of the world economy seems to be accelerating. Following the weak growth of 2016, projections suggest that global economic activity will rebound in 2017 and 2018, with widespread gains in the countries. Nonetheless, growth will continue presenting weaknesses and uncertainties, especially in some advanced economies and in commodity-exporting countries.
- The growth projections from various international agencies exhibit a wide dispersion. This is due, in particular, to the uncertainty caused by current policy orientation of several countries that are important global players (the United States, China, and several European Union countries), the international effects of these policies, and the outcome of trade and political negotiations (TPP, Brexit).
- Among the main risks that can affect this recovery is a possible shift towards protectionist and isolationist policies, worsening global financial conditions, intensified geopolitical tensions and a more marked slowdown of growth in China.
- In the long term, structural obstacles, including low productivity growth and high income inequality, are of fundamental importance in the process of economic recovery. In such a scenario, economic policies assume the important role of reducing risks and securing recovery.

Trends

Global growth reached a record low in 2016, but rebounded towards the end of the year

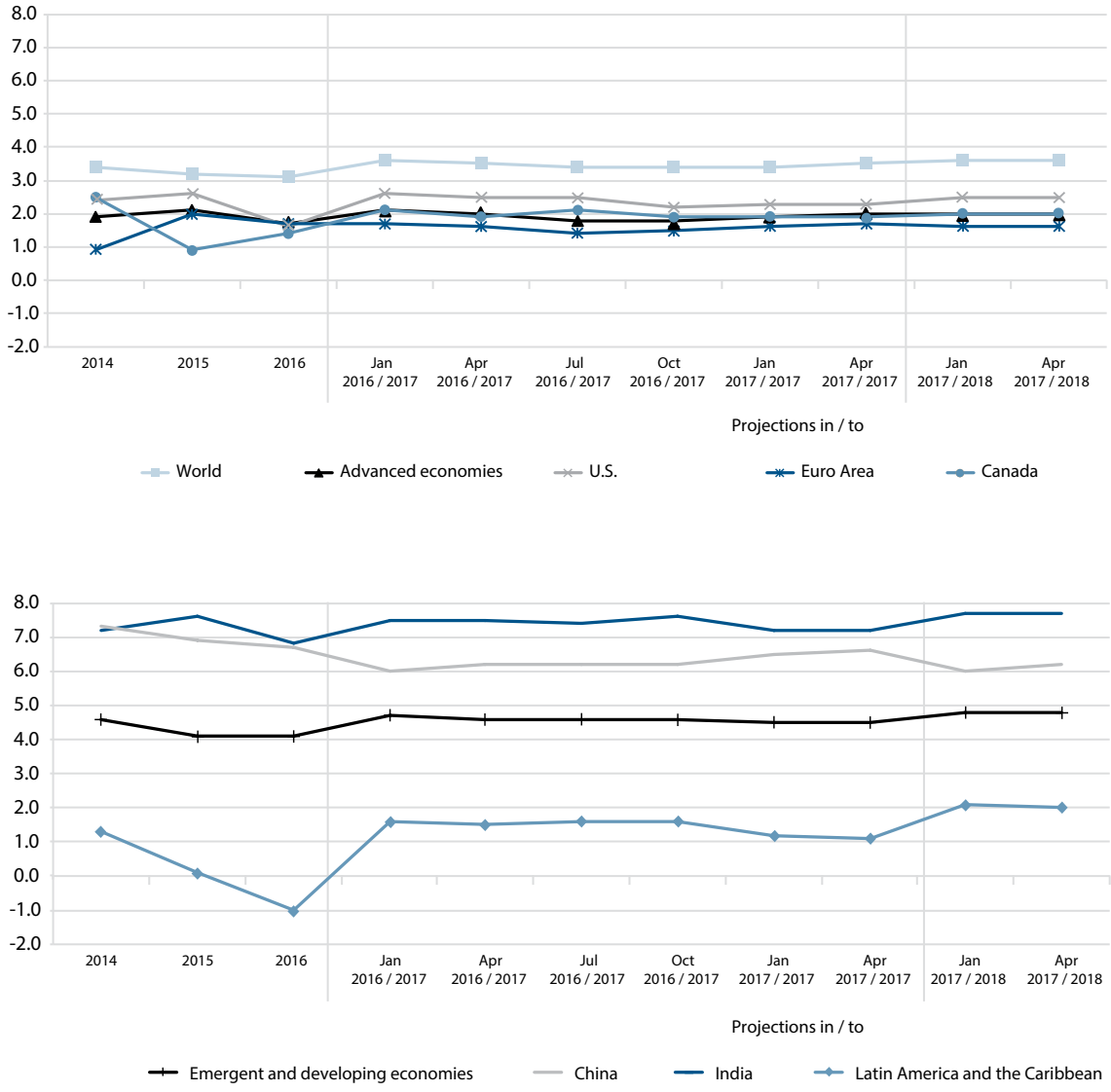
During the first half of 2016, the world economy hit bottom, with an annualized growth rate indicating one of the worst performance in the post-crisis period. However, in the second half of the year the global gross domestic product (GDP) gained some impetus, thanks to the rebound observed in advanced economies. Economic activity has picked up in recent months in major economies such as the United States, Britain (in spite of Brexit), Germany, Spain and Japan. That rebound impacted global growth, prompting optimistic forecasts from international agencies that growth will accelerate in 2017.

However, the situation in emerging and developing economies is less promising. To shore up their growth, these economies depend on the situation of raw materials, whose price has been declining in recent years. The slowdown in the Chinese economy, which impacts the demand for raw materials, especially metals, and the decline in oil prices, have been the main performance determinants in emerging, commodity exporting, economies. During the last months of 2016 there was a slight rebound in commodity prices, which is expected to continue in 2017. As a result, in this group of economies, the growth rate reached 4.1% in 2016, concluding a period of consistent deceleration that began in 2011 and has been more or less widespread in the different regions.

In Latin America, in addition to low commodity prices, other factors, such as the emergence of internal political crises in various countries of the region, the uncertainty over US trade policies and the need for more permanent fiscal adjustments, due to the reduction of fiscal revenues from trade in raw materials, have contributed to poor economic performance.

According to the International Monetary Fund (IMF), in 2016 the world growth rate was 3.1% (Figure 1), a declining trend compared to previous years, but with a significant and hopeful acceleration towards the last months of the year. The latest forecasts indicate that growth could reach 3.5% in 2017. The advanced economies achieved a growth rate of 1.7% in 2016, lower than that of 2014 and even that of 2015, but it is expected that in 2017 this rate will reach 2.0%. The Euro Zone grew at the same level in 2016, although with significant variations ranging from 3.2% in Spain, to 1.8% in Germany, and even to 0.9% in Italy. Projections for the Eurozone indicate stable GDP growth in 2017, although individual country performances may differ. The best 2017 growth forecasts are for the United States (from 1.6% in 2016 to 2.3% in 2017), Canada (from 1.4% to 1.9%), Japan (from 1.0% to 1.2%) and the United Kingdom (from 1.8% to 2.0%).

Figures 1a and 1b. Growth rates and projections of GDP in the main advanced and emerging economies (%)



Source: Prepared using IMF data (2017a).

The weak regional economic performance of 2016 was mainly due to the fall in investment and consumption in South America

In 2016, investment was the component of regional GDP that suffered the largest decline (around 6.8%), according to ECLAC (2016a). The drop in both private and public consumption (about -1.0%), also contributed to the contraction of regional GDP. Due to the fall in domestic demand, imports declined by about 3%, resulting in a positive contribution of net exports to the region's GDP in the last year. Like with economic activity, GDP components also exhibited sub-regional variation in 2016. In South America investment declined sharply (-9.9%) and, to a lesser extent, private consumption (-2.3%). However, in Central America both components increased (about 1.9% and 3.0%, respectively).

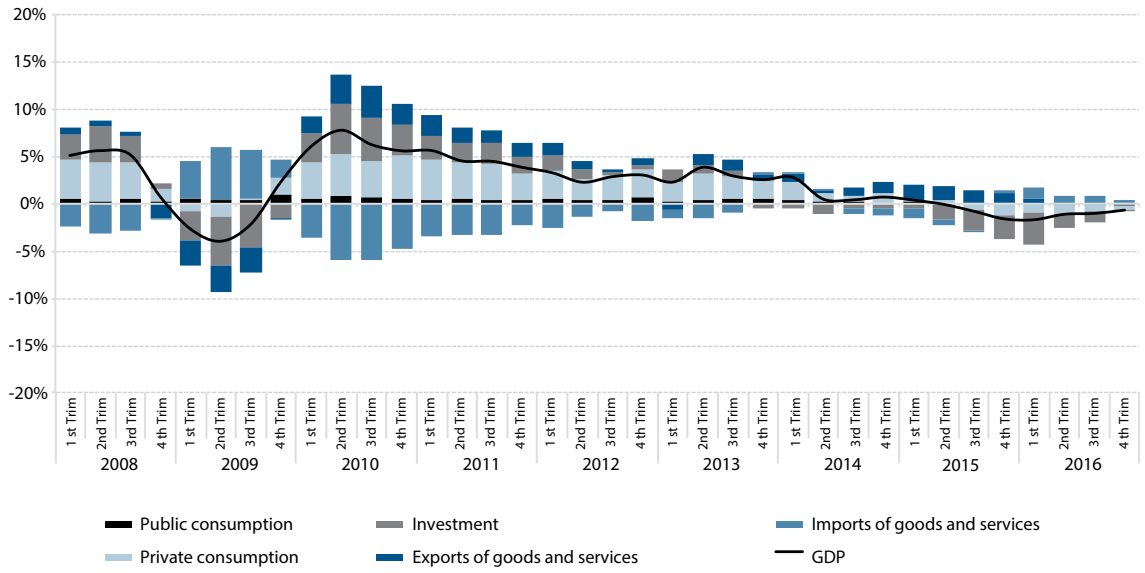
Gross fixed capital formation, an indicator used as a proxy for investment, has recently shrunk as a percentage of GDP in Latin America and the Caribbean (LAC), from 21.3% (2013) to 18.4% (2016). The largest decreases occurred in Venezuela, Brazil and Ecuador. According to ECLAC (2016a), a negative contribution of investment to GDP growth had previously been observed only in years of economic crisis in the region: in 1995, due to the Mexican economic crisis; in 1999, due to the Brazilian crisis; in 2002, due to the Argentine crisis and the "dotcom companies" crisis; and in 2009, due to the international economic and financial crisis.

Because of their importance for productivity and longer-term economic activity, changes in investment rate are particularly relevant in explaining a country's growth. In all advanced economies, for example, growth in gross fixed capital formation declined from 3.0% in 2014 to 1.5% in 2016 (IMF 2017a). In 2017, investment is expected to accelerate in these economies, with the growth rate reaching 2.8%. At the closing of the report (July, 2017), there was no information on the behavior of investment in LAC for this year, preventing the comparison of regional trends with those observed in advanced economies. Even so, it is well known that an acceleration of investment in developed economies is linked to stronger international trade and higher prices of raw materials, which should have a positive effect on global and regional economic activity.

In the case of private consumption, the contraction observed in South America is a reflection of both the increase in the unemployment rate and the precariousness of employment, which has subsequently resulted in the fall of real wages. Between 2015 and 2016, the regional urban unemployment rate increased from 7.4% to 9.0% (an additional 4.1 million people), resulting in a total of 21.3 million people being unemployed in the last year (ECLAC 2016a). There are distinct sub-regional differences: in South America, the urban unemployment rate went from 8.2% (2015) to 10.5% (2016), while in Central America, Mexico and the Dominican Republic it fell from 4.9% to 4.6%, and in the English speaking Caribbean, from 10.0% to 9.3%. Although in all South American countries the rate of urban unemployment increased in the last year, this increase was particularly noticeable in Brazil: 9.2% to 12.8%. Excluding Brazil from regional calculations, the LAC unemployment rate increased from 6.2% in 2015 to 6.5% in 2016. The precariousness of labor is evident in the reduction of the number of wage earners (-0.2% at the regional level) and in the increase of self-employed workers (2.7%) in the last year.

The growth of real wages was also affected by weak regional labor demand, as well as by the acceleration of inflation, albeit with differences across sub-regions. According to ECLAC (2016a), real wages in formal employment increased by 1% in 2016 in the region, one percentage point less than in 2015. South America - and especially Brazil - was, again, the sub-region most affected. In this group of countries, the fall in real wages in Brazil and

Figure 2. Latin America: GDP growth rate and contribution to GDP growth of the components of domestic demand and net exports in 2002-2014 (in percentages and percentage points, constant 2014 dollars).



Source: Prepared using ECLAC data (2016a).

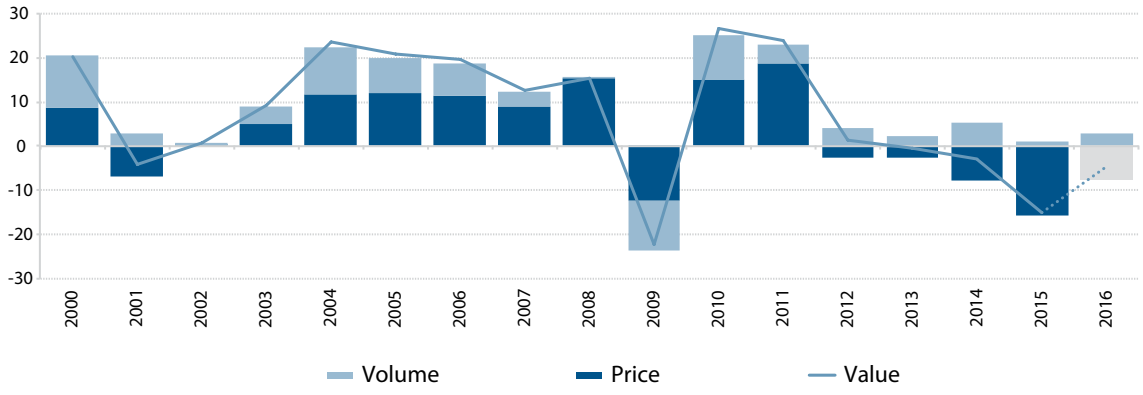
Colombia offset the slight increases in Chile, Peru and Uruguay. In contrast, in Central American and Mexican countries there was a further rise in real wages, although less than in 2015.

Trade growth in 2015-2016 was less than the growth of global GDP (almost unprecedented in recent decades), although it began to rebound at the end of 2016 due to increases in investment

World trade grew 2.6% (in volume) in 2015 and 2.2% in 2016, according to the IMF (2017b). Both rates were lower than the growth of global GDP, a phenomenon unprecedented within the last five decades. In addition, these increases account for less than half of the average rate of trade expansion for the three decades preceding the global economic and financial crisis of 2008-2009. According to the IMF (2016a), the overall weakness of economic activity, especially in terms of investment, has been the main constraint to the growth of global trade in goods and services in recent years. In particular, commodity-exporting countries experienced a drastic contraction in investment and imports throughout 2016, a pattern similar to that observed in 2015. Other factors, such as the decline in the growth of global value chains, changes in China's growth pattern, the slowdown in trade liberalization, and the recent surge in protectionism would also have an impact.

The weak growth of global trade in recent years has had a direct impact on trade in LAC, which in 2015-2016 had its worst performance in eight decades (ECLAC 2016b). In 2016, the value of regional exports of goods fell by 5%, due to a 6.7% drop in shipment prices and a 1.7% increase in volume. This trend marks four consecutive years of declines in the value of total exports for the region, although the performance in 2016 was somewhat better than in 2015, when the value of regional exports fell by 15% due to an even sharper decline in prices and a smaller increase in volume exported. On the other hand, the 2016 fall in regional imports was similar to that of 2015 (around 10% in value), with prices falling more than imports. A recovery is not yet in sight; on the contrary, the weakness of aggregate demand will likely persist. This behavior is mainly explained by the decrease in imports within South America.

Figure 3. Annual change in trade in goods in LAC, by volume, price and value, 2000-2016 (the data for 2016 is an estimate) (in percentages).



Source: Prepared using ECLAC data (2016b)

Intraregional trade declined much more sharply than regional exports to the rest of the world, both in 2015 and 2016 (ECLAC 2016b). In the last year, intraregional exports fell by around 10%, while exports to the rest of the world fell by 4%. This pattern was replicated across all sub-regions and blocs, and was particularly relevant in South America. In 2016, the region marked four consecutive years of falling intra-regional trade, the last three with a contraction greater than that of trade with the rest of the world. This resulted in an intraregional trade coefficient of only 15%.

The low dynamism of intraregional trade is particularly worrying, as the regional market is the main destination for exports manufactured within the region. That is, intraregional exports have a higher added value and a higher level of manufacturing processing than the region's exports to the rest of the world, which mainly correspond to raw materials. In that sense, the weakness of intraregional trade would be limiting the region's potential to advance in terms of diversification and value added to its exports (ECLAC 2016b).

Decreases in imports and increases in remittances from migrants have reduced the deficit in the regional balance of payments, which has traditionally been financed through foreign direct investment (FDI) and external bonds

The deficit in the balance of current account payments reached 2.2% of regional GDP in 2016, lower than the 3.4% in 2015. Almost all countries of the region, but especially Brazil, experienced an improvement in balance the payments (ECLAC 2017). Although all components of the current account contributed to the reduction of the deficit, the main factor was the 81% reduction in the goods deficit, thanks to a reduction of imports greater than the decrease observed in exports. On the other hand, the balance of current transfers, whose main component is the remittances of migrants, continued to be a surplus and gradually regained pre-crisis levels.

The financing of the current account deficit in the region was more than offset by the net financial flows received in 2016, equivalent to 2.6% of regional GDP, despite the fact that this level was 17% lower than in 2015. Thus, in the last year the region as a whole accumulated international reserves equivalent to 0.4% of GDP. FDI, which is the largest financial flow in the region, reached some USD 133.5 billion in 2015 and remained stable in 2016.

External bonds issued by LAC countries, which are another type of financial flow, grew substantially in 2016, about 55% above their level in 2015. This increase has been dominated by some countries, such as Mexico, Argentina, and Brazil, and was possible due to the decline in sovereign risk in all the countries of the region throughout 2016, due to better conditions in the global financial markets and the improvement in political tensions and economic prospects in some countries in the region. In 2016 sovereign risk was reduced especially in those countries that had experienced significant increases during 2015, as in the cases of Brazil and Ecuador.

The recent decline in commodity prices decelerated in 2016, and improvements are expected in 2017, which should positively impact terms of trade in the region

The contraction in commodity prices in 2016, approximately 6%, was much lower than in 2015, when prices fell 29%. In the last year, energy products have suffered the largest falls (-16%), followed by minerals and metals (-4%). Prices of agricultural products showed a slight increase on average (3%) in 2016, after a decrease of -16% the previous year. In recent months, commodity prices have increased in conjunction with improvements in the outlook for economic activity. The IMF's primary commodity price index rose by 15% between August 2016 and early 2017, with fuel increases being higher as a result of production cuts agreed upon by the Organization of Petroleum Exporting Countries (OPEC) and other producers, as well as improved projections of global demand (IMF 2017).

In 2016, the region experienced a 1% decline in the terms of trade, better than the 9% drop observed in 2015. Hydrocarbon exporting countries were most affected in both 2015 and 2016, with decreases of 28% (2015) and 8% (2016), followed by mining exporting countries, with falls of 5% (2015) and 2% (2016). In turn, Central American countries, agro-industrial exporting countries, and the Caribbean, with the exception of Trinidad and Tobago, have benefited from lower energy prices, with improved terms of trade, although less in 2016 than in 2015.

Regional inflation (increasing since mid-2009) increased in 2016, due to higher food prices and currency depreciation, which has impacted monetary policies in several countries

The average level of inflation in LAC economies increased, from 6.9% in 2015 to 8.4% at the end of 2016 (ECLAC 2016a). Regional inflation has been accelerating since October 2009, when it reached a level of 3.5%, the lowest in the last decade.

All sub-regions experienced greater inflation, although in South America and the Caribbean the increase was driven by just a few countries. At the country level, the degree of inflation of goods in Argentina and Suriname stands out, with rates higher than 50%, reflecting the effects of the sharp depreciation of the nominal exchange rate and the adjustment of the tariffs on public services. It is interesting to note that the regional increase in inflation, especially in those economies where it has particularly accelerated (Argentina, Suriname and Venezuela), occurred jointly with significant contraction of economic activity.

Although the increase in regional inflation manifested itself across all its components, goods inflation exceeded that of services, and food inflation surpassed general inflation, both at the regional level and in each sub-region. Indeed, for the region as a whole, food inflation was 10.7% in 2016, (2.4 percent point greater than the value in 2015). In South America, food inflation reached 14.4% (4.5 percent points higher than 2015), 7.4% in the Caribbean, and 3.4% in Central America (including the Dominican Republic and Mexico).

In 2016, the region's currencies weakened against the dollar, albeit with high variability throughout the year, due to uncertainty and volatility in international financial markets. Although by the end of 2016 several economies experienced an appreciation of their currencies (relative to the dollar), this was not enough to reverse the trend of regional depreciation. In fact, the currencies of 13 countries in the region depreciated nominally against the dollar between the end of 2015 and 2016, with the largest depreciations of more than 15% in Argentina, Haiti, Mexico, Suriname and Venezuela (ECLAC 2016a). These depreciations have been an additional component that has put pressure on rising inflation rates.

The acceleration of inflation in 2016 reduced the space for adopting expansionary monetary policies, while the volatility of financial markets and their impact on exchange rates also imposed restrictions on the management of the interest rate to boost internal spending. However, structural differences in economies have resulted in a wide variety of strategies for the use of monetary policy instruments. In some countries, the persistent rise in inflation has led central banks to increase the federal interest rate, while in cases where inflation has decreased, rate management was used to stimulate weakened economic activity. Thus, in the economies of Brazil, Colombia, Mexico and Peru, the central bank rate adjusted upwards, reaching one of the highest levels of the last five years, while in Chile, Costa Rica, Guatemala, Paraguay, and the Dominican Republic, the current rates are close to the lowest values since 2011. In addition, regional economies using monetary aggregates as their main monetary policy instrument have seen a slowdown in the rate of money being issued by the central banks in 2016, in an attempt to combat inflationary dynamics.

Outlook

Growth prospects of the global economy have been adjusted upward slightly, thanks to the recovery of investment, prices of raw materials, and activity of the manufacturing sector

World economic growth, 3.1% in 2016, is expected to increase to 3.5% in 2017, and to 3.6% in 2018, a slight upward revision from the IMF projections (Figure 1). Although projections of the economic activity for various country blocs have also been modified to some extent, world growth will continue to be determined largely by the strengthening of activity in emerging economies (IMF 2017a). The growth of these economies will increase from 4.1% in 2016 to 4.5% and 4.8% in 2017 and 2018 respectively, thanks to the stabilization or recovery of some raw material export economies and the strong expansion of some Asian economies, such as India, Bangladesh, and the Philippines, among others.

In the case of advanced economies, growth will reach 2.0% in 2017 and 2018, an upward adjustment from projections made last year. The reasons for this improvement are the recovery seen at the end of 2016 in the manufacturing and investment. There is also greater market confidence, especially after the US elections, although this factor is surrounded by uncertainty due to changes in policy orientation and the internal and external tensions faced by the new government.

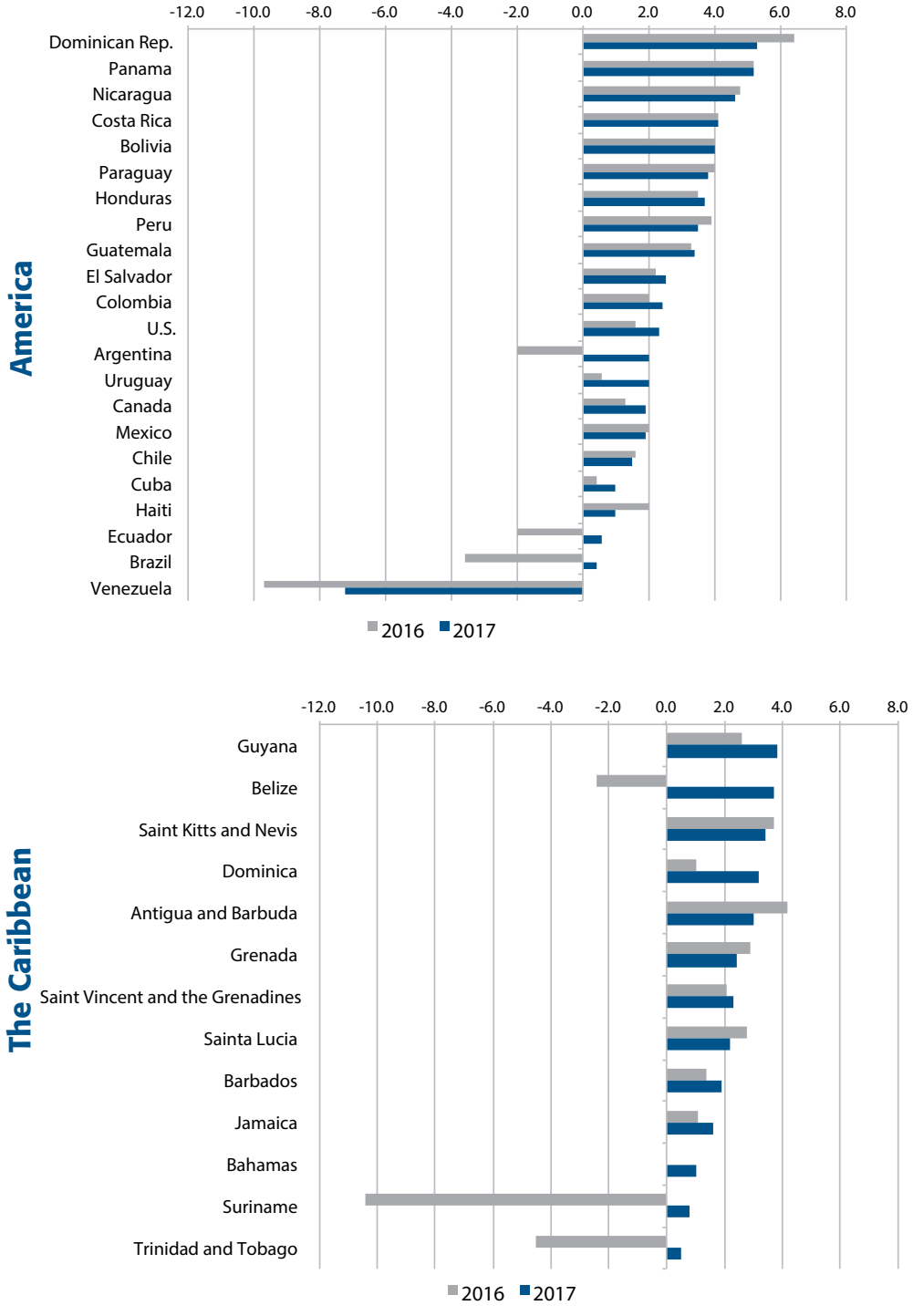
The projections for LAC, however, are contrary to the global outlook and were adjusted downward in recent months. The recovery in regional activity is expected to be weaker than at the end of 2016, with expected growth of 1.1% in 2017 and 2.0% in 2018, albeit with marked differences between countries. Among exporters of raw materials, Brazil and Argentina would exit recession, with an expected growth of 0.2% and 2.2% in 2017 and of 1.7% and 2.3% in 2018, respectively. Rising commodity prices will also help stimulate growth in 2017 in other South American countries, such as Chile (1.7%) and Colombia (2.3%). In 2017, only Venezuela's GDP is expected to decrease. Mexico, on the other hand, would have a more moderate growth rate of 1.7% in 2017 and 2.0% in 2018. These figures were revised downward from the end of 2016, due to forecasts for investment and consumption, and uncertainty about the evolution of trade and migration relations with the United States.

Global projections for 2017 are based on the assumptions that fiscal policy will be neutral or expansionary in advanced economies, and somewhat restrictive in emerging economies, and that monetary policy rates will accelerate in the United States, but will remain negative in the European Union, in both cases without major impacts on the volatility of global financial markets. The forecast also sees an increase in international commodity prices.

The recovery forecasted for the region's economies is subject to the same assumptions of global growth, including commodity price recovery and activity acceleration in some of the major advanced economies. Due to its great weight, the recovery of the Brazilian economy, after one of the deepest recessions it has experienced in recent years, is particularly important in order to improve regional growth. Despite recent political developments, Brazil faces a somewhat less uncertain scenario than in recent years, and its program of structural reforms, as well as measures to combat corruption, have presented advances for a more favorable investment scenario in the coming months.

In the case of Mexico, uncertainty regarding foreign policy of the new US government affects investment plans and, therefore, growth of the country, in a direction contrary to the stimuli that could generate the acceleration of the economic activity in the neighbor of the north. Such uncertainty would also affect the growth of the Central American economies, whose rates of expansion should remain more or less stable in the coming years.

Figure 4. GDP growth in the Americas and the Caribbean, 2016-2017



Source: Prepared using data from ECLAC (2016a) and the IMF (2017a).

Recovery in the price of raw materials would improve the terms of trade, but would increase inflation

ECLAC (2016a) projects a recovery in commodity prices of about 8% for 2017, led by energy products, which were up 19%. Such a rise, however, would not be enough to compensate for the almost 60% fall recorded between 2014 and the end of 2016. Prices for other commodities will exhibit a much more moderate increase (2%), with the expected increase in prices of mining products greater than that of agricultural products.

If these projections are fulfilled (ECLAC 2016a), the regional terms of trade could increase by nearly 5%, but with important differences between countries, according to the relative weight of these goods in the exports and imports of each economy. Oil-exporting countries should be the most favored. Such assumptions are based on the recovery of external demand facing the region and a better performance of intraregional trade. Economies with greater trade integration with the United States, while benefiting from the greater economic dynamism expected for the United States, could be affected by changes in trade policies, which are being reviewed by the new administration.

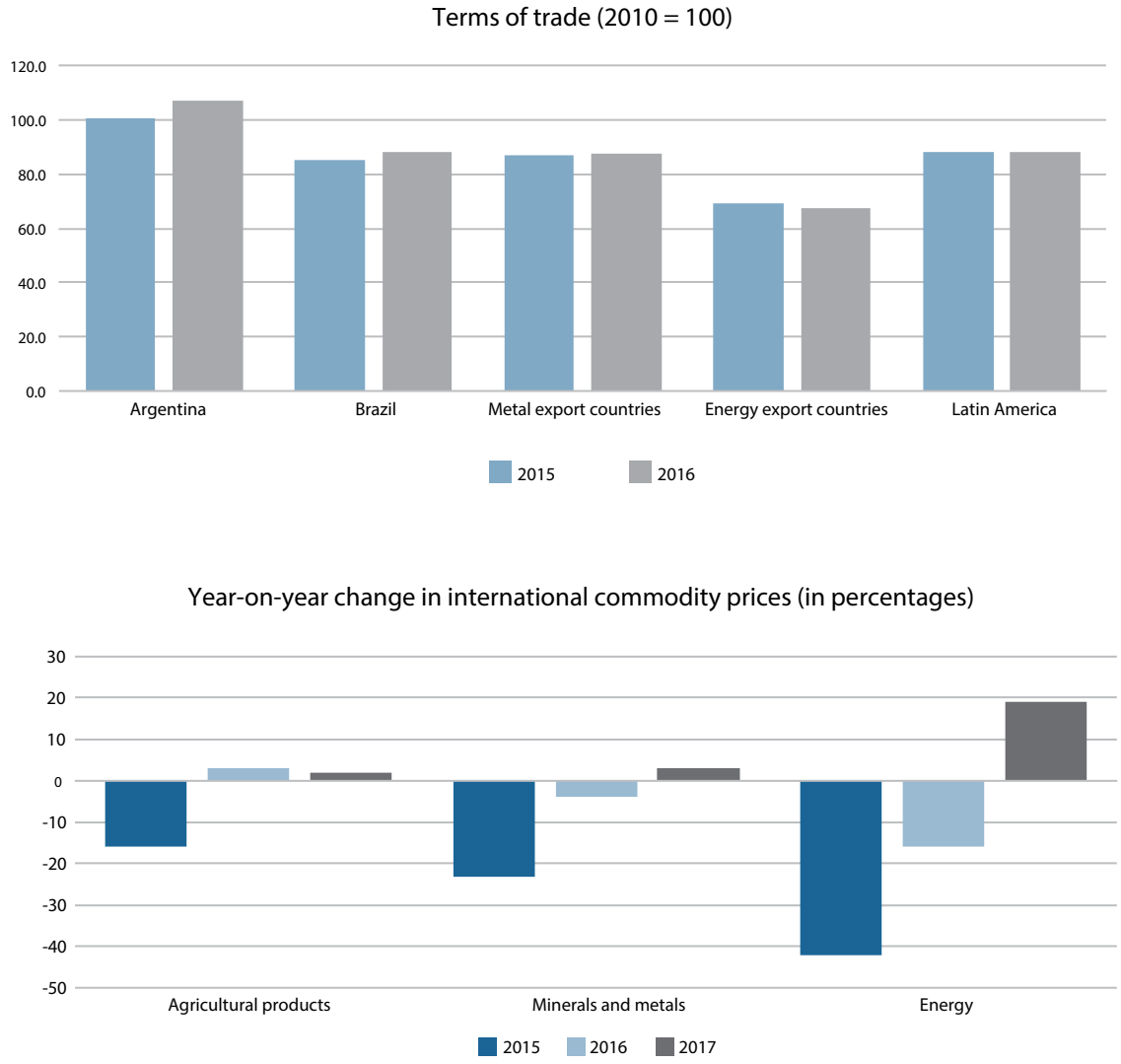
However, due to the rebound in commodity prices and its impact on producer prices, general inflation rates in 2017 are expected to rise in advanced economies as well as in emerging and developing economies. In most of the advanced economies, inflation rates will be higher in 2017 than in 2016. Projected inflation for this group is 2.0% in 2017 (compared to 0.8% in 2016) with a stable trajectory around this level in the coming years. In emerging economies, inflation will increase to 4.7% in 2017, up from 4.4% last year, largely as a result of rising commodity prices (IMF 2017a).

International trade will grow again, but recent protectionist tendencies have generated new uncertainties and risks regarding the future of the world economy

Indications of recovery observed since the second half of 2016, especially in investment in the advanced economies, lead to a forecast indicating expansion of international trade in 2017, as demand and, more importantly capital expenditure, recover. Thus, international trade is projected to increase further in 2017 and 2018 at rates higher than the growth of world production, as the gradual recovery of investment stimulates the growth of imports. According to projections by international agencies, global trade will expand at a rate close to 4% in 2017 and 2018. However, such projections are subject to the uncertainty of internationally observed protectionist tendencies, as observed recently in some economies. According to ECLAC (2016b), a number of countries face increasing dissatisfaction with globalization; such dissatisfaction has manifested in several forms such as the recent referendum on Brexit, the last presidential election in the United States, and in the growth of anti-globalization movements in several countries. According to some surveys, a significant proportion of the population in these countries questions the benefits of trade and investment from foreign companies.

The weak economic recovery has resulted in high social costs, especially in those economies that have not yet returned to pre-crisis employment levels. In this context, the sustained increase in immigration in some countries has strengthened tensions. In addition, despite the reduction of poverty worldwide, income distribution has deteriorated in almost all advanced economies in the last decades, while the fall in aggregate demand and more intense global competition

Figure 5. Year-on-year change in international commodity prices and terms of trade in LAC, in percentages, 2015-2017



Source: Prepared using ECLAC data (2016a).

have had a negative impact on employment and wages, especially among unskilled workers. All these factors contributed to increasing discontent with globalization (ECLAC 2016b).

The protectionist tendencies emerging from this discontent, generated new uncertainties and risks regarding the future of the world economy. The freezing of some areas of multilateral negotiations within the framework of the World Trade Organization (WTO), together with the questioning of free trade agreements such as the Trans-Pacific Partnership Agreement (TPP) and the North America Free Trade Agreement (NAFTA), are subjecting global trade to additional tensions than those stemming from low economic growth. The new global production dynamic, with changes in global value chains and the strategies of transnational corporations, is also affecting business opportunities. Protectionist trends in the United States and other advanced economies coupled with uncertainties about migration policies and the dynamics of money transfers from migrants have global effects and, at the regional level, should particularly affect Mexico and countries of Central America.

International agencies are optimistic about the recent recovery in investment and global growth prospects, but also highlight potential risks

Recent market optimism and growth prospects for investment and trade reflect concrete possibilities for short-term improvements in global economic conditions. However, a number of sources of uncertainty represent clear risks to medium-term global economic growth, among which the following stand out: a) a possible increase in protectionism, with the consequent reduction of international trade and investment flows; b) the deterioration of conditions for emerging economies to access financing, which could be caused by a rapid adjustment of interest rates in the United States and/or the increase in the vulnerability of the financial system in emerging economies, particularly in China; c) increased external and internal geopolitical tensions, terrorism, and risks stemming from poor governance and corruption; and d) other risks associated with extreme climatic events, disasters and epidemics (World Bank 2017, IMF 2017a, ECLAC 2016a).

The main forces that determine the growth prospects of advanced and emerging economies are not the same, nor are the growth risks. For advanced economies, weak productivity dynamics, persistent imbalances in the balance of payments, prolonged deficits in private demand, and a lack of progress in reforms (including the reorganization of bank balance sheets), combined with demographic factors such as an aging population, can restrict growth in the medium term. In emerging economies, strong dependence on commodity exports for economic performance remains a key factor influencing the outlook in both the short and medium term, as well as the high level of debt and vulnerability to shocks in global financial conditions. Lower productivity growth and the increasing technological and digital divide with advanced economies are other structural factors that represent medium-term challenge for emerging economies.

The Agenda 2030 for Sustainable Development poses challenges for the quality of economic growth

In the longer term, and taking into account the Sustainable Development Goals (SDGs) set out in the 2030 Agenda for Sustainable Development, the challenges to achieve a level of global growth compatible with greater inclusion and sustainability are even more severe. For example, the diversification of emerging economies that rely heavily on commodities will be a major challenge, especially in the context of de-industrialization and unfavorable macroeconomic conditions after years of low growth. At the same time,

the transition to low-carbon economies - while increasing energy demand and intensifying energy security risks - is another challenge that both advanced and emerging economies will face in the coming years. Further, greater inequality increases the risks of social conflicts and the migratory crisis increases the pressure for protectionist policies. In this sense, it will be fundamental to work on the generation of more inclusive societies, despite forecasts that suggest a future with intense demographic changes, growth without employment, and greater labor informality.

Policy Recommendations

The implementation of appropriate policies will be decisive for the attainment of those forecast of greater dynamism for the global economy and international trade, as well as for the mitigation of the risks and challenges analyzed in this document. **The choice of a set of national and supranational policies aimed at harnessing the potential of global growth, improving productivity, and reinforcing social inclusion, sustainability, and resilience to external shocks will be critical to achieving or improving growth prospects, in advanced, emerging, and developing economies.**

If this is the case, recent forecasts for improved growth, higher commodity prices, and stronger trade may provide some relief to a number of economies, but further restoration of macroeconomic stability will be necessary. This includes making **monetary policy adjustments to address inflation and creating greater fiscal space through progressive tax reforms, and fighting evasion, avoidance, and corruption,** so as to increase the possibilities of investment. **Trade liberalization, exchange rate flexibility, and the strengthening of institutions** will help economies to take advantage of the growth momentum generated by external conditions. Macroeconomic policies must accompany and support the structural reforms needed to promote productivity, investment, and growth.

The risk of global imbalances deepening and prompting radical policy changes and volatility in financial and foreign exchange markets is real, potentially affecting the most vulnerable emerging and developing economies. In general, **improving resilience** can reduce vulnerability to deteriorating market conditions. This implies **adopting stronger risk management practices and containing balance of payments mismatches** in its different components, especially in those economies with a high level of short-term debt. There is also a need to **strengthen the resilience of the banking and financial system, which includes designing more effective regulatory frameworks at the national and international levels and creating a more resilient global protection network** capable of protecting economies vulnerable to the contagious effects of global financial shocks (ECLAC 2017).

The IMF (2016a) notes that medium-term growth rates will largely respond to the growth rate of total factor productivity (TFP), whose persistent lack of global dynamism in recent years is partially a consequence of the financial crisis. In advanced economies, particularly in Europe, high levels of corporate debt and delinquencies have restricted investment and technological change, while in emerging economies the slower growth of TFP has been associated with depletion of reforms capable of structural change.

In LAC, the slower pace of growth has been associated with technological and productive gaps, especially in the leading sectors of the new industrial revolution, such as information and communication technologies (ICT), biotechnology, and nanotechnology. As the world faces a disruptive process of technological and economic change, the region needs to promote the productive

transformations needed to accelerate long-term growth, sustain progress in reducing poverty and improving income distribution, and promoting transition to low carbon economies (ECLAC 2016a). Along with the **revival and renewal of industrial policies,** the region must contribute more actively to efforts to improve governance of the global economy by creating global public goods, including increased infrastructure and trade facilitation. To reverse the unfavorable behavior of regional investment in a context of increasing difficulties for the financing of countercyclical fiscal policies, the **mobilization of internal and external resources to finance investment** must be one of the priorities for regional policies.

The deceleration of the global economy in recent years and the slow growth of international trade have had impacts at very different levels. The sharp deceleration of growth slowed distributive improvement in several countries and has, in some cases, led to a setback in reducing poverty and inequality, resulting in increased political tensions, protectionism, and migratory crises. There is some erosion of the consensus regarding the benefits of cross-border economic integration, resulting in increasing restrictions on world trade and migration, with negative impacts on productivity and income. In order to promote and distribute economic growth more equitably, it will be necessary to avoid protectionist measures and promote inclusive policies, especially aimed at unskilled workers. In that sense, **investment in education, continuing training, knowledge acquisition and technological training,** with an emphasis on the labor market and the young population, can facilitate occupational and geographical mobility of workers and the diversification of economies, as well as promote investment, dynamism, and innovation in the markets for goods and services, fundamental objectives to achieve structural changes. In addition, it is essential to accelerate the trade integration of MERCOSUR countries with the world, and to achieve greater political stability that favors the establishment of medium- and long-term economic policies.

In the longer term, countries that depend heavily on raw materials should strive to diversify their export base, starting with the **search for opportunities to add value to traditional production**, through industrial transformation or the development of new markets linked to product differentiation. The best opportunities are linked to the transformations needed to adapt these traditional sectors to the new demands of society and current markets: to be able to lower their carbon footprint, adapt to the impacts of climate change, and to incorporate new technologies to bridge the gap between commodity-producing countries and industrialized countries.

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Chapter 2
Sectoral Analysis

2.1 Context of the Agricultural Sector

Context of the Agricultural Sector

While half of LAC countries showed significant increases in real agricultural income during 2015, the other half, primarily exporters of grains and oilseeds, experienced reductions of up to 23%.

Facts

- As its share of the global agrifood market continues to grow, Latin America and the Caribbean (LAC) will play an even bigger role as a supplier of food and agricultural raw materials to the rest of the world. In doing so, however, it will have to improve in areas such as trade barriers, infrastructure and regulatory frameworks. In 1990, LAC's share of global agrifood exports was 8.3 %, but by 2015 the figure had risen to 13.8 %.
- The cost of complying with agricultural regulations and the time involved (registration of seeds, fertilizers and products, operation of tractors, export requirements and import licenses, transportation permits, cross-border transportation, etc.) are key factors for the development of agribusinesses. High and middle- income countries are more efficient (time and cost to comply with different regulations are faster and less expensive), than developing nations (WB 2017).
- LAC is the developing region most urbanized, with more than 80 % of the population living in urban areas. It also has the highest per capita income and the smallest percentage of people living in poverty. However, the region has more obesity and health problems than other developing regions. (IFPRI 2017).
- The growth of big data is having significant effects on the safety, reliability and manageability of agricultural technology, as it contributes to the development of more productive and resilient agricultural systems, enhances producers' capacity to improve conservation, management and use of genetic resources, helps to preserve biodiversity, promotes transparency and accountability of governments and organizations, and makes research systems and agricultural innovation more efficient.

Trends

Agricultural production in LAC has responded positively to the relatively high real agricultural prices of recent years, but in several countries real agricultural income is falling

Table 1 presents two measures of the growth of the agriculture sector. One is the change in production volumes, calculated based on growth rates of agricultural value added (AVA) measured in constant local currency (CLC);[1] the other is the change in real agricultural income, calculated using as a proxy, the growth rates of AVA expressed in local currency and deflated with the implicit deflator of national gross domestic product (GDP) (for the concepts and methodology of AVA in deflated local currency (DLC) see Paz et al. 2009).

These analyses highlight four groups of countries. One important group is that of countries that shows sustained growth in the volume of production and in real agricultural income over a ten-year period. It comprises the Dominican Republic, Colombia, Guyana, Peru and Chile, with year-on-year growth of more than 6 % in real income in 2015, although production volumes grew by only around 3 %. In addition to higher plantain production and yield, the Dominican Republic's cocoa exports rose 16 %, while global growth was only 1 % (UN 2016). In Colombia, real agricultural income increased 11.2 % thanks to the outstanding performance of the coffee, pork, rice, palm oil, cocoa and tree fruit subsectors (Mejía-López n.d.). In 2015, Chile's agricultural sector was boosted by stronger fruit exports and higher production of vegetables for domestic consumption. In Guyana, the sector's good performance was due to increases in rice and fisheries production, while Peru saw significant growth in the livestock subsector, and an upturn in the fisheries subsector.

In the countries of the second group, production rose but real income fell. These countries are mainly agro-exporters in South America, including Argentina, Brazil, Bolivia, Paraguay and Uruguay. In 2015, Argentina's production (AVA CLC) was 6.5 % higher than in the previous year, followed by Paraguay (5.2 %), Brazil (1.83 %) and Uruguay (0.87 %). However, income adjusted for inflation[2] (AVA DLC, Table 1) fell 22.9 % in Argentina, 6.9 % in Uruguay, 6.5% in Paraguay and 4.6% in Brazil. These countries specialize in the production of cereals and oilseeds, whose international prices collapsed in the last three years (see section on prices). The sharpest drop in real agricultural income, which occurred in Argentina, should not come as a surprise, since the country's agriculture sector was affected by taxes and export restrictions until 2015. In 2015, the agricultural production of Argentina, Paraguay and Bolivia grew by more than 5 %, thanks to the relative prices that favored soybean production. A similar trend was observed in the United States of America (USA), where real farm income fell 30 % between 2013 and the time at which this document was prepared, according to data from the United States Department of Agriculture (USDA) (Johansson 2017).

Among the third group of countries, rates of growth of production volumes and real income were negative. Most of the countries are in the Caribbean (Belize, Bahamas, Barbados, Dominica, St. Kitts and Nevis), where in 2015 farmers had to contend with a prolonged dry season that affected root and vegetable crops, the effects of black sigatoka, which damaged

1 This indicator is the standard one used for official national statistics.

2 Production in historical prices, usually with a one- to two-year time lag (which producers use to make projections) but the income reflects current prices. If income is adjusted for the GDP (implicit price) deflator, then it reflects the trends in agricultural prices with respect to the prices of all goods and services produced in the economy.

Table 1. Average annual rate of growth of Agricultural Value Added (AVA) expressed in volume and real income in the Americas (2006-2015)

Country	AVA CLC[1]			AVA DLC[1]		
	2006-2015	2013-2015	2015/2014	2006-2015	2013-2015	2015/2014
Southern Region						
Argentina	0.89%	4.75 %	6.54 %	-0.16 %	-9.28 %	-22.93 %
Brazil	2.87%	1.94 %	1.83 %	2.93 %	-2.52 %	-4.16 %
Chile	1.43%	0.58 %	4.25 %	3.20 %	9.98 %	6.07 %
Guyana	2.04%	3.29 %	1.11 %	1.70 %	4.94 %	8.29 %
Paraguay	5.90%	4.82 %	5.18 %	4.05 %	-3.67 %	-6.47 %
Suriname	4.22%	4.43 %	2.05 %	2.17 %	8.91 %	4.55 %
Uruguay	1.91%	0.57 %	0.87 %	1.50 %	-8.15 %	-6.95 %
Andean Region						
Bolivia	2.78%	4.37 %	5.12 %	4.05 %	6.38 %	10.23 %
Colombia	2.07%	3.17 %	3.34 %	1.48 %	9.15 %	11.20 %
Ecuador	3.39%	4.05 %	3.83 %	3.74 %	5.31 %	3.94 %
Peru	2.94%	1.26 %	3.71 %	5.57 %	5.62 %	7.27 %
Venezuela, RB [2]	0.52%	-4.67 %	-4.57 %	5.61 %	-1.47 %	-1.46 %
Central American Region						
Costa Rica	1.15%	-1.08 %	-2.90 %	-2.67 %	3.09 %	-0.30 %
Honduras	3.78%	2.94 %	3.24 %	4.06 %	4.65 %	2.28 %
Guatemala	3.35%	3.16 %	3.25 %	2.26 %	3.51 %	2.33 %
Nicaragua	2.00%	2.92 %	2.84 %	4.52 %	6.88 %	3.23 %
Panama	-0.88%	3.53 %	-0.66 %	-0.99 %	1.73 %	-2.11 %
El Salvador	1.04%	1.04 %	0.78 %	0.77 %	3.35 %	2.61 %
Caribbean Region						
Dominican Republic	4.23%	2.16 %	1.16 %	1.52 %	10.06 %	13.03 %
Antigua & Barbuda	-0.49%	-2.59 %	13.08 %	0.33 %	-0.21 %	14.76 %
Bahamas	-3.71%	-2.52 %	-2.37 %	-3.16 %	-4.63 %	-9.39 %
Belize	1.39%	-5.78 %	-13.15 %	3.52 %	-3.26 %	-10.13 %
Barbados [3]	…	…	…	0.58 %	-7.10 %	-6.85 %
Dominica	2.23%	-2.15 %	-4.07 %	3.83 %	-1.43 %	-4.09 %
Grenada	1.12%	0.65 %	-2.68 %	-2.49 %	6.32 %	10.44 %
Haiti [5]	-0.21%	-3.53 %	-5.44 %	…	…	…
Jamaica	2.27%	-0.27 %	-0.05 %	2.46 %	3.14 %	5.75 %
St Kitts & Nevis	-0.80%	-5.26 %	-5.27 %	1.08 %	-6.90 %	-6.08 %
St Lucia	-3.67%	-2.63 %	6.99 %	-3.47 %	-4.59 %	4.17 %
Trinidad & Tobago	-1.59%	1.42 %	1.17 %	1.36 %	3.46 %	9.87 %
St Vincent & the Grenadines	0.02%	-0.78 %	-4.19 %	2.55 %	0.50 %	-2.02 %
Northern Region						
Canada [4.5]	2.15%	-2.09 %	3.35 %	…	…	…
USA [2]	1.68%	2.64 %	2.68 %	4.68 %	-6.24 %	-6.05 %
Mexico	1.36%	2.24 %	0.39 %	2.97 %	1.87 %	2.38 %

Notes: 1 AVA in constant local currency (CLC) and deflated local currency (DLC), which is an adjustment for inflation using the implicit deflator of national GDP. A logarithmic function was used to calculate average annual growth rates. 2 Data for the USA and Venezuela available through 2014. 3 Data in constant values not available. 4 Data in constant local currency available from 2007 onwards. 5 Data for Canada and Haiti not available in current values.

Source: CAESPA with data from WB (2017).

banana and plantain harvests, and bacterial infection, which affected shrimp fishing (Dominica News Online 2015, McKenzie 2015).

The fourth group of countries includes Costa Rica, whose situation is unusual, since production declined but real income increased thanks to the positive effect of the relative prices of the products that the country produces and exports. During the period 2013-2015, the AVA CLC declined 2.9 %, mainly due to the negative impact of El Niño, which affected harvests of bananas and pineapple, the country's two biggest export crops (Mora and Borbón 2015). However, in terms of real income (AVA DLC), the sector grew by an annual rate of 3.1 % during that period.

Preliminary data for 2016 suggests that agricultural production grew in several LAC countries

Preliminary data for 2016 for some countries in the region[3] suggests that the AVA (in constant local currency) grew more strongly than in 2015. These countries include the Dominican Republic (10 % vs. 1.16 %), St. Lucia (7.9 % vs. 6.99 %), Costa Rica (5 % vs. 2.9 %), Brazil (4.48 % vs. 1.83 %), Mexico (4.1 % vs. 0.39 %) and Haiti (3 % vs. -5.44 %).

This growth contrasts with the falls observed in the cases of Guyana (0.3 % vs. 1.11% in 2015), Colombia (0.5 % vs. 3.3 %) and Chile (3.2 % vs. 4.3 %). Furthermore, several Caribbean countries were affected by Hurricane Matthew, and the citrus subsector by Pierce's disease (greening).

The projections for changes in AVA in 2017 are conservative.[4] They are placer roughly at 4.9 % for St. Lucia, 3.5 % for Chile, 3.2% for Mexico, 2.3 % for Costa Rica, 2.1 % for Colombia, 2 % for Brazil and 1.9 % for Guyana. In other countries, the expectations are less than 1.5% and negative in the case of Haiti (-0.16%).

International commodity prices are on the rise, except for cereals

Over the last year, cereal prices have fallen by an average of 6.2 %t (annualized through February 2017 and adjusted for inflation). It is the first time in the last fourteen years that cereal prices have behaved differently from the prices of other food groups (see Figure 1). Prices of dairy products rose by 70 %, sugar prices by 31 %, oils by 14 % and meat by 6%. Despite lower cereal prices, food prices have risen roughly 15.5% in the last year.

The decline in cereal prices is due to record global production and stocks, weakening demand and the global economy. The sharp increase in the prices of dairy products (following a fall of 22.3 % in the previous three years) was driven by higher demand in Asian markets and a decline in global production.

The long-term (fourteen-year) rise in international food prices is positive, although at a moderate annual rate of 2.4 % (adjusted for inflation). The international prices of all the groups of products that make up the food index also rose during that period, although the rates varied. The most striking is the annual 4.9% increase in sugar prices, driven by burgeoning demand and the lower production forecast.

3 According to a survey sent to the authorities via IICA's delegations in the countries in March 2017, and for which official data was available. The sources of information were: SEPSA (2017), CNA and CEPEA (2016), IHSI (2017), Bureau of Statistics, Guyana (2017.), Gumicio (2016), DANE (2017), BCCR (2017), Los sectores económicos… (2017), CNA (2017), INEGI (2017), and Banco Central de la República Dominicana (2017)

4 See note 3 on the sources from which the information was obtained.

As shown in Figure 1, international food prices remain highly variable or cyclical, with continuous periods of increases followed by periods of falling prices. For three years (from March 2013 to February 2016), the prices of dairy products fell by an annual average of 22%, before rising 70 % over the past year (from March 2016 to February 2017). During the same periods, sugar prices fell 13 % and then rose 31 %. Prices of oils decreased 14 %, only to rebound and increase by almost the same amount. Meat prices declined 7 % and then rose 6 %. Unlike the other food groups, the cycle of falling cereal prices has been prolonged, but a modest upturn is expected in 2017, as growth in the world economy gathers pace.

International food prices, adjusted for the devaluation of local currencies, rose significantly compared to the same prices in USD

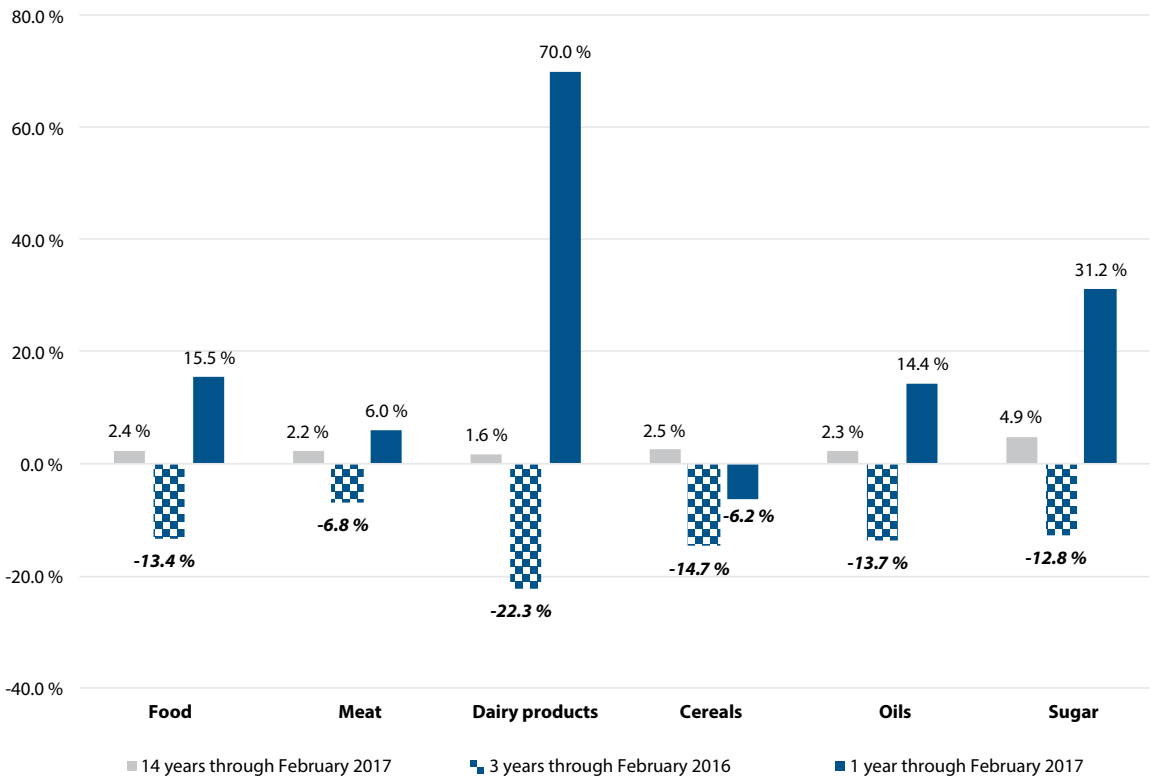
During the period March 2016-February 2017, international food prices, adjusted for the devaluation of local currencies, rose significantly compared to the same prices expressed in USD (Figure 2). The most striking increase, close to an annual rate of 40 %, was in food prices, adjusted for the devaluation of the Mexican peso, compared with an annualized rate of growth of 15.5 % in constant US dollars. According to Figure 2, the situation is very similar in all the countries included in the sample analyzed, except for Argentina and Brazil, where prices in local currencies fell by an annual rate of up to 10 %.

This very different trend in prices expressed in other currencies is of key importance because of the differentiated effects on food imports and exports and domestic inflation. For the most part, commodities are traded internationally in US dollars, therefore any appreciation of the dollar (depreciation of local currencies) means that products are perceived internationally as being more expensive, which depresses world demand. However, producers in exporting countries receive more capital in local currency for each US dollar exported, which means that any devaluation functions as an incentive to production. On the other hand, a devaluation pushes up the cost of importing food and can spark domestic inflation, especially in net importing countries.

The effect of exchange rates has also been significant in periods of falling international prices. Over the three-year period from March 2013 to February 2016, international food prices in constant US dollars fell 13.4 % per year, but the fall was felt much less strongly in countries like Canada, Mexico, Colombia, Peru, Chile, Paraguay, Uruguay and Argentina because of the devaluation of their currencies against the US dollar. In Colombia and Brazil, the devaluation was so great that, instead of falling, international food prices expressed in their local currencies actually rose. In Guatemala, Trinidad and Tobago and Ecuador, the opposite effect of the appreciation of their currencies (adjusted for inflation) meant that the fall in international food prices was more marked.

During the period 2003-2017, the effect of long-term variations in exchange rates was to make the rates of growth of international food prices in local currencies higher than the rates expressed in constant US dollars. In the long run, this has created a favorable scenario for exports from LAC countries. In the case of the Mexican peso (6 %) and Argentine peso (7.2 %), the long-term growth rate was more than double the rate in constant US dollars (2.4 %). In the case of Canadian dollars (4.3 %), Salvadorian dollars (3.8 %) and Nicaraguan Cordobas (3.6 %), the growth rates were more than 50 % of the same rates expressed in US dollars. In the case of El Salvador, the increase was not due to an effect of the exchange rate, since that country's economy is dollarized, but mainly to domestic inflation, which was higher than in the USA. Over the same period as a whole, a real appreciation of the currencies of Paraguay and Uruguay occurred, which explains the negative rate of long-term growth in international food prices when expressed in their local currencies.

Figure 1. Annual average increase in food prices (constant US dollars over the long, medium and short terms)

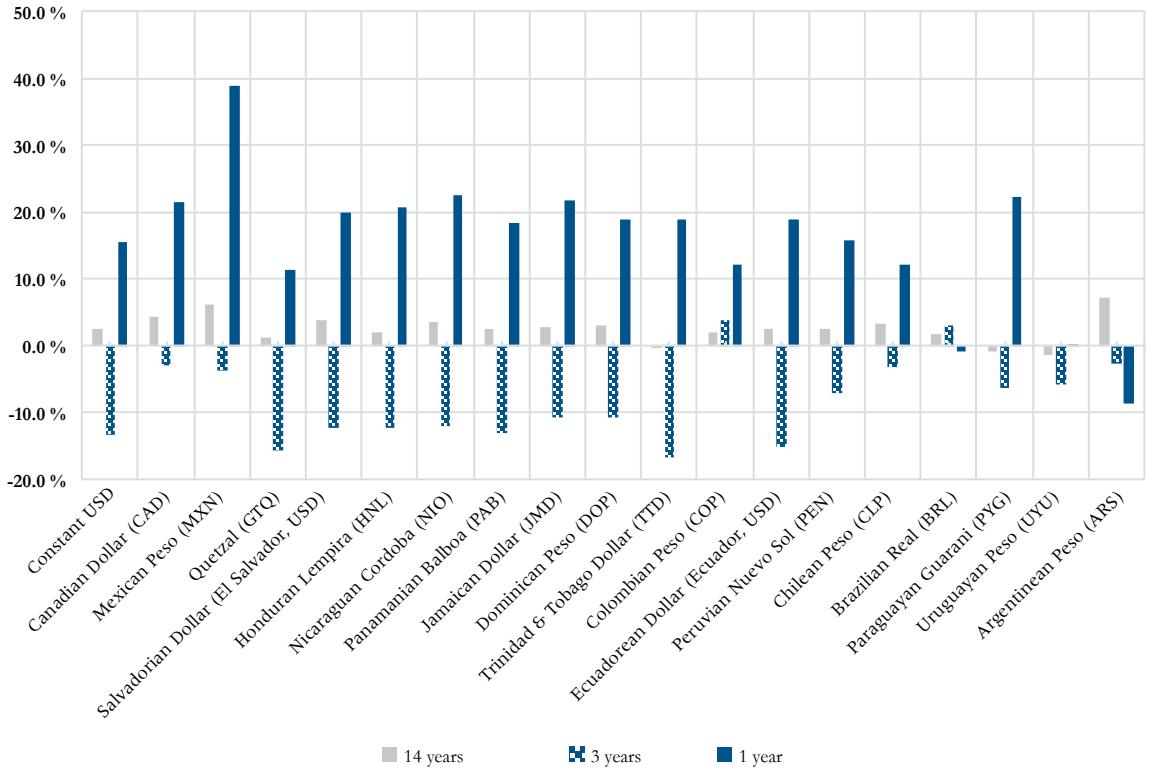


Source: CAESPA, with data from FAO (2017) and IMF (2017)

The trends in international prices vary even more depending on the commodities and currencies involved

Between March 2016 and February 2017, the trend towards a general increase in international prices of agricultural commodities and agricultural raw materials in constant US dollars (Table 2) was driven by rises in the prices of dairy products (70 %), tea (58 %), oranges (46 %), lamb (34 %), Robusta coffee (32.5 %), free market sugar (28 %), cotton (23 %), fine wool (25%), rapeseed oil (19.5 %), shrimp (15 %), palm oil (12.5 %), salmon (12 %), soybean oil (8.7%), Arabica coffee (8.3 %), olive oil (5.4 %) and soybeans (2.8 %). The positive growth rates of these products are part of the medium and long-term upward trends. In the cases of lamb meat and, to a lesser degree, olive oil, prices were well above the long-term trend, in one case due to insufficient supplies because of the dry season and stronger demand (Gastesi 2017) and, in the other, to the favorable price paid for lamb's wool.

Figure 2. Average annual growth of international food prices (over the long, medium and short terms, selection of currencies)



Source: CAESPA, with data from FAO (2017) and IMF (2017)

It should be noted that the prices in constant US dollars for all commodities, including minerals and energy commodities, rose significantly between March 2016 and February 2017, more than the price of the food group (23.3 % compared with 15.5 %). In Table 2, growth rates are also expressed in the currencies of a selected group of countries, in order to show the differences between countries with regard to their exposure to changes in international prices and their possible effects on domestic consumption, production and trade in agricultural products. The final impact on domestic prices depends on many other factors, such as tariffs, nontariff barriers, transaction costs, logistics, insurance, local taxes and trade balances, among others.

Most of the prices that rose, recorded smaller increases in local currencies. The exception are the prices expressed in Mexican pesos, which in some cases tripled the growth rates in constant US dollars (in the case of meat, the figure was 27.5 %, compared to 6 %). The growth rates in Dominican pesos were more modest.

Table 2. International prices of agricultural commodities and raw materials in constant US dollars in a sample of LAC countries (annualized average growth rates).

Currency	Constant USD			Selection of currencies (one year: from March 2016 to February 2017)				
Commodities	From March 2003 to Feb 2017a [a]	From March 2014 to Feb 2017	From March 2016 to Feb 2017	BRL[b]	COP	GTQ	MXN	DOP
All	**1.8**	**-25.4**	**23.3**	**5.8**	**19.6**	**18.8**	**48**	**26.9**
Food[c]	**2.4**	**-13.4**	**15.5**	**-1**	**12.1**	**11.2**	**38.8**	**18.9**
Meat	2.2	**-6.8**	6	**-9.2**	2.8	2.1	27.5	9.2
Beef	4	1	-1	-15.3	-3.9	-4.7	19.3	2
Lamb	-5.6	-4.3	34	15.1	30.1	29.2	60.7	38
Pork[d]	-0.1	-14.8	-21.9	-33.4	-24.3	-24.9	-5.6	-19.5
Chicken	2.1	3.5	0.1	-14.4	-2.9	-3.7	20.5	3.1
Fish and shellfish	3.7	5.3	**-4.8**	**-18.6**	**-7.7**	**-8.4**	14.7	**-1.9**
Salmon	3.2	-11.6	12	-4	8.7	7.9	34.7	15.4
Shrimp	0.1	-7.6	14.7	-1.6	11.4	10.5	37.9	18.2
Dairy Products	**1.6**	**-22.3**	**70**	**46.5**	**65.2**	**64**	**103.1**	**74.9**
Cereals	**2.5**	**-14.7**	**-6.2**	**-19.8**	**-9.1**	**-9.7**	**13**	**-3.4**
Hard wheat	0.8	-18.4	-24	-35.2	-26.3	-26.9	-8.1	-21.7
Maize	3.3	-18.2	-8.8	-22	-11.6	-12.2	10	-6
Rice	2.6	-14	-11.3	-24.2	-13.9	-14.6	7.1	-8.5
Barley	1.2	-20.8	-0.8	-15.1	-3.8	-4.5	19.4	2.2
Oils	**2.3**	**-13.7**	**14.4**	**-1.9**	**11**	**10.2**	**37.4**	**17.8**
Soybeans	3	-19.8	2.8	-12	-0.2	-1	23.8	5.9
Soybean paste	3.7	-17.2	0.1	-14.3	-2.9	-3.6	20.5	3.1
Soybean oil	1.5	-18.2	8.7	-6.9	5.5	4.7	30.7	11.9
Rapeseed oil	-0.1	-14.3	19.5	2.5	16	15.1	43.5	23
Sunflower oil	1.6	-11.2	-6.5	-20	-9.3	-9.9	12.8	-3.6
Olive oil	-4	4.5	5.4	-9.7	2.3	1.5	26.9	8.6
Palm oil	2.6	-15.7	12.5	-3.5	9.2	8.4	35.3	15.9
Peanuts	6.1	-11.5	-7.1	-20.6	-9.9	-10.6	12	-4.3
Sugar	**4.9**	**-12.8**	**31.2**	**12.7**	**27.3**	**26.4**	**57.3**	**35**
European sugar	-3.9	-2.7	-19.5	-31.3	-21.9	-22.5	-2.7	-17.0
Sugar imported from USA	0.2	7.3	16.2	-0.4	12.7	11.9	39.6	19.6
Free market sugar	4.9	-13	27.7	9.7	24	23.1	53.2	31.5
Beverages	**4.3**	**1.3**	**-3.9**	**-17.8**	**-6.8**	**-7.5**	**15.8**	**-1**
Cocoa beans	3.4	10.3	-39.3	-48.4	-41.2	-41.7	-26.3	-37.4

(Continued Table 2)

Currency	Constant USD			Selection of currencies (one year: from March 2016 to February 2017)				
Commodities	From March 2003 to Feb 2017a [a]	From March 2014 to Feb 2017	From March 2016 to Feb 2017	BRL[b]	COP	GTQ	MXN	DOP
Arabica coffee	4.5	2.3	8.3	-7.2	5.1	4.3	30.3	11.6
Robusta coffee	4.9	-6	32.5	13.8	28.7	27.7	58.9	36.4
Tea	1.4	13.9	57.9	35.9	53.4	52.3	88.9	62.5
Fruits	**1.8**	**-33.2**	**37.6**	**18.3**	**33.6**	**32.7**	**65**	**41.7**
Bananas	4.3	1.3	-3.9	-17.8	-6.8	-7.5	15.8	-1
Oranges	-2.2	-16.4	46.4	25.9	42.1	41.1	75.3	50.6
Agricultural raw materials	**0.3**	**-9**	**6.1**	**-9.1**	**2.9**	**2.2**	**27.7**	**9.3**
Cotton	1.1	-13.5	23.4	5.9	19.8	18.9	48.2	27.1
Fine wool	2.6	-7	24.6	7	21	20.1	49.6	28.3
Thick wool	3.9	-8.2	-0.1	-14.5	-3.1	-3.8	20.3	2.9
Hard sawn wood	0.4	-2.7	-19.6	-31.3	-22	-22.6	-2.8	-17.1
Smooth sawn wood	-2.6	-2.8	-1	-15.3	-4	-4.7	19.3	2
Hardwood	0.9	-9.7	-6	-19.6	-8.8	-9.5	13.4	-3.1
Smooth wood	0.9	-9.7	-6	-19.6	-8.8	-9.5	13.4	-3.1
Skins	0.8	-9.5	3.1	-11.7	0	-0.7	24.1	6.2
Fish meal	5.4	-0.8	-24.7	-35.7	-27	-27.5	-8.8	-22.3

Source: CAESPA, with data from FAO (2017) and IMF (2017).

Notes: [a] 14 years to show the long-term trend and three years to show the short-term trend. [b] In local currency per dollar adjusted for relative inflation in the USA and in the other country: BRL = Brazilian real, COP = Colombian peso, GTQ = Guatemalan quetzal, MXN = Mexican peso, DOP = Dominican Peso. [c] FAO index that includes cereals, oils, dairy products, sugar, and meats. Fruits and fish are not included in the index. [d] The products in shading indicate that the growth rates in constant US dollars were negative in the last year.

At the other end of the scale is the case of Brazil, whose prices expressed in Reais fell, but rose in US dollars. Cereals declined 19.8 % in Reais, but rose 6.2 % in US dollars; meat decreased 9.2 %, but increased 6 % in US dollars; and oils fell 1.9 %, but rose 14.4 % in US dollars.

The group of products whose prices in constant US dollars fell between March 2016 and February 2017 included cocoa beans (-39.3 %), fish meal (-24.7 %), hard wheat (-24 %), pork (-21.9 %), hard sawn wood (-19.6 %) and rice (-11.3 %). In countries like Brazil, that export wheat and meat, the fall expressed in their currencies was even greater. In countries that produce cocoa, such as Colombia and the Dominican Republic, the exchange rate's effect on prices was moderate, cushioning the fall in the Dominican Republic and accentuating it in Colombia. It should be pointed out, however, that the trend in most of these prices has been toward long-term growth, except for smooth sawn wood, pork and sugar (European benchmark).

LAC is positioning itself in the global agrifood market in a context of shrinking world trade

In 2015, global agrifood exports (chapters 1-24 of the harmonized system) fell 11.2 % with respect to 2014 (Table 3); however, in LAC they only decreased 7.7 %, which confirms that this region performed better than other parts of the world.

Table 3. Performance of agrifood trade in the Americas: various indicators and classifications

Country/region	% change 2015/2014		Values 2015		Growth 2015/2014	
	Exp[1]	Imp[2]	CAE[3]	CAI[4]	CAE	CAI
World	**-11.2 %**	**-9.2 %**	..	..	..	..
CATEGORY I: Countries and regions with CAE>0 and positive growth rates over 10 years						
Latin America and the Caribbean[5]	-7.7%	-7.9%	1.32	-0.10	0.06	-0.01
Central Region	-2.6%	0%	2.07	0.63	0.05	0.03
Caribbean Region	-6.3%	-0.3%	0.65	0.70	0.16	0.06
Southern Region	-10.5%	-13.2%	2.09	-0.34	0.08	0.04
Northern Region	-12.8%	-1.4%	0.06	-0.35	-0.09	-0.01
Grenada[6]	..	..	..	..	..	..
St. Kitts and Nevis[7,8]	..	..	..	..	..	..
Belize	-1.9%	-5.2%	3.74	1.06	0.44	-0.15
Costa Rica	-2.3%	-5.6%	2.17	0.42	0.21	0.01
Ecuador	-3.8%	-11.6%	2.42	0.08	0.52	0.10
Peru	-7.1%	-3.1%	1.14	0.37	0.07	0.04
Argentina	-8.5%	0.5%	2.82	-1.10	0.21	0.05
Dominican Rep.	-9.8%	3.7%	1.24	0.69	0.07	0.03
Brazil	-10.1%	-20.4%	1.95	-0.45	0.07	0.03
Chile	-10.6%	-7%	1.29	0.11	0.08	0.03
USA	-10.7%	0.7%	0.11	-0.39	-0.07	0.01
Jamaica	-11.7%	-8.1%	1.15	1.04	0	0.05
Panama	-11.7%	1%	3.25	0.56	0.10	0.11
Paraguay	-17.9%	-9.4%	2.93	0.08	-0.16	0.03
Uruguay	-21%	2.3%	2.88	0.51	-0.18	0.13
Canada	-27.7%	-4.5%	0.08	0.01	-0.22	0.02
CATEGORY II: Countries with CAE>0 and negative growth rates over ten years						
Andean Region	-6.5%	-6.8%	1.36	0.24	0.31	0.06
St. Lucia[6,8]	..	.	0.87	-0.48	.	.
El Salvador	6.6%	3.2%	1.01	0.82	0.01	0.01

(Continued Table 3)

Country/region	% change 2015/2014		Values 2015		Growth 2015/2014	
	Exp[1]	Imp[2]	CAE[3]	CAI[4]	CAE	CAI
Honduras[4]	5.3%	6.1%	2.77	0.89	0.23	-0.03
Guyana	3.3%	-2.5%	1.93	0.37	-0.12	-0.30
Guatemala	-2.3%	0.5%	2.19	0.63	-0.03	0.01
St. Vincent & the Grenadines[7,8]	-3.1%	4.8%	0.36	0.28	-2.82	-0.88
Colombia	-5.4%	-6.9%	0.96	0.26	0.43	0.07
Nicaragua	-5.8%	4.3%	2.31	0.82	-0.01	-0.01
Barbados	-7.7%	1.2%	0.95	1.10	-0.13	0.07
Bahamas	-9%	0.2%	0.66	0.98	0.38	0.18
Dominica[8]	-12.1%	-19.5%	0.11	0.81	0.06	-0.31
Bolivia	-22.1%	-14.6%	0.80	-0.18	0.14	-0.13
CATEGORY III: Countries with CAE<0 and positive growth rates over ten years						
Antigua & Barbuda	-16.8%	1.3%	-0.41	1.41	-0.35	0.20
CATEGORY IV: Countries with CAE<0 and negative growth rates over ten years						
Venezuela[8]	46.8%	-53.9%	-2.68	1.03	0.61	-0.26
Suriname[8]	..	.	.	.	.	.
Trinidad & Tobago	7.8%	-1.9%	-0.84	0.36	0.37	.
Mexico	4.4%	-8.3%	-0.20	-0.33	0.07	-0.12
Haiti	4.1%	-10.5%	-0.73	1.50	-0.24	-0.20

Source: CAESPA, with data from UN (2017)

[1] Exports; [2] imports; [3] revealed comparative advantages of exports; [4] revealed comparative advantages of imports; [5] the regional totals were calculated by adding together the complete data for the entire period from 22 countries: Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominica, Ecuador, El Salvador, Guatemala, Guyana, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago and Uruguay; [6] trade data for these countries for 2015 and 2014 was not available when the information was compiled, but they were classified according to the long-term trend in the CAE; [7] for these countries, the growth rate was calculated using a linear function divided between the annual average of trade because data is not available for all years; [8] the data was taken from the ITC (2017), which means it is mirror data, calculated based on trade data from other countries.

Within LAC, the Central American sub-region recorded the smallest reduction (2.6 %), due to El Salvador's higher exports (6.6 %) and the less pronounced falls in exports from Guatemala (2.3 %), Costa Rica (2.3 %), Belize (1.9 %) and Nicaragua (5.8 %). This was partly due to the proximity of these countries to the USA, whose economy rebounded strongly that year, resulting in a 2.2 % increase in imports of food, animals and beverages, and, in particular, a 9.8 % rise in imports of fresh fruits. El Salvador's coffee exports were 35 % higher, even though world demand fell 2 %, but it should be remembered that the country's exports had been more than halved by the effects of the coffee rust. Costa Rica, on the other hand, managed to increase its coffee exports before the effects of the rust appeared. In the case of Guatemala, banana exports rose 15.6 % but coffee and palm oil exports fell (UN 2016).

Central America was followed, in descending order, by the Caribbean sub-region, whose agrifood exports decreased only 6.3 %, thanks to the higher exports of Guyana (3.3 %), Trinidad and Tobago (7.8 %) and Haiti (4.1 %), although other countries recorded significant falls, including Antigua and Barbuda (16.8 %), Jamaica (11.7 %), the Dominican Republic (9.8 %), Bahamas (9 %) and Barbados (7.7 %). These countries together account for nearly 90 % of Caribbean agrifood exports. Dominican banana exports fell 30.8%, while cocoa exports rose 18.2 %. Jamaica's sugarcane exports decreased 43 % and exports of roots and tubers 13.8 %, although coffee exports rose 11.7 % (ITC 2017).

The Andean sub-region was next, with a 6.5% rate of decrease, better than the LAC average (7.7 %), due to the lower rates of decrease of Ecuador's exports (3.8 %) and despite the significant fall experienced by Bolivia (-22.2 %). Ecuador achieved increases in its exports of bananas (7.6 %), cocoa (35.7%) and palm oil (8 %), counterbalanced by lower exports of shellfish (43.8 %), fish preparations (25.8 %) and tea and mate extracts, essences and concentrates (17.1 %). Furthermore, Bolivia's exports of soybean cake decreased 22.5 %, and soybean grain exports by 12.8 %. Despite a total fall in exports of 35 %, Colombia increased the value of its coffee exports, to which the devaluation of the currency contributed (Table 2), although flower and banana exports were down. Peru recorded falls in its exports of seafood (7 %) and coffee (20 %) (ITC 2017).

According to the ITC (2017), the Southern sub-region's exports decreased 10.5 % as a result of the following falls in agrifood exports:

- 21 % in Uruguay, mainly due to a 30.8 % decline in exports of oilseed products, and a 29.6 % decrease in rice exports;
- 17.9 % in Paraguay, also due to oilseed exports, which fell 31 %. Exports of oilseed products fell much more heavily in Uruguay and Paraguay than in countries such as Brazil (9.7 %) and the United States (20.2 %);
- 10.6 % in Chile, due to declines in fish and seafood (20 %) and grape (12 %) exports;
- 10.1 % in Brazil; and,
- 8.5 % in Argentina, whose exports of soybean cake (18 %), maize (11 %) and soybeans (22 %) all declined.

Due to the relative weight of the Southern sub-region's trade, it accounted for 93 % of the fall in LAC agrifood exports (7.15 % of the total of 7.7 %).

Finally, the exports of the Northern sub-region fell most heavily (by an average of 12.8 %), due to the decreases in the exports of the USA (10.6 %) and Canada (27.7 %). In the case of Mexico, exports increased 4.4 %, aided by a significant depreciation of the peso. The Mexican exports that performed the best were mainly in the categories of food, live animals, beverages and tobacco, especially beef (20.3 %) and fresh fruits (11.4 %) (UN 2016).

The competitiveness of LAC's agrifood exports is improving, but some countries are doing much better than others

When trade data is analyzed from the standpoint of competitiveness (the capacity to sustain or expand the market share of a product or group of products), the LAC countries fall into four big categories (Table 3). The classifications used to categorize the countries was done using the average level and the long-term annual growth rate (ten years: 2006-2015) of the index of the revealed comparative advantage for exports (CAE) (For details of this methodology, see Arias-Segura and Segura-Ruiz 2004). The index shows the dynamism of trade in a product or group of products related to the other goods in which

the country trades and and compares it with competing countries across the world. To save space, Table 3 does not show the calculations for the ten-year period, but rather shows the values of the CAE and the index of revealed comparative advantages for imports (CAI) for 2015, and their annual growth until 2014, with the purpose of comparing the performance of agri-food trade in that year with the long-term trend according to the four country categories.

The first category (CAE>0 and positive annual growth over the ten-year period) includes Ecuador, Belize, Argentina and Costa Rica, whose agrifood CAE in 2015 increased by 0.52, 0.44, 0.21 and 0.21 points, respectively. In the case of Ecuador, this growth was due mainly to bananas, cocoa and palm oil, while in the case of Belize, it was sugar and vegetables. Argentina is notable for a 13 % rise in soybean exports and 10.02 % increase in soybean oil exports, although exports of soybean cake (18.3 %) and maize (11.2 %) fell. Costa Rica increased its exports of meat, dairy products, vegetables and fruits (ITC 2017).

In 2015, the CAE of the northern sub-region decreased 0.09 points, due to the fall in the agrifood CAE of the USA (-0.07), affected mainly by the slowdown in global demand and the appreciation of the dollar, which made its export products more expensive. U.S. wheat exports declined by 28.3 %, losing market share to Argentina's exports, which rose 71.1% in 2015, despite the fact that the world demand for wheat contracted by 17.1% (ITC 2017).

In 2015, the agrifood CAE of Uruguay, Paraguay and Canada also fell, while their agrifood CAI rose. This means that national production for the domestic market was less competitive, and lost ground to foreign competitors.

In the second category (CAE>0 and negative growth over the ten-year period, Table 3), the countries whose competitiveness improved significantly in 2015 were Colombia, Honduras and Bahamas, reversing the long-term negative trend that all three had been experiencing. The increase in Honduras' CAE was due mainly to a 5.35 % rise in agrifood exports, stronger than the growth seen in other sectors of the economy. This was achieved despite a 7 % fall in Honduras' biggest export—coffee—and thanks to a 29 % increase in fish and shellfish exports. The situation in the Bahamas was different, since the country's agrifood exports and exports of other economically more important industries (minerals, plastics and organic chemicals) decreased. This suggests an improvement in the competitiveness of the agrifood sector. Something similar occurred in Colombia, where the country's total exports fell 35 %, but agrifood exports were only around 5 % lower (UN 2016).

Another group of countries whose agrifood CAE fell in 2015 due the same long-term trend includes Barbados (0.13 point drop in CAE), Guyana (0.12 points), St. Vincent and the Grenadines (2.82 points, the most significant decrease), Guatemala (0.03) and Nicaragua (0.01). The sharp fall in the agrifood CAE of St. Vincent and the Grenadines was due to the fact that other industries, such as electronic equipment, iron and steel products and alcoholic beverages, among others, rapidly increased their share of exports (ITC 2017). While the performance of the agrifood sector was positive, the rate of growth was slower (14 % for fruits and 29 % for fish and shellfish). The case of Guyana is similar. Although its agrifood exports rose 1.81 %, the more rapid growth of other non-agricultural industries, mining and machinery and transportation equipment meant that the agrifood CAE fell (UN 2016). Barbados' CAE fell 0.14 points because, even though its exports of non-agricultural manufactured goods (mainly jewelry) grew, food and beverage exports fell 7.9 %, and animal and vegetable oils were down 11.6 % (UN 2016). Finally, the fall in competitiveness in Nicaragua, although much smaller, was due to lower exports of coffee, rice and sorghum, for which increases in beef and fish exports failed to compensate (ITC 2017).

Antigua and Barbuda is the only country in the third category (CAE<0 and positive growth rates over the ten-year period). Due to the sharp drop in exports in 2015 (16.8 %), caused mainly by a fall in exports of alcoholic beverages, the country's agrifood CAE decreased 0.35 points while the CAI rose, indicating that its imports were more competitive.

One of the countries in the fourth and last category (CAE<0 and negative growth rates over the ten-year period) is Mexico, which in 2015 increased its agrifood CAE due to the growth of various exports, including vegetables (3 %), fruits (14 %), preparations of cereals (5 %) and meats (13 %), even though its exports of sugar and confectionery fell 4 %. Haiti increased its exports of fish and shellfish, fruits and cocoa (ITC n.d.), although not enough to improve its agrifood CAE in 2015.

Preliminary data for 2016 shows an upturn in the growth of LAC's agrifood exports

According to mirror data[5] from the ITC (2017), global agrifood exports fell 3.58 % in 2016. In contrast, official data for 2016 for 12 LAC countries[6] available in the COMTRADE database at the time of writing this report (UN 2017) suggests that the region's agrifood exports fell by barely 0.4 %. This figure is insignificant compared with the fall in global agrifood exports and in LAC's total exports of goods (-2.55 %) during the same period. The countries that contributed most to this situation, because of the size of their trade and the decrease in the agrifood exports of LAC as a whole were Brazil (4.10 %) and Uruguay (5.55 %). On the other hand, the countries that did most to offset the fall by achieving significant increases in their agrifood exports were Mexico (8.82 %), Chile (4.01 %), Peru (4.49 %) and Paraguay (2.42 %).

According to SEPSA (2017), Costa Rica's agrifood exports in 2016 were 6.2 % higher than in the previous year, reflecting the recovery in the country's agricultural production, whose AVA (in constant currency) rose 5 % after having fallen 2.9 % in 2015.

Outlook

Greater diversification is needed to take advantage of niche markets that demand differentiated and specialized products

As urbanization progresses there is larger number of women in the workforce and more single-person and childless households, a declining birth rate, a greater longevity of the population, and growing interest in health and healthy eating. Consumers are also increasingly seeking convenience, preferring products that require less time to cook, single portion products and takeaway food. Moreover, they demand greater transparency and information about where and how food is produced, bringing into play factors such as inclusion and equity, respect for the environment and animal well-being, among others. Mass consumption products will remain popular but product diversification will increase, targeted at niche markets that demand specialized and differentiated products. Finally, many consumers will continue to be price-conscious but the burgeoning middle class, with its greater purchasing power, will drive the

5 Mirror data is calculated based on the trade activities reported by other countries, so it is provisional until official data becomes available.

6 Colombia, Peru, Barbados, Guyana, Jamaica, Belize, El Salvador, Mexico, Brazil, Chile, Paraguay and Uruguay.

demand for more premium products, with consumers increasingly prioritizing quality over price (Cienfuegos 2014, Murcia 2016).

It should be pointed out that the pace and scale of these changes in demand and consumer preferences will vary from country to country and among different segments of the population, as people's priorities are related to their level of economic and social development. Jank (2017) suggests that economies go through four stages of transformation (with possible overlapping between them) as they are modernized, value chains are formed and markets become segmented and specialized. In the process, consumers' priorities change from the satisfaction of basic food needs (food security and food self-sufficiency) to issues such as food safety and quality, traceability, differentiation, brand names and product labeling, eventually going as far as to require that more individualized attention be given to needs related to the environment, social inclusion, animal well-being, use of antibiotics, genetic modification, nutrition and health, as has occurred with consumers in the most developed countries (USA, Japan, Singapore and countries in Europe). The challenge for LAC is to ensure that value chains respond quickly to such trends, especially those in the developed countries, where their main export markets lie.

These trends, together with the need for policies to address the double burden of obesity and undernutrition in developed and developing countries, are driving the current sharp rise in the demand for organic products and fruits and vegetables, while consumption of flours and starches is falling.

In 2015, retail sales of organic foods and beverages worldwide reached USD 81.6 billion, compared with USD 15.2 billion in 1999. North America and Europe accounted for 90 % of sales, with the USA (USD 39.4 billion), Germany (USD 9.5 billion) and France (USD 6.1 billion) leading the way. In Latin America, Brazil is the most important market for organic products. In terms of cultivated area, some 460,000 organic farmers worked 6.7 million hectares of land in the LAC countries in 2014, nearly 13 % of the world total. The list of countries is headed by Argentina (3.1 million hectares), followed by Uruguay (1.3 million), Brazil (750,000 in 2014), Mexico (584,000), Peru (327,000), the Dominican Republic (164,000), Bolivia (114,000), Paraguay (64,000) and Ecuador (46,000) (FiBL and IFOAM 2016 and 2017). It should be noted that the USA is importing more organic maize and soybean due to limited national supplies and growing demand for organic meat and dairy products.

It is estimated that in the next five years consumption of fruit (excluding fruit juices) will rise 9 % and demand for fresh vegetables by 8 %. In addition, after factoring in population growth (4 %), per capita consumption of fruits and vegetables is expected to rise 5 % and 4 %, respectively (PBHF 2015).

Another important trend in the USA is lower consumption of wheat flour (and other starches) as people opt for diets with fewer carbohydrates and consume more gluten-free products (USDA; ERS 2016). Consumption of free range eggs is also expected to grow, reflecting consumers' concern for animal well-being (USDA 2016). This trend began some years ago in Europe and producers' organizations then used social networks to encourage a similar change in the U.S. market. It would not be surprising to see similar changes in LAC production systems over the medium term.

The diversification of fluid milk consumption is another market trend. Until a few years ago, the choices available to consumers were limited to whole, skimmed and fat free cow's milk. Most markets now offer a range of options, including milk from other species, such as goats, and many products used in beverages as milk substitutes, including soybeans, almonds, oats, rice and coconuts. The Canadean Wisdom consulting firm forecasts a 0.2 % fall in animal

milk consumption and a 2.2 % increase in the consumption of milk substitutes (FoodBev Media 2016). This trend will be more pronounced in the USA, with a 1.8 % decrease in animal milk consumption and a 3.2 % rise in the consumption of substitutes. The situation in Latin America is quite different, with an estimated 1.6 % increase in consumption and a 2.8 % rise in the consumption of substitutes. This is due to the growing number of middle-class consumers whose purchasing power enables them to buy dairy products they did not use to consume.

Although fluid milk consumption in the USA is falling, total consumption of dairy products (equivalent in milk solids) is increasing, due to the sustained growth in per capita consumption of other dairy products since the 1990s, especially yogurt, butter and cheeses other than American and cottage cheese (for further details, see Widmar 2016).

Finally, consumption of fair trade products is on the rise. Despite the overall fall in international trade in goods and agri-food products in 2015 (see previous section on trade), Fairtrade International (2017) reports a 16 % rise in global sales of fair trade products compared with 2014. The figures for the increase in the amount of specific fair trade products marketed in 2015 include 12 % for bananas, 27 % for cocoa (see Box 3 in the chapter on Agriculture), 18 % for coffee, 6 % for flowers and plants, and 3 % for tea. On the other hand, the amount of sugarcane marketed fell 32 %, mainly due to changes in European Union policy relating to the increase in the supply of beet sugar available. These six products accounted for 90 % of fair trade products in 2015.

The above figures reflect the growth in the number of fair trade producers, sales and products. It is estimated that by 2015 the number of fair trade producers and workers had reached 1.6 million (Fairtrade International 2017) and that figure looks set to grow, as long as there is assurance of better salaries and income and improved living conditions for producers and workers. This means that fair trade premiums must compensate for the explicit and implicit costs of obtaining and maintaining certification.

If consumption patterns and non-sustainable forms of production remain unchanged, environmental degradation and pressure on natural resources will continue

One of the challenges currently facing humankind is the degradation of natural resources. Changing consumption patterns (FAO 2012), due to population dynamics, urbanization, the larger number of animal proteins consumed, higher production (mainly of forage crops) and climate change, will intensify competition for natural resources, exerting pressure mainly on soil, water and forests (FAO 2017).

According to figures from FAO (2017), 7 million hectares of tropical and subtropical forest were lost every year during the period 2000-2010. According to the most recent United Nations report (UNEP 2016),306 million hectares of land in LAC have been affected by human-induced soil degradation, including nearly 22 % of soils in areas with high or very high soil degradation. With respect to water resources, the total water footprint of national production in LAC was 1162 billion m3/year during the period 1996-2005, with crops and pasturelands accounting for 94 % of the total (Mekonnen et al. 2015). It is estimated that by 2050, the population of the planet will be more than nine billion, which will increase the demand for food. But the growth of food production is contingent upon improvements in agricultural innovation and more efficient and sustainable use of natural resources, especially soil and water (IICA 2014a).

Although the rate of conversion of natural systems has begun to decrease, ecosystem loss in general, continues to be high (UNEP

2016).[7] It is therefore worth mentioning the ongoing efforts to reverse the problems of environmental degradation. Many national efforts are aligned with the international conventions and treaties on climate change, the combating of desertification and drought, and the conservation and sustainable use of biodiversity.[8] There are also global initiatives, such as 4 per 1000, Initiative 20x20 and the Bonn Challenge, aimed at restoring degraded and deforested areas through the application of sustainable practices such as reforestation, agroforestry, soil restoration, conservation agriculture, the improvement of pastureland and the recycling of organic waste (IICA 2014a, 2017).

Halting environmental degradation and reducing the pressure on resources will require efforts to strengthen the design and implementation of public policies to promote sustainable production, manage and make better use of water, and promote regulatory instruments and economic incentives and technical assistance to improve decision-making and national and area planning.

Agriculture is set to become an information and knowledge-based industry

With the ongoing digital revolution, data will soon come to play a much more important role in decision-making across value chains, making it possible to substantially improve the performance of the agriculture sector, reduce risks and enhance efficiency throughout chains. This will be achieved thanks to improvements in connectivity, further development of the concept of the Internet of Things (IoT),[9] advances in the generation and use of big data, and a greater supply of tools for capturing information, including less costly options for data storage, dissemination and analysis.

The concept of big data includes the use of apps, engineering and scientific elements to collect, store, distribute and use data (Shi 2014). Generally, it has four main features: volume, velocity, variety and veracity. For business communities, it entails the large-scale collection of complex, diverse and heterogeneous data with high potential value, while policymakers use it as a strategic resource and a key factor in promoting innovation.

Estimates from BI Intelligence suggest that the installation of IoT devices in agriculture worldwide will increase from 30 million in 2015 to 70 million in 2020. OnFarm estimates that the average farm generated 190 000 data points in 2014, a figure that will rise to 4.1 million by 2050, allowing more efficient use to be made of resources like water and energy (Meola 2016).

In the Americas, the use of big data in agriculture has increased, but at the local level and with variations from country to country. In the USA, for example, its use has spread more rapidly, since corporations (Monsanto, DuPont, John Deere and others), the government and academia are investing resources in the use of the data generated by the sector and in the development of tools and solutions for agriculture. Based on information provided by American Farm Bureau Federation, Business Insider (Bobkoff 2015) suggests that all new agricultural equipment contains sensors and other types of

7 For example, since 1990 the Caribbean countries have increased their forest cover 43 %; however, in LAC as a whole forest cover shrank 9.5 % over the same period (UNEP 2016).

8 The action programs of 25 LAC countries can be found on the website of the Convention to Combat Desertification (UN 2017).

9 Refers to the inter-networking of computer devices embedded in objects of everyday use, to collect and exchange data.

measuring devices that, according to farmers themselves, have made it possible to reduce input costs by 15 % and increase yields 13 %. Other areas of agricultural production have also benefited from the use of big data, such as collaborative work between the public and private sector, which has enabled Wal-Mart to develop specifications for the management of chicken and reduce contamination by salmonella, enhancing its impact on consumer health.

Some of the constraints to greater use of big data have to do with storage, security and ownership, which is the hot issue at present.

In LAC, the use of big data is advancing slowly and heterogeneously because of connectivity problems. According to figures presented by Rojas *et al.* (2016), use of the Internet in the region grew faster in 2015, reaching 55 % of the population. On the other hand, quality is a major issue, as in no LAC country do at least 5 % of connections offer speeds of more than 15 Mbps. Another important aspect is the gap in Internet access between urban and rural areas, with the latter also lagging behind the former in infrastructure, education and services (ITU 2016). Of the countries studied by Rojas *et al.* (2016), Brazil and Colombia are the ones with the widest gap, more than 30 points, while the countries with the narrowest gaps are Uruguay (the LAC country with the best Internet access in rural areas), Costa Rica and El Salvador.

In LAC, it is primarily large corporations and countries with the biggest production that have been incorporating big data into their processes. In Mexico, for example, "Grupo Modelo" highlights the implementation of technologies such as the SmartBarley[10] platform, which is enabling local barley producers to make sound decisions and increase per hectare yields (Rodríguez 2017). In Argentina, Microsoft recently presented examples of technological transformations in the countryside that it is promoting, including the Kilimo[11] tool that tells producers how much water the soil needs based on big data.

Governments, multinational research centers and international organizations are also playing an important role in promoting the use of big data across the region. According to Shi (2014), initiatives like Open Data have encouraged citizen participation and institutional transparency in different sectors of society, making it possible to improve planning and establish early warning and monitoring and evaluation systems. For this reason, institutions like the United Nations have called for the collection of more and better data, and the use of big data to improve policy-making and the work of institutions. In Brazil, one of the countries in the forefront of big data development in LAC, the government is one of the five large sectors investing in big data to improve decision-making (Gomes 2014). In the private sector, the Brazilian firm Cignifi developed a technology that can recognize patterns in consumer phone calls, text messages and data usage, which is being used to predict lifestyles and credit profiles (Kshetri 2014).[12] In 2017, the Government of Colombia plans to implement a policy for big data, spearheaded by the National Planning Department (DNP), pursuant to the National Development Plan 2014-2018, which aims to take advantage of the State's information for the design of public policies. As a first step, a partnership was created in

10 The SmartBarley platform was developed by the company AB InBev, which has a network of producers across the globe, based in countries such as Argentina, Brazil, Canada, Mexico, the USA and Uruguay. For more information about this platform, visit http://www.smartbarley.com.

11 More information on the subject is available at http://www.kilimo.com.ar/.

12 More information can be found at bigdata-startups.com.

2016 involving the public and private sectors and academia. The objective of the Centro de Excelencia y Apropiación en Big Data y Data Analytics (Alianza CAOBA)[13] is to improve the generation of data analysis solutions (DNP 2016).

Recommendations

With the slowdown in agricultural growth, redoubled efforts are needed to raise productivity in the sector through further investment in research and development, rural education, extension services and rural infrastructure (targets 2.3 and 2.a of Sustainable Development Goal [SDG] 2). A favorable business environment stimulates the supply and production of food and raw materials, so modernizing regulations is a matter of urgency. New and more effective regulations would save time and money, reduce transaction costs, ensure the safety and quality of agricultural products and inputs, and help the sector and agricultural markets to function better (targets 2.b and 2.c of SDG 2). Commercial logistics are one of the areas that need to improve (targets 9.1 and 9.a of SDG 9). The Inter-American Development Bank (IDB 2015) estimates that, on average, 25 % of delays in trade are due to poor infrastructure (roads and ports), while 75 % are because of inefficient processes. In the case of perishables, each additional day of delay reduces exports by 7 %; the figure for non-perishables is 1 %. As a complementary measure, the efficiency and transparency of border administration needs to be improved, since LAC (and Central America in particular) is one of the most inefficient regions. In Central America, logistical costs can account for up to 40 % of the final price, compared with 18 % in Chile and 8 % in the member countries of the Organization for Economic Co-operation and Development (OECD).

Given the opportunities offered by niche markets due to changing demographics and consumer tastes and preferences, producers should be prepared to consider differentiated products and take greater risks by participating more fully in value chains that would increase their income. To tap the opportunities offered by various markets (e.g., fruits and vegetables, and organic, more nutrient-dense and fair trade products), it is essential to promote a value chain approach with a long-term vision; produce for specific markets in order to respond more quickly to changes in the demand for foodstuffs; develop mechanisms for coordination and joint work; and promote synergies among the stakeholders and a broader, more efficient flow of products, financial services and information, to reduce transaction costs and tie production much more closely to consumption.

Finally, much work is needed if LAC is to make progress with the dissemination, expansion and adoption of big data. Far too few people working with data have the level of expertise required for big data and find the techniques involved very complex; this is an obstacle to greater use of such technologies (Kshetri 2014). The potential of big data justifies the creation of a national technological capacity building program to make its adoption possible.

Furthermore, governments should take advantage of big data to be more transparent, making pertinent information available to the public and acting as the driving force behind an ecosystem of big data. They must tackle the major challenge of providing smallholders

13 According to the DNP, the Alianza CAOBA is a "center of excellence and appropriation," co-funded by Colombia's Ministry of Information Technology and Communications (MinTic) and the Administrative Department of Science, Technology, and Innovation (Colciencias). The Pontificia Universidad Javeriana is the executing entity. The participants include the Nutresa and Bancolombia groups, the ICESI, EAFIT and los Andes universities, the firms IBM, EMC and SAS, and the Corporacion Clúster CreaTIC.

and medium-scale producers with access, to increase the adoption of more effective technologies that will improve farmers' agricultural productivity. Governments also need to invest in the creation of databases containing information that farmers can use for decision-making, beginning with those that are needed most urgently, related to efficient fertilization, agricultural censuses, climate, etc.

Precision agriculture can be promoted in the LAC countries through the adoption of technologies that have been tried and tested and fully implemented in developed countries. Data needs to be subjected to algorithm analysis by experts and converted into technical advice and personalized information. If this is sent to producers and machines in real time, with precise instructions for the application of pesticides, herbicides and fertilizers, among others, and to specific locations and in optimal quantities, productivity will improve significantly. Some studies have suggested that ineffective farm operations, including late planting and weeding, the lack of proper land preparation and harvesting techniques, inadequate storage and poor housing and feeding for livestock, can reduce smallholders' productivity by up to 40 % (Kshetri 2014). Tailoring information and advice to farmers could increase annual worldwide crop production by USD 20 billion (Kshetri 2014).

The parallel development and adoption of technologies and services, such as machinery, combine harvesters, robotics, drones, biotechnology and genome editing, will help big data to make further headway in LAC (Brown 2017). Nevertheless, it is important to develop protocols and regulations that protect agricultural entrepreneurs from inappropriate use of their data, to create confidence in these technologies. That will facilitate greater use of the cloud as an alternative to expensive investments in high-performance computers for data management.

Unless the adoption of big data is promoted proactively throughout the agriculture sector, it is likely to become another source of inequity between smallholders and medium-scale producers and large corporations.

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2.2 Agriculture (Crops)

Agriculture (Crops)

After experiencing slight declines in production and export of some crops in the Americas during the 2015-2016 biennium, it is expected that most of them will recover during 2017, resulting in larger supplies for local markets and countries will enjoy a bigger share of international markets. While some countries in Central America, the Caribbean and the Andean Region will make up part of the ground lost in international markets of tropical crops, the Southern Region will build on its potential as an exporter of cereals. Many Latin American and Caribbean countries will also continue to focus on nontraditional, differentiated markets in which small farmers can obtain a bigger return by offering products with higher value added.

Facts

- In recent years, global production of agricultural crops, particularly cereals and oilseeds, has outstripped consumption, which has increased stocks and weighed on prices.
- In 2015 and 2016, weather conditions were the most significant factors affecting crop yields.
- Some of the most important crop producing and exporting countries in the Americas opted for changes in their trade policies, particularly Argentina, Peru, Brazil and the United States of America (USA).
- Latin America and the Caribbean (LAC) has somewhat recovered in relation to some tropical crops (especially coffee and cocoa), although Asian and African countries continue to gain a bigger share of international markets.

Trends

Reductions in oilseed production in Argentina and cereals in Brazil were responsible for the poor performance of the main agricultural commodities in the Americas during 2016 (both production and exports)

In 2016, there were little good news for the countries that are the main producers and exporters of oilseeds and cereals in the Americas.

In the case of oilseeds, Argentina's soybean production fell considerably in 2016, following the government's easing of restrictions on cereal and oilseed exports. That decision made it more profitable to produce and export maize and sunflowers, while soybeans became a less attractive proposition. Consequently, the area planted with soybean shrank by more than 3 % in Argentina in 2016 and, coupled with unfavorable weather conditions; this resulted in a decrease in output of more than 6 % (AMIS 2017b; IICA 2017a).

Production in Brazil and the USA, the world's two largest exporters of soybeans, also recorded small decreases (of less than 1 %). It is interesting to note that production in Brazil fell immediately after the country became the world's largest exporter in 2015. The decline in soybean production in the two countries was due to lower international prices (El Once 2016).

The performance of cereals in the Americas in 2016 was mixed (Figure 1). While maize yields in Brazil fell sharply (27 %), causing a decline in total production estimated to be 22 % lower than in 2015, in the USA, Canada and Argentina, output rose by 10 %, 8 % and 17 %, respectively (FAO 2017b). Given that Brazil accounts for such a large share of cereal production in the Americas, the decline in the country's output had a bigger effect than the increases observed in the other nations.

The decrease in maize production in Brazil led to a contraction of almost 48 % (FAO 2017b) in the country's maize exports. This was partially offset, by the rise in Argentina's exports, which reached record levels in 2016. The increase was due to the elimination of export restrictions and bigger harvests (FAO 2017b).

Despite Argentina's higher exports, cereal exports in the Southern region as a whole were 11 % lower in 2016 than in 2015.

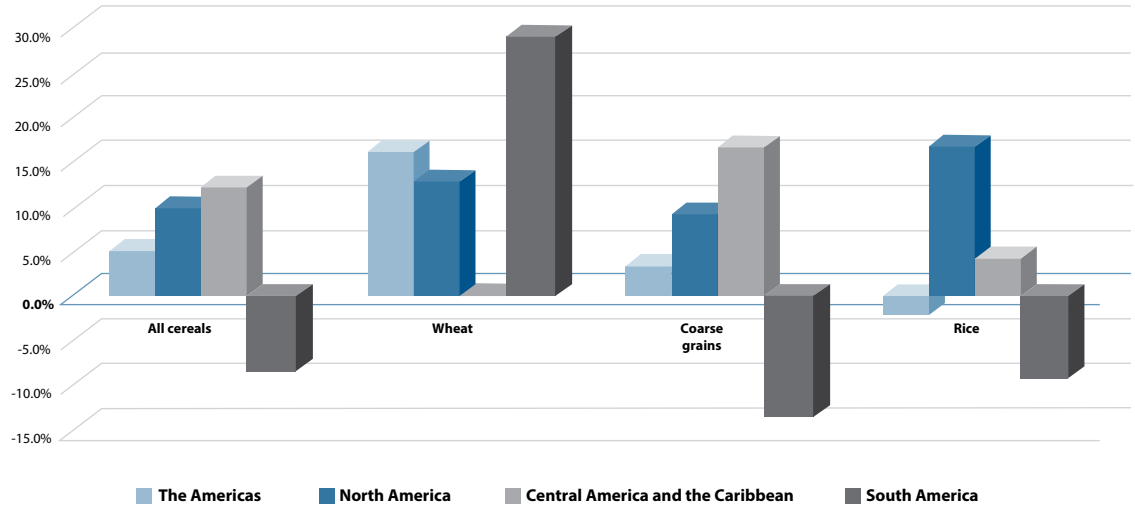
Production of other cereals also fell due to several variables. For example, rice output declined by 15 % and 12 % in Brazil and Argentina, respectively, as farmers opted to plant more profitable crops (FAO 2017b). In Chile and Paraguay, there was a contraction in the area planted with cereals due to low relative prices and higher production costs (FAO 2017b), while the decrease in cereal production in Bolivia, Ecuador and Venezuela was caused by outbreaks of pests and diseases.

The case of wheat is particularly significant, since of all the cereals analyzed it was the one whose production grew most strongly in 2016 (USA, Canada, Argentina and Brazil), with growth rates ranging from 12% to 46% (Figure 1).

In Mexico and most of the Central American and Caribbean countries, cereal production recovered in 2016 after being seriously affected by El Niño in 2015 and the first half of 2016. Favorable weather conditions led to higher cereal yields (mainly in the case of maize) and encouraged many farmers to plant cereals to boost their income following major losses in 2015 (FAO 2016a).

In Central America and the Caribbean, total cereal output rose by nearly 12 % in 2016, thanks to higher production of rice and maize (Figure 1), crops that together account for 24 % and 34 %of the calories consumed in the

Figure 1. Variation in cereal production in the Americas in 2016 by region (compared with 2015).



Source: IICA (CAESPA), based on data from FAO 2017b.

Caribbean and Central America, respectively (FAOSTAT 2017).

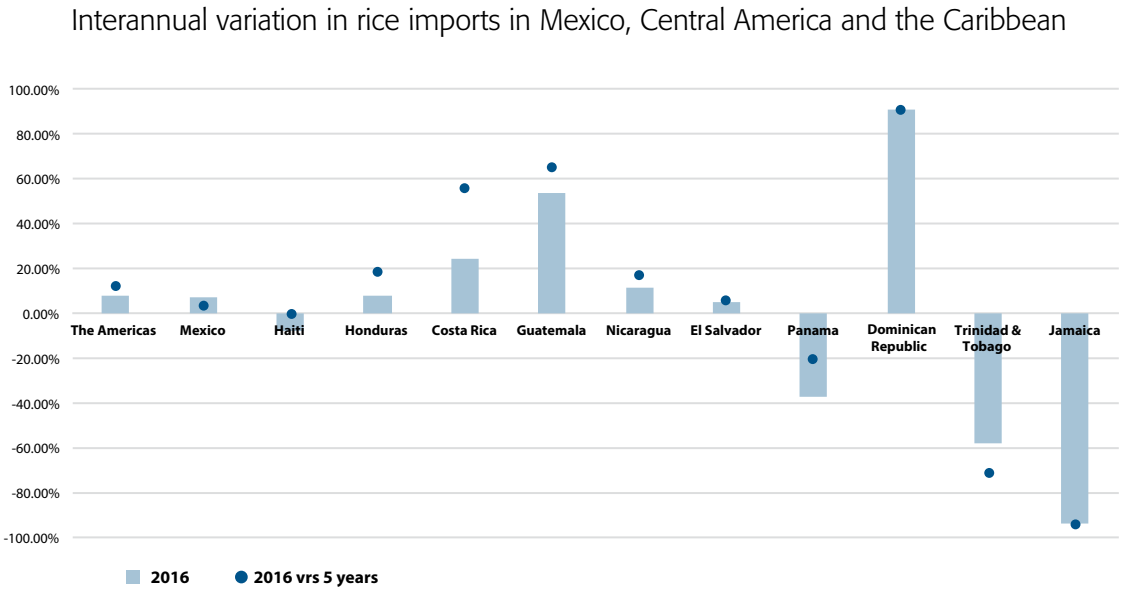
Domestic prices in the countries that are the biggest net importers of basic grains rose in response to temporary shortages

In per capita terms, Mexico and Central America are the biggest net importers of basic grains in the Americas. In 2013, nearly 35 % of the domestic demand was met with imports (FAOSTAT 2017). In the case of rice (Honduras and Mexico), beans (Costa Rica) and maize (Costa Rica), basic grains that are a very important part of the population's diet, imports can account for more than 70 % of the supply.

In 2015 and 2016, El Niño had a serious impact on the production of basic grains in those countries. In Central America and the Caribbean, for example, output of coarse grains (mainly maize) fell 9 % in 2015, with Honduras and Nicaragua who were the countries hardest hit by El Niño (fall of 20 %). Similar situations occurred with other crops like rice and beans (FAO 2017b).

Faced with shortages in local markets due to lower production in 2015 and the early months of 2016, most of these net importing countries increased their imports substantially (mainly imports of rice and maize). In some cases, maize imports reached record levels in 2016 (Figure 2). The most notable situation occurred in Nicaragua, where maize imports were 129 % higher in 2016 than the average for the previous five years, while the increase for Jamaica, El Salvador and Mexico was 50 %. In the case of rice, some countries (mainly Panama and certain Caribbean nations) did not intensify their imports, but others were obliged to resort to international markets to compensate for lower national production. It should be noted that in 2016, imports of rice in the Dominican Republic, Guatemala and Costa Rica not only reached record levels, but were also substantially higher than the average for the previous five years (90 %, 65 % and 56 %, respectively).

Figure 2. Inter-annual variation in rice imports in Mexico, Central America and certain Caribbean countries (2016 and 2016 vs five previous years)



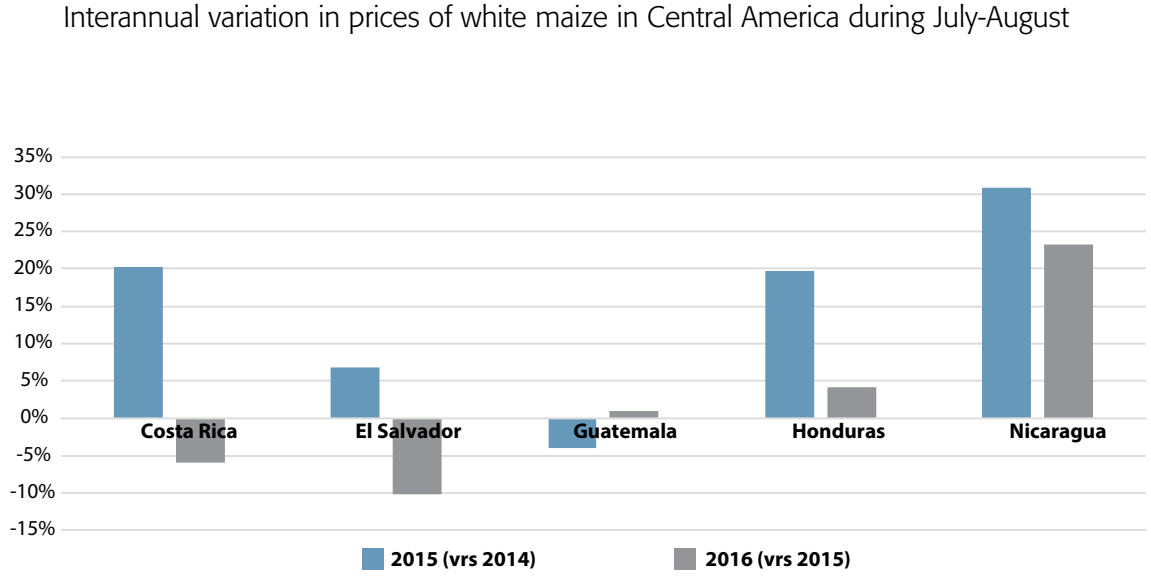
Source: IICA (CAESPA), based on data from ITC (2017).

Although imports made up for most of the national production that was lost, some countries failed to purchase supplies on the international markets quickly enough. That resulted in temporary shortages in the domestic markets of certain net importing countries (mainly those in Central America). Coupled with the fact that output was expected to be lower, prices were pushed up and made domestic prices (mainly of maize and beans) more volatile.

IICA (2009) estimated the seasonality of domestic maize prices in Central America in 2009, based on monthly prices from 2000 to 2007. According to the findings of that study, maize prices in most Central American countries peaked during July and August, but in Guatemala (the region's biggest maize producer and consumer) they peaked twice, first in July-August and then again in March. In practically all the countries, the lowest domestic prices of maize were recorded in November-December, when most national harvests enters the market (Figure 3).

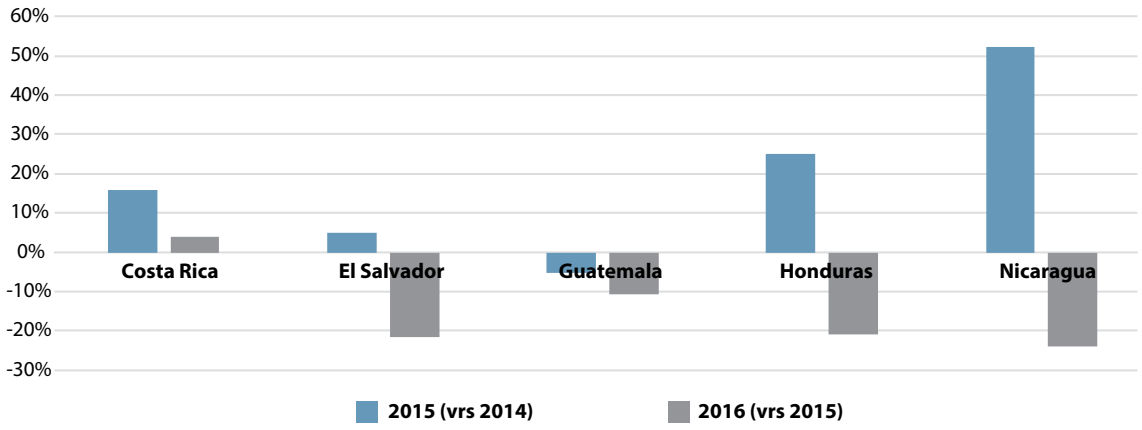
In general, the trend remained the same in 2015-2016; however, the levels observed during the months of "high prices" and "low prices" were significantly higher than the levels observed in 2014 (except for Guatemala). In other words, the peaks in higher and lower prices were much more pronounced than the previous year.

Figure 3. Inter-annual variation in wholesale domestic prices of maize in some Central American countries for 2015 and 2016.



(Continued Figure 3)

Interannual variation in prices of white maize in Central America during November-December



Source: IICA (CAESPA), based on data from FEWS NET (2017) and ITC (2017).

Although the dynamics were different in each country, Figure 3 suggests that the peaks were sharper during November-December 2015 (shown in the right-hand figure). During those months, the first maize harvest normally begins to appear in local markets in most Central American countries, but in this occasion, the crop had been seriously impacted by weather conditions related to El Niño. The countries failed to compensate for the decline in domestic harvests with rapid imports of maize, and temporary shortages occurred which pushed up local prices. The effects on maize markets were much greater in Honduras and Nicaragua, with the result that during November-December 2015 domestic prices of maize were 25 % and 52 % higher, respectively, than price levels in the same months in 2014. In the second half of 2016, maize harvests increased again, thanks to favorable weather conditions, and domestic prices returned to their previous levels.

Colombia, Central America and Peru took advantage of their competitors' poor performance to capture a bigger share of the world coffee market

During the period 2008-2013, the coffee production and exports of certain Asian and African countries grew rapidly, with Latin American coffee exporters seeing their share of the world market decline as a result (ECLAC *et al.* 2015).

Between 2014 and 2016, the world coffee market underwent significant changes that led to a repositioning of the main players. International prices fell considerably, while the world's biggest producers saw their production and exports decline (over the same period, the value of global coffee exports shrank by more than 8 %). These changes affected Brazil, Mexico and certain African and Asian countries.

In Brazil, during 2015 and some months of 2016, lower rainfall caused by the effects of El Niño impacted coffee production and, as a result, coffee exports. In 2016, the value of Brazilian coffee exports was almost 20 % less than in 2014. That translated into a loss of over 3 % in the country's share of the world market, which decreased from 29 % to 25.5 %. Mexico's exports also shrank by more than 25 % during the same period, partly due to the output lost because of the coffee rust that has ravaged that country and the Central American region.

However, the news for coffee producers and exporters was more positive in the other LAC countries. Although some had to contend with diseases (mainly rust) and adverse weather conditions in some months, the recovery in production and exports enabled most—Colombia, Honduras, Peru, Guatemala, Nicaragua and Costa Rica, in particular—to increase their share of the world coffee market (Figure 4).

Although El Niño hit Colombia hard, the volume of the country's coffee exports grew by nearly 19 % during the period 2014-2016 (ITC 2017). According to information obtained by IICA within the country itself (IICA 2017a), the major efforts undertaken to modernize farms and plant rust-resistant varieties enabled Colombia to achieve the highest per hectare productivity in its history (17.7 sacks, equivalent to one metric ton).

Peru experienced the biggest increase in export volume in the region (31 %), mainly thanks to the growth of exports to nontraditional markets such as China (664 %), Egypt (303 %) and Russia (290 %) (Agencia Peruana de Noticias 2017). However, lower prices meant that the value of coffee exports for the period 2014-2016 rose by only 3 %.

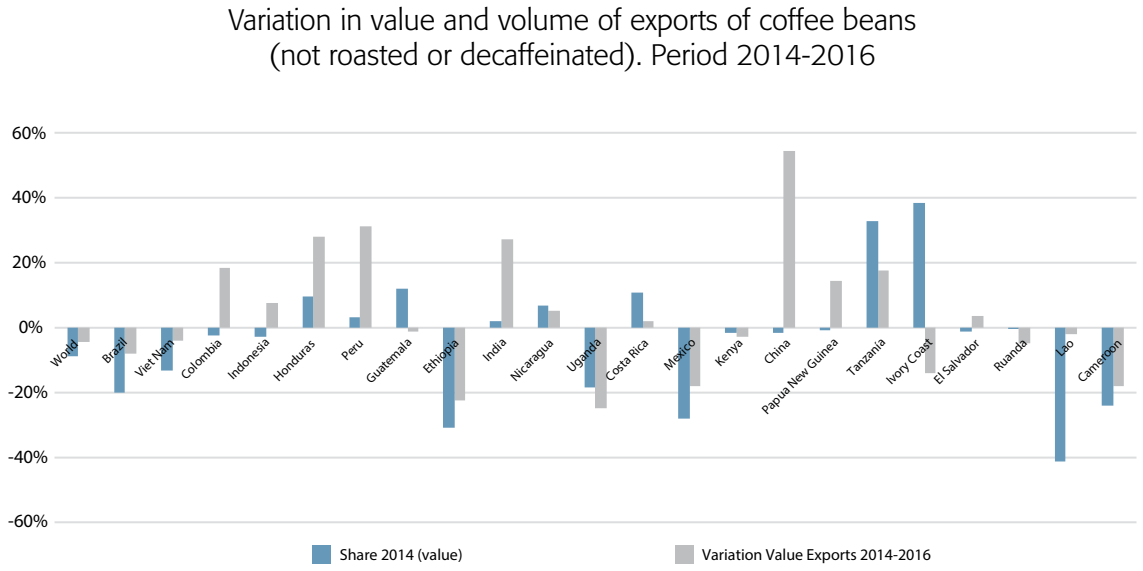
The only Asian and African countries whose coffee production and exports enjoyed continued sustained growth were Indonesia, Tanzania and Ivory Coast. The other producer countries on the two continents mentioned saw the value of their exports decrease considerably. In the case of Viet Nam, the world's second largest coffee exporter, the value of its exports fell by more than 13 %, leading to a 1 % drop its share of the international market. The value of the coffee exports of other countries also dropped sharply between 2014 and 2016, including those of Ethiopia (31 %), Uganda (19 %), Laos (41 %) and Cameroon (24 %).

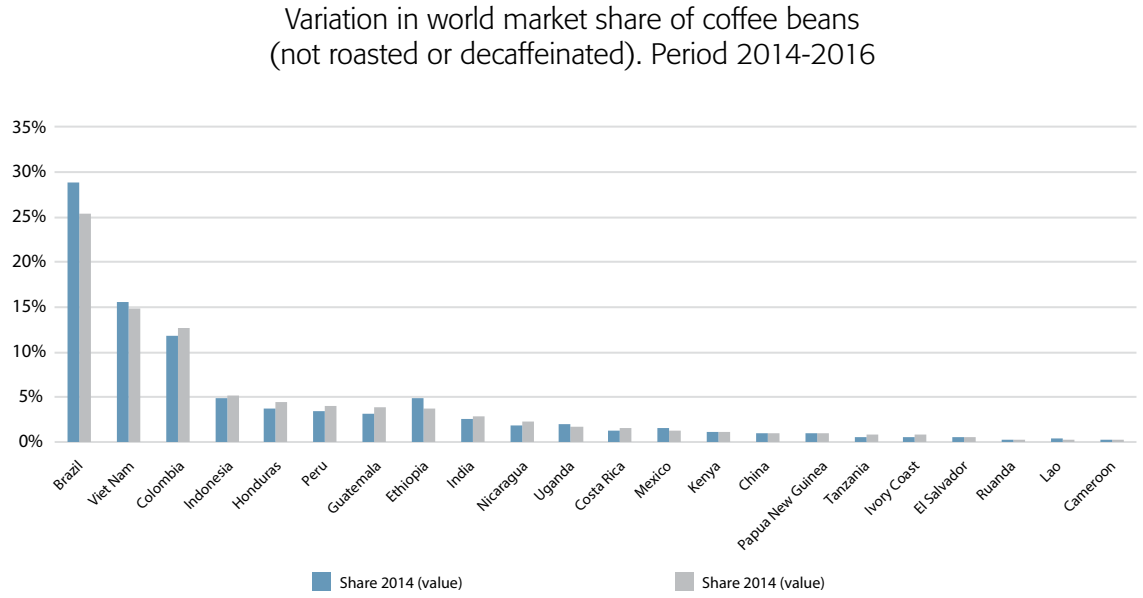
In Central America, a region that accounts for nearly 15 % of the world's Arabica coffee output, rust limited production considerably during 2015 and 2016. In aggregate terms, Central America's coffee output rose by nearly 2.5 % in 2016, after falling significantly in 2015. Honduras recorded the biggest increase in coffee production, thanks to the recent replacement of its trees with rust-resistant varieties. That enabled the country to increase the volume of its exports by more than 28 % in 2016 in comparison with 2014 (Figure 4). In addition to Honduras, Nicaragua's output recovered significantly, thanks to favorable weather conditions that boosted yields. In the other three Central American countries, production remained roughly at 2015 levels, still much lower than before the rust crisis (USDA 2016). In the case of Guatemala and Costa Rica, the increase in the value of their exports was due to higher coffee prices.

LAC makes up ground lost in the global cocoa market

Until 2013, LAC's share of the world cocoa market had been declining consistently. During the period 2008-2013, the African countries not only increased their share of world trade in this product, but also experienced the fastest growth (especially Ghana, Côte d'Ivoire's and Nigeria), to the point where their rates were triple those of the LAC countries (ECLAC *et al.* 2015).

Figure 4. Variation in exports and share of the global coffee bean market during the period 2014-2016.





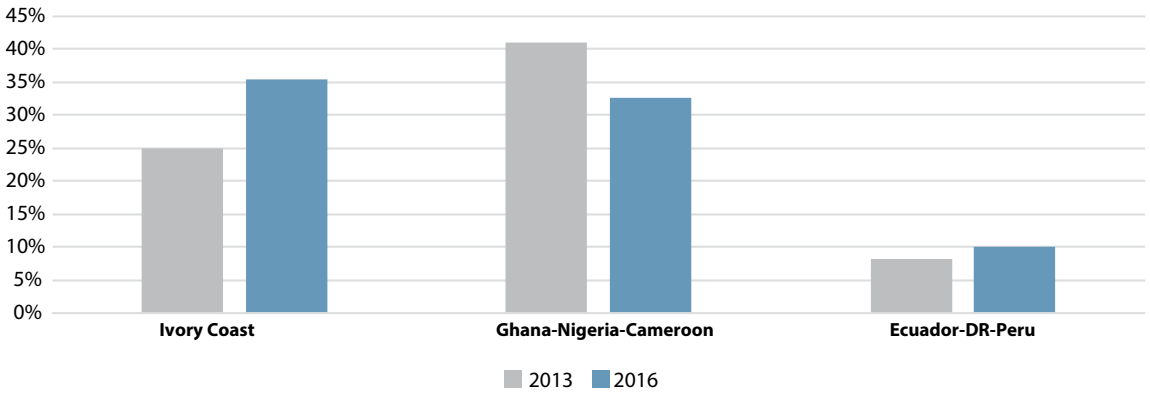
Source: IICA (CAESPA) based on data from the ITC (2017)

This scenario seems to have begun to change in 2014. Although Côte d'Ivoire's cocoa exports continue to grow exponentially (by 28 % during the period 2014-2016), the exports of other very important African countries like Ghana and Nigeria, the world's second and third largest exporters of cocoa beans, decreased significantly, with the biggest falls occurring in 2015 (11 % and 15 %, respectively). In contrast, the most important LAC countries in this category, such as Ecuador, Peru, the Dominican Republic and Colombia, saw their production and trade rise, enabling them to increase their share of international markets. The highest rates of growth of cocoa production and exports in LAC were recorded in 2015, when they were above the world average.

In 2016, poor weather reduced yields in Brazil and Ecuador.

As a result, the three LAC countries that are the most important in the world cocoa market (Ecuador, the Dominican Republic and Peru) increased their share of global exports by 25 %, which translated into a 2 % gain in international markets (Figure 5).

Figure 5. Variation in share of world cocoa bean market (value).



Source: IICA (CAESPA), based on ITC data (2017).

Although LAC continues to be the world's biggest banana producer and exporter, continued rapid growth is increasing the African countries' share of the market

Bananas are LAC's largest tropical fruit export, accounting for nearly 29 % of the total fruit exports from the Region. The trend in exports during the period 2015-2016, was similar to the one observed since 2013. But, although the LAC countries continue to be the largest banana exporters, African countries like Côte d'Ivoire, Cameroon and Ghana are experiencing faster rates of growth. Over the last three years, the value of the latter two countries' banana exports has grown exponentially. Even though Ghana recorded the smallest percentage growth last year, over the period 2013-2016 it was the country with the biggest increase (2015 %). As a result of this huge growth, the three African countries' combined share of world banana exports rose from less than 1 % of the total in 2013 to 7.2 % in 2016.

Ecuador, the world's biggest banana exporter, experimented serious production difficulties in 2015 and 2016. The country's output fell by close to 5 % in 2015, leading to a 3 % drop in exports and a 1.7 % smaller share of the world market during the period 2013-2016. In contrast, Guatemala, Costa Rica, Colombia, and especially the Dominican Republic, saw major growth in their banana production and exports, thanks to which their combined share of the world market increased by 6.4 %.

Box 1. Avocados: a market experiencing explosive growth.

The avocado market has experienced dizzying growth in recent years, with avocados becoming a fashionable product that also possesses high nutritional properties (healthy oils and fats). Over the last decade, world exports of this product grew at an average annual rate of 15 %. As a result of burgeoning demand, international avocado prices have reached historic levels. For example, in April 2017 the wholesale price of a 10-kilogram box of Mexican Hass avocados in the USA was USD 28, more than twice the price in April 2016. That surge in prices has given producers an incentive to invest in this crop. In 2016, avocados became LAC's second biggest fruit export (after bananas), replacing fresh grapes.

Mexico has been the main driving force in the world avocado market. It currently accounts for nearly 46 % of global exports. Over the last decade, its exports have grown at an annual rate of 17 %. Its principal markets are the USA (the world's biggest buyer, importing 43 % of global exports), Japan and Canada. U.S. avocado consumption has also increased rapidly in recent years, with the annual per capita figure up from 3.5 pounds in 2006 to 6.9 pounds in 2015 (Pérez and Durisin 2017). Driven by growing demand, U.S. avocado imports have risen by an average annual rate of 17 % in the last decade.

Peru and Chile are also major avocado exporters, accounting for 9 % and 8 % of world exports, respectively.

Serious shortages are expected in the world avocado market in 2017 because of lower production in Mexico, Peru and the USA. In Mexico, the seasonality of the crop and dry conditions will reduce production, and a large percentage will be used to supply the local market. In Peru, El Niño had an impact on several coastal production areas, affecting not only harvests (the first crop is expected to be later than usual) but also impacted the infrastructure of the region. In California, the harvest is expected to be 44 % less due to a fall in yields caused by drought. As a result of shrinking supplies and stronger demand (which will be even greater around public holidays and over Easter), further upward pressure on avocado prices is expected in 2017.

In addition to burgeoning international demand and significant price increases, for the last two years the international avocado market has been affected by a trade dispute between Costa Rica and Mexico. Citing concerns over a possible outbreak of the sunblotch viroid, in April 2015 Costa Rica's health authorities (State Plant Health Service) banned imports of avocado from eight countries (Australia, Spain, Ghana, Guatemala, Israel, Mexico, South Africa and

(Continued Box 1)

Venezuela) and from the state of Florida, USA (Resolution No. DSFE 03-2015).

Before this measure was instituted (2009-2014), Costa Rican imports of avocados from Mexico were growing by 15 % year on year, and accounted for 98 % of the total in 2014. With no access to the Mexican market, Costa Rica was obliged to rapidly increase its imports from Chile and Peru; nonetheless, Costa Rica's total avocado imports have fallen substantially (they are down 13 % since 2014), leading to a rise in domestic prices of up to 18 % (Barquero 2017).

Following two years of fruitless meetings between Costa Rica and Mexico to try to resolve the dispute, in March 2017 Mexico formally requested that the World Trade Organization (WTO) arrange dispute consultations with Costa Rica because of the ban on Hass avocado imports. The world's leading avocado exporter alleges that there was no technical or scientific justification for closing the Costa Rican market, as laboratory tests confirm that there is no significant risk of Mexican Hass avocados causing an outbreak of sunblotch. At the time of writing, the dispute had yet to be resolved.

Source: IICA (CAESPA), based on ITC 2017, Fresh Plaza 2017, Pérez and Durisin 2017 and Barquero 2017.

Climate variability and the intensification of monocrops created the conditions for the reappearance of plant pests and diseases in some LAC countries

It is becoming increasingly evident that more frequent extreme weather events and variable temperatures, humidity and precipitation have modified the behavior and distribution of weeds, pests and diseases, which, in turn, has affected agricultural production in the region.

Some recent outbreaks of pests include: a) locusts (Schistocerca cancellata) in Bolivia, which by April 2017 had devoured more than 1500 hectares of maize, soybean, sorghum and beans (CNN Chile 2017); b) the oriental fruit fly (Bactrocera dorsalis) in Florida, USA, leading to the declaration of a state of emergency and temporarily preventing more than 400 agricultural products from being marketed in Miami-Dade county (APF 2015); c) the fall armyworm (Spodoptera frugiperda), which damaged more than 7224 hectares of rice, cocoa and coffee in Manabí, Ecuador (El Diario Manabita de Libre Pensamiento 2017); d) the sugarcane aphid in maize and sorghum, the fruit fly in mangos and melons, and the pink bollworm in cotton, which have all caused problems in Mexico (Ruiz 2017); e) the sugarcane aphid in El Salvador, which affected more than 30 % of the sorghum harvest (Quintanilla 2016); and f) rust, which impacted coffee production in Central America, Colombia and Peru, with El Salvador the country hardest hit, as its output fell by 70 % in 2015 (FEWS NET and PROMECAFE 2016). Other cases included increases in the incidence of pests and diseases in crops in Honduras (the sugarcane aphid in sorghum, the Mediterranean fruit fly in tomatoes, the southern pine beetle and HLB in citrus fruits), Nicaragua (the sugarcane aphid in sorghum) and Argentina (boll weevil), among others. These examples are important, as scientific evidence suggests that variations in water patterns can create the ideal conditions for increased outbreaks of pests in young crops (Rosenzweig *et al.* 2001).

Outlook for the Short-Term

In general, the short-term prospects for the production and exports of most crops in the Americas are positive. Rising world demand is expected to be accompanied by increases in the output of cereals, oilseeds, fruits, vegetables and beverages in the Americas. This would allow countries in the region, not only to strengthen their position in international markets, but also, were they to adopt the right policy instruments, to improve the income and living conditions of local producers, especially the poorest. Thus, as will be discussed in greater depth in the Special Chapter of this document, the region's agriculture, is well placed to make a significant contribution to the attainment of the goals set in the 2030 Agenda for Sustainable Development.

The Southern region will further consolidate its position as a cereal exporter, while production in the Northern region will be more balanced

Preliminary data suggests that the prospects for the 2017 cereal harvest in the Americas vary from country to country. While U.S. production (especially of wheat) is expected to fall due to unfavorable weather conditions and the strengthening of the dollar (making exports more expensive and influencing planting decisions), output in the Southern region (especially of cereals) will increase due to higher demand, the good prices anticipated and favorable weather conditions (FAO 2017b).

In the case of North America, planting perspectives at the time of writing (June 2017) suggest that the area sown with wheat in the USA in 2017 will be 10 % less than in 2016, leading to a fall in output of more than 20 %. In Canada, the area planted will not vary significantly but adverse weather conditions will reduce yields, so that wheat production is likely to be down nearly 10 % from 2016 (FAO 2017b).

In the Southern region, it is estimated that 2017 will see a big increase in maize output in Argentina and Brazil, countries which together account for 66 % of the region's cereal production. Data reported by the IICA Delegation in Argentina (IICA 2017a) suggests that the area of maize planted in that country will increase 5 % in 2017, in response to higher demand sparked by the depreciation of the local currency (FAO 2017b) and the lowering of taxes on exports. In Brazil, the IICA Delegation (IICA 2017a) has reported that, thanks to improved weather conditions, the area planted in 2017 is expected to be roughly 3.5 % more than in 2016, confirming the forecasts of FAO (FAO 2017b). The combination of a larger area planted with cereals and higher yields due to more favorable weather will result in an increase of more than 20 % in the maize output of Argentina and Brazil (USA 2017b). It is also worth noting that the area planted with wheat in Argentina (2017-2018 crop) is expected to increase by 8 %, which would be the biggest area sown with this crop in the last ten years (La Nación 2017).

Although no official data was available at the time of writing, prospective sowings of cereals in other countries such as Chile and Ecuador look very positive, with high prices encouraging farmers to plant and weather conditions favoring yields. In Bolivia, the outlook for cereal production is uncertain, due to insufficient rainfall and the impact of locust infestations on plantings (FAO 2017b).

World trade in cereals will recover and the countries of the Americas will play a leading role in the growth of global exports

The prospects for growth in the economies of the world's main consumers of agricultural products are positive for 2017 (see chapter on sectoral context), which will be reflected in higher international demand for crops. Thanks to the good performance of the biggest producers and exporters in the Americas (mainly the Southern region), the continent will make a major contribution to the growth of world crop exports.

It is estimated that world exports of maize will grow by nearly 25 % in 2017, mainly due to a large increase in Brazil's exports, which will virtually double after falling 15% in 2016 (USA 2017b). This increase will easily compensate for the decline in Canada's maize exports (42 %).

The only LAC country that accounts for a small share of world rice exports is Brazil, whose production will recover 8 % in 2017, possibly leading to a slight increase in exports (which fell by almost 35 % in 2016). In addition to the recovery in Brazil, the better weather conditions forecast for the Central American countries will boost yields and encourage planting, which means that rice harvests in 2017 could increase considerably, thus reducing the need for imports. USDA estimates that Central American and Caribbean rice imports will decrease by more than 8 % in 2017 (USDA, 2017 b). The exception is Costa Rica, where greater competition from imports has made growing rice less profitable and led to a reduction in the area planted. According to data from the Ministry of Agriculture and Livestock of Costa Rica obtained by the IICA Delegation in that country (IICA 2017a), domestic output is expected to fall by roughly 9 % in 2017, leading to shortages in domestic markets and an increase of close to 21 % in imports.

World demand for wheat is expected to rise by 3.6 % in 2017, slightly less than in 2016, when it grew at a rate of nearly 5 %. In LAC, it is worth noting that Argentina's exports are expected to decline by 7 %, after achieving impressive (more than 80 %) growth in 2016, while Brazil's will increase by more than 50 %, after falling by more than one third in 2016 (USA 2017b).

South America will play an important part in the recovery of world oilseed production and exports

Forecasts made by all the institutions involved in the subject (AMIS 2017b) suggest that 2017 will see a significant increase in soybean production and exports in the Americas. In Brazil, output will recover strongly (12 %), thanks to better weather conditions that will not only encourage farmers to increase planting (2.2 %), but also will lead to higher yields (IICA 2017a). The country's exports are expected to grow by nearly 7 %, due to higher international demand and increased domestic supplies. In addition to Brazil, the USA, Paraguay and Bolivia are also set to see their soybean production and exports rise. In the first two countries, soybean exports are expected to grow by 5 % and 15 %, respectively (USDA 2017b).

In Argentina, on the other hand, oilseeds will face increased competition from other crops such as maize and sunflowers. Coupled with unfavorable weather conditions, this will lead to a slight reduction of nearly 2 % in soybean production in 2017 (AMIS 2017b). The fall in domestic supplies will mean a 6 % drop in Argentina's soybean exports in 2017 (USDA 2017b).

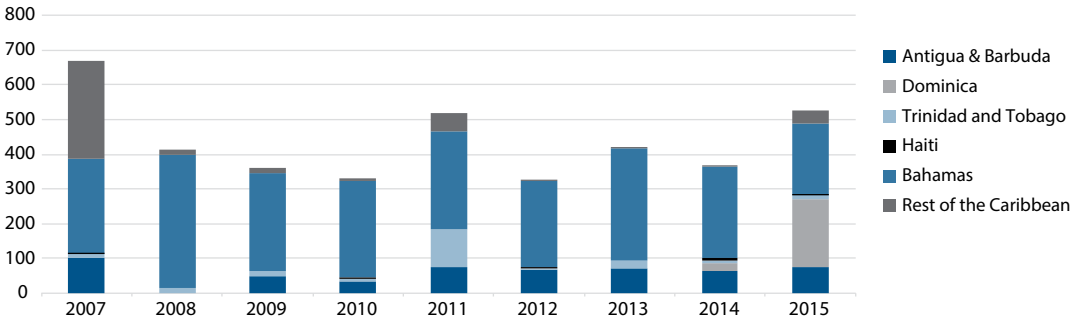
Box 2. Cassava: an opportunity for the Caribbean countries to improve their food security.

Last year (2016) was an exception, but the global cassava market has grown strongly in recent years. Between 2008 and 2015, the value of world exports grew at a sustained annual rate of 15 %. In 2016, the world market contracted 14 %, due to a 28 % fall in the value of Thailand's exports, which account for almost one third of the world total.

Although in recent years the growth of LAC's cassava exports has been weaker than that of countries such as Cambodia, Laos, Thailand, Vietnam and India (as discussed in the previous Outlook for Agriculture report), the crop has great potential for improving the food security of some of the low-income countries in the region.

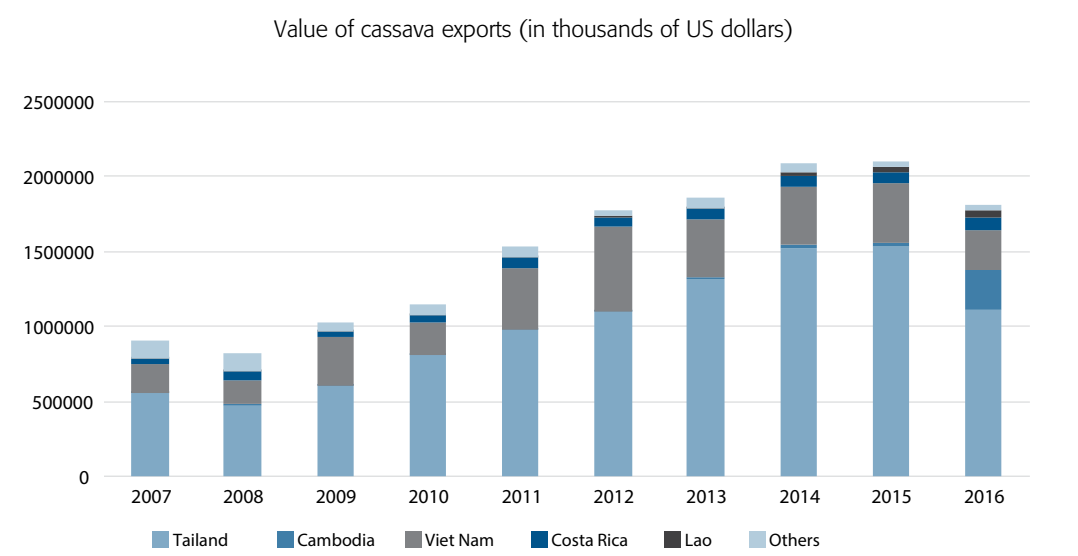
In the Caribbean countries, cassava is one of the most important root crops for both the economy and the local diet. It accounts for more than 40 % of the total harvested area of roots and tubers and contributes nearly 2 % of the calories consumed each day (Kcal/person/day, in 2013). Its socioeconomic importance is even greater, as most production in the Caribbean (more than 80 %) is carried out in countries with high levels of poverty and malnutrition, such as Haiti.

Value of cassava imports of Caribbean countries (in thousands of US dollars)



Source: IICA (CAESPA) based on Trade Map data.

(Continued Box 2)



Source: IICA (CAESPA) based on Trade Map data.

Despite cassava's importance, imports in the Caribbean have grown at an average annual rate of 4.5 % since 2010, due especially to temporary shortages in local markets (especially in The Bahamas, Dominica and Antigua and Barbuda). FAO predicts that if the Caribbean fails to expand its productive capacity, its cassava import bill could rise significantly over the next four years.

Given the importance of cassava to the population's diet and the production base that already exists in the Caribbean, a group of institutions (IICA, FAO and the Caribbean AgriBusiness Association-CABA) is working together to promote investments throughout the entire value chain. Thanks to these institutions' efforts, cassava is expected not only to account for a bigger proportion of the fresh produce consumed by the population, but also to replace most of the wheat and maize flour used for human and animal consumption. Strengthening the cassava chain should also create jobs and boost the income of many small farmers, thereby revitalizing the rural sector in the Caribbean.

As part of these efforts, the first goal of the program proposed by the three institutions involved is to strengthen the institutional framework of the cassava chain in the Caribbean, and then expand the domestic market. This includes increasing untapped uses of the crop, which currently include animal feed (cassava hay, fried potatoes, granules and fodder) and industrial uses such as raw material for biofuels, sweeteners, alcohol, plywood and textiles, among others.

Source: Prepared by the author based on data from TIC 2017, FAO 2017a and Imagen Agropecuaria 2016.

Long-Term Outlook

Over the long term (ten years), the main forecasts predict that growth in the demand for crops in the Americas will slow, and that the focus on exports will increase. Linkages with markets that offer more value added are also expected to increase, which would boost local producers' incomes.

Reduction in the growth of the demand for cereals and oilseeds

Although the growth of livestock production over the next decade will increase the demand for cereals for animal feed (particularly maize) it will be insufficient to compensate for the fall in demand that will occur due to: a) a reduction in the population growth rate; b) a slowdown in the growth of developing economies; c) a shift in the agricultural policies of many countries toward policies aimed at achieving greater food self-sufficiency; and d) less use of cereals to produce fuels (OECD and FAO 2016).

This situation will oblige LAC countries to rework their policies and investment plans for agriculture, in order to either strengthen value added in primary crops or develop modern productive/commercial strategies designed to prioritize products for which demand is strongest.

Further concentration of exports

According to the OECD and FAO (2016), over the next decade, world trade in most agricultural crops will become even more concentrated (wheat and cotton are two notable exceptions). As this occurs, the incorporation of new arable land and higher yields will enable major producers and exporters in the Americas to increase their market share even further.

In the case of soybeans, the world's five biggest exporters will account for 95 % of all exports. The four largest exporters are the USA, Canada, Brazil and Argentina. The opposite will happen with global wheat exports, with the principal exporters, especially the USA and Canada, losing out to new trading powers that will emerge and consolidate their position, such as the former Soviet republics (OECD and FAO 2016). A similar situation will occur in the world cotton market, in which strong new competitors will emerge.

In addition to cereals and oilseeds, exports will focus increasingly on tropical crops such as roots and tubers and sugar. It is forecasted that over the next decade, Thailand will achieve a 45 % share of world trade in roots and tubers, and Brazil will strengthen its domination of the world sugar market.

Policy Recommendations

Bearing in mind the trends and prospects analyzed in the previous sections of this chapter, and the need to achieve the Sustainable Development Goals (SDG) established in the 2030 Agenda for Sustainable Development, it is essential that the countries of the Americas continue to work on three broad fronts:

Policies designed to improve crop productivity

As stated in SDG goals 2 and 8, a sustained increase in the productivity of agriculture (particularly crops) is essential to end hunger, food insecurity and non-sustainable practices.

In light of the information presented in this chapter, and drawing on some of the recommendations made in the technical document that IICA and the Government of Mexico presented during the Meeting of Ministers of Agriculture of the Americas

Box 3. Prospects for the cocoa market: in response to the fall in international prices, fine, aromatic and certified cocoas will emerge as an opportunity to improve producers' living conditions

Following several years of sustained growth, since the end of 2016 the world cocoa market has seen an oversupply and a significant fall in international prices. The exponential growth of production in Côte d'Ivoire and Ghana, the world's largest exporters, coupled with a decrease in the growth of per capita consumption among the world largest consumers, created strong downward pressure on international prices (Ahanotu 2017).

In 2017, the rapid growth of world production (15 %) and the impossibility of achieving a substantial increase in grinding capacity (it will grow by only 3 %) will create a surplus that will push international prices even lower. The investment being made by producer countries and the increase in harvested area suggest that the surplus will be structural, and downward pressure on prices will continue for several years (Bavier and Aboa 2017).

The impact of the fall in international cocoa prices could have serious consequences for producers in the LAC region, especially since 90 % of them are small- and medium-scale family farmers (Arvelo *et al.* 2016).

One response to the situation would be for LAC to harness its potential to produce and market fine, certified and aromatic cocoas to improve the living conditions of its producers. In addition to the growth potential of the differentiated cocoa industry and LAC's share of the market, these chains are more inclusive and yield greater benefits for producers.

- **Growth of differentiated cocoas:** Unlike the generic cocoa market, the demand for fine, certified and aromatic cocoas is predicted to grow, as the chocolate industry responds rapidly to consumers' growing interest in issues such as health, differentiated origin and biodiversity-friendly products.

- **LAC's share of differentiated cocoas:** Although fine, aromatic and certified cocoas make up a small part of the international market (nearly 5 %), the LAC countries are leaders in their production. Ecuador is the main world exporter of fine and aromatic cocoas (55 % of the market), followed by Papua New Guinea (14 %), the Dominican Republic (11 %) and Peru (9 %). In the case of organic cocoa, the proportion is even smaller (0.5 % of total production) and the main producers are Madagascar, Tanzania, Uganda, Belize, Bolivia, Brazil, Costa Rica, the Dominican Republic, El Salvador, Mexico, Nicaragua, Panama, Peru and Venezuela (Arvelo *et al.* 2016).

- **A market that offers producers a bigger return:** The vast majority of cocoa producers are poor family farmers. Furthermore, producers receive only 6.6 % of the price that consumers pay. However, unlike the traditional cocoa industry, producers of aromatic, fine and organic cocoas receive a better price for their products. Although there is no established pattern, over the last three years the prices paid for certified cocoas have been 4 to 20 % higher than international prices in general. Premiums of more than 23 % above the international price have been paid for fine and aromatic cocoas, and it is estimated that the premium prices paid for exclusive fine cocoas are more than 66 % higher than the normal international price (Arvelo et al. 2016).

Source: Prepared based on Arvelo *et al.* 2016, Ahanotu 2017, Bavier and Aboa 2017, Clarke 2017 and Vanguardia Liberal 2017.

2015 (IICA 2015), it is recommended that the countries: a) coordinate long-term efforts aimed at improving agricultural productivity that involve not only all the institutions of the State, but also the private sector, civil society and international cooperation; b) commit to a sustained increase in investment in research and development, innovation and the productive infrastructure for agriculture, principally in rural areas where the gaps are greatest and in small-scale farming; c) strengthen the business culture, achieve more equitable access to services for small farmers, and coordinate regional, national and local strategies designed to improve the business environment and facilitate trade in crops; and d) draw on, tap and improve the management of the genetic wealth, technology, customs and uses of traditional farming in all of the strategies devised.

Policies to reduce inequity within agrifood chains, facilitating equitable distribution of the benefits among all the stakeholders

As proposed in the SDG, to achieve this objective the countries must reduce the asymmetries in market information and knowledge (this applies particularly to the smallest countries), ensure equitable access to the factors of production and production services, and balance out the negotiating power of the stakeholders in the chains.

In light of the situations described in this chapter, it is recommended that the countries increase the access of producers of more vulnerable crops (family farmers, women and indigenous populations, among others) to productive infrastructure, assets, knowledge, inputs and risk management services. This would not only ensure that they produce the crops required for their countries' domestic and international markets, but also give farmers more income to meet their food and other basic needs. It is also suggested that the countries promote greater competition in agricultural markets (especially crop markets) to reduce the concentration of information and negotiating power, thereby permitting small farmers not only a bigger return from value added, but also lower transaction costs and better allocations of resources.

Furthermore, countries should construct inter-institutional strategies that make it possible, firstly, to identify future shortages in an expeditious manner (models for predicting national production whose parameters are based on hard technical knowledge) so that domestic markets can be re-supplied rapidly when unexpected falls in national harvests occur. This includes increasing strategic reserves of basic grains (based on efficiency and cost/benefit criteria), putting early warning and market information/analysis systems in place, and devising and implementing strategies that facilitate agricultural trade.

Finally, it is recommended that the countries promote stronger linkages with the differentiated markets of beverages (cocoa/coffee) and tropical products in which demand is more stable, prices are less volatile and producers (especially small farmers) receive a bigger return. This should be done mainly by promoting national and/or regional initiatives that facilitate the positioning of crops as differentiated products; improving quality through the adoption of good agricultural and management practices; increasing supplies of products to meet the requirements of marketing channels; and establishing trade agreements with the processing industry under which the prices paid reflect the value of differentiated products that meet the requirements to be marketed as such (seals) (IICA 2017b).

Policies aimed at the development of systems based on farming that is more resilient and has a smaller impact on natural resources and the climate

As stated in the SDG, it is essential that the countries of the Americas make their agricultural systems more sustainable through the application of resilient practices that boost crop productivity, contribute to the maintenance of ecosystems, enhance adaptability to climate change and extreme climate variability, and gradually improve soil and land quality. In relation to the points addressed in this chapter, countries need to focus on two basic areas:

Firstly, and bearing in mind that climate change is going to exacerbate the pressure on farming systems, it is imperative that countries devise and implement public policy instruments that reduce non-climate pressures. For example, they should redouble efforts to promote and encourage the recovery of degraded land, improve soil fertility and make more efficient use of water per unit of product, among other measures. This would make it possible not only to reduce the pressure on production systems but also to optimize the productivity of factors of production (especially for the most vulnerable farmers). It is also necessary to reduce the negative impact of crop production on natural resources and the environment, thus ensuring the long-term environmental sustainability of production systems. This includes reducing the intensity of emissions per unit of product (which is frequently linked to greater efficiency and competitiveness), improvements in the management and governance of water resources, etc.

Secondly, it is essential that countries enhance their capacity to develop and manage knowledge that can be used for evidence-based decision making. It is necessary to improve the development, dissemination and use of agro-climate information, so that it can be used by the stakeholders throughout agricultural chains for socio-productive decision making. Planning and implementing the transformations required as climates change will mean that countries will have to increase their capacity to use and interpret climate, biophysical and economic models that make it possible to gauge the potential impact of climate change on farming and livelihoods on different spatial-temporal scales. This knowledge is crucial to assess and evaluate the different adaptation strategies, selecting the most suitable in each case.

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2.3 Livestock

Livestock

The production of meat and milk in Latin America and the Caribbean (LAC) has grown rapidly in the last decade, mainly as the result of higher poultry production. While Brazil continues to dominate the livestock industry in LAC, production is also growing in other countries of the region, including Argentina, Mexico, Uruguay, Colombia and Chile. Globally, there is greater emphasis on the development of sustainable production systems, which has occurred in parallel to the intensification of production. In addition, efforts to eradicate and control animal diseases have been successful which, in turn, has allowed the expansion of production and access to world markets.

Facts

- LAC represents more than 25% of world beef production and more than 20% of poultry production.
- Beef production in the Western Hemisphere is growing, with production in LAC growing at a faster rate than in the rest of the world.
- Growth of livestock inventories and improvements in productivity continue to drive the production of meat and milk in LAC.
- The top three producers in the region are responsible for 50% to 70% of the total production of the region's main livestock species, while the top five countries represent 70% to 80% of production.
- In the last decade, exports of beef from LAC have more than doubled, while exports of pork and poultry from Brazil and Chile have more than quadrupled.
- Low prices for feed grains continue to facilitate the intensification of meat and dairy production.
- The availability of additional land for extensive production has slowed the adoption of technological innovations, as well as potential improvements in food security, the economy and environmental sustainability.
- Market competition, driven by an increase in trade, continues to promote investment in modern supply chains, cold storage capacity and food quality.
- Uncertainty related to trade policies in the U.S. has likely increased in LAC (Brazil) and in other regions outside the U.S.
- Approximately 85% of the cattle inventory in South America is recognised as free of foot-and-mouth disease (FMD). However, other diseases such as bovine tuberculosis, avian influenza and porcine epidemic diarrhoea virus, continue to affect production and markets.
- The livestock sector in LAC faces an important challenge to increase production through the reduction of environmental threats.

Trends[1]

The 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs), approved by the United Nations General Assembly in September 2015, represents a consensus of governments and other stakeholders on a new vision for economic, social and environmental sustainability.

As part of this consensus, the member states recognized that food, livelihoods and the management of natural resources should not be considered separately. Food and agriculture are essential to eradicate poverty and hunger, mitigate the impacts of climate change and conserve our natural resources (FAO 2016).

In this regard, the sustainable growth of the livestock sector can contribute to achieving several of the SDGs, given that farm animals provide a broad spectrum of benefits for society, including income and employment, food and nutrition, manure, energy supplies and transportation services, savings, insurance and environmental and health services (Zezza *et al.* 2016). Livestock are important for food and nutrition security, providing livelihoods to an estimated one billion people as well as services such as loan security, transport, ploughing, manure for fertilizer and fuel, and natural fibres. Nevertheless, the sector is facing unprecedented challenges. It is estimated that by 2050, demand for livestock products globally will grow 70% due to the increase of the world's population, wealth and urbanization. This growth in demand is occurring at a time when, as noted in the 2030 Agenda, concerns about resource scarcity, climate change and the need for more equitable development are becoming increasingly important (OECD and FAO 2016).

Clearly, the livestock sector has an enormous potential in developing economies, including: a) as a source of high-quality food for nutrition and health; b) as a contributor to rural livelihoods and the overall economic progress of developing countries; c) as a contributing factor in social sustainability since small producers are highly dependent on animals for their survival, and d) as an important factor in the maintenance of ecosystems (Diaz 2012). Although all of the SDGs are important, there is a general consensus that five of the goals are more relevant in terms of the livestock industry: a) eradicating poverty in all its forms worldwide (SDG 1); b) ending hunger, achieving food and nutritional security, and promoting sustainable agriculture (SDG 2); c) ensuring sustainable patterns of consumption and production (SDG 12); d) adopting urgent measures to combat climate change and its effects (SDG 13); and, e) protecting and promoting the sustainable use of land ecosystems, managing forests sustainably, fighting desertification, preventing and reversing land degradation, and stopping the loss of biodiversity (SDG 15) (FAO 2016b).

The growth of the livestock industry can contribute to poverty alleviation

Livestock production in LAC continues its rapid pace of growth. Although countries of the region represent only 9% of the world's population, they produce around a quarter of the world's meat and poultry (Table 1). In the case of eggs and milk, the region accounts for approximately 10% of the global production of both products and about 7% of pork production. LAC is clearly emerging as a major world supplier of animal protein.

In LAC, where livestock activity is present in 84.5% of the total agricultural area, the rapid

1 Sources of this data are indicated in the attached tables. In general, all data on meat and dairy production comes from the OECD (2017) and livestock inventory data is from FAO (2017).

growth of livestock production is helping to improve the quality of life for most of the approximately two-thirds of the population whose livelihoods depend, at least in part, on livestock (Salcedo & Guzman 2014). Due to their proximity to centres of consumption, family farmers who live near urban areas in LAC, are better able to take advantage of the rapid growth in demand for meat and other animal products derived from urban development. They also face greater social and environmental pressures, given the growth of cities and the ignorance of many city dwellers about animal production. These small farms tend to benefit from direct sales to wholesalers or retailers of urban food supplies. However, in remote areas, where infrastructure conditions tend to be less favorable, small producers are largely dependent on local economies, which are generally insufficient to promote the development of livestock activity.

Regardless of their location, small livestock producers in LAC, many of whom belong to indigenous groups, or are small-scale farmers, landless workers or subsistence farmers, continue to face critical barriers to benefit fully from the growth of demand for animal products. This include obstacles such as a lack of access to technologies, credit and financing, inputs and information, as well as a lack of training and the emergence of new animal diseases (FAO 2017a).

Strategic investments in infrastructure, training and the provision of new technologies, as well as better national management of animal genetic resources, more efficient production management systems, animal health services and other inputs in these areas, could generate important social changes by allowing small and medium-sized producers to capture a greater share of the benefits resulting from the industry's overall growth. In addition, for growth in the livestock sector to contribute efficiently to poverty alleviation, policies should focus on improving macroeconomic conditions and eliminating obstacles in the access of rural households to assets, particularly land and capital. Livestock is historically, one of the fastest growing agricultural sub-sectors in developing countries, but experience shows that rapid growth per se, does not necessarily translate into benefits for the poor (Acosta *et al.* 2017).

In this regard, evidence linking the growth of livestock production and poverty reduction is not yet conclusive. This limits the potential of the sector to support poverty reduction strategies in rural households, even though livestock represents an important complementary activity for poor rural producers to diversify their income, food and agricultural inputs, and earn more respect in their communities (FAO 2009, Kristijanson et al. 2010, IFAD 2011, Meinzen-Dick et al. 2011, Njuki and Sanginga 2013).

Poultry and milk production lead growth in the livestock sector

Poultry production in LAC has more than doubled since 2000, reaching 25.9 million tons of poultry meat in 2016, or 26% more than in the U.S. (Table 1). Meanwhile, milk production in the region, which totaled 85.3 million tons in 2016, grew around 32% between 2000 and 2016, which is higher than in the U.S. (27%), but much lower than the global average growth (41%) for the period. In overall terms, milk production in LAC remains well below the level of the United States, which produced 96.7 million tons in 2016.

In LAC, the rapid growth of livestock production is more the result of higher inventories than the adoption of technologies to improve performance. Poor farmers raise animals such as poultry, pigs, sheep and goats instead of cattle due to the lower required capital investment and greater efficiency in production of meat. However, unsurprisingly, much of the growth in the production of poultry and pork since 2000 is the result of efficiencies obtained thanks to an increase in

the scale of production and vertical integration, which, as in the case of Chile (Bickford & Herrera, 2013), has led to a greater number of animals in the hands of fewer producers.

Since 2000, a 53% increase in poultry stocks has been the main driver of production growth in the region. The yields from poultry farms increased only 2% during the same period. In the case of milk production, growth has been the result of a more balanced increase, both in terms of inventories (19.2%) and production efficiency (10.7%).

Production of beef and pork is also increasing

Between 2000 and 2016, the decline in cattle inventories in the U.S. of almost 10%, and the resulting 9% decline in beef production, was compensated by an expansion in inventories and production in LAC, which grew 17% and 31.5%, respectively, during the period (Table 1). The recent U.S. recovery from drought and record-high prices has facilitated growth of livestock inventories and beef production, which is likely to increase competition in the sector. However, beef production in LAC is now almost 70% more than in the U.S. and represents more than one quarter of world production. In addition, between 2000 and 2016, the production of pork in the region grew at a faster rate than in the U.S. and the world (31.1% growth compared with 6.5% and 9.4% growth, respectively), but in overall terms is still only about two-thirds of the volume of U.S. production. Meanwhile, the production of lamb in LAC continues to increase slowly and in the short term is not expected to become a very significant sector, despite its importance in certain niche markets.

Different trends in beef exports from LAC

Excluding lamb, exports of all types of meat from LAC rose between 2000 and 2016 (Table 3). In Paraguay and Uruguay, which continue to dominate beef exports from the region, exports account for about 60% of their total beef production. Brazilian beef exports have also increased almost 2.5 times since 2000, which accounts for about 21% of total production in the country. Meanwhile, exports of beef from Argentina continue to fall, down nearly 28% between 2000 and 2016. A severe drought in Argentina 2008 led to the sale of cattle in 2009 and a subsequent shortage of meat. Argentine farmers have been reluctant to reinvest in cattle farming due to government restrictions on exports and price controls. However, in early 2016 the government lifted restrictions to help lower domestic prices (Reuters staff 2016). Meanwhile, countries in Central America continue to suffer from the lack of competitiveness of livestock exports, partly because of weak animal health and food safety systems in the region (Martínez 2012), which has prevented producers in these countries from taking full advantage of free trade agreements.

Important increase in exports of pork and poultry

The recent growth in exports of pork and poultry in LAC has been remarkable. The percentage increase in exports of pork from Argentina, Brazil, Chile and Mexico between 2000 and 2016 reached triple digits, including average growth in exports from LAC of 344% during this period (Table 3). In addition, after many years, Chile's efforts to eradicate the

porcine reproductive and respiratory syndrome virus (PRRS) have reduced its incidence to less than 5% of what it was in previous years and exports are responding positively (Martinez, 2016).

Brazil is still the biggest exporter of poultry in LAC, representing more than 90% of all poultry exports in the region. However, the broiler chicken industry in Argentina is growing rapidly, with production reaching unprecedented levels in 2016, mainly due to problems of red meat supply in domestic markets, new export opportunities, lower prices of feed and vastly improved sanitary conditions,. Although Argentina exports only 10% of its production, exports have grown 128% since 2008. In addition, it now exports more chicken to neighboring countries in Latin America than Brazil.

Production of dairy products increasing amid lower imports

While many Latin American countries remain net importers of milk powder products, the participation of LAC in global imports of whole and skim milk powder dropped from 24% in 2000 to 15% in 2016 (OECD and FAO, 2017). While the rapid growth of per capita income in the region has driven demand for imported dairy products, it has also stimulated growth of 32% in milk production in LAC, particularly in Brazil and Mexico. Between 2000 and 2016, net imports of powdered milk (whole and skim) in LAC increased only 11%, while the relationship between total consumption and demand for these imports increased almost 50% in the same period (FAO, 2017b). For many years, Venezuela has been the largest importer of dairy products in South America, and the second largest importer in the Americas after Mexico. However, in recent years, Venezuela has faced a severe recession due to the fall in oil prices and political uncertainty. In this scenario, Venezuela's lack of foreign reserves and currency depreciation has limited investment in the national dairy industry, which has resulted in high domestic prices of dairy products, a reduction in imports and a shortage of dairy products in the country.

Livestock inventories concentrated in a few countries

Livestock production in LAC is concentrated in a relatively few countries. The three main producing countries (Brazil, Argentina and Mexico) account for 50-70% of the inventories of LAC's main livestock species, and the top five producing countries in the region represent 70-80% of total inventories. Poultry and sheep stocks are less concentrated, with the top five countries accounting for 67.5% and 52.7% of inventories, respectively. Brazil is the leading producer in LAC of all the main species, with 52% of beef cattle, 50% of dairy cattle, 43% of pigs, 40% of poultry and 22% of sheep. The Brazilian government's financial support for the expansion of private enterprise, rebuilding herd numbers, genetic selection and improved pasture, livestock improvement programs, and sustained high prices, has improved the competitive advantage of the national livestock industry.

With 13% of total inventories, Argentina is the second largest producer of beef in LAC and the second largest producer of sheep (18%). For its part, Mexico is the second largest producer of pigs (18%) and poultry (16%), the third largest producer of dairy cattle (5%) behind Colombia (14%), and the third largest producer of beef. Peru, Bolivia, Mexico and Uruguay (in that order) together represent nearly half of all inventories of sheep in LAC. In Central America, milk production in Nicaragua is expected to recover after animal health conflicts that led to the temporary closure of neighboring markets, such as Costa Rica.

In Central America, livestock production is recovering after two consecutive years of

drought due to the worst El Niño on record in the Central American dry corridor. Even so, around 3.5 million people in Guatemala, El Salvador and Honduras still struggle to get enough food, including many who depend on food aid for survival (Moloney, 2016). The drought forced some livestock farmers, and particularly young farmers, to abandon their farms and migrate northward, creating additional pressure along the Mexico-U.S. border (Baez et al., 2017). Forecasts for 2017 indicate a continuing moderate water deficit in much of Mexico, with persistent extreme deficits in some areas, and surpluses of water in much of Central America (ISCIENCES, 2106). The result will likely be continued pressure on livestock production in the region, with a particularly strong impact on small producers.

Growth in Livestock production helps to reduce hunger and improve food security in the region

The growth of livestock production in LAC has helped improve the daily intake of calories per person, with the average daily intake of livestock products in LAC equivalent to 572 kcal/capita/day, which is greater than the average for developing countries (189 kcal/capita/day) and the global average (514 kcal/capita/day) (FAO, 2017b). However, even though per capita consumption of livestock products in LAC grew 6% in the last decade, while per capita consumption in the U.S. fell 4%, the consumption of livestock products in the region is still only 42% of per capita consumption in the U.S. Among the products of animal origin, milk is the largest contributor to the daily caloric intake of consumers in LAC (168 kcal/capita/day), which is approximately 2.5 times the level of developing countries, but only 45% of U.S. consumption.

Since 2000, the growing availability of meat in the region has facilitated substantial growth in per capita consumption of meat, especially poultry and pork (Table 2). The average Latin American household spends 19% of its food budget on meat and dairy products (FAO, 2017a). However, people in LAC appear to be changing their diets from beef to other sources of protein, as shown by the decline of more than 2% in the per capita consumption of beef and the growth in per capita consumption of other types of meat since 2000. This change is consistent with global trends, which is reflected in a 20% decrease in per capita consumption of beef in the U.S. since 2000 and a 35% decrease worldwide during the same period. By contrast, the per capita consumption of pork and poultry in LAC increased 28% and 59%, respectively, during the period.

In 2016, Uruguay's annual per capita consumption of dairy products was 2.5 times that of the U.S. (175 kg vs. 75 kg, Table 2), while Brazil's per capita consumption of dairy products also exceeded the U.S. (76.4 kg vs. 74.6 kg). Other major consumers of fresh dairy products in the region include Chile, where per capita consumption decreased 20.1% between 2000 and 2016 to 56.4 kg, and Mexico, where per capita consumption increased almost 23% in the same period to 42.8 kg. The rest of LAC countries combined consumed an average of nearly 69 kg of dairy products per capita in 2016, which implies a growth of 8.5% since 2000.

Livestock in Latin America and the Caribbean - Sustainability aspects

The intensification of livestock production can lead to higher production with fewer resources, but it raises concerns in terms of sustainability. A lack of public investment in transport, ports, distribution, marketing and related infrastructure has prevented the industry from reaching its potential. Low levels of public and private investment continue restricting growth in efficient and sustainable livestock production systems.

Livestock production in LAC represents a significant economic opportunity for small producers, large commercial producers and the economies of many countries in the region. For example, the livestock sector represents 36% of Nicaraguan agricultural exports (Van der Hoek et al., 2016). In Costa Rica, where the livestock sector accounts for 30% of national carbon emissions and occupies 35.5% of its territory, various public, private and academic institutions are working to achieve an ambitious goal of carbon neutrality by 2021 (Costa Rica leads…, 2017).

Livestock production in LAC has broad and varied impacts on the environment, which means that the opportunities offered by the growing livestock industry may be a threat to sustainable development in the region (Davies, 2014). Around 70% of grasslands in LAC have suffered moderate to severe degradation. In addition, livestock production is increasingly related to deforestation, degradation of soil and grasslands, biodiversity loss, a decrease in water sources and higher greenhouse gas emissions (Davies, 2014). The areas where the clash between the needs of the livestock industry and potential environmental damage is most severe include Brazil's Amazon rainforest, the semi-arid Chaco region in Argentina, Paraguay and Bolivia, and the arid and semi-arid areas in Argentina and Chile (Davies, 2014). This dilemma also affects Central America where the extensive production of dual-purpose livestock (milk and meat) is leading to soil degradation, deforestation, high levels of greenhouse gas emissions per unit produced, and a displacement of the agricultural frontier towards the Caribbean (Van der Hoek et al., 2016).

The abundance of arable land, particularly in South America, has slowed the adoption of technologies that improve productivity in the LAC livestock industry (Thorton, 2010). Some producers are moving towards the use of more intensive mixed crops-livestock systems. An increase in the cost of land for extensive production can be an incentive to adopt technologies and practices that use less land and increase livestock productivity (Wirsenius *et al.,* 2010). These practices can include small-scale grazing, use of higher quality feed, improved technologies for genetic selection, greater reproductive efficiency and health interventions, and improved management of grasslands (Havlik et al., 2014). The result is more efficient extensive livestock production systems, such as mixed crops-livestock systems (Havlik et al., 2014). The transition to more efficient livestock production in LAC has been promoted as an efficient means to increase productivity while mitigating emissions of CH_4 and N_2O (Havlik et al., 2014).

Other key trends in the livestock industry

Currently, there are several related issues affecting the livestock industry in LAC, including a) political uncertainty, b) foreign investment in agriculture in LAC (see Macro and Sectoral chapters), c) production technology, and d) animal diseases.

Political uncertainty has limited the growth of the livestock industry in several countries in the region. For example, Argentina implemented policies that have negatively affected its livestock industries, including restrictions on beef exports and price controls. These measures led to lower prices, which resulted in lower beef production. However, the current government is implementing policies, that are expected, to drive production and help the industry recover its level of exports. For its part, Brazil continues to face an economic recession (Soto & Cascione, 2016) and has recently experienced problems related to food safety in meat handling (Rosemary, 2017), which led to the suspension of imports of Brazilian beef by many of its biggest customers and the closure of processing plants. However, in many countries, these suspensions were only temporary and Brazil is working to strengthen its safety systems to ensure the

quality of its exports and restore its standing in international markets.

The uncertainty regarding trade policies in the U.S., which is a major customer and competitor for many exporters in LAC, has generated uncertainty in agri-food trade, including products of animal origin. While the North American Free Trade Agreement (NAFTA) allows free trade in many categories of meat and livestock, mainly between Mexico and the U.S., recent comments by the U.S. government regarding the potential increase in tariffs, or the implementation of new tariffs, and the renegotiation or abandonment of NAFTA itself, has created great uncertainty among producers in both countries, many of which are vertically integrated. During the next 12 months, the three member countries are expected to "renegotiate" NAFTA, which would reduce uncertainty in trade between the three signatory countries. Meanwhile, talks are continuing between the U.S. and Brazil related to a proposed expanded trade agreement, which would enable greater trade in fresh and frozen meat.

The growth of LAC's livestock industry is due not only to higher inventories, but also to the adoption of new livestock production technologies, including modern breeding techniques. The Brazilian beef industry, in particular, is modernizing and genetic selection for cattle breeding is increasingly common in the region. However, there is still a big gap between the technologies and innovations in developed countries and those used in the majority of livestock farms in LAC; largely due to costs, but also to a lack of extension systems that would make these technologies more accessible to farmers, mainly family farmers or small-scale producers. For the LAC livestock industry to remain competitive in global markets, livestock production systems should focus not only on the efficiency of production, but also on the quality of the final product, animal welfare, resistance to diseases, the proper use of antimicrobials and the optimal use of natural resources. In addition, growing environmental concerns, are expected to drive research on the adaptation of species to new climatic conditions in LAC, as well as to the development of production systems that ensure the quality of products under these new conditions.

As the livestock industry in LAC continues its rapid growth, animal diseases represent a continuing threat. In addition, climate change will create new problems of disease emergence or resurgence. In this scenario, a more detailed understanding of vector-borne diseases and the transmission of diseases to humans would help to improve public health in the region. Meanwhile, the inappropriate use of antimicrobials in animal production has contributed to the growing trend of antimicrobial resistance (AMR) and human infections around the world (Acosta et al., 2017). In this scenario, the World Health Organization's Global Action Plan on AMR stresses the need to adopt a 'One Health' (Una Salud) approach, with the participation of health and veterinary authorities, agro-food sectors and other relevant partners. In this regard, FAO has developed its own action plan on AMR (FAO, 2016a).

The World Organization for Animal Health (OIE) predicts that by 2018 Brazil will be certified as free of Foot and Mouth Disease (FMD) through the vaccination of animals (Melo, 2016). Meanwhile, Central American and Caribbean countries are free of FMD without vaccination (Estrada & Orozco, 2014), as is Chile. Recently, in June 2017, an outbreak of FMD was recorded in Tame Arauca, Colombia, after eight years of being FMD-free (IOE, 2017). In this regard, more resources are needed in the region in order to strengthen programmes for the eradication of FMD, including monitoring systems and preparation for disease management and emergency care. Ensuring that animal health remains a high priority on national political agendas, is the most critical factor for the control and eradication of animal diseases in LAC.

Despite the concerns of local producers, in 2016 the U.S. government suspended its ban on imports of beef from FMD-free areas with vaccination in the north of Argentina and in 14 of Brazil's 27 states after the government concluded both countries could meet U.S. import requirements. U.S. risk assessments have indicated that beef (chilled or frozen) can be safely imported, providing that certain conditions are met to ensure that meat exported to the US. is FMD-free (News Desk 2015 and Stradheim 2016).

A global outbreak of avian influenza (AI) is a concern for countries in LAC. Despite outbreaks of AI in North America in recent years, no new outbreaks have been reported in LAC, outside Mexico and the U.S. (OIE, 2017). While it is likely that AI will continue spreading in Mexico and further south through populations of migratory birds, Mexican authorities have imposed restrictions on live poultry imports and quarantined poultry for breeding imported from the U.S. due to the recent outbreak of highly pathogenic avian influenza (HPAI) in that country. The threat of HPAI in the U.S. has forced the sector to implement permanent safety and bio-security measures and to find alternatives to reduce the risk of contamination.

As for other diseases, in 2017 Paraguay obtained certification from the OIE as being free of classical swine fever (CSF). However, studies in Mexico, Chile and Colombia indicate that porcine reproductive and respiratory syndrome (PRRS) remains a major challenge for swine health in Latin America (PRRS in Latin America… 2016). Also, the outbreak of porcine epidemic diarrhoea virus (PEDv) in the U.S. in 2013-2014 spread widely, which is why Mexico and Colombia have also faced outbreaks of PEDv (Effects of porcine… 2016).

Perspectives

Going forward, the continued growth of the livestock industry in LAC will depend increasingly on improved efficiency resulting from the adoption of new technology and vertical integration. Public policies, the intensification of production, and concerns related to sustainability, environmental impacts and climate change are all likely to affect the future growth of the sector.

Growth in production of meat and milk will meet higher demand in domestic and export markets

The production of meat and dairy products in LAC is expected to continue its rapid growth, continuing the trend seen in the previous decade (Table 4). The rate of growth will likely be sufficient to cover the increase in local demand, as well as to increase the region's exports. The participation of LAC in global inventories of livestock, meat supplies and world meat exports are likely to increase along with per capita consumption of meat. Key factors for the continued strong performance of the meat industry in LAC include low grain prices, the intensification of production, higher per capita incomes, the continued change in consumer preferences from beef and lamb to chicken and pork, and policies designed to stimulate production and minimize environmental impacts.

The growth in exports of livestock products from LAC will continue to contribute to the improvement of infrastructure. For example, Anderson et al. (2016) has described the growth of infrastructure between Mexico and the U.S. since their adoption of NAFTA. As a result, Mexican meat producers are increasingly competitive in the North American market. The competitiveness of meat producers in LAC will likely increase as product quality and supply chain infrastructure

improves. However, growing exports of meat from LAC could create tensions within the region. For example, greater opportunities for Brazil to export beef to the U.S. may result in the substitution of exports from other Latin American countries. In general, even though export opportunities outside LAC are expected to grow, this could increase competition in the region.

It is unlikely that this growth in exports will have a significant impact on poverty reduction or on the food and nutritional security of the most vulnerable producers, especially since growth tends to be inequitable and does not translate into better employment or income opportunities in rural areas. In general, growth in the sector has been led by an increase in the size of specialized production units, resulting in greater pressure on natural resources and the environment, and, with some exceptions, a reduction in the number of holdings of small and medium-sized producers, mainly due to the lack of specific policies and programmes that promote family livestock production.

In this context, there are opportunities to increase production efficiency in LAC, particularly when performance is compared with the U.S. In this regard, Ahola (2014) has highlighted some key points:

- South America slaughters an average 20% of its livestock inventory annually, which is equivalent to approximately half of the percentage slaughtered in the U.S. (37%).
- The four largest beef producers in LAC export a higher percentage of their production than the U.S. or other important beef producers (for example, Uruguay exports 70% to 80% of its production).
- Apart from Paraguay, the average producer in the Southern Cone has more cattle than the average U.S. producer who has an average of 98 heads of cattle per farm, including all ranches, dairies and feedlots.
- South America has more than three times as many cattle per capita (1.1 heads of cattle per person) as in the U.S. (0.3 heads of cattle).
- In South America most cattle are slaughtered at close to 30 months (or more) of age, while the average for steers and heifers in the U.S. is approximately 17 months.
- Average carcass weights in South America are almost 227kg, while the average carcass weight in the U.S. for steers and heifers was 378kg in 2012 (more than 60% heavier).

Demand for beef production has important potential

Beef production in Argentina, Uruguay and Brazil is expected to grow 12.8% between 2017 and 2025 (Table 4). In the short term, Latin America's livestock industry will likely benefit from sanctions imposed on Russia that have reduced meat exports to that country from the U.S., Norway, Canada, Australia, the European Union (EU) and New Zealand. For example, after Russia banned imports of pork from the EU in 2014, approximately 89% of its pork imports in 2016 came from Brazil (Vanderberg, 2016).

Brazilian beef production is projected to grow 13% between 2016 and 2025, which will allow exports to rise 19%, while per capita domestic consumption is only expected to increase 2.6% (see Table 4). This growth will be supported by limited government subsidies in the areas of genetic research, grasslands, machinery, cold storage capacity and other public programmes that do not necessarily benefit the poorest producers. Meanwhile, Argentina's elimination of restrictions on beef

exports is expected to increase its exports almost 140% by 2025 (Table 4).

Currently, one of the biggest challenges facing the industry is to achieve production efficiency and use technologies, management and genetics to increase the amount of meat produced per unit of product (including livestock, animal feed and land). Another challenge is to prevent outbreaks of diseases such as FMD, which can negatively affect exports of beef and live cattle from South America. The sustainable production of beef, which does not negatively affect the environment (particularly in Brazil's Amazon rainforest), is also a major challenge. Finally, the livestock industry in LAC faces similar concerns as in the United States, such as animal welfare, product quality, palatability, traceability and inadequate communication among links in the supply chain. Other challenges to overcome include the relative increase in the cost of land, labour and natural resources.

As for pork, other countries in the region will likely challenge Brazil's dominance in this sector going forward. Although Brazilian production of pork is expected to grow 18% between 2016 and 2025, average growth in production in LAC is also expected to reach about 14% in the same period, led by Argentina, Mexico and Chile (Table 4).

Finally, although poultry production in LAC more than doubled in the last decade, it is expected to grow only 16% in the next decade (Table 4). Even so, poultry exports in LAC are expected to grow at double the rate of production, which means per capita consumption could increase 4.5% by 2025.

Milk production will continue to grow

Production of fresh dairy products in Latin America is expected to continue to increase in the next decade, although at a slower rate (12%) than in the previous decade (32%; Tables 1 and 4). Brazil is one of the largest importers of dairy products in the world; however, exports exceed imports. Government support and the low production costs have helped Brazil to become the fifth largest producer of milk in the world. Brazil's dairy cattle industry is increasingly dominated by purebred Gir cows, native to Gujarat, India, which are a highly efficient in terms of milk production. According to various reports, the production of milk provides employment to almost one million people in Brazil (Sheth, 2017). The Brazilian government provides constant but relatively limited support to rebuild herds and for genetic improvements to support the growth of the dairy industry. However, Brazil needs to resolve its supply chain and product quality problems in order to significantly expand its share of global dairy markets.

Progress in the reduction of animal disease outbreaks

Significant progress has been made to eradicate FMD in South America, with more countries recognized by the OIE as FMD-free with or without vaccination. Given that the growth of the cattle industry in LAC is historically linked to the elimination of FMD, in particular when countries become more dependent on exports, countries of the region should continue to work intensively to eradicate this disease and prevent new outbreaks. Meanwhile, outbreaks of endemic and epidemic diseases in intensive systems are likely to increase since the high concentration of animals, as well as climatic variability and the inappropriate use of antibiotics, could generate new species and strains of pathogens. Countries should continue to strengthen their monitoring systems and emergency health services at all levels, with the main challenge of extending these services to small livestock producers (Perry et al. 2011). Given that many animal diseases cross borders easily, effective multinational cooperation would be useful

for the monitoring and control of diseases. In addition, it is necessary to ensure minimum health standards among regional, sub-regional and national institutions to address cross-border animal health and food safety crises, in particular in the early stages of outbreaks (monitoring and preparation).

Finally, as small and medium-scale producers increase their production, the demand for services, inputs, feed and genetic resources is likely to increase, which will require greater involvement of the private sector to complement public sector services.

Policy Recommendations

To meet the challenges facing the sustainable development of the livestock sector, integrated policy strategies are required this include, policies related to investment, financing, innovation, sustainable development and social inclusion. Policies focused exclusively on livestock production are not enough, as these need to be linked to policies in other areas and form part of a coherent policy strategy.

In this regard, future policy analysis should be based on the evidence of the livestock sector's significant contribution to the reduction of poverty, food and nutritional security, consumption, responsible production, and the sustainable use of resources and ecosystem services. This includes indicators and figures that allow decision-makers to create incentives and make strategic investments considering the sector's social, economic and environmental impact.

Going forward, it is important not just to strengthen institutions in the sector, but also to promote the participation of producer organizations, the private sector and universities in development frameworks and policy dialogues.

Stronger efforts, are also needed in terms of coordination and cooperation between governments, the private sector, civil society and international development agencies.

Continue reducing the impact of animal diseases

Important progress has been made in mitigating the impacts of animal diseases in some Latin American countries such as Brazil, Argentina and Uruguay. These countries have also developed and implemented animal traceability systems, which could be implemented in other countries of the region to create new growth opportunities in the industry. Meanwhile, the U.S. lags behind several Latin American countries in the implementation of an integrated animal tracking system, which has weakened its capacity to compete in world markets.

No system will work without the participation of producers. Educational efforts designed to educate producers about the importance of bio-security and the monitoring of disease outbreaks, as well as informing health authorities about suspected diseases, can help to eliminate them. Among the responsibilities of animal health authorities is working with producers to establish practical guidelines. Governments in different countries can also efficiently create frameworks for the control and eradication of diseases.

Reducing obstacles to the development of the industry

As the industry grows and production intensifies, pressure on small-scale producers is increasing since higher production results in lower prices, making it more difficult for these producers to compete and prosper. In this context, differentiated policies are needed to

support small-scale producers, which should include among other the following:

- Investments in the development of marketing systems and partnerships to help small-scale producers access larger markets, including increasing opportunities in systems that currently are open only to large producers.

- Educational programmes on alternative production methods, animal health and marketing, among other topics.

- Investment in transportation systems and improvement of infrastructure, which could include cold storage systems, roads and market information, to help small-scale producers compete with larger producers and at a lower cost (Goals 9.1 and 9.a, SDG 9).

- Investment in research and development, including food security, nutrition, better animal breeds adapted to the climate and environment, and reproductive efficiency (Goal 2.a, SDG 2).

- Assistance to invest in more high quality breeding stock and/or the improvement of available genetic resources (Goal 2.a of SDG 2).

Towards sustainable development

The sustainable development of the livestock sector means optimizing the performance of producers, while linking aspects of production to the environment and social justice. This requires, the development of initiatives aimed at: contributing to the efficient use of resources; strengthening resilience and ensuring equity and social responsibility in livestock activity; strengthening public policy frameworks that favour the development of a sustainable livestock industry; coordinating and harmonizing institutional capacities of the entities responsible for supervising interactions between livestock producers and the environment; and, promoting the adoption of new technologies.

The development of national sustainability indicators would enable the evaluation and management of natural resources according to a set of targets, which are in line with the SDGs agreed by governments and diverse stakeholders in pursuit of a common vision of economic, social and environmental sustainability.

In this regard, more information needs to be collected about small-scale producers and workers in supply chains in order to: improve the role of livestock in the eradication of poverty; collect information on how to increase access to markets for small-scale producers; find ways to eliminate competition between human food and animal feed, including by prioritizing the use of products that are not suitable for human consumption in animal feed ; limit waste throughout the supply chain; strengthen local management of animal genetic resources in livestock production; generate changes in consumption habits for livestock products; improve management of water resources and the selection of drought-resistant genetic characteristics; improve animal health in terms of the control of diseases and improvements in grazing; facilitate interventions in agro-forestry, the security of feed supply and income diversification; and improve grassland management to contribute to the restoration of pastures, soil carbon sequestration and the reduction of deforestation.

Conclusions

The livestock industry in LAC will continue to support economic growth in the region. This growth will also contribute to achieving other national objectives, including the reduction of poverty, an increase in food security, the provision of better economic opportunities and the efficient and responsible use of natural resources.

As incomes rise, growth in demand for animal products globally will create new opportunities. At the same time, lower production costs will encourage the intensification of production and economic growth, which will bring challenges across the industry as well as potential benefits for each country.

While it is important to accept that the industry's growth is inevitable, there is an opportunity to establish "rules of the game" to ensure sustainable growth and obtain the desired results, which will benefit society in general.

In this regard, family livestock producers are important actors in the development process and play a strategic role in achieving food and nutritional security in rural areas. The greater integration of family producers in markets will not only help to meet future demand for high quality animal products, but will also create more opportunities for producers to move up the social ladder and, eventually, out of poverty.

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Table 1. Meat and milk production in LAC, United States and World in 2016, percentage change from 2000 to 2016, and share of world production.

	Production 2016			Percent change (2000-2016)			Share of World production	
	LAC	U.S.	World	LAC	U.S.	World	LAC	U.S.
	Millions of tons			%			%	
Beef	18.3	10.8	69.1	31.5	-8.6	16.6	26.5	15.6
Pork	7.7	11.2	118.4	53.1	33.1	31.1	6.5	9.4
Sheep meat	0.4	0.1	14.5	6.7	-33.4	26.9	2.7	0.5
Poultry	25.9	20.5	113	108.1	28.4	68.2	23.7	19.2
Milk	85.3	96.7	817	31.7	27.3	41	10.9	12.3

Source: OCDE - FAO 2017.

Table 2. Per capita consumption of meat and dairy products, 2016 and percentage change 2000-2016, selected LAC countries.

	Beef		Pork		Poultry		Sheep meat		Dairy[a]	
	kg/ca	% change	kg/ca	% change	kg/ca	% change	kg/ca	% change	kg/ca	% change
Uruguay	46.7	-15.2	14.4	83.9	13.7	-9.8	5.7	-37	175.4	-18.8
Argentina	41.4	-8	8.3	38.6	36.6	65.1	1.2	-17.7	44	13.7
Brazil	25.5	4	12	11.5	40.5	57.1	0.4	-4.3	76.4	17.4
Chile	15.1	-4.1	17.6	38.4	31	29.2	0.4	-43.8	56.4	-20.1
Mexico	8.8	-15.3	11.6	30.5	26.5	49.9	0.5	-25.7	42.8	22.8
Other LAC	12.1	6.9	8.3	44.5	19.1	97.1	0.6	-11.5	81.9	7.1
LAC	17	-2.2	9.5	27.9	31.9	59.4	0.5	-19	68.6	8.5
U.S.	25	-19.6	22.9	-1.6	48.5	12.7	0.4	-22.3	74.6	-16.9
World	6.5	-3.5	12.4	9	13.7	40.5	1.7	6.1	57.3	21.6

[a] Fresh dairy products as defined by OCDE-FAO (2017).

Source: OCDE - FAO 2017.

Table 3. Percentage change in meat exports (2000-2016) and export share of domestic supply (2016), LAC and selected countries.

	Argentina	Brazil	Chile	Mexico	Paraguay	Uruguay	LAC
	% change						
Beef							
Export	-27.8	241.1	1/	49.1	540.5	53.5	128.8
Export share	8.8	21.1	8.2	22.2	57.7	61.5	19.8
Pork							
Export	820.3	314.1	759.5	201.4	1/	15.5	344.1
Export share	3.1	13.1	30	7.3	1.2	0.1	10
Sheep meat							
Export	140.5	1/	17.8	30.6	-77.7	-48.4	-27.0
Export share	5.9	0.6	35.7	0.1	0	33.3	5.3
Poultry							
Export	1/	340.5	420.5	464.8	-97.6	3636.4	358.6
Export share	11	30.1	20.7	0.1	0	26.1	17.7

1/ = Large percentage change from a small number.

Source: Calculated from data in OECD-FAO (2017).

Table 4. Projected percentage growth in meat and dairy product production, per capita consumption, and exports in LAC, selected LAC countries, the US, and the World, 2016-2025.

	Uruguay	Argentina	Brazil	Chile	Mexico	Other LAC	LAC	U.S.	World
	% change								
Beef									
Production	0.7	22.5	12.7	-5.3	12.8	6.2	12.8	11.2	11
Consumption/capita	4.3	-0.5	0.3	2.1	1.4	2.2	0.2	3.3	2.6
Exports	-3.4	138.8	38.1	-3.9	186	-1.4	35.1	43.8	19.4
Pork									
Production	0.9	18	17.7	4.1	12.1	8	14.3	9	9.2
Consumption/capita	3.9	10.7	10.5	2.5	4.8	3.2	6.8	1.8	0.9
Exports	0	-17.4	21.7	-9.6	-1.7	-69	11.8	17.4	12.5
Sheep meat									
Production	12.4	8.7	0.9	1.5	11	12.3	72	6.1	18
Consumption/capita	3.7	3.4	-4.8	1.5	-1	40.7	0.3	-3.2	8.7
Exports	26	-31.4	-45.1	-13.3	43.1	0	4.9	0.8	14

(Continued Table 4)

	Uruguay	Argentina	Brazil	Chile	Mexico	Other LAC	LAC	U.S.	World
Poultry									
Production	-6.7	15.1	17.3	7.3	24.6	15	16.1	9.4	11.6
Consumption/capita	3.4	2.7	4.3	2	9.3	1.4	4.5	1.9	3.1
Exports	-3.8	47.7	33.1	-4.4	10.7	0.1	32.3	18.7	22.3
Dairy Products [a]									
Production	4.3	13.1	15.6	7.2	9.6	77.8	12	6.6	19
Consumption/capita	1.6	5.4	6.6	-0.1	0.6	0.4	4.3	0.8	9.9

[a] Fresh dairy products as defined by OECD-FAO (2017).
1/ = Large percentage change from a small number

Source: Calculated from data in OECD-FAO (2017).

2.4 Fishing and Aquaculture

Fishing and Aquaculture

Fisheries and aquaculture production in Latin America has grown at a rate above average compared to other regions of the world, driven primarily by aquaculture given that the region has the largest area in the world with potential for its expansion.

Facts

- Capture volumes of the major fisheries in Latin America, like Peruvian anchovy, Chilean jack mackerel and hake, has shown important signs of contraction in the last decade (a 6% reduction between 2008 and 2015). The main reason for this decline is a combination of overfishing and the effects of climate variability and climate change.
- Total production of regional fisheries was 11 million tons in 2016, which is far below the record catch level registered in 2000 of 19.8 million tons, which is expected to remain as the maximum level for years to come.
- Salmon farming still represents almost 50% of regional aquaculture production, while shrimp production is steady and production of tilapia and some Amazonian species has shown significant growth both, in terms of volume and area.
- Like other primary sectors, the industrial aquaculture sector is experiencing increasing concentration, with high levels of foreign investment as a result of the acquisition of local companies and vertical integration, mainly in Chile, Brazil, Mexico, Costa Rica and Honduras.
- The limited-resource, micro and small-scale aquaculture sector contributes significantly to aquaculture production in countries such as Colombia, Paraguay and Bolivia, exceeding 65% of national production in these cases.
- Fish consumption in countries of LAC has increased steadily, reaching an average 9.5 kg/capita/year in Guyana, Peru, Panama, Mexico and Brazil, whose average consumption exceeds the 12 kg recommended by international health agencies.

Trends

Fisheries and aquaculture sectors facing different situations but common challenges

The region's fishing and aquaculture sectors face opposite scenarios in terms of production, but they also face some common challenges. While production by capture fisheries has shown a significant contraction in volume, mainly in large-scale marine fisheries (Peruvian anchovy-Engraulis ringens, Chilean jack mackerel-Trachurus murphyi, hake-Merluccius gayi), which registered a 6% decrease in total production between 2008 and 2015; aquaculture production has grown at a rate of over 6% annually in the last five years (FAO, 2016) despite repeated outbreaks of disease in farmed populations, which threaten aquaculture production mainly that that takes place on an industrial scale (Table 1).

Fishing and aquaculture communities also face common challenges, such as the effects of climate change. In the fishing sector, these have reduced the abundance of resources in fishing grounds, while in the aquaculture sector they have reduced productivity due to lower availability of water. Another challenge common to both sectors is their relatively low policy prioritization on national development agendas.

Capture volumes from marine fisheries continue declining

The highest annual capture volume in the region this century, 19.8 million tons, was recorded in 2000. However, this was followed by a general decline, with maximum expected production now around 15 million tons annually, even though the volume captured in 2016 was slightly less than 11 million tons, mainly due to a significant reduction in the Peruvian anchovy catch, which fell to around 3.8 million tons in 2015 (Table 1).

Extrinsic factors, associated with climate variability and climate change, as well as intrinsic factors derived from overfishing and institutional weaknesses in terms of the sustainable management of fishery resources, has led to regulations that in many cases limit the number of new boats permitted or reduce catch quotas. As a result, economic alternatives are required for fishermen, who are forced to stop their main activity for the sake of the sustainability of fishery resources.

Inland fishing is a relatively small sector, but with high nutritional and social importance

Inland fishing, which is practiced in non-coastal, inland waters, produce around half a million tons in the region annually, which represents approximately 3% of the total fisheries and aquaculture production in LAC. It is the main source of animal protein for thousands of communities, many of them living in poverty, as well as many indigenous peoples living along river basins and fluvial-lagoon systems in at least 23 countries of the region (FAO 2016c).

Although statistical records of inland fisheries production show growth of 5% in the last decade, it is likely that the reported figures significantly underestimate the actual production given the geographic dispersion and weak institutional capacity for monitoring catch volumes destined mainly for household consumption (Valbo-Jørgensen et al. 2008)

Brazil and Mexico together, contribute more than 70% of inland fisheries production in the region. Both countries have important fisheries based mainly on tilapia farming for sale in local markets. Amazonian communities in Brazil, Peru, and the Orinoco basin also catch important volumes of native species for

Table 1. Volumes and values of aquaculture production; fisheries capture volumes and impact of aquaculture on the total volume of fishing production in LAC for countries with production above 100 tons per year

Country/ Region	Volume of aquaculture production				Value of aquaculture production				Capture volume			Volume of aquaculture production / Catch volume (%)		
	Thousands of metric tons				Millions of USD				Thousands of metric tons					
	2006-2008	2009-2011	2012-2014	% total 2012-2014	2006-2008	2009-2011	2012-2014	% total 2012-2014	2006-2008	2009-2011	2012-2014	2006-2008	2009-2011	2012-2014
Caribbean	**41.8**	**36.2**	**31.6**	**1.2**	**87.7**	**68.7**	**45.7**	**0.3**	**185.3**	**199.4**	**185.6**	**22.6**	**18.2**	**17.0**
Cuba	33.8	30.7	28.4	1.1	47.9	39.3	35.3	0.3	62.4	56.3	50.5	54.2	54.5	56.2
Dominican Republic	1.0	1.6	1.5	0.1	7.9	9.4	5.5	0.0	15.1	15.8	15.1	6.9	9.8	10.2
Haiti	0.1	0.4	0.7	0.0	0.3	0.8	1.3	0.0	13.6	15.8	17.2	0.9	2.5	4.2
Jamaica	6.5	3.4	0.7	0.0	28.1	17.6	2.2	0.0	22.2	19.8	16.4	29.4	17.3	4.4
Others	0.3	0.2	0.1	0.0	3.5	1.7	1.4	0.0	72.0	91.7	86.4	0.5	0.2	0.2
Central America	**275.3**	**257.0**	**328.3**	**12.9**	**1 066.6**	**953.8**	**1 240.4**	**9.3**	**2 410.0**	**2 488.6**	**2 324.0**	**11.4**	**10.3**	**14.1**
Mexico	151.3	140.1	169.9	6.7	568.7	445.0	620.7	4.7	1 622.9	1708.9	1 740.2	9.3	8.2	9.8
Honduras	52.4	35.6	66.6	2.6	205.9	153.0	281.4	2.1	70.2	47.4	77.5	74.7	74.9	85.9
Costa Rica	24.3	26.4	27.3	1.1	54.1	60.5	57.6	0.4	43.8	54.7	68.8	55.5	31.5	39.4
Nicaragua	12.9	17.2	27.1	1.1	54.1	60.5	57.6	0.4	43.8	54.7	68.8	29.6	31.5	39.4
Guatemala	17.1	20.3	18.5	0.7	78.8	104.5	84.1	0.6	36.7	41.1	39.9	46.6	49.4	46.4
Panama	8.6	6.7	8.7	0.3	40.4	31.6	38.5	0.3	246.9	203.6	187.7	3.5	3.5	4.6
Belize	5.1	6.1	6.7	0.3	23.8	22.7	23.1	0.2	290.3	333.3	101.0	1.8	1.8	6.7
El Salvador	3.5	4.6	3.4	0.1	8.0	10.6	10.1	0.1	53.9	52.0	59.8	6.6	8.8	5.7
South America	**1 406.6**	**1 670.5**	**2 188.0**	**85.9**	**7 180.4**	**8 591.8**	**12 007.3**	**90.3**	**15 489.2**	**13 911.9**	**11 840.2**	**9.1**	**12.0**	**18.5**
Chile	805.7	816.3	1 106.4	43.4	4 971.3	4 996.7	7 407.3	55.7	4 650.6	3 881.9	3 279.5	17.3	21.0	33.7
Brazil	297.3	403.7	506.3	19.9	684.0	1 307.7	1 341.6	10.1	1 082.1	1 195.7	1 290.5	27.5	33.8	39.2
Ecuador	171.2	267.1	340.9	13.4	829.5	1 253.4	1 631.7	12.3	623.4	735.4	904.8	27.1	36.3	37.7
Peru	37.0	75.2	104.4	4.1	267.0	546.3	663.2	5.0	7 244.5	6 569.0	4 863.3	0.5	1.1	2.1
Colombia	68.3	81.6	90.4	3.5	329.8	297.3	267.5	2.0	181.1	173.3	174.8	37.7	47.1	51.7
Venezuela	20.7	19.0	27.9	1.1	73.0	157.6	637.0	4.8	340.1	264.5	240.2	6.1	7.2	11.6
Paraguay	2.4	3.5	6.5	0.3	3.9	7.1	23.0	0.2	22.6	21.3	23.5	10.4	16.4	27.5
Argentina	2.7	2.8	3.6	0.1	16.8	14.1	23.2	0.2	1 053.6	825.2	816.5	0.3	0.3	0.4
Bolivia	0.6	0.9	1.2	0.0	1.9	3.6	5.6	0.0	6.8	7.9	8.2	8.2	10.9	14.4
Guyana	0.5	0.4	0.3	0.0	1.3	1.8	1.2	0.0	48.3	44.4	47.2	1.1	0.9	0.6
Uruguay	0.0	0.1	0.2	0.0	1.1	5.6	5.2	0.0	117.2	81.5	67.0	0.0	0.1	0.3
Others	0.2	0.1	0.1	0.0	0.9	0.5	0.6	0.0	109.9	112.7	124.7	0.1	0.1	0.1
Total	**1 723.7**	**1 963.7**	**2 547.9**	**100.0**	**8 334.8**	**9 614.3**	**13 293.4**	**100.0**	**18 084.5**	**15 599.9**	**14 349.8**	**9.5**	**11.8**	**17.8**

Source: FAO 2016b

household consumption, although the volume is unknown due to a lack of reliable data (Valbo-Jørgensen et al. 2008).

The Sustainable Development Goals are an opportunity to strengthen the sustainability of fishery resources

Given the urgent global need to address the rapid growth of marine and inland fisheries, and to ensure that this activity allows the conservation of biodiversity and fishery resources, countries of the region have adopted political commitments within the framework of the UN's Sustainable Development Goals, in particular SDG 14, which is aimed at strengthening the sustainability of fishery resources and protecting and improving the livelihoods of the more than 2.4 million families in Latin America that depend on these sectors for their food security and income (FAO 2016c). This represents an important opportunity to prioritize on national development agendas the strengthening of systems for the evaluation and sustainable management of fisheries resources.

Industrial fishing and aquaculture activities are focused on exports

Large-scale fisheries and aquaculture producers export most of their production, with Peru and Chile being still the major producers in Latin America. In the first case, with production of around 3 million tons annually, Peru's anchovy fishery, which is historically important for the production of fishmeal and fish feed oil, contributes significantly to GDP (from 0.7% to 1.5%). Aquaculture production in Chile, which is based on salmon and trout for export markets and exceeded 1.2 million tons in 2015, represents one of the country's major sources of foreign exchange.

Through aquaculture, other countries in the region, such as Ecuador, Mexico, Costa Rica and Honduras, have substantially increased their production of shrimp and tilapia for export. While Ecuador remains the leading regional exporter of shrimp to the United States, Honduras has positioned itself as the leading exporter of tilapia to the same market.

Some emerging threats have kept health authorities in the sector on alert. Even though Chile has overcome the crisis caused by virus outbreaks that hit its salmon industry between 2008 and 2010, its early warning systems remain in place and more sustainable farming practices have been implemented. Meanwhile, the regional shrimp farming industry has been affected by diseases such as Early Mortality Syndrome (EMS), which in 2012 harmed the industry in countries like Mexico and Honduras. Although this crisis has largely been overcome, the trend of low shrimp prices in global markets has discouraged the expansion of production in the last five years (FAO 2017b).

In 2014, the emergence, in Asia, of the Tilapia Lake Virus (TiLV), which causes mortality in farmed populations of tilapia, triggered warning systems in various countries of the region, which closed their borders to imports of this species from countries where the presence of this pathogen was detected, even though it does not represent a threat to human health (Eyngor et al. 2014).

Brazil plays an important role in the aquaculture sector

As a result of structural policies, including a development plan for aquaculture activity (Plano Safra Pesca e Aquicultura) with a budget that is unprecedented in the history of the sector (2 billion reais), Brazil reached its goals ahead of schedule and surpassed its own predictions in terms of aquaculture production, producing over 580,000 tons in 2015 and becoming the second regional aquaculture producer after Chile (FAO 2016b).

Thanks in part, to the effectiveness of Brazil's public communication campaigns to increase domestic consumption of fish and shellfish, which were developed by the then-Ministry of Fisheries and Aquaculture, domestic demand for fish has grown to 12 kg/capita/year in less than eight years (from 6.15 kg/capita/year in 2000), generating a strong domestic market that accounts for almost all of Brazil's aquaculture production. Paradoxically, however, the rate of demand growth has exceeded domestic supply, which has favored imports (SEBRAE 2015).

Despite the elimination of the Ministry of Fisheries and Aquaculture in 2015, the country has maintained an important rate of expansion in the aquaculture sector and is considering the implementation of an ambitious concessions plan for inland waterways (hydroelectric dams), which would allow the country to become the continent's top aquaculture producer in the coming years.

Climate change poses a threat to fishing and aquaculture production in the region

In some cases, the environmental scenarios in the region, which have been affected by climate change, have overwhelmed the capacity of fisheries and aquaculture institutions and communities to respond. These new scenarios require a greater capacity for adaptation, including the diversification of livelihoods, as well as shared responsibility for stronger and more effective measures to ensure the sustainability of fishery resources.

The changes are happening much faster than many forecasts had predicted, which means fishing communities face challenges such as: i) the decline of fish stocks in fishing areas, which implies more investment needed for navigation which leads to conflicts with other communities over access to fishing areas; ((ii) changes in the composition of catches, which forces then to adapt their technology to capture new species, and iii) direct impacts on their living spaces due to a rise in sea level or increased incidence of extreme weather events (FAO 2013).

Similarly, aquaculture producers, many of whom are also family farmers, have seen their livelihoods threatened by various factors including: i) changes in water temperature that exceed the biological capacity of adaptation by cultivated species or alter their life cycles; (ii) lower availability of water due to changes in hydrological patterns; ((iii) outbreaks of new and more virulent pathogens associated with extreme climates, and iv) direct impacts on their productive and living spaces due to the increased incidence of natural disasters (FAO 2013).

However, the majority of countries of the region have made efforts to strengthen the resilience of rural communities and, gradually, of fishing and aquaculture communities. In some cases, such as in Peru and Chile, studies of the sector's vulnerability to climate change have been carried out (Alarcón et al. 2013 and PRODUCE 2016), and national strategies are being developed for the adaptation of fisheries and aquaculture. In addition, it is increasingly common in the region for countries to take a more systemic approach (multi-sectoral) in the formulation of disaster risk management policies and the establishment of adaptation mechanisms.

Illegal, unreported and unregulated fishing represents a growing threat

With the human population in coastal areas growing, due to both demographic factors and migratory processes, the pressure on fishery resources is exceeding the biological capacity of some species, which is exacerbated by the instability of institutional systems for monitoring and surveillance of the implementation of regulations. Given its

clandestine nature, illegal, unreported and unregulated fishing (IUU fishing) in national territorial waters, especially in artisanal fisheries, is a growing problem, the size of which has not been quantified, but which demands our immediate attention.

A growing number of countries in the region are moving towards joining or ratifying the Agreement on Port State Measures to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (AMERP) promoted by FAO, which is an important first step given that it is the only binding mechanism adopted by the international community to combat these problems. Chile, Costa Rica, Cuba, Panama and Uruguay are members of the agreement, which also allows more transparent access to global markets.

In this regard, the artisanal segment of IUU fishing is perceived as the main threat, since it directly affects the sustainability of the livelihoods of the most vulnerable fishermen who are legalized. These illegal practices in territorial waters are, in many cases, associated with other criminal activities, such as drug trafficking, and pose a threat to the social stability of coastal communities and the sustainability of fishery resources. A specific example of this growing problem is the sea cucumber and jellyfish fisheries in Central American countries (UNODCC 2016).

The concentration of aquaculture production is a recent phenomenon

Industrial aquaculture in Latin America is experiencing a similar phenomenon to that observed in other sectors discussed in this document, which is the gradual concentration of units and concessions in terms of area and production licenses. Countries such as Chile, Costa Rica and Honduras have recorded a sustained increase in the production of salmon and tilapia, respectively, generated by an increasingly small number of aquaculture producers, which have acquired small-scale production units. This may result in an increase in production efficiency from a microeconomic perspective, but from a social perspective, it could mean a contraction in rural employment associated with these projects.

The increase in prices of inputs for production, particularly of balanced feed for aquaculture, has negatively affected production costs, with a greater impact on small-scale producers. On the other hand, low prices of aquaculture products from Asia have prevented Latin American producers from passing on this marginal cost to the sales price, which has reduced the competitiveness of medium-size producers, and even many small-scale producers linked to complex export-oriented systems.

As a result, transnational corporations have acquired productive assets and concessions, which is a phenomenon that is reducing the size of the medium-scale aquaculture business at two different levels: industrial aquaculture and micro and small enterprises, the latter including many types of businesses classified as "limited-resource aquaculture".

"Limited-resource aquaculture", including micro and small enterprises, is expanding, providing self-employment and food security to rural communities in practically all countries of the region. Moreover, in some countries such as Colombia, Paraguay and Bolivia, the contribution of these sub-sectors to domestic production exceeds 60%. Recent estimates indicate that more than 500,000 families depend directly on small-scale aquaculture in the region (Flores-Nava et al. 2017).

Fisheries and aquaculture play an important role in food and nutritional security

While fishing and aquaculture are gradually being recognized as important pillars of food

and nutritional security in thousands of communities on coastlines and in the vast river basins of Central and South America, the full development of their potential is still not prioritized at the same level as other primary sectors on national development agendas.

Greater social awareness, mainly in the urban population, thanks to effective social media campaigns, has stimulated an increase in the consumption of fish and shellfish in Latin American countries in recent years, reaching an average of 9 kg/capita/year, although this is still far below the average 20.5 kg consumed globally. Two facts are notable in this regard; i) in all countries of the region there has been an increase in the consumption of fish and shellfish, and ii) Brazil, Guyana, Mexico, Panama and Peru have exceeded the minimum level of consumption recommended by international health organizations (12 kg/year). However, there are still significant asymmetries between countries and between regions within countries; for example, Bolivia consumes less than 2 kg/capita/year, while Guyana consumes over 35 kg/capita/year.

Empirical evidence shows that the prevalence of malnutrition in coastal indigenous communities is significantly less than in non-coastal communities, suggesting that access to fishery products may help to explain this difference (Villanueva and Flores-Nava 2016). The inclusion of fish in social programs, and particularly in school nutrition programs (PAE), is still incipient in the region.

In this regard, FAO's recent efforts in Latin American countries include projects to organize producers as suppliers for PAE programs, as well as the promotion of fish-based diets according to the local culture, and pilot projects for the inclusion of fish in primary school nutrition programs in Guatemala, Honduras and Paraguay (FAO 2017a).

Perspectives

Fishing has limited growth potential

No significant changes are expected in the current fish production scenario in the region. Recent trends show the stabilization of the total annual capture volume of the main fisheries, which varies between 11 million and 15 million tons. Even so, Peruvian anchovy production will likely continue to see swings in production volumes directly linked to climatic phenomena, mainly associated with El Niño, while the Chilean jack mackerel and Pacific hake fisheries will require the implementation of strong measures to begin the recovery of their populations, although climatic uncertainty makes it difficult to predict production accurately.

International certification processes for sustainable fisheries have helped to improve the practices of some fisheries in the region, such as the Argentine hake *(Merluccius hubbsi)*, lobster from northern Chile (yellow squat lobster - *Cervimunida johni*, red squat lobster - *Pleuroncodes monodon*, and nylon shrimp - *Heterocarpus reedi)*, and the California spiny lobster *(Panulirus interruptus)* on Mexico's Pacific coast.

Another phenomenon associated with climate change that affects fishing and aquaculture in various parts of the region is the greater frequency of harmful algal blooms (red tides), which affect the distribution of commercially important species and can kill organisms on the seafloor and in cages. Given that this phenomenon will likely be repeated, early warning systems developed in countries like Chile and the International Regional Organisation for Plant and Animal Health (OIRSA in Spanish) are very important to minimize their negative impacts (OIRSA 2017).

If environmental conditions remain at acceptable levels, fisheries of different shrimp species, which are traditionally important in Mexico, Central America, Colombia, Argentina and northern Chile, will likely maintain current production levels, which in many cases are near capacity, and could be the target of measures to increase social participation. The end of the practice of collecting juvenile shrimp in the wild will continue to allow the harmonious coexistence of capture fisheries and aquaculture based on controlled seed production, as well as market segmentation with the largest volumes produced by fishing activities.

In some countries, the tilapia market has greater potential for conflict. In Mexico, for example, the production of tilapia from aquaculture in reservoirs (based on the release of juveniles produced in a controlled environment) is very high, reaching more than 60,000 tons annually. However many of the fishes produced in this conditions are of smaller size that are commercialized in local markets where they compete unfairly with product from artisan and small fisheries, increasing the opportunities for social conflicts.

Growing technological and regulatory efforts are aimed at reducing the bycatch of fisheries and the discards of fauna caught by trawl fisheries, which reach a total 7 million tons annually, according to FAO (2011). The decreasing trend in both practices is likely to continue in the coming years due to stricter market conditions that support their eventual elimination (FAO 2011).

Artisanal fishing in Latin America, with its broad mix of scales, species and levels of organization, will continue to be an extremely important sector due to its contribution to employment and the rural economy. According to FAO (2016c), it accounts for 90% of employment in the fisheries sector. Recently, the Latin American Parliament, with the assistance of FAO, approved and published a Model Law of Artisanal Fisheries, which aims to provide a reference for countries of the region in the formulation of national legislative frameworks that protect the rights of artisanal fishermen and their families, while promoting the sustainable management of fishery resources. In this regard, an increasing number of specific regulatory frameworks are being developed, including bills in Costa Rica, Honduras and El Salvador.

A permanent dialogue should be established between institutions in the fishing sector and markets for products derived from species facing over-exploitation, in order to jointly introduce measures that ensure the sustainability of resources and social stability in coastal communities. This is particularly important in fisheries such as sea cucumber (Gen. *Holothuroidea*), jellyfish *(Stomolophus meleagris)*, fighting conch *(Strombus spp)*, lobster *(Panulirus spp)* and totoaba *(Totoaba macdonaldi)* in Central America and Mexico.

The recent acquisition of state-of-the-art research vessels by countries such as Mexico, Argentina, Peru and Chile creates new opportunities for international cooperation through South-South cooperation schemes that allow shared exploratory fishing and include coastal countries that lack resources to carry out research related to natural capital in their territorial waters or to develop new fisheries.

For its part, inland fishing could be significantly affected by processes of climate change, as well as human activities such as mining or the construction of reservoirs. In this regard, it is important to begin analyzing the situation of these fisheries nationally, and in trans-boundary basins, to establish measures that will ensure the recovery and sustainability of species in critical condition.

Aquaculture will continue its solid growth

Latin America has the largest area with potential for aquaculture expansion in the world. Even though it is a relatively recent economic activity in the region compared to other primary sectors, its 11% average annual growth rate between 2006 and 2014 (Table 2) is much higher than other primary sectors. Production is expected to continue increasing in the coming years, stimulated by growth in demand for aquaculture products in local markets and a gradual increase in private investment in mariculture.

In addition to the main species by volume and value that are currently produced, and which are concentrated in four taxonomic groups (salmon, shrimp, tilapia and mussels), a significant number of emerging species could contribute in an important way to commercial aquaculture in the region in the next decade. These include the Peruvian scallop *(Argopecten purpurata)*, the cachama blanca *(Piaractus brachypomus)* and cachama negra *(Colossoma macropomum)* in Colombia; the paiche *(Arapaima gigas)* in Peru and Brazil; the catfish (Pseudopltystoma spp.), the pacu (Piaractus mesopotamicus) and the tambaqui *(C. macropomum)* in Brazil, and farm-raised tuna *(Tunnidae)* in Mexico (see Table 2).

Table 2. Main species farmed in LAC in the period 2000-2014.

Species		Scientific name	Volume (thousands of tons)						Value (millions of USD, 2015)					
			2000-2002	2006-2008	2009-2011	2012-2012	% of total 2012-2014	Cumulative %	2000-2002	2006-2008	2009-2011	2012-2012	% of total 2012-2014	Cumulative %
1	Whiteleg shrimp	*Penaeus vannamei*	186.9	459.4	514.5	627.4	24.6	24.6	1331.9	2171.2	2524.3	3460.4	26.0	26.0
2	Atlantic salmon	*Salmo salar*	228.8	365.5	207.0	512.2	20.1	44.7	1105.4	2757.3	1561.4	3492.6	26.3	52.3
3	Tilapias	*Oreochromis (=Tilapia) spp*	70.3	125.2	203.2	271.4	10.7	55.4	230.8	303.9	540.5	588.5	4.4	56.7
4	Chilean mussel	*Mytilus chilensis*	33.3	155.8	225.7	241.4	9.5	64.9	52.9	470.7	723.1	1750.0	13.2	69.9
5	Rainbow trout	*Oncorhynchus mykiss*	116.9	175.2	253.3	236.0	9.3	74.1	496.1	1092.7	1786.1	1461.5	11.0	80.9
6	Pacific salmon	*Oncorhynchus kisutch*	110.9	105.3	146.4	155.2	6.1	80.2	500.9	457.3	88.3	721.1	5.4	86.8
7	Cachama negra	*Colossoma macropomum*	23.0	47.5	65.8	113.5	4.5	84.7	70.0	121.5	193.6	306.4	2.3	88.6
8	Nile Tilapia	*Oreochromis niloticus*	35.2	82.0	105.2	99.0	3.9	88.5	108.1	209.2	349.0	308.5	2.3	90.9
9	Peruvian scallop	*Argopecten purpuratus*	22.1	34.4	54.4	54.2	2.1	90.7	169.3	380.0	516.3	508.8	3.8	94.8
10	Tambacu	*P. mesopotamicus x C. macropomum*	12.4	12.4	22.3	36.2	1.4	92.1	35.6	28.5	59.0	81.0	0.6	95.4
11	Pacú	*Piaractus brachypomus*	10.1	2.9	13.8	22.8	0.9	93.0	37.6	8.1	41.9	64.7	0.5	95.9
12	Carps	*Cyprinidae*	0.0	11.3	27.5	22.0	0.9	93.9	0.0	31.2	78.2	51.5	0.4	96.3

(Continued Table 2)

Species		Scientific name	Volume (thousands of tons)						Value (millions of USD, 2015)					
			2000-2002	2006-2008	2009-2011	2012-2012	% of total 2012-2014	Cumulative %	2000-2002	2006-2008	2009-2011	2012-2012	% of total 2012-2014	Cumulative %
13	Brown mussel	*Perna perna*	10.6	11.7	13.6	18.9	0.7	94.6	7.6	9.5	20.8	27.3	0.2	96.5
14	Cachama	*Piaractus mesopotamicus*	6.1	13.4	18.1	16.1	0.6	95.2	21.5	38.2	59.5	48.4	0.4	96.8
15	Catfish	*Siluroidei*			3.3	15.7	0.6	95.8			14.5	56.6	0.4	97.3
16	Silver carp	*Hypophthalmichthys molitrix*	14.4	17.4	16.1	15.6	0.6	96.5	15.1	18.8	16.6	14.6	0.1	97.4
17	Tambatinga	*C. macropomum x P. brachypomus*	0.1	2.9	6.2	10.7	0.4	96.9	0.4	6.7	16.4	30.2	0.2	97.6
18	Yamú	*Brycon amazonicus*			2.1	8.1	0.3	97.2			7.4	24.7	0.2	97.8
19	Osteíctios	*Osteichthyes*	21.1	14.0	13.0	7.7	0.3	97.5	24.8	15.7	28.2	28.6	0.2	98.0
20	African catfish	*Clarias gariepinus*	0.4	1.8	5.7	6.6	0.3	97.8	1.3	2.4	6.4	6.2	0.1	98.0
21	Paiche or pirarucú	*Arapaima gigas*		0.0	0.9	5.8	0.2	98.0		0.1	5.9	25.8	0.2	98.2
22	Pacific bluefin tuna	*Thunnus orientalis*	0.3	2.4	2.9	5.4	0.2	98.2	6.8	21.0	17.3	38.6	0.3	98.5
23	Cortez oyster	*Crassostrea corteziensis*	0.4	0.6	0.9	4.8	0.2	98.4	0.6	0.9	1.3	2.3	0.0	98.5
24	Common carp	*Cyprinus carpio*	67.4	39.1	3.5	4.6	0.2	98.6	97.6	46.3	5.8	7.6	0.1	98.6
25	Boga	*Leporinus spp*			0.0	3.0	0.1	98.7			0.1	9.0	0.1	98.7
26	Pacific oyster	*Crassotea spp*	1.6	2.3	2.1	2.7	0.1	98.8	3.4	5.1	4.9	3.9	0.0	98.7
27	Shad	*Prochilodus spp*	2.9	3.2	4.1	2.7	0.1	98.9	6.7	4.6	13.1	8.2	0.1	98.8
28	Pacific oyster	*Crassotea gigas*	6.4	2.9	2.3	2.7	0.1	99.0	12.0	6.6	3.6	2.9	0.0	98.8
29	Netted prochilod	*Prochilodus reticulatus*	1.0	4.1	2.0	2.5	0.1	99.1	3.7	11.5	5.9	6.9	0.1	98.8
30	Ribbed mussel	*Aulacomya ater*	0.8	1.1	2.3	2.3	0.1	99.2	1.8	2.6	7.5	2.0	0.0	98.8
31	Other	Other	28.3	29.8	25.4	20.6	0.8	100.0	141.6	113.5	117.5	154.4	1.2	100.0
Total			1011.9	1723.7	1963.7	2547.9	100.0		4483.7	8334.8	9614.3	13 293.4	100.0	

Source: FAO 2016b.

The development of the mariculture sector, which is still pending in the region, requires a multi-sectoral approach that considers each country's natural capital with a long-term vision. In addition, the exchange of knowledge and experiences between countries is essential within the framework of South-South and triangular cooperation in order to decrease risks and strengthen capabilities. The region boasts ideal conditions for the development of coastal and marine fish farming, which if combined with environmentally and socially sustainable practices, the adaptation of technologies to local conditions and favorable public policies could facilitate commercial mariculture.

Prices of production inputs remain one of the main constraints for the development of aquaculture in the region, especially for small-scale aquaculture, which has the capacity to contribute to food and nutritional security and in the elimination of rural poverty. In this regard, efforts on different fronts to research and develop alternative, low-cost aquaculture feed have had some success. In some Colombian communities, a FAO research project has helped a significant number of producers to completely replace commercial fish feed with locally produced feed (Flores-Nava 2017). The exchange of this type of knowledge will help to replicate the results elsewhere, and improve the competitiveness of limited-resource aquaculture producers in Colombia and, gradually, throughout the region.

The recurrence of epizootic diseases in regional aquaculture clearly represents one of the main risks for the expansion of the activity. However, health and safety systems in practically all the countries of the region are better prepared to deal with these problems. Proof of this is that, in recent years, the effects of diseases on the industry in general have been significantly lower than in the 1980s and 1990s when shrimp production was hit by virus outbreaks.

Although limited-resource aquaculture, including micro and small enterprises, generally lacks resources to ensure its long-term sustainability, it represents an important segment of family producers, many of whom are also engaged in family farming. This segment is expected to continue growing and contributing to food production and local economies, provided that public policies are strengthened to support the development of this activity.

Policy Recommendations

A new multi-sectorial approach is essential for the development of fishing and aquaculture in the region

A multi-sectoral approach is needed to face the multiple problems and constraints that hinder the development of fisheries and aquaculture in the region. The sector-based framework and institutional structure that prevails in most countries of the region continues to limit inter-institutional cooperation and policy complementarities, especially at the territorial level. In this regard, the establishment of permanent inter-institutional mechanisms is highly recommended to develop a systemic view of problems and their solutions, which would help formulate policies that promote the development of all sectors as a means to contribute to comprehensive territorial development.

The institutional framework for fishing and aquaculture should be improved

The traditional institutional logic has led to a direct relationship between the size of primary sectors and the size and importance of related institutions. This means that undeveloped sectors, despite their potential social and economic contribution, tend to have weak institutions and low importance

in the government's organizational structure. In this regard, it is necessary to determine the best institutional mechanisms in each country that can lead to the development of the fishing and aquaculture sectors by increasing their political importance and prioritization on national development agendas. If fisheries and aquaculture maintain their current low position in the region's institutional structure, they will continue to miss opportunities that would otherwise lead to their expansion and development.

Modern regulatory frameworks are necessary

Important progress has been made in countries of the region to develop regulatory frameworks for fishing and aquaculture, which ensure clear rules for investment and sustainable use of fisheries and aquaculture resources. However, there are important asymmetries in many countries with outdated laws. The current economic, environmental and geopolitical situation requires the incorporation of important issues in regulatory frameworks to achieve more sustainable management. These include an eco-systemic approach to fishing and aquaculture; international agreements to fight IUU fishing; climate change and its effects, and rights-based fisheries governance.

The information gathering system should be strengthened to improve decision-making

Management decisions related to these sectors should be based on the best scientific information available, which means efforts to strengthen institutional capacities in the evaluation of fisheries and aquaculture resources are essential, as well as developing and implementing monitoring programs to develop adequate management measures that ensure the sustainability of fisheries resources and the communities that use them.

Monitoring, inspection and surveillance systems urgently need to be strengthened

One of the main threats to the sustainability of national fisheries resources is IUU fishing. The weakness of monitoring, inspection and surveillance systems is a common denominator that prevents the effective implementation of laws. In this regard, coordinated inter-institutional programs are urgently needed that strengthen surveillance, generate social awareness about the importance of protecting resources, and promote the participation of users in monitoring and protection.

Social participation mechanisms in fisheries management should be strengthened

The most effective way of managing fisheries and aquaculture resources is through the direct participation of users. Therefore, the development of formal mechanisms that promote the informed and transparent participation of fishermen and aquaculture producers in decisions related to the management of these resources is highly recommended.

Developing the capacities of limited-resource, micro and small-scale aquaculture producers should be a priority

Limited-resource, micro and small-scale aquaculture producers represent thousands of families who contribute to the food security and economies of rural communities. However, they face important challenges to ensure their sustainability. Policies should be designed, and implemented, aimed at strengthening the organizational and technological capacities of these producers to improve their competitiveness and access

to markets. In this context, it is important to consider the important role of women and incorporate a gender-based approach.

Climate change adaptation measures need to be strengthened

Given the threat posed by climate change, it is important to research the vulnerability of the fisheries and aquaculture sector in each country, identifying gaps and potential areas of intervention to strengthen the resilience of fishing and aquaculture communities, while also promoting a multi-sectoral dialogue to generate comprehensive adaptation strategies.

Conclusion

In Latin America, fisheries and aquaculture offer significant potential for food production and employment generation, in addition to bringing in foreign exchange through exports. However, both of these activities, and capture fishing in particular, face major challenges associated with climate change, illegal fishing and the weakness of information systems for decision-making.

Despite a contraction in the volumes of marine catches, production will continue to grow driven by the strong expansion of aquaculture. This rate of growth could generate greater social benefits within a framework of sustainability and organization, but the relevant institutions need to be strengthened and policies developed with a comprehensive vision of territorial development that includes fishing and aquaculture.

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2.5 Forest

Forests and the 2030 Agenda
for Sustainable Development

While the rate of forest loss is slowing in Latin America and the Caribbean, deforestation in the region is still significant in relation to the annual rate of global deforestation and reduces the likelihood of achieving the Sustainable Development Goals in the region.

Facts

- In Latin America and the Caribbean, which has a forest cover equivalent to 46.4% of the region's total land area, or 23% of the world's forest area, forests are essential for the fulfilment of the Sustainable Development Goals (SDGs).
- While the rate of forest loss is slowing in the region, from 4.45 million hectares per year during the period 1990-2000 to 2.18 million hectares per year during the period 2010-2015, deforestation in LAC is still significant in relation to the annual rate of global deforestation and reduces the likelihood of achieving the SDGs in the region.
- In order to reduce the rate of deforestation, countries in the region have made efforts to promote sustainable forest management (15.7% of forests are under forest management plans), increase the forest area that is legally protected (32.8% of the total forest area is in protected areas), and expand the area of certified forest, although this process is still incipient (1.8% of the total forest area is certified).
- SDG 15 "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss," explicitly includes the sustainable management of forests in the 2030 Agenda for Sustainable Development (Agenda 2030). Furthermore, seven SDGs of this agenda recognize the broad functions of forests.
- The Global Climate Accord concerning mitigation of greenhouse gases and national commitments for the adaptation of livelihoods, mainly of the most vulnerable rural populations, also highlights forests and sustainable forest management as important elements in the international climate debate.

Trends

Latin America and the Caribbean (LAC) have abundant forestry resources. The total forest area in the region amounts to 935.5 million hectares, which corresponds to 46.4% of the total area in the region and 23.4% of the total forest area in the world (FAO 2015b).

Table 1. Area of forests, woodlands and land under other uses (2015)

Sub-region[1]	Forests		Other woodlands		Other lands		Land area	Inland waters	Total area
	Thousand ha	% of total area	Thousand ha	% of total area	Thousand ha	% of total area	Thousand ha	Thousand ha	Thousand ha
Southern Cone	62 015	15.3	79 025	19.4	265 432	65.3	406 471	6692	413 164
Amazon	779 996	58.2	77 405	5.8	482 728	36.0	1 340 128	27 121	1 367 249
Mesoamerica	86 290	35.2	25 831	10.5	133 105	54.3	245 227	3439	248 666
Caribbean	7195	31.9	1065	4.7	14 267	63.3	22 528	815	23 343
Latin America and the Caribbean	**935 496**	**46.4**	**183 326**	**9.1**	**895 532**	**44.5**	**2 014 354**	**38 068**	**2 052 422**

Source: FAO 2015b.

Around 83% of the forest area in the region is found in countries that share the Amazon sub-region, while only 1% is in the Caribbean. Mesoamerica has 9% and the Southern Cone has 7% of the total forest area in LAC. Five countries account for 80% of the total forest area in Latin America and the Caribbean, including Brazil, which has more than half of the total area (53%).

Table 2. Forest area of the five countries with largest forest cover in LAC.

Country	Thousands of ha	% of forest area in LAC (2015)
Brazil	493 538	53
Peru	73 973	8
Mexico	66 040	7
Colombia	58 502	6
Bolivia	54 764	6

Source: FAO 2015b.

1 Amazon: Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname and Venezuela. Mesoamerica: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua and Panama. Southern Cone: Argentina, Chile, Falkland Islands, Paraguay and Uruguay. Caribbean: Anguilla, Antigua and Barbuda, Aruba, Bahamas, Bermuda, British Virgin Islands, Cayman Islands, Cuba, Dominica, Dominican Republic, Granada, Guadeloupe, Haiti, Jamaica, Martinique, Montserrat, Netherlands Antilles, Puerto Rico, Saint Kitts and Nevis, Santa Lucia, Saint Martin (French part), Saint Vicente and the Grenadines, San Bartolomé, Trinidad and Tobago, Turks and Caicos, and the United States Virgin Islands.

About 46% of the forest area in the region is considered to be "primary forest", 2% is planted forest, and the remaining 52% is naturally regenerated forest[2]. Globally, this compares to an average area of 32% primary forest, 7% planted forest, and 61% naturally regenerated forest (FAO 2015c).

The region continues to lose forest area, but the rate of loss is slowing, from 4.45 million hectares per year during the period 1990-2010 to 2.18 million per year during the period 2010-2015. This corresponds to a decrease in the net loss rate from 0.44% per year between 1990 and 2010 to 0.23% per year between 2010 and 2015. Net changes in forest area are the accumulative effect of processes that increase the forest area (forestation and natural forest expansion) and deforestation.

The slowdown is mainly due to the fact, that Brazil reduced its annual rate of forest loss from 2.54 million hectares during the period 1990-2000 to 0.98 million hectares during the period 2010-2015, in response to actions designed to strengthen the implementation of the Forest Law and prevent the conversion of woodland to other uses. In addition, the sub-regions of Mesoamerica and the Southern Cone have also shown a reduction in the annual loss of forest area (FAO 2015c).

Although the rate of deforestation in Brazil during the period 2010-2015 was three times that of Argentina, which is second in order of magnitude, it also saw the largest drop in the annual rate of deforestation in the region. In order of magnitude of deforestation, Brazil and Argentina are followed by Bolivia, Peru and Mexico, all with annual deforestation of more than 100 000 hectares.

Table 3. Rate of annual change in forest area of the five countries with the highest rates of deforestation in LAC.

Country	Forest area (thousands of ha)					Annual rate of change							
						1990-2000		2000-2010		2010-2015		1990-2015	
	1990	2000	2005	2010	2015	Thousand ha/yr	%	Thousand ha/yr	%	Thousand ha/yr	%	Thousand ha/yr	%
Brazil	546 705	521 274	506 734	498 458	493 538	-2543.1	-0.5	-2281.6	-0.4	-984.0	-0.2	-2126.7	-0.4
Argentina	34 793	31 860	30 186	28 596	27 112	-293.3	-0.9	-326.4	-1.1	-296.8	-1.1	-307.2	-1.0
Bolivia	62 796	60 091	58 734	56 209	54 764	-270.4	-0.4	-388.2	-0.7	-289.0	-0.5	-321.2	-0.5
Peru	77 921	76 147	75 528	74 811	73 973	-177.4	-0.2	-133.6	-0.2	-167.6	-0.2	-157.9	-0.2
Mexico	69 760	67 856	67 083	66 498	66 040	-190.4	-0.3	-135.8	-0.2	-91.6	-0.1	-148.8	-0.2

Source: FAO 2015b

2 Primary forest: Naturally regenerated forest, composed of indigenous species in which there are no obvious signs of human activity and where ecological processes have not been altered significantly; Planted forest: Forest composed predominantly of trees established by planting and/or seeding; Naturally regenerated forest: Forest in which there are obvious signs of human activity.

Meanwhile, the Caribbean has shown a net increase in forest area in the period 2010-2015, mainly due to the abandonment of sugar cane plantations and other agricultural lands. This increase in forest area is particularly evident in Cuba, the Dominican Republic, Puerto Rico and Trinidad and Tobago. Outside the Caribbean, Chile, Costa Rica and Uruguay are the only countries that have shown an increase in forest area according to FAO (2015b).

In terms of planted forest, in 2015 LAC had an estimated 15.6 million hectares, which corresponds to a significant increase since 1990 when there were 8.8 million hectares (the average increase in planted forest in the region is 280,000 hectares per year). This increase reflects the global trend towards an increase in planted forest area with the aim of providing lumber to the forest industry with more homogenous characteristics than wood from natural forests.

Five countries are particularly important in terms of planted forest area (more than 1 million hectares) - Brazil, Chile, Argentina, Peru and Uruguay. Although the regional area of planted forest increased during the period 1990-2015, as indicated above, a reduction in the rate of annual deforestation in the countries with the largest area of planted forest was observed during the period 2010-2015. Of these countries, only Chile and Peru recorded an increase in annual rates of reforestation compared to previous periods, and only Brazil and Chile showed higher average annual rates between 2010 and 2015 compared to the period 1990-2015. In other words, an overall increase in planted forest area in the region was observed in the period 1990-2015, with a decrease in reforestation efforts towards the end of period.

Table 4. Annual rate of change in planted forest area of the five countries in LAC with the largest reforested areas.

Country	Forest area (thousands of ha)					Average annual change in planted forest area							
						1990-2000		2000-2010		2010-2015		1990-2015	
	1990	2000	2005	2010	2015	Thousand ha/yr	%	Thousand ha/yr	%	Thousand ha/yr	%	Thousand ha/yr	%
Brazil	4984	5176	5620	6973	7736	19.2	0.4	179.7	3.0	152.6	2.1	110.1	1.8
Chile	1707	1936	2063	2384	3044	22.9	1.3	44.8	2.1	132.0	5.0	53.5	2.3
Argentina	766	1076	1173	1187	1202	31.0	3.5	11.1	1.0	3.0	0.3	17.4	1.8
Peru	263	715	754	993	1157	45.2	10.5	27.8	3.3	32.8	3.1	35.8	6.1
Uruguay	201	629	782	979	1062	42.8	12.1	35.0	4.5	16.6	1.6	34.4	6.9

Source: FAO 2015b.

In general, the actions taken in LAC to promote the conservation and sustainable use of forests show their importance for a range of environmental services, such as the protection of river basins, carbon sequestration, or habitat conservation, as well as for sustainable development in the region. These actions have resulted in an increase in the percentage of forests in protected areas, the size of the area under sustainable forest management, and the certification of forests.

In this regard, as of 2015, 32.8% of the total forest area in the region was in protected areas. In overall terms, this amount has increased substantially, from 114.6 million

hectares in 1990 to 305.4 million hectares by 2015. Almost 36% of forests in the Amazon are in protected areas, while in the Caribbean and Mesoamerica the figure is about 20%, and in the Southern Cone 12.2%.

In addition, it is estimated that about 147 million hectares of forest in LAC are under a forest management plan. The majority of this area is in the Amazon (almost 123 million hectares), followed by Mesoamerica (19 million hectares, mostly in Mexico), the Caribbean (2.7 million hectares, mostly in Cuba), and the Southern Cone (2.1 million hectares). The predominant scheme of forest certification in the region is the Forest Stewardship Council (FSC) with 12.8 million hectares certified in 2014. This is followed by the Programme for the Endorsement of Forest Certification (PEFC), which has certified 3.5 million hectares, and national certification schemes, which have certified about 0.3 million hectares. There are 18 countries in the region with forests certified by the FSC: four in the Southern Cone, seven in the Amazon, and seven in Mesoamerica (FAO 2015c).

Table 5. Area of certified forest and number of certified forest management plans.

Sub-region	FSC (2014)		PEFC (2014)		National (2012)	
	Thousand ha	Number of plans	Thousand ha	Number of plans	Thousand ha	Number of plans
Southern Cone	3569	4	1905	1	0	0
Amazon	7785	7	1637	1	0	0
Mesoamerica	1451	7	0	0	207	1
Caribbean	0	0	0	0	98	2
Latin America and Caribbean	**12 805**	**18**	**3542**	**2**	**306**	**3**

Source: FAO 2015b.

Outlook

Forests and sustainable forest management are important elements for the fulfilment of many of the Sustainable Development Goals (SDGs). Their importance is likely to grow with greater recognition of their social, economic and environmental benefits for sustainable livelihoods (SDG 1 and SDG 2), food production (SDG 2), health and well-being of humans (SDG 3), generation and conservation of environmental services (SDG 6), the production of renewable energy and materials for resilient human settlements (SDG 7 and SDG 11), the generation of income and employment (SDG 8), as well as the provision of services to face climate change and mitigate its impacts (SDG 13).

The importance of forests for the implementation of the 2030 Agenda is growing

The SDGs recognize the broad functions of forests, especially in the framework of SDG 15 **"Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss."**

This SDG explicitly includes the sustainable management of forests in the 2030 Agenda.

Forests are home to more than 75% of the world's biodiversity. Around 17% of the world's forests are in legally protected areas, which represents an area of 651 million hectares. The region has the greatest biodiversity of the planet (the Amazon is one of the most important ecosystems globally from the perspective of biodiversity and the climate system), and includes several of the world's mega-biodiverse countries. The percentage of forests in protected areas of the region is almost twice the global average; 32.8% of the total area of forests of the region lies within protected areas, all of them native forests. Around 18% of the forests in the region, or 168.46 million hectares, have been designated specifically as areas for the protection and conservation of biodiversity, which is a significant increase since 1990, when only 48.67 million hectares of forests were designated for this function. This increase reflects the importance of forests to society, beyond the provision of lumber, due to the varied ecosystem services they provide.

There are 2 billion hectares of deforested and degraded land in the world in need of restoration. Forestation and reforestation are cost-effective alternatives for the restoration of degraded lands. Forest restoration could help to reduce poverty, improve food security, mitigate the effects of climate change, conserve biodiversity, increase the protection of soil and water and increase the total forest area from 31% to 47%. The region has 12% of all the arable land on the planet. During the last 50 years (1961-2011), the agricultural area in the region increased significantly, from 561 million hectares to 741 million hectares, with the strongest expansion in South America, where the area rose from 441 million hectares to 607 million hectares. Higher production usually goes hand-in-hand with the intensive use of inputs, degradation of soil and water sources, reduction of biodiversity and deforestation. As a result, 14% of global soil degradation has occurred in LAC, with the most serious situation in Mesoamerica, where 26% of land is affected compared to 14% in South America (FAO 2016d).

Through their responsible and sustainable management, forests and the ecosystem services they provide (goods and services), do not just contribute to fulfilling SDG 15, but also the following SDGs: SDG 1 "To end poverty in all its forms throughout the world"; SDG 2 "Put an end to hunger, achieve food security and nutrition improvement, and promote sustainable agriculture"; SDG 3 "Ensure a healthy life and promote well-being for everyone of all ages,"; SDG 6 "Guarantee the availability of water and its sustainable management and sanitation for all"; SDG 7 "Ensure access to affordable, safe, sustainable energy for all"; SDG 8 "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all"; SDG 11 "Make cities and human settlements inclusive, safe, resilient and sustainable"; and SDG 13 "Adopt urgent measures to combat climate change and its effects".

Forests allow the diversification of incomes in rural areas, especially of the most vulnerable

It is not always possible to quantify the contribution of forests to the fulfilment of the SDGs, owing to the lack of data and the difficulty of collecting comparable socio-economic and environmental information in the region. In terms of **SDG 1 "To end poverty in all its forms throughout the world"**, forests contribute to the local and national economy, especially in rural areas, where they provide income through the commercialization and use of wood and non-wood forest products, as well as environmental services.

A report by FAO on the State of the World's Forests (FAO 2014b), estimated that the

formal contribution of the forestry sector[3] to the economy of the region reached USD 49 billion at 2011 prices, as part of a global contribution of USD 606 billion. Both figures represent 0.9% of gross value added in total GDP at the regional and global level.

Table 6. Gross value added by the forestry sector in LAC and the world.

Region	Gross value added by the forest sector (USD billions at 2011 prices)				Gross value added by the forest sector (% of total GDP)			
	Forests	MAP	PP	Total	Forests	MAP	PP	Total
Latin America and the Caribbean	14	12	24	49	0.3	0.2	0.4	0.9
World	169	170	266	606	0.3	0.3	0.4	0.9

Note: Forests = forestry and logging; MAP = sawn wood and wood panels; PP = pulp and paper

Source: FAO 2014b

In addition to the income generated by the sale of wood, some forest owners can also receive payment for environmental services (PES). These payments consist of remuneration received by the owners or managers of forest resources for the provision of environmental services, such as the protection of river basins, carbon storage, or habitat conservation.

The income obtained from PES depends on the year, the season, and the duration of the programmes, but generally has shown an upward trend. For example, in the period between 2005 and 2010, worldwide PES revenues slightly exceeded USD 1.9 billion a year, which rose to USD 2.5 billion in 2011. In Latin America and the Caribbean, average annual PES income from 2005 to 2010 was USD 91 million, which rose to USD 164 million in 2011 (FAO 2014b).

Table 7. Income from payments for environmental services provided by forests.

Region	Promedio de ingresos anuales en concepto de PSA (en millones de USD)	
	2005-2010	2011
Latin America and the Caribbean	91	164
World	1863	2535

Source: FAO 2014b

3 Includes forestry and logging activities; production of sawn wood and wood panels; and, production of pulp and paper.

In many cases, the use, exchange and trade in wood and non-wood forest products, which constitute an important source of income for a large part of the rural population in some countries, are informal and therefore are not reflected in national accounts. Some estimates of income from "informal" wood production suggest that the total amount is relatively important. In 2011, it was estimated that, globally, informal wood production reached USD 33 billion, of which approximately one third came from the production of firewood and the other two thirds from charcoal. A very small amount of income is generated from the informal production of construction materials, but the amount is uncertain and the actual numbers may be higher. Meanwhile, revenues from non-wood forest products could reach USD 88 billion worldwide, which is higher than the income from informal wood production. However, the situation is different in Latin America and the Caribbean (FAO 2014b). Informal income associated with wood production is higher (USD 8.97 billion) than revenues from non-wood forest products (USD 3.64 billion).

Table 8. Estimated income from informal forestry production.

Region	Income generated from informal production (USD millions at 2011 prices)							
	Wood				Non-wood forest products			
	Firewood	Charcoal	Timber	Total	Medicinal plants	Animal origin	Vegetable origin	Total
Latin America and the Caribbean	3909	5067	0	8976	29	646	2963	3638
World	12 060	21 055	159	33 274	697	10 596	76 810	88 013

Source: FAO 2010, 2014b, 2017.

Estimated income from informal wood products (USD 8.976 billion), non-wood forest products (USD 3.638 billion) and environmental services (USD 164 million), corresponds to 26% of the gross value added of the forestry sector to the regional economy (USD 49.0 billion).

Forestry activities represent a source of employment and income for the rural population

The forestry sector in the region employs around 1.3 million people, which corresponds to 0.5% of the total workforce. This figure is slightly higher than the world average of 0.4%, which is equivalent to an estimated 13.2 million people.

Table 9. Employment in the forestry sector and share of the total workforce.

Region	Employment in the forestry sector (millions, 2011)				Proportion of total workforce employed in the sector (%)			
	Forests	LWP	PP	Total	Forests	LWP	PP	Total
Latin America and the Caribbean	0.4	0.6	0.4	1.3	0.1	0.2	0.1	0.5
World	3.5	5.4	4.3	13.2	0.1	0.2	0.1	0.4

Note: Forests = forestry and logging; LWP = lumber and wood panels; PP = pulp and paper

Source: FAO 2014b

Informal employment in the forestry sector includes the production of wood that is not reflected in official statistics (e.g., informal production of fuelwood and charcoal, materials used for housing, small handicraft enterprises, or other handicrafts), as well as workers employed in the commercial production of non-wood forest products (NWFPs). There is little information available on employment in these activities, which are known to play an important role in developing countries (FAO 2014b).

Table 10. Workers employed in the production of fuelwood and charcoal in LAC and the world as a proportion of total workforce.

Region	Estimate of the number of people involved in the production of fuelwood and charcoal (equivalent to fulltime work, millions in 2011)					Proportion of total employment (%)
	For urban use		For rural use		Total	
	Firewood	Charcoal	Firewood	Charcoal		
Latin America and the Caribbean	6.3	2.3	5.7	1.8	16.0	3.6
World	18.3	16.1	74.5	6.4	115.3	1.2

Source: FAO 2014b.

Non-wood forest products continue contributing to the nutrition and health of local populations

The forest sector contributes to **SDG 2 "End hunger, achieve food security, improve nutrition, and promote sustainable agriculture"**. At the global level, FAO estimates that 750 million people live in or near forests, and that 500 million people living in open forests may depend on them for their livelihoods. These people could depend directly on forests, for example through the consumption and sale of foods obtained in them, or indirectly through jobs and income related to forest products, forest ecosystem

services and forest biodiversity. Foods of the forest, such as leaves, seeds, nuts, honey, fruits, fungi, insects and other forest animals have been important components of rural diets for millennia.

In Latin America and the Caribbean, around 5.6 million tons of edible forest products are consumed annually, including 95% of vegetable origin (2011). This figure implies per capita consumption of 9.4 kg of NWFPs, which is second only to Asia and Oceania with per capita consumption of 14.6 kg. Even so, the consumption of NWFPs in the region corresponds to only 7.4% of the global consumption of these products.

Table 11. Total and per capita consumption of foods from forests.

Region	Total consumption (thousands of tons, 2011)			Per capita consumption (kg, 2011)		
	NWFPs of animal origin	NWFPs of vegetable origin	Total	NWFPs of animal origin	NWFPs of vegetable origin	Total
Latin America and the Caribbean	271	5360	5631	0.5	9.0	9.4
World	3578	72 560	76 138	0,5	10.4	10.9

Source: FAO 2014b.

The caloric contribution of food from forests is relatively low, accounting for only 0.6% of the total caloric intake worldwide. In LAC, this value is 0.5% and corresponds to 15.7 kcal/person/day. However, it is likely that these figures underestimate the contribution of total forest food consumption since information about the production (and consumption) of these products is incomplete (FAO 2104b).

In addition, it is important to recognize that these products, which are mainly consumed by people in rural areas, help to improve their diets and contribute to food security. Unfortunately, there is little information about these nutrition strategies, which means the importance of forest products cannot be accurately determined.

Table 12. Foods from forests and their contribution to the total food supply.

Region	Food supply provided by edible NWFPs (kcal/person/day, 2011)			Contribution to total food supply (%, according to FAO statistics)		
	NWFPs of animal origin	NWFPs of vegetable origin	Total	NWFPs of animal origin	NWFPs of vegetable origin	Total
Latin America and the Caribbean	3.3	12.4	15.7	0.5	0.5	0.6
World	2.8	13.7	16.5	0.6	0.6	0.6

Source: FAO 2014b.

In addition to the contribution of NWFPs to food security, forest products can also have an impact on the health of the inhabitants of rural areas, given that forests are an important source of medicinal plants, which are commonly used in traditional medicine in all rural areas of the continent **(SDG 3 "Ensure healthy lives and promote well-being for all at all ages").** It is estimated that income from medicinal plants in the region is around USD 29 million at 2011 prices. However, it is likely that this figure is substantially lower than the real value because there is no official record of the use or trade in these plants for this purpose, and also because these plants are used informally on a daily basis. According to the information provided by the State of the World Forests 2014 (FAO 2014b), about 28% of households in LAC use plant-based medicines on a daily basis, many of which come from forests.

The supply of water is an ecosystem service provided by forests

The region of Latin America and the Caribbean is well endowed with water resources. With only 15% of the global land area and 10% of the world's population, it receives 29% of the planet's rainfall. However, in the last three decades the extraction of water in the region has doubled, while growing at a rate much higher than the world average. In LAC and worldwide, the agricultural sector, and especially irrigated agriculture, uses around 70% of the available water (FAO 2016d).

Forests regulate the water cycle, prevent water loss and encourage infiltration of rainwater, which replenishes the soil and underground water tables. Forests help maintain a high quality of water, increase the amount of water available, and regulate the flow of surface waters and groundwater. In addition, they contribute to the reduction of risks related to water such as landslides, floods and droughts and prevent desertification and salinization[4]. This function is essential for the supply of clean drinking water, as well as for agricultural and other uses. When deforestation occurs, it generates soil erosion and water quality is altered. In this regard, forests contribute to the fulfilment of **SDG 6 "Ensure availability and sustainable management of water and sanitation for all".**

Worldwide, about a third of the forest area is designated for the conservation of soil and water. In LAC, 74.48 million hectares of forest served this function in 1990, which increased only slightly to 74.80 million hectares in 2005. By 2015, that area had reached 81.96 million hectares, which represented 8.76% of the forest cover in the region, but is still below the global average.

Considering that LAC has 15% of the global land area and receives 29% of the rainfall, albeit distributed heterogeneously in the region, the availability of water is relatively high compared to other regions. This implies the need to provide higher levels of forest cover in the region to protect soils and promote the regulation of the hydrological regime, in order to improve the availability of water for human consumption and agricultural use, and reduce levels of soil degradation. In other words, the growth in forest area with the main function of soil and water conservation should be maintained, at least until reaching a level that is equivalent to the global average.

Wood energy is an important source of renewable energy for a population with limited resources

An important contribution of forests for many segments of society is the wood used for cooking and sterilizing water, which has

4 http://www.fao.org/sustainable-forest-management/toolbox/modules/forest-and-water/basic-knowledge/es/

positive impacts both on food security for people in rural areas and ensuring their supply of energy. An estimated 2.4 billion people worldwide use wood as fuel for cooking, which means forests contribute directly to **SDG 7 "Ensure access to affordable, safe and sustainable energy and for all".** Wood energy, which is often the only energy source available in rural areas of the least developed countries, is especially important for the poor (FAO 2016d).

Globally, fuelwood harvested from forests provides 496 million tons of oil equivalent (TOE) and the processing of forest products another 277 million TOE, which in total represents 773 million TOE. This figure represents about 6% of the total primary energy supply (TPES) in the world. In LAC, wood energy provides 109 million TOE, which is equivalent to 13% of the energy matrix, or around double the global average of 6%. In addition, 16% of households in the region use wood as a primary fuel for cooking, which benefits some 95 million people.

Fossil fuels in LAC are responsible for 63% of the energy supply (36% oil and 27% natural gas). Fuelwood represents only 7% of the total supply, which is about the same level as hydroelectric power, which accounts for 8% of the total. According to the Latin American Energy Organization (OLADE), countries of the region have established renewable energy targets for 2035 ranging from 20% to 85% of their total energy matrix. In the context of these goals, wood energy can become an important alternative for countries of the region where there are more than 200 million hectares in need of forest restoration, and only 2% of forest cover corresponds to forest plantations.

Table 13. Population that uses wood and wood products for cooking.

Region	Estimated population that uses wood for cooking (thousands, 2011)			Proportion of total households that use wood as a primary fuel for cooking (%)		
	Firewood	Charcoal	Fuelwood	Firewood	Charcoal	Fuelwood
Latin America and the Caribbean	89 569	5383	94 952	15	1	16
World	2 234 890	169 108	2 403 998	32	2	34

Source: FAO 2014b.

Wood is an important material for construction

Wood also helps to meet basic housing needs since it is used as a construction material. This is important in rural areas of LAC, especially if wood is available at low prices, or if it can be directly collected by individuals and families for use in their own homes **(SDG 11 "Make cities and human settlements inclusive, safe, resilient and sustainable").**

In civil construction, wood is used mainly in walls (15% of households), ceilings (7%) and floors (4%). Globally, forest products are used in the construction of 18% of homes and provide housing for about 1.3 billion people. At the regional level, it is estimated that 73.4 million people live in houses that use forest products as the main construction material, which corresponds to 12% of the total number of households (FAO 2014b).

The Inter-American Development Bank (IDB) reports that one of every three families in LAC (59 million people) lives in inadequate housing, structures made from poor materials or structures lacking basic services. The housing deficit is high. Wood, with its relatively low cost compared to other building materials and ease of handling, is an important option to close the housing gap in countries of the region, especially in those with a greater availability of this resource.

Forests are essential for climate change adaptation and mitigation

Forests are linked in various ways to climate change and its effects **(SDG 13 "Adopt urgent measures to combat climate change and its effects"):**

a) Sustainable forest management and agroforestry systems are important elements in agricultural production, which in certain situations can promote the adaptation of livelihoods to climate change and mitigate its effects, thereby reducing the vulnerability of farmers.
b) Sustainably managed forests can produce renewable energy, which represents a less harmful alternative to fossil fuels.
c) Forests contribute almost one-sixth of global carbon emissions worldwide due to deforestation and land degradation caused by human activities.
d) Forest ecosystems and their natural resources are sensitive to climate changes, which affect their productivity and quality of their products and services.
e) Forests have the potential to absorb, through their biomass, soils and products, about 10% of global carbon emissions expected in the first half of this century[5].

On this last point, in 2015 LAC had an estimated 107.3 billion tons of carbon in living forest biomass. This amount is equivalent to 36% of global carbon stocks contained in 22% of the global forest area. In other words, the region has forests with a relatively high content of carbon in live forest biomass (an average 114.6 tons of CO2eq per hectare of forest). In this regard, deforestation in LAC, in addition to its social, economic, biological and environmental impacts, has climatic effects due to carbon emissions that are relatively higher than those caused by deforestation in similar areas of other regions. In fact, total carbon stocks in the region's live forest biomass have declined since 1990 from 116.1 billion tons to 107.3 billion tons, due to the loss of forest area[6].

Table 14. Carbon stocks in forests of LAC.

Sub-region	Carbon stocks in live biomass			Change in existing carbon stocks (million tons/year)		Carbon stocks in live biomass by land area (tons/ha)	
	1990	2005	2015	1990-2005	2005-2015	1990	2015
Southern Cone	6936	6587	6230	-23.3	-35.7	96.3	100.5
Amazon	104 171	98 525	96 551	-376.4	-197.4	121.3	123.8
Mesoamerica	4545	4085	3907	-30.7	-17.8	47.0	45.3
Caribbean	462	649	636	12.4	-1.3	92.1	88.4
Latin America and the Caribbean	**116 114**	**109 846**	**107 324**	**-417.9**	**-252.2**	**112.4**	**114.6**

Source: FAO 2015b.

5 See http://www.fao.org/forestry/climatechange/53459/es/.

6 Ibid.

In addition, forests are important for climate change mitigation, not only for carbon storage in above-ground biomass (59% of total forest carbon stocks), but also in terms of carbon stored in organic matter in the soil (25%) and in underground biomass (13%). Meanwhile, fallen leaves and dead wood represent a much smaller source of carbon storage (less than 2% each).

While reforestation and agroforestry systems have potential for climate change mitigation in LAC, the main potential to achieve this goal, at least in the short term, lies primarily in reducing deforestation.

Policy Recommendations

The figures reported in "The State of the World's Forests 2015" (FAO 2015b) offer an overview of the current situation of forest resources in the world and, more importantly, of the changes that have occurred in the past 25 years. This information - provided by countries to FAO for this report - is the basis for the formulation of policies, the development of practices, and realizing investments that affect forests and forestry activities. Based on the policies and measures recommended in the "Non-binding legal instrument on all types of forests"[7], for the development of policies to strengthen the contribution of forests to the fulfilment of SDGs, countries in the region may consider the following recommendations:

National forest programmes: Update national forest programmes or other strategies for sustainable forest management to include policies or objectives linking forests to poverty alleviation, food security, health and well being, water availability, the development of renewable energy and the promotion of resilient infrastructure based on forest products (UN 2007). In other words, forest policies should not only focus on sustainable forest management or the conservation of forest resources, but also develop proposals as part of a national development agenda that integrate different perspectives on forests and forest management, while supporting the implementation of the 2030 Agenda.

Promotion of goods and services provided by forest ecosystems: Develop and implement policies that encourage the sustainable management of forests to provide a wide variety of goods and services that contribute to the reduction of poverty and the development of rural communities. This implies promoting the recognition not only of the environmental or economic value of forests based on the production of wood, but also of the forest's value in terms of its contribution to national and local socio-economic development through various ecosystem services and products. This could be achieved through national systems of payment for environmental services, and through initiatives to stimulate the private sector and producer associations to invest and develop a range of marketable environmental services.

Private sector and local actors: Create a favorable environment to encourage investment from the private sector, as well as the participation of local and indigenous communities, forest owners and other relevant stakeholders, in the sustainable management of forests through a framework of policies, incentives and regulations. Broad participation is important, but the responsibilities and benefits of the exploitation of forest resources should also be shared. Countries have

7 The United Nations Economic and Social Council, in Resolution 2007/40, December 17, 2007, approved a legally non-binding instrument on all types of forests with principles based on the Rio Declaration on Environment and Development's Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of All Types of Forests (Rio Forest Principles) (UN 2007).

determined that the participation of the private sector is necessary for the fulfilment of the SDGs, so public policies that promote forest management to contribute to these goals should also consider the participation in the private sector.

Inter-sectoral coordination in developing public policies: Design and implement measures to enhance inter-sectoral policy coordination among sectors affected by these policies in order to integrate the forest sector into national decision-making processes and promote sustainable forest management. This would help to address the underlying causes of deforestation and degradation, while also promoting the conservation of forests (UN 2007). Given the multi-sectoral nature of the SDGs, meeting these goals requires joint action in various sectors. Specific policies for the forest sector tend to be limited in scope and, therefore, less effective in achieving the SDGs. For this reason, inter-sectoral cooperation is necessary.

Managing threats to forests: Analyze the causes of threats to the health and vitality of forests due to natural disasters and human activities, including fires, pollution, pests, diseases and invasive alien species and propose alternatives for its solution (UN 2007). Public policies should aim to promote the resilience of forests to climate change through the incorporation of "good practices" in the design and implementation of management plans, which seek to reduce the impact of natural disasters on vulnerable sectors. It is also important to consider that climate change may exacerbate the impact of extreme weather events, natural disasters, pests and diseases, among other harmful factors.

Conservation areas: Create, develop, improve and maintain networks of protected forest areas through a range of conservation mechanisms both inside and outside protected areas. The declaration of forests as protected areas is an important instrument for promoting the conservation of forest resources, diversifying their use through tourism activities, and valuing a wider range of priority environmental services provided by forests.

Access to forest resources: Promote the access of families and small-scale forest owners, as well as local and indigenous communities that depend on forests, to forest resources and markets in order to support livelihoods and the diversification of income derived from forest management. This involves not only the development of public policies that ensure access and equitable use of forests by society, but also providing adequate technical assistance for small-scale farmers and access to financing to facilitate their investments necessary for sustainable forest management.

Conclusions

The forests of LAC cover slightly less than half of the region's land area. They provide products and services that contribute to socio-economic development and the protection of the environment. They are also essential for the lives of millions of people, mainly those living in poverty in rural areas, by providing food and other non-wood products, energy, medicines and important ecosystem services that are vital for the sustainability of their livelihoods and well being. Responsible and sustainable forest management, and actions to promote sustainable development (conservation, restoration, protection and production) of the natural resources in forest ecosystems, are essential for countries of the region to achieve the SDGs.

Sustainable forest management is an explicit objective of the 2030 Agenda incorporated in SDG 15. In addition, given the multiple functions of forests, sustainable forest management and the conservation, restoration, protection and production of forest resources can contribute to achieving several other SDGs, especially those related to poverty alleviation, food security, health

and well-being, water availability, renewable energy and infrastructure resilience.

The forestry sector, which is a cause of climate change due to emissions associated primarily with changes in land use, is also suffering the effects of climate change on productivity and the quality of goods and services produced by forest ecosystems. Avoiding deforestation, while supporting reforestation efforts and sustainable forest management, are particularly important actions to face climate change and its effects. These actions can also promote climate change adaptation, which can make the livelihoods of rural populations more resilient, and contribute to climate change mitigation by capturing greenhouse gases.

Globally, millions of people depend on forests for their livelihoods, either directly through the consumption of food from forests or through income generated by the sale of forest products. In LAC, the annual per capita consumption of edible forest products is estimated at 9.4 kg, which corresponds to 15.7 kcal/person/day. While this number seems modest, it is important to consider that consumption is not homogeneous at the national level, and is usually concentrated in rural areas and low-income populations. Therefore, deforestation, as well as being an environmental problem, is a socio-economic problem that affects vulnerable populations in rural areas.

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Chapter 3
Rural Welfare

Rural Welfare

The region shows a steady transition from agriculture to non-agriculture; between 2002 and 2014 rural LAC saw its agricultural sectors (wage and autonomous) shrink by more than one-fifth, while the wage non-agricultural sector increased by 50 %. While this developmental transition halted during the peak of the global financial crisis (2007-2010) the region managed to weather the recession with existing social programs. However, the expansion of the inactive sector indicates there is a significant skills mismatch between households leaving agriculture to enter the non-agricultural sector. In particular, skilled jobs in non-agriculture are vacant for 3 times as long as unskilled jobs: the region needs to provide training opportunities to ensure firms non-agricultural sector have a skilled workforce to draw from.

Facts

- The region continues to undergo the transition from agriculture to non-agriculture; employment in agricultural sectors shrank by 11 percentage points between 2002 and 2014. To ensure agricultural households have the skills required by the non-agricultural sector, governments should work with the private sector to design in training and retraining programs.
- Although the female labor force participation rate increased by 10 percentage points between 1990 and 2014, and the rate of female headship increased by 40 % between 2002 and 2014, there are still significant gender inequalities in the region. Three-quarters of the households headed by women are classified as inactive or in small-scale agriculture. If governments implement and enforce equal access to legal, property, and information, female empowerment and gender equality will increase.
- Between 2002 and 2014, the region experienced modest gains in non-monetary measures of welfare, such as housing quality and years of educational attainment. However, the agriculture and non-agriculture sectors faced very distinct trends. The educational attainment gap between the wealthiest and poorest actually increased in agricultural sectors (by 0.5 years of schooling). Governments should target educational investments carefully to prevent this gap from increasing.

Introduction

In 2014, there were approximately 30 million rural households[1] in Latin America and the Caribbean (LAC), which is just over 25 %t of all households. This is nearly equivalent to the total number of households in Bolivia, Chile, Colombia, Costa Rica, Honduras, Panama, Paraguay, El Salvador, and the Dominican Republic combined. While the majority of rural households, in absolute terms, live in Brazil (9.5 million) and Mexico (11.2 million), rural households continue to be an integral part of the regional economy. For more than half the countries in our sample (see Table 1 for a list of countries and years analyzed), rural households made up more than one-third of all households, even in 2014; in Honduras this figure reaches 50 %.

Despite their large share in the population, rural households are being crowded out of agriculture, due to increased land concentration (GPS, 2013)[2]. However, steady increases in the region's non-agricultural activities (Gindling and Newhouse, 2014) have allowed some rural households to consider transitions from agriculture to other productive activities. It is crucial, then, to understand how agricultural and non agricultural rural households are faring and to estimate whether they are reaping at least some of the economic benefits they conferred on the region, and how governments can further support their development.

In this chapter, we analyze the welfare of rural households in the Latin America and Caribbean region (see Table 1). The analysis is based on a classification designed to categorize households by employment type, utilizing national household surveys. The classification identifies five mutually exclusive types of households, covering the range of productive activities in which they engage. The categories, defined according to the primary occupation of household heads, are.[3,4]:

1. Wage agricultural: household head is a wage-earning agricultural worker,
2) Wage non-agricultural: household head is a wage-earning non-agricultural worker,
3) Autonomous agricultural: household head is self-employed or owns an agricultural business,
4) Autonomous non-agricultural: household head is self-employed or owns a non-agricultural business, and
5) Inactive: household heads are not part of the labor force, because they are inactive or because they are unemployed.[5]

1 In our analyses, a rural household is one that is located outside of urban and metropolitan areas.

2 In the last 20 years, agricultural exports have grown at a rate of 8 % annually, according to the World Bank (2013).

3 The agricultural sector includes activities related to crop production, livestock, fisheries and aquaculture, and forestry production. The non-agricultural sector includes economic activities outside of these four areas.

4 The classification used in the previous report defined six types of households by the primary occupation of the household head: 1) wage agricultural, 2) wage non-agricultural, 3) employer (household heads employ others, either in agricultural or non-agricultural activities), 4) autonomous agricultural, 5) autonomous non-agricultural, and 6) inactive. Throughout the LAC region, the employer category is small (at most 10 % of all households) (ECLAC/FAO/IICA, 2015). Further, these household businesses are more similar in size and operation to households in the self-employment category than typical large-scale businesses (Gindling and Newhouse, 2014). Finally, even small fluctuations can seem weightier when the base is small, as in the case of the employer category. Thus to reduce vulnerability to year-on-year changes that may be statistically significant but have little implications for public policy, and to ensure household categories are internally consistent but markedly distinct from each other, we removed the employer category. The new classification separates employer households into their agricultural and non-agricultural components, and merges these households into the autonomous agricultural and non-agricultural categories, respectively.

5 The inactive category also includes unremunerated households, in which the head does not receive payment for work or services provided. In general, the share of household heads that do not receive remuneration is small (around one-tenth of 1 %), so that including unremunerated households with inactive ones does not change the employment distribution.

As the classification suggests, the household is the primary unit of analysis. This assumes the household is the relevant economic unit in which employment decisions are made. Further, it assumes the structure of employment within a household is representative of its productive orientation. These assumptions imply that changes within a household are indicative of the structural changes that take place within the economy as a whole.

Table 1 Household surveys: Countries and years utilized, along with sample sizes.

	pre-crisis							Post-crisis			
	2001	2002	2003	2005	2006	2007	2008	2009	2010	2013	2014
Bolivia		5746				4148		4034		9553	
Brazil		105984				117858		121163			119001
Chile			71321		73720			6285		66725	
Colombia		129164					221988		226303		228932
Costa Rica		11094				12361		13244			11405
Honduras		22010				21630			7043	7320	
Mexico		17167					29468		27655		19479
Nicaragua	4191			6882				6515			
Panama		13404				13091			13391		11857
Paraguay		3789				4812			5003		5165
El Salvador	11953						16674		21166		21129
Dominican Republic		5720				7649			8181		8089

Source: Own elaboration, country household surveys

Table 1 displays the countries, years, and the number of households sampled in the surveys utilized in our analyses. To understand differences in trends before and after the financial crisis, we compare two periods: 2002 to 2007 and 2010 to 2014. When the exact survey year is not available, we allow for +/- 1 year, as in Fry and Straub (2017). The main exception is Nicaragua, for which only 2001, 2005, and 2009 are available. Nicaragua is included in the pre-crisis period, but is excluded from the post-crisis analyses.

During the recent global economic and financial crisis that started in 2007, Latin America and the Caribbean (LAC) was the hardest hit amongst the developing regions (World Bank, 2017). After years of steady expansion, LAC experienced two years of negative growth in 2015 and 2016, the first time since the 1980s regional debt crisis (OECD/ECLAC/CAF, 2016; OECD/ECLAC/CAF, 2015; IMF, 2016; World Bank, 2017). Although positive economic growth is expected in 2017 (OECD/ECLAC/CAF, 2016; IMF, 2016; World Bank, 2017), the region will take time to recover.

To account for different trends in rural well-being before and after the global recession, we analyze changes in various welfare measures across the household employment distribution for distinct two periods: 2002-2007 and 2010-2014[6]. We utilize data from household surveys administered in 12 Latin American and Caribbean countries; Table 1 indicates the years available and the number of households surveyed in each year.

With the recent approval and pursuance of the 2030 Agenda for Sustainable Development, analysts are charged with understanding current progress towards the Sustainable Development Goals and providing policymakers with the information to design effective programs. This chapter relates rural welfare in Latin America and the Caribbean to seven of the seventeen goals.

- *Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all* (SDG 8): In the General Trends section, we analyze changes to the household employment distribution, focusing on the welfare of inactive households and households in transition.

- *End poverty in all its forms everywhere* (ODS 1) and *Reduce inequality within and among countries* (SDG 10): In the Perspectives on Poverty and Inequality section, we discuss trends in the poverty rate, the poverty gap, and income inequality (measured by the Palma Ratio).

- *Ensure healthy lives and promote well-bring for all at all ages* (SDG 3), *Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (SDG 4), and Make cities and human settlements inclusive, safe, resilient and sustainable* (SDG 11): *The Perspectives on Non-monetary Measures of Well-being section focuses on housing quality and inequalities in education.*

- *Achieve gender equality and empower all women and girls* (SDG 5): *Throughout the chapter, we conduct separate analyses to assess the region's progress towards gender parity.*

The analyses in this chapter have specific implications for public policy:

- *Training programs via private-public partnerships* to improve the skills of households leaving agriculture and reduce the skills mismatch in the non-agricultural sector.

- *Support for women and girls* via equal education, pay, and access to information to improve female empowerment now and stem the cycle on gender inequality in the long-run.

- *Investments in housing and education* to reduce inequality and promote socioeconomic mobility.

If pursued, this set of policy recommendations will further support rural households to successfully navigate a new economic and employment climate and ensure the region maintains its position as a global economic force.

6 When the exact survey year is not available, we allow for +/- 1 year, as in Fry and Straub (2017). The main exception is Nicaragua, for which only 2001, 2005, and 2009 are available.

Trends

Household employment distribution

The transition from agriculture to non-agriculture was stalled by the global financial crisis; social programs mitigated the depth of the impact.

As noted in the introduction, rural households make up more than a quarter of the region's households, as of 2014; this share has stayed fairly stable since 2000, although it decreased slightly (see Table 2).[7] The table also depicts the region's steady transition from agriculture to non-agriculture (Muchnik, Morales, and Vargas, 1997; Gindling and Newhouse, 2014). Between 2002 and 2014, rural LAC saw its agricultural sectors (wage and autonomous) shrink by more than one-fifth, while the wage non-agricultural sector increased by 50 % and the number of households classified as inactive grew by approximately one-third.

However, this developmental transition halted during the period of the global financial crisis. Table 2 shows that, with the exception of the autonomous non-agricultural sector, all other employment categories trended similarly. Sectors expanded (contracted) steadily before the crisis and faced accelerated growth (reduction) after 2010. Between 2007 and 2010, however, regional development arrested quite starkly; there is almost no discernible change in the employment distribution during this period. Starting in 2007, the region experienced sluggish growth, which lasted through 2010 (and beyond) (OECD/ECLAC/CAF, 2016). The fall in commodity prices, especially in metals and oil, upset trade balances in the region, particularly for Venezuela, Ecuador, Colombia, and Chile (IMF, 2016; OECD/ECLAC/CAF, 2016). This impacted households: upon the shock of the crisis, they paused to evaluate its progression before changing employment sectors.

Table 2. Changes in the rural household employment distribution, Latin America, 2002-2014.

	Pre-crisis		Post-crisis	
	2002	2007	2010	2014
Share of households classified as rural	29%	27%	28%	27%
Wage agriculture	18%	16%	16%	14%
Wage non-agriculture	18%	21%	22%	24%
Autonomous agriculture	33%	29%	28%	26%
Autonomous non-agriculture	12%	11%	11%	11%
Inactive	19%	22%	23%	25%

Source: Own elaboration, country household surveys

Table 2 shows changes in the rural household employment distribution before and after the global financial crisis. While the share of households classified as rural is fairly constant between 2002 and 2014, rural households fluctuate significantly between employment categories. The table depicts the region's steady transition from agriculture to non-agriculture. Further the table portrays three distuingishing trends: 1) the expansion of the inactive sector from 2002 to 2014, 2) arrested regional development between 2007 and 2010, and 3) a stagnant Autonomous non-agricultural sector.

7 Country-specific numbers are available in the Appendix.

Note that trends slowed or even stalled in all employment sectors. This includes the inactive sector which did not balloon, even with decreased employment levels caused by the financial crisis (IMF, 2016). The previous report (ECLAC/FAO/IICA, 2015) noted that despite the economic crisis, poverty rates fell substantially throughout the region (see also the next section), positing the expansion of social programs (cash transfers) as a possible reason for this phenomenon.[8] A larger social safety net also likely accounts for the stagnant employment distribution, especially of the inactive sector, between 2007 and 2010. Although households faced reduced income flows, they could prevent transition to the inactive sector by utilizing government programs. However, as discussed below, though direct transfers and public works programs provided a stop-gap for at-risk households, they did not improve their employment prospects (ILO, 2016; OECD/ECLAC/CAF, 2016).

Box 1. Spotlight SDG 5: Gender disparities within the household employment distribution.

Sustainable Development Goal 5 focuses on achieving gender equality and female empowerment. Over the last forty years, LAC demonstrated considerable progress towards this goal, exhibiting large gains in gender parity for education, health, and labor force participation (Chioda, 2016). In particular, the increase in the regional female labor force participation rate was the largest in the world, and currently nears the level of the United States (Novta and Wong, 2017).*

To the extent that female household headship could proxy for female empowerment, Appendix 1 indicates regional gains in this context. Between 2002 and 2014, the region saw a 40 % increase in the share of rural households headed by women. However, Appendix 1 also shows the total rate of rural female headship is low: less than 25 %. This likely reflects regional social norms regarding gender roles: it is men who are designated as the household heads, even when both men and women contribute to total household welfare (Chioda, 2016).

Thus households headed by women will likely be single-earner households. They will be more vulnerable to economic shocks and at risk for poverty. This is depicted by their employment distribution: throughout the region more than half of the households headed by women are categorized as inactive, while 25 to 30 % are in autonomous employment (Figure 1). There remains, then, considerable gender disparity regarding the opportunities available to low-income, unskilled women.

Policies to support these households, further empower women, and achieve gender parity should entail:

8 As listed in ECLAC/FAO/IICA (2015), these social programs include conditional cash transfers such as Bolsa Verda (Brazil), Mi Familia Progresa (Guatemala), and relaxing pension eligibility requirements (Colombia Mayor, Colombia). More information about these policies is available on the website for the Economic Commission for Latin America and the Caribbean (www.cepal.org/en/).

(Continued Box 1)

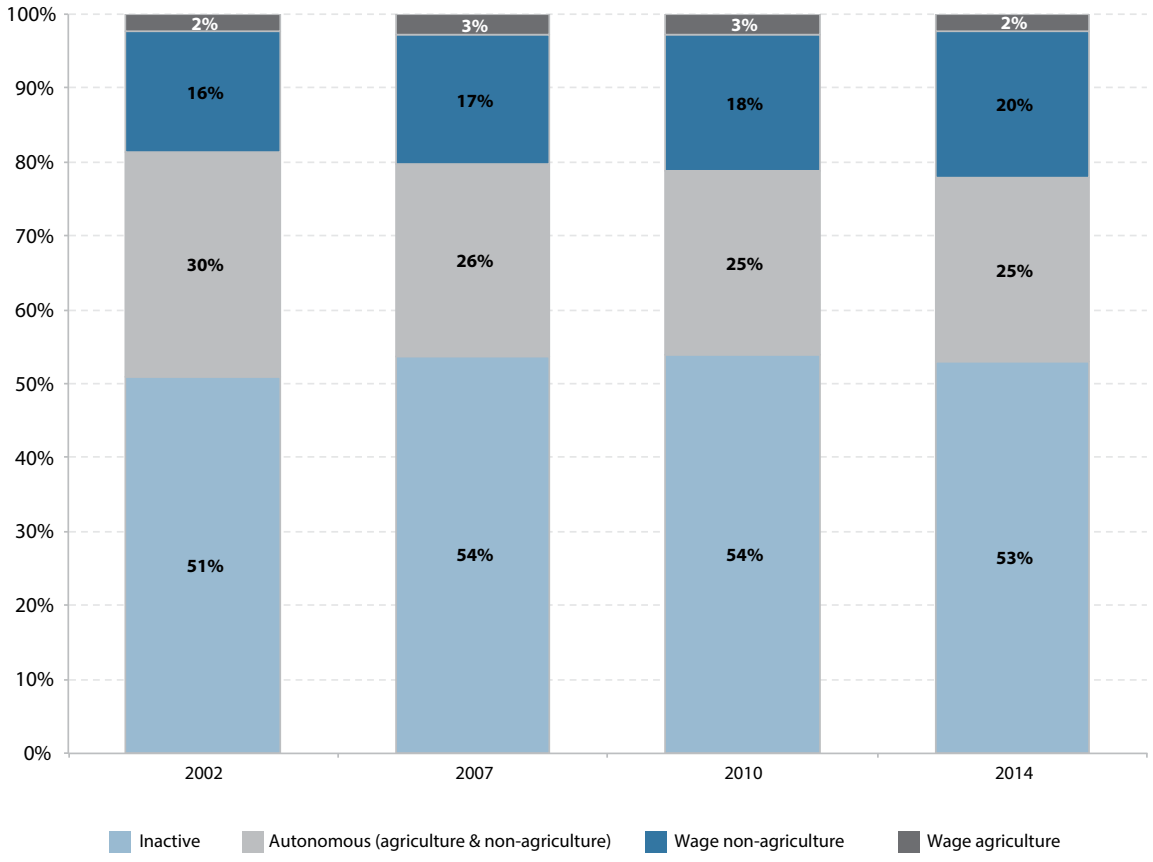
- ***Greater support of indigenous populations.*** For many countries in the region, indigenous populations are often geographically isolated, with limited access to public services. This is a particular issue in Guatemala, Bolivia, Peru, and Mexico (Chioda, 2011). By improving support for indigenous peoples, countries will reduce gender gaps along multiple fronts (e.g. education and pay), this increasing female empowerment and progress towards overall gender parity.

- ***Equal legal and property rights and access to information.*** While many countries in the LAC technically provide women with legal equality, enforcement of these protections is often weak (IMF, 2017 citing Goodwin and Whelan, 2015). Ensuring that women have equal rights and, just as importantly, are aware of these rights, will increase female empowerment and improve gender parity in the short and long term. With increased legal protection, women will have greater control over financial resources, increasing intra-household equality (short-term benefit). This will benefit the next generation of girls: when women have greater control household resources, they direct more money towards girls' education and health (Chioda, 2011; Chioda, 2016).

- ***Parity in the work place.*** This would include equal pay and general parental leave (instead of separately designating maternity and paternity leave). The former increases the incentive for women to enter the labor force, as the opportunity cost of time increases. The latter reduces a firm's preference to employ men, since every employee will have the same parental benefits.

* In 1990, the female labor force participation rate in LAC was 44 %; by 2014, this rate increased to 54 % (Novta and Wong, 2017).

Figure 1. Relative changes in the regional rural female-headed household employment distribution, 2002-2014



Source: Own elaboration using household country surveys

Figure 1 depicts the employment distribution for rural households headed by women, which has stagnated for 12 years. More than half of these households remain in the inactive sector, indicating limited employment prospects for rural women.

An expanding inactive sector and a stagnant autonomous non-agricultural sector indicate the need for strong retraining programs and greater support for entrepreneurs

Figure 2 portrays two regional trends that distinguish themselves from the rest. The first is the expansion of the inactive sector over the 2002 to 2014 period. As discussed in the 2015 report (ECLAC/FAO/IICA), this likely reflects that households leaving agriculture were not able to immediately find employment in non-agriculture. The inactive sector seems to act as a transition state, allowing household heads the time to change their skill set according to the demands of the non-agricultural sector. The hazard of the inactive sector operating as such, is that without high-quality retraining programs, households will be trapped in this state for extended periods.

The second notable trend is that compared to other sectors, the share of households engaged in autonomous non-agriculture between 2002 and 2014 remained stable, and perhaps could be considered stagnant. This likely reflects the high degree of informal employment that persists in the region. Despite the non-agricultural sector experiencing a high growth period, informality was close to 50 % in 2013 (ILO, 2014; IDB, 2016).[9] The region's transition to non-agriculture puts agricultural workers at risk. Without proper retraining, they are forced to enter the informal sector where they are much more vulnerable (due to lower wage and little or no job or social security). This is precisely why so many countries in the region fell into the middle-income trap, and why so few (excepting Chile and Uruguay) have managed to escape it (OECD/ECLAC/CAF, 2016).[10]

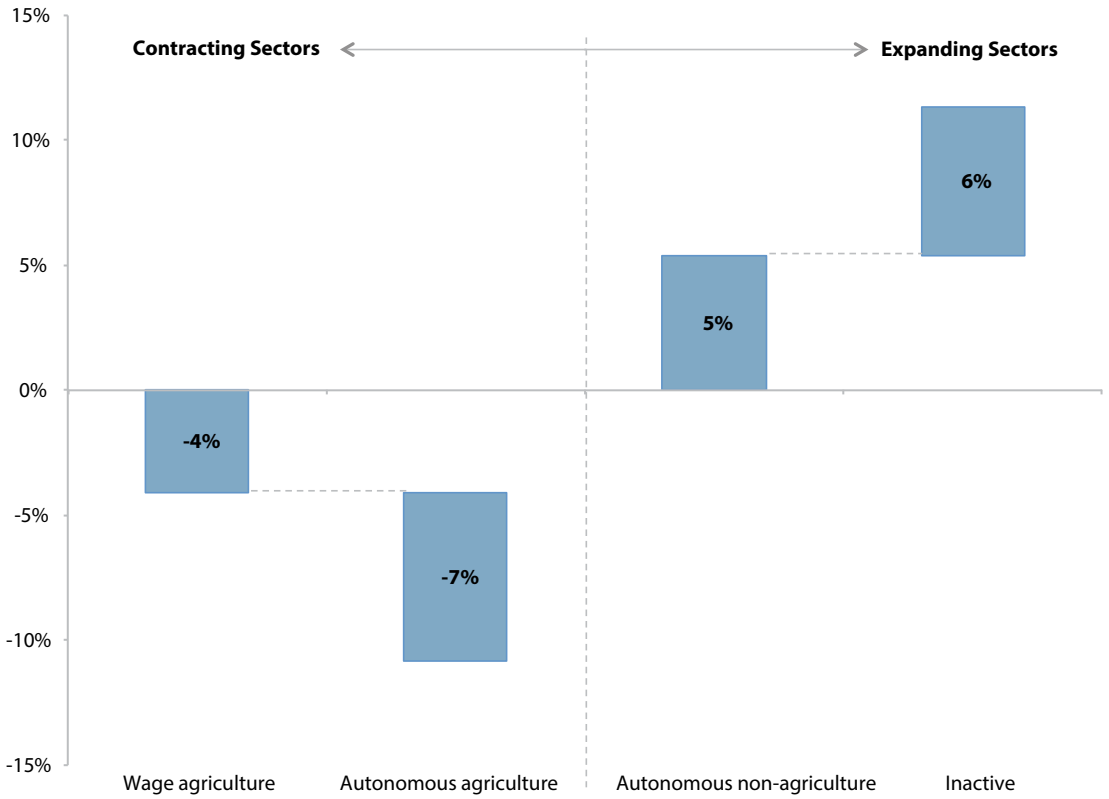
Figure 2 quantifies the agricultural to non-agricultural transition the LAC region has and continues to experience. Agricultural sectors are contracting while non-agricultural sectors expand. To ensure transitioning agricultural households do not become trapped in the inactive sectors, governments must implement high-quality retraining programs, providing households with the necessary skills to succeed in non-agriculture.

Taken together, these trends suggest the need for a new policy approach. Social programs, an integral part of the region's policy portfolio, were appropriate when poverty was rampant and GDP low. Their successful implementation facilitated the steep drop in poverty. To maintain the growth and development of the 1990s and 2000s, governments need to seek active solutions that promote skills acquisition to ensure long-term poverty reduction and continued economic growth (IDB, 2016). It is only recently that governments increased spending on active labor market policies (Cerutti et al., 2014). However, there continues to be a significant mismatch of the skills firms demand and those workers provide. In the LAC skilled jobs are vacant for more than 3 times as long as unskilled jobs (OECD/ECLAC/CAF, 2016). To reduce the skills mismatch and high degree of informality and overcome the middle-income trap, governments should provide job search assistance (short-term gains) and provide retraining and support for entrepreneurs (long-term gains) (Kluve, 2016; Hennig et al., 2015; IDB, 2016; Cerutti et al., 2014).

9 The extent of informality does differ throughout the region. According to the OECD/ECLAC/CAF (2016), some LAC countries (Honduras, Nicaragua, Guatemala, Peru) face informality rates of more than 80 %. In other countries (Chile, Costa, Uruguay) informality is less severe, about 40 %.

10 The middle-income trap can occur as countries transition from low-income to middle-income. The high growth stemming from early development stagnates, and nations find themselves "stuck" if there is limited skilled labor, favorable investment climate, and a strong institutional environment to support entrepreneurship (OECD/ECLAC/CAF, 2016).

Figure 2. Contracting and expanding sectors of the regional rural household employment distribution, 2002 to 2014



Source: Own elaboration using household country surveys

Perspectives: Rural income poverty and inequality

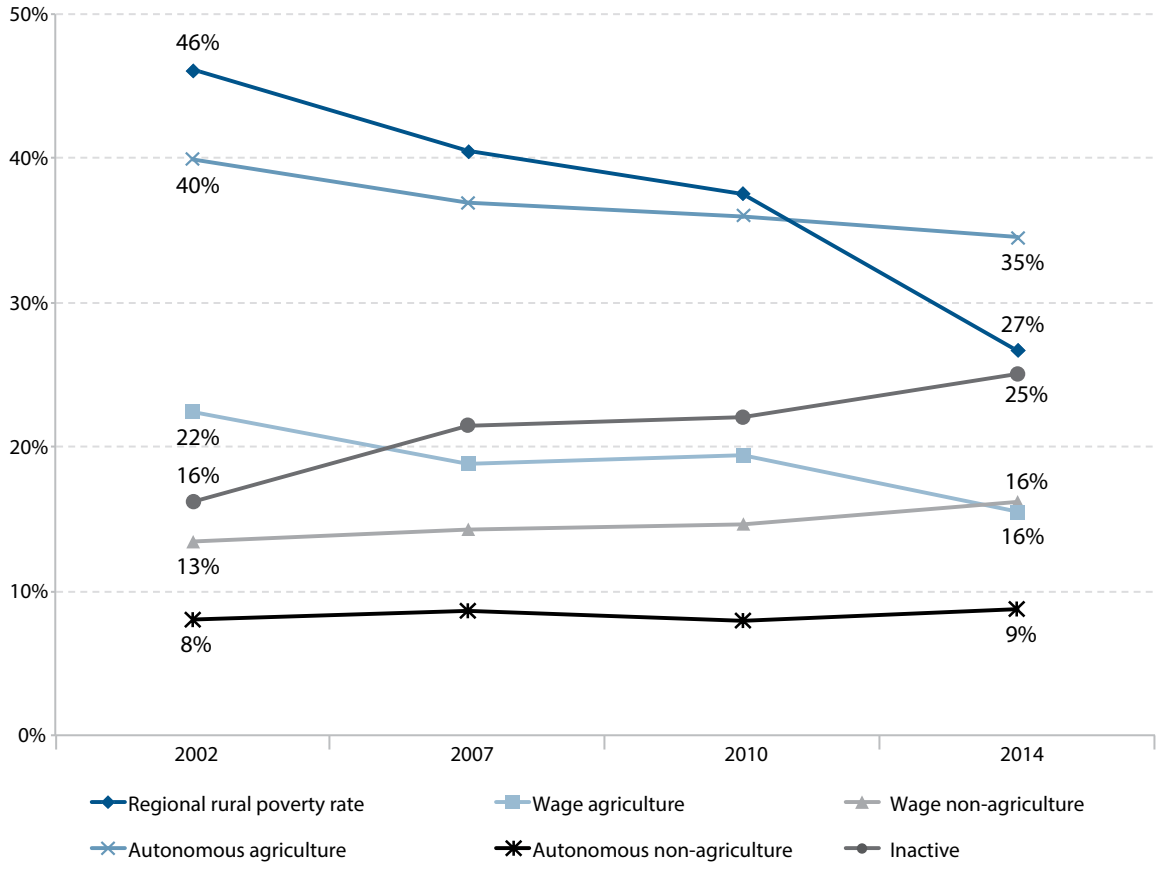
While sectors with a large skills mismatch faced higher poverty rates, all employment sectors experienced decreases in the poverty gap and inequality, due to an increased social safety net

We derive regional poverty as a population weighted average of national poverty rates, which were computed using official poverty lines. This allows us to capture the inherent differences in living standards and cost throughout the region, rather than using a fixed dollar amount. For example, a household income of $10 000 implies a vastly different quality of life in Chile versus Honduras.

Combined, Figures 3, 4, and 5 portray the severity of household poverty and inequality in the region before, during, and after the financial crisis. What emerges is an interesting and surprising picture. Between 2002 and 2014 and especially in the post-crisis period, the extent and severity of poverty decreased throughout the region, along with income inequality (discussed in the previous report

ECLAC/FAO/IICA, 2015). However, some households that moved from agriculture into non-agriculture or inactivity did face worse economic situations: the poverty rates in these sectors increased. As discussed throughout this chapter, this is likely due to skills mismatch that limits employment opportunities for these households. Crucially, the sectoral analysis reveals that increased poverty does not automatically result in increased poverty depth or income inequality. That is, despite higher poverty rates, the poverty gap and Palma Ratio decreased in these sectors.

Figure 3. Reductions in the regional household poverty rate across the employment distribution, 2002 to 2014



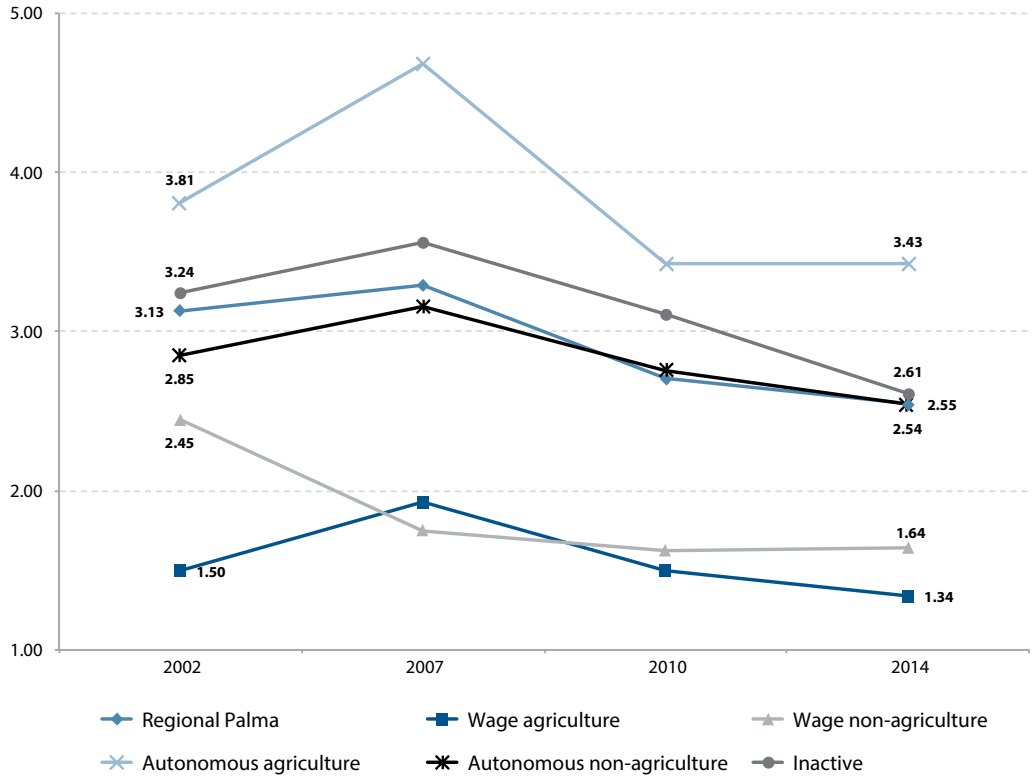
Source: Own elaboration using household country surveys

Figure 4. Reductions in the regional household poverty gap across the employment distribution, 2002 to 2014

Source: Own elaboration using household country surveys

This peculiar combination of trends was likely due to the confluence of the agricultural to non-agricultural transition, the global financial crisis, and subsequent governmental policy response. Between 2002 and 2007, prior to the crisis, households switching from agriculture experienced a skills mismatch in the labor market, resulting in increased poverty rates in the non-agricultural and inactive sectors and a greater poverty gap. The onset of the crisis and the expansion of social programs resulted in lower poverty rates and reduced poverty gaps in all sectors. Thus government assistance not only prevented deep poverty, but actually resulted in poor households moving towards the poverty line and a narrowing of the income distribution.

Figure 5. Changes in the regional (income) Palma Ratio across the employment distribution, 2002 to 2014



Source: Own elaboration using household country surveys

Figures 3, 4, and 5 show trends in the regional household poverty rate, poverty gap, and income inequality, disaggregated by employment sector. In the post-crisis period (after 2010), poverty and inequality decreased at the regional level. However, the sectoral analysis shows households moving from agriculture into non-agriculture or inactivity faced greater poverty. However, this increased poverty did not result in increased poverty depth or income inequality. That is, despite higher poverty rates, the poverty gap and Palma Ratio decreased in these sectors.

BOX 2. Spotlight SDG 10: Reductions in income inequality

We utilize the Palma Ratio to measure income inequality. It is calculated as the ratio between the amount of wealth owned by the richest 10% and poorest 40% of the income distribution. Apart from its statistical advantages, the Palma Ratio is easy to interpret: a 50 % decrease implies an equivalent transfer of wealth from the top decile to the bottom four deciles.* As such, the Palma has become popular in policy discussions, which even considered including a "Palma target" in the post-2015 development agenda (Cobham, Schlogl, and Sumner, 2015).**

Figure 5 shows that between 2002 and 2014, the region experienced large fluctuations in income inequality (and subsequently, the Palma). Although net regional inequality decreased by 20 % by 2014, pre- and post-crisis analyses reveal distinct trends. As the region rapidly grew between 2002 and 2007, income inequality increased (the Palma increased by 5 %). This was driven primarily by the agricultural sectors: in wage agriculture the Palma increased by nearly 30 %, in autonomous agriculture by nearly a quarter. Government programs supported the poorest 40 %, reducing the Palma between 2010 and 2014.

With respect to the 2030 agenda and inequality goals, significant work remains. As of 2014, only Mexico and El Salvador achieved Palma Ratios below 2 (El Salvador started at a Palma of 2.1 in 2002). Thus the Doyle and Stiglitz (2014) goal of reaching a Palma of 1 is unlikely. However, LAC countries are progressing towards the Engber-Pederson (2013) proposal of halving the gap between the current Palma and 1. Between 2002 and 20014, Bolivia, Colombia, and Mexico experienced Palma decreases of 25-35 %. Interestingly, Bolivia and Mexico saw the largest reductions after the crisis, while Colombia made greater advances before 2007. If these trends continue, all three countries are on track to halve the gap between their current Palma Ratios and a Palma of 1 by 2030.

In contrast, Honduras and the Dominican Republic saw greater inequality: the Palma Ratio increased by 25-35 % over this same period. With regional growth expected to trend upwards again in the next few years and resulting contraction of social programs, we may see inequality increase again. Policies to support the bottom 40 % must take priority to ensure the poor also partake in the gains from economic development.

* See the previous report (ECLAC/FAO/IICA, 2015) for a detailed explanation of the measure and why it is our preferred indicator for income inequality.

** Doyle and Stiglitz (2014) suggest a Palma of 1 by 2030, which may be ambitious for countries with high inequality. In contrast, Engber-Pederson (2013) proposes a country-specific, contextualized goal: halving the gap between the current Palma and a Palma equal to 1.

Perspectives: Non-monetary measures of well-being

Regionally, housing and educational gaps have narrowed slightly; but wide variations across countries and sectors underlie these trends.

Recently, and particularly with the launch of the Sustainable Development Goals, policy makers and analysts have turned to non-monetary measures of welfare to better understand well-being (Alkire and Sumner, 2013; Ferreira and Lugo, 2013; Battiston et al., 2013; Santos et al., 2015). For any individual (poor or not), income does not fully capture quality of life: well-being is multifaceted. Thus only by understanding deprivations in other dimensions, such as education and housing, can policymakers better understand how to best support their underserved populations.[11]

In the analysis conducted by ECLAC, we focused on regional housing and education because these variables capture short- and long-term welfare respectively.[12] We adapt the Palma Ratio to the non-monetary context, comparing outcomes for the wealthiest 10% of the population to the poorest 40%. The region has had varied success across these indicators (OECD/ECLAC/CAF, 2016); engaging in such an analysis allows us to recognize progress made and identify areas for improvement.

Housing

Housing is a basic and immediate need;[13] without it, families are exposed to the elements, increasing the likelihood of malnutrition and illness. Using the quality of housing construction, we can assess the extent to which this primary need is being met. We measure housing quality via an index constructed from four variables: construction material of the floor and walls, whether the house has access to electricity, and the type of sewage system.[14] To have a comparable measure across countries and years, we standardize the index (mean = 0, standard deviation = 1).[15] We take the difference in the standardized measure between the richest 10% and the poorest 40% and derive a housing Palma.[16]

Figure 6 depicts the regional trends in housing quality from 2002 to 2014. The average difference between the wealthy and the low-income is consistent for most of this period. Overall, the top 10% of the income distribution enjoy a quality of housing that is 0.7 standard deviations greater than the bottom 40%. We do observe greater housing equality by 2014. This consistent with the trend in Figure 5: low-income households used the benefits from regional social programs to support their housing needs.

11 In fact, the OECD and ECLAC are developing a new framework and new indicators to best measure welfare in the LAC region. The initiative puts greater focus on well-being and sustainability, in light of the Sustainable Goals agenda (OECD/ECLAC/CAF, 2016).

12 This is a simplification; these variables (and many others) have implications for welfare in the short- and long-term. Designating such a classification allows for a more streamlined analysis and discussion, as well as clearer policy implications.

13 The concept of basic needs was introduced by the International Labour Organization (ILO) at its 1976 World Employment Conference (ILO, 1977).

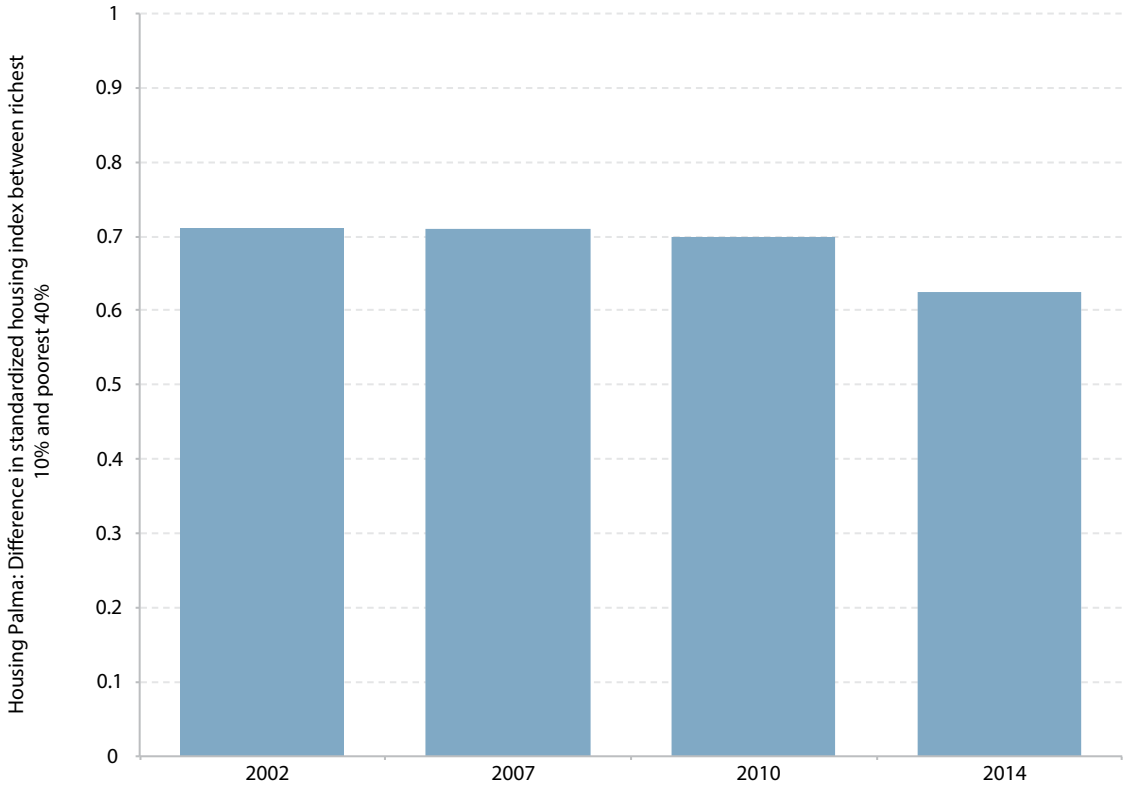
14 Arias and De Vos (1996) set the UN standard for a housing quality index, updated versions of which are still in use today (Fiadzo, 2011; Galiani et al., 2017).

15 Ost, Gangopadhyaya, and Schiman (2017) discuss the advantages of standardization.

16 Panama does not have housing construction information (for any year); Colombia does not have these variables in 2002; Brazil does not have information on the construction material for the floor of the dwelling.

The difference in access to adequate housing between the wealthy and poor underscores the need for government intervention. Our index considers access to the most basic of housing needs: proper construction, electricity, and hygienic sanitation systems, yet we still measure significant inequalities in the region. With proper housing, low-income households can overcome the first hurdle in their transition from poverty, and subsequently invest more in their own human capital. In their analysis of Techo, a program to improve housing quality in El Salvador, Mexico, and Urugay, Galiani *et al.* (2017) find that an investment of $1000 (for a pre-fabricated house) raises the average housing quality index by nearly 0.5 standard deviations. If all regional governments made such investments, the housing gap between the poorest 40% and the richest 10% would be halved.

Figure 6. Changes in the regional rural housing quality Palma Ratio across the employment distribution, Latin America 2002 to 2014



Source: Own elaboration using household country surveys

Figure 6 shows trends in the regional housing quality Palma, defined as the difference in the standardized housing index between the richest 10% and the poorest 40%. Between 2002 and 2010, trends in housing inequality were steady, with the richest 10% facing a higher housing quality (by 0.7 standard deviations) than the poorest 40%. While this gap shrank by 2014, there is still a large gap in access to adequate housing between high-income and low-income rural households.

Education

Education impacts multiple generations: investment in parental human capital today affects current income and children's future socioeconomic mobility. Thus by measuring current educational deprivations, we can glimpse into likely paths future economic development will take. Our measure is the difference in completed years of schooling between the wealthiest 10% and the poorest 40% of the income distribution. Figure 7 shows the regional and sectoral trends in this measure before and after the financial crisis.

Between 2002 and 2014, the region made some gains: between the wealthiest 10% and the poorest 40%, the average difference in years of schooling fell to below 2 years.[18] However, underlying this achievement are wide geographic and sectoral variations. Bolivia, Chile, Costa Rica, and Panama all saw educational inequality widen by around 1 year of schooling (Appendix 5), a trend that was not limited to the crisis. In contrast, Brazil, Colombia, and the Dominican Republic narrowed the educational gap by more than three-quarters of a year.

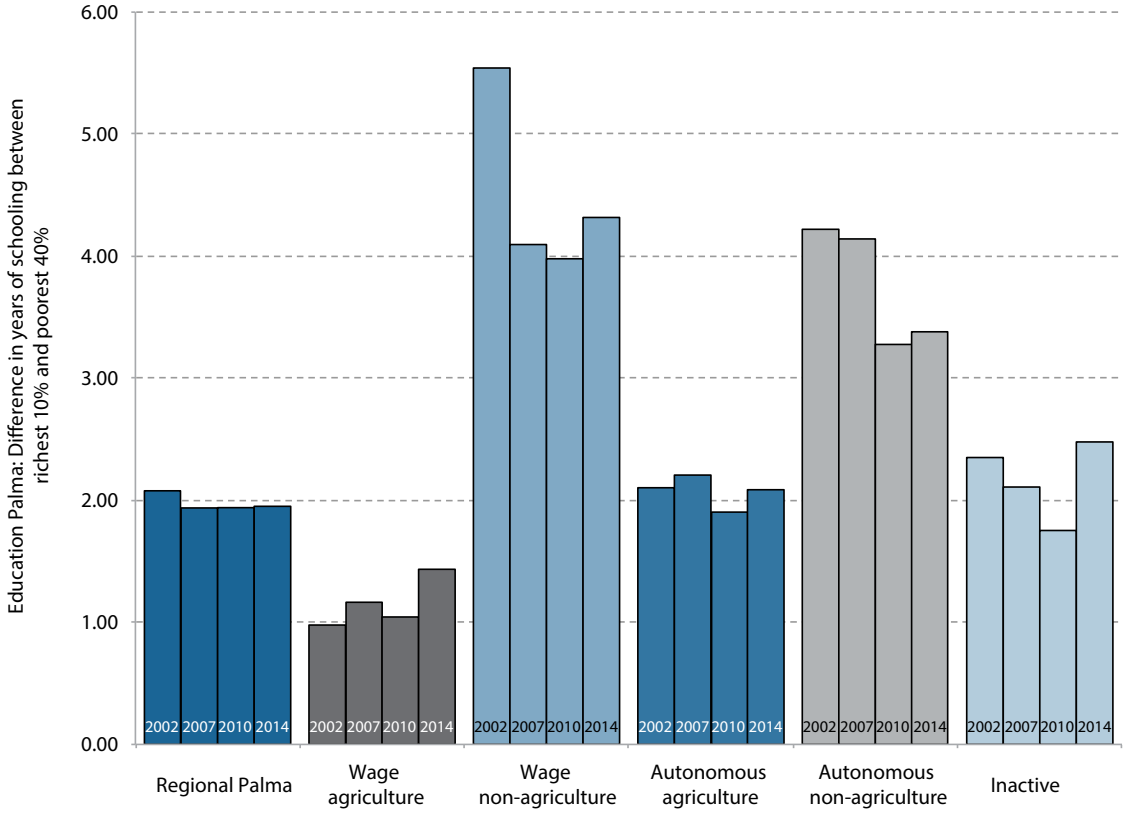
The non-agricultural sectors saw a narrowing of the educational attainment distribution, while agricultural sectors saw an increase. Combined with the trends observed in Figure 2, we infer that the households for which it was advantageous to make the leap into non-agriculture were those with average or relatively high years of education. As these households transition, the agricultural sectors became more unequal with respect to educational attainment.

The implication of these trends is two-fold. To achieve greater educational equality, countries will have to invest in education. However, these investments need to be carefully targeted to ensure the most vulnerable have access to quality education. Otherwise the region will continue to face greater polarization between the non-agricultural and agricultural sectors, with households in the latter being left behind.

Figure 7 shows trends in the regional educational Palma, defined as the difference in total years of schooling between the richest 10% and the poorest 40%. Between 2002 and 2014, regional educational inequality decreased. However, the sectoral trends vary much more. Between 2002 and 2014, agricultural sectors face higher educational inequality, while non-agricultural sectors face lower inequality. This could indicate that the households able to transition from agriculture to non-agriculture are those with more years of education, causing the educational gap to widen in agriculture and narrow in non-agriculture.

18 As a reference, in 2002 the region's wealthiest 10% received nearly 4 years of schooling, while the poorest 40% received approximately 1.5 years of schooling. By 2014, the wealthiest 10% attained nearly 4.5 years of schooling, and the poorest 40% attained about 2.5 years.

Figure 7. Changes in the regional rural educational Palma Ratio across the employment distribution, Latin America, 2002 to 2014



Source: Own elaboration using household country surveys

Policy Implications

The analyses in this chapter show that the Latin American and Caribbean countries have made considerable gain in improving rural welfare in recent years. However, the global financial crisis has had a significant impact on the region, and for Latin America to emerge even stronger, it will require policies that are designed for and targeted towards the poor and underserved. We suggest a comprehensive three-pronged policy approach to ensure continued economic development, reduced inequality, and gender parity in the short- and long-term.

Training programs via public-private partnerships

Households leaving agriculture must have access to training and retraining programs so they have the appropriate skills for non-agricultural work. Such training will avoid the skills mismatch observed throughout the region, and reduce the vacancy period for skilled jobs. Designing these skills acquisition programs in conjunction with the private sector ensures workers will have the skills firms are demanding. Further, it will reduce

government costs if firms are providing the training. In the short-term, workers will be able to manage the transition from agriculture to non-agriculture more easily, without facing extended unemployment. In the long-run, these additional skills can support socioeconomic mobility. Governments can incentivize corporate participation in employee training by providing tax credits for firms offering retraining courses or working with training centers to design effective curricula.

Supporting women and girls

To achieve gender parity in the short-term, governments must ensure women have equal skills, pay, and access to information. Greater education, finances, and knowledge will increase female empowerment and independence, especially for female-headed households. This can stem the cycle of gender inequality as women direct resources towards girls' education. Combined with existing regional programs that require school attendance, the region can achieve gender equality in the long-term.

Investing in housing

Poor rural households continue to face inadequate access to basic housing. Public provision of this primary need in the short-term allows families to maximize their long-term welfare, by focusing on skills acquisition and education. Public housing could take the form of a public works program, where future residents must participate in the construction in order to be eligible for housing. Such a program would provide work for vulnerable households, and could function as a retraining program that would ease the transition from agriculture to non-agriculture.

With this comprehensive approach, governments can continue to support at-risk rural households while pursuing the 2030 Development Agenda. These policy recommendations support ending poverty, reducing inequality, sustainable settlements, and achieving gender equality. Implementing such policies promote rural welfare and will continue to position the region as powerful economic force.

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Appendices, Regional data

Appendix 1. Rural household employment distribution in LAC for female-headed households, 2002 to 2014

	Year	Wage Agriculture	Wage Non-agriculture	Autonomous Agriculture	Autonomous Non-agriculture	Inactive	Region
Share of rural household headed by women	2002	2%	16%	14%	17%	51%	17%
	2007	3%	17%	12%	14%	54%	20%
	2010	3%	18%	10%	15%	54%	20%
	2014	2%	20%	11%	14%	53%	24%

Appendix 2. Sectoral household poverty, rural LAC, 2002 to 2014

	Year	Wage Agriculture	Wage Non-agriculture	Autonomous Agriculture	Autonomous Non-agriculture	Inactive	Region
Regional rural poverty rate	2002	22%	13%	40%	8%	16%	46%
	2007	19%	14%	37%	9%	21%	41%
	2010	19%	15%	36%	8%	22%	38%
	2014	16%	16%	35%	9%	25%	27%

Appendix 3. Sectoral household poverty gap, rural LAC, 2002 to 2014

	Year	Wage Agriculture	Wage Non-agriculture	Autonomous Agriculture	Autonomous Non-agriculture	Inactive	Region
Regional rural poverty gap	2002	25%	11%	28%	12%	19%	21%
	2007	19%	9%	26%	12%	21%	19%
	2010	18%	8%	24%	10%	18%	16%
	2014	13%	6%	20%	9%	15%	13%

Appendix 4. Sectoral inequality (Palma Ratio), rural LAC, 2002 to 2014

	Year	Wage Agriculture	Wage Non-agriculture	Autonomous Agriculture	Autonomous Non-agriculture	Inactive	Region
Regional Income Palma	2002	1.50	2.45	3.81	2.85	3.24	3.13
	2007	1.93	1.75	4.68	3.16	3.57	3.30
	2010	1.50	1.62	3.43	2.75	3.11	2.70
	2014	1.34	1.64	3.43	2.54	2.61	2.55

Appendix 5. Schooling Palma Ratio, rural LAC, 2002 to 2014

	Year	Wage Agriculture	Wage Non-agriculture	Autonomous Agriculture	Autonomous Non-agriculture	Inactive	Region
Regional Schooling Palma	2002	1.01	1.40	1.04	1.01	0.84	0.71
	2007	0.63	0.57	0.74	0.61	0.68	0.71
	2010	0.84	1.42	0.95	1.06	0.96	0.70
	2014	0.53	0.46	0.67	0.59	0.53	0.62

Appendix 6. Housing quality Palma Ratio, rural LAC, 2002 to 2014

	Year	Wage Agriculture	Wage Non-agriculture	Autonomous Agriculture	Autonomous Non-agriculture	Inactive	Region
Housing Quality Palma	2002	0.98	5.54	2.10	4.22	2.35	2.08
	2007	1.17	4.10	2.21	4.14	2.11	1.94
	2010	1.04	3.98	1.91	3.28	1.75	1.94
	2014	1.43	4.32	2.09	3.38	2.48	1.95

Chapter 4
Policies and the institutional framework

Policies and the institutional framework

There is a growing trend among most Latin American and Caribbean countries toward allocating more public resources to the provision of general services for producers collectively. Such services have multiplier effects that are more long-lasting than individual support mechanisms. The results of these internal policies will be greater insofar as current economic integration processes improve the income of all stakeholders throughout the agricultural chain.

Facts

- An immediate critical task is to design and implement policies that will enable the agrosilvopastoral sector to respond to the Sustainable Development Goals (SDG). This calls for innovations in the ways that food is produced, distributed and consumed.
- The SDG cover a broad range of issues, from poverty, hunger, education, water and sanitation to infrastructure, energy and urbanization. Hence, a systemic approach is required that recognizes the central role of agriculture in eradicating poverty and hunger, achieving environmental sustainability and conserving natural resources, particularly soil and water.
- Family farming remains a priority for the Latin American and Caribbean (LAC) countries, which are continuing to make efforts to implement differentiated policies designed to meet the subsector's needs.

Governments are continually seeking ways of making public spending more effective and more efficient, in order to tackle the challenges and tap the opportunities for the sustainable development of agriculture and rural areas. They are also endeavoring to provide an adequate response to the commitments assumed in global forums and to changes in the context of international competition. Presented below are the most recent innovations in the management of public policies for agriculture. Reference is made to the goals and targets of the 2030 Agenda for Sustainable Development.

Trends

Across the world, policies are evolving towards a markets approach that allows farmers to make better decisions, although this trend is less apparent in LAC countries

Policies are more market-oriented when they do not distort prices, stocks levels are known and managed transparently and public support is decoupled from production decisions. Depending on how such policies are designed and implemented, they can make agricultural problems worse instead of helping to solve them. In such cases, they lead to more volatility, permanent problems of shortages and surpluses, and losses and corruption, thereby affecting producers' profitability and increasing the fiscal cost.

The following analysis examines the structure of the supports (or monetary transfers) that States provide to agriculture (market price support, payments based on input use, investment in general services, etc.), which will help to determine whether policies in fact make a positive contribution or distort the market. For the purposes of this analysis, support is classified according to the criteria used to implement it (Box 1), drawing a distinction between transfers based on production, inputs, current or non-current production or current or non-current cultivated area, and those based on commodity or non-commodity criteria. Countries are compared in terms of the levels of support they provide to agriculture, the structure or composition of the support and its evolution over time.

The level of support for producers (Producer Support Estimate - PSE) of the member countries of the Organization for Economic Co-operation and Development (OECD) is around 20 percent, meaning that, on average, 20 percent of gross farm income is generated by transfers that producers receive thanks to their government's support policies. In LAC,[1] only Jamaica and Guatemala exceed those levels of support (33 and 24 percent, respectively). In seven of the 18 countries for which data is available in Agrimonitor (Figure 1, IDB 2017), the level of the PSE is between 13 percent and 19 percent. In six countries, the PSE ranges from one to seven percent, while in three others (Argentina, Guyana and Suriname) the PSE is negative. This equates to a tax on agriculture in those countries, since domestic prices are kept lower than international prices. The data is for 2013 and the situation in Argentina has changed since then, as export duties and restrictions have been eliminated.

In addition to reduced government support for individual producers, the structure of support in developed countries is changing to a system under which support measures are being decoupled from prices and production levels. This gives producers greater flexibility in deciding what to produce. In some developed countries, there is a trend toward a lower level of direct support for producers, with measures being implemented that are gradually decoupled from production. For example, following the major reforms instituted in the early 1990s, Canada reduced its level of support from more than 25 percent of gross income to less than 15 percent, a level that has remained stable. Similar trends can be observed in the USA (8.8 percent of PSE in

1 The data for the PSE indicator is for 18 LAC countries for which information is available: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Paraguay, Peru, Suriname and Uruguay.

BOX 1. Classification of support for agriculture.

Support for agriculture is defined as a policy of transfers whose main beneficiary is agriculture. Both the OECD and the IDB (2017) use the following classification:

- Support for producers (Producer Support Estimate - PSE), targeted directly at farmers.
- Support for general services (General Services Support Estimate - GSSE), which is a broader type of support for agriculture, e.g., funding channeled into infrastructure, development, education and research and development (R&D).
- Support for consumers (Consumer Support Estimate - CSE), which is a support (or tax) for consumers during the first stage of agricultural products, such as cooperatives or commercial processors.

The Total Support Estimate (TSE) is the total value of all financial transfers to agriculture, i.e., the sum of the PSE, the GSSE and the CSE.

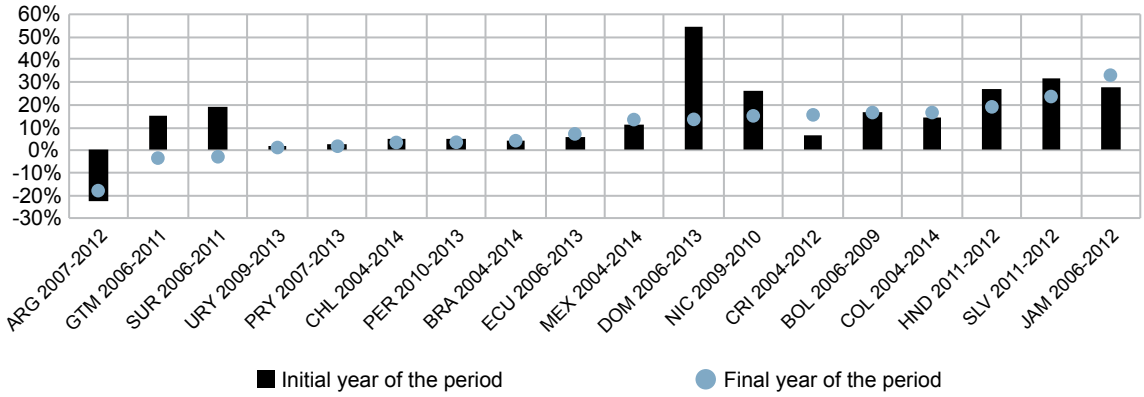
2015) and the European Union (EU) (down from nearly 40 percent in the mid-1990s to 19 percent in 2015). Over time, these countries have significantly reduced support for primary production and increased payments not based on production (OECD 2016). This has permitted farmers to respond to market signals and at the same time promoted innovation and sustainability, while States have been able to free up resources for other needs.

In recent years, the trends in LAC have varied. The level of PSE (Figure 1) has declined or remained stable in 15 countries, with significant reductions in the Dominican Republic, Suriname, and Guatemala. The reduction in support for farmers is most evident in the countries with most historical data, such as Chile, where the PSE fell from 8.1 percent in 1995 to 3.2 percent in 2015, and also changed from transfers based on primary production to input use support (OECD 2016). The trend in Brazil has been the opposite, with the negative PSE of the mid-1990s (-15 percent) giving way to a 3.1 percent level of support in 2015, mainly in the form of transfers related to input use.

In general,[2] producer support policies in LAC involve transfers associated with prices and market management (including the input market). This makes them a disincentive to improve productivity and intraregional trade, inasmuch as they protect domestic markets from international competition.

2 Although with differences between agricultural production sectors, e.g., production for export and the domestic market and subsistence farming (IDB 2017).

Figure 1. Producer support estimate (PSE) as a percentage of the income that farmers receive from agricultural activities in 18 Latin American and Caribbean countries, according to the corresponding period.

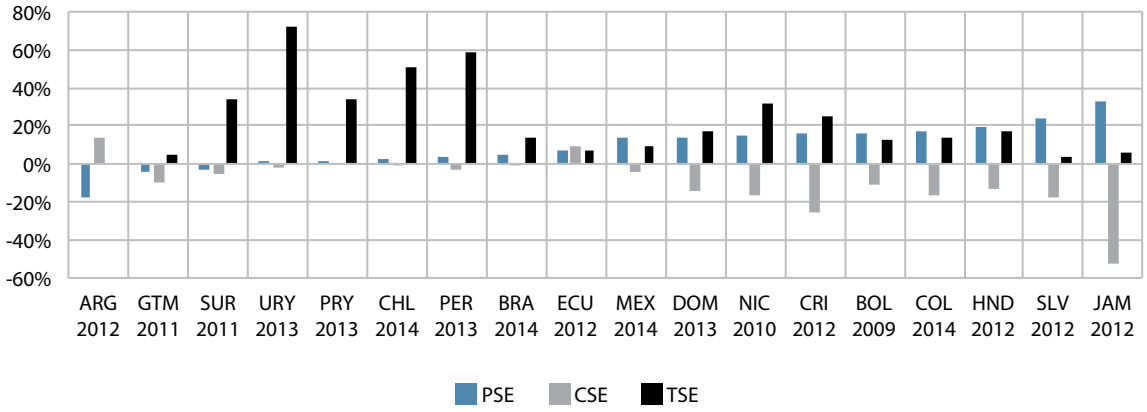


Source: IICA (CAESPA), with data from IDB 2017.

In addition to the effort to modify support for producers, there is a growing trend in the region toward the allocation of more public funds for transfers to general services to agriculture collectively (rather than direct transfers to producers individually). Such services include R&D, inspection, marketing, promotion, agricultural education, infrastructure and public storage, with more lasting impacts and multiplier effects. In 10 of the 18 LAC countries included in the sample (the last year for which information is available), spending on general services (GSSE) was higher than the Producer Support Estimate (PSE) (see Figure 2), although the emphasis varies from country to country. In Argentina, Colombia and Uruguay, for example, the proportion of GSSE assigned to R&D is close to 50 percent, while in other countries the figure is barely around 10 percent (IDB 2014). These differences point to the variety of priorities and approaches that exist on the agendas for improving productivity and efficiency in the sector, but also indicate the existence of other priorities, such as the strengthening of animal and plant health and food safety inspection services.

Another form of State intervention is through implicit taxes on consumers that become a subsidy for agricultural producers. This is observed in most of the LAC countries where the consumer support estimate (CSE) is negative (see Figure 2) and means that consumers, via duties, tariffs or other mechanisms, pay a higher price for agricultural products than the international benchmark price. Although such implicit taxes on consumers should be reflected in higher rates of return for agricultural producers and increased fiscal revenues, incentives of this kind have counterproductive effects, as they encourage producers to continue producing for artificially created reasons, because there is less competition, and also have a negative effect on (mainly low-income) consumers who spend more of their income on food. In LAC, only Ecuador and Argentina have public policies that benefit (subsidize) consumers with domestic prices that are lower than international benchmark prices (positive CSE), which also have a net negative effect on the agricultural sector by depressing producer prices.

Figure 2. Producer support estimate, consumer support estimate and general services support estimate (percentage) in 18 Latin American and Caribbean countries.



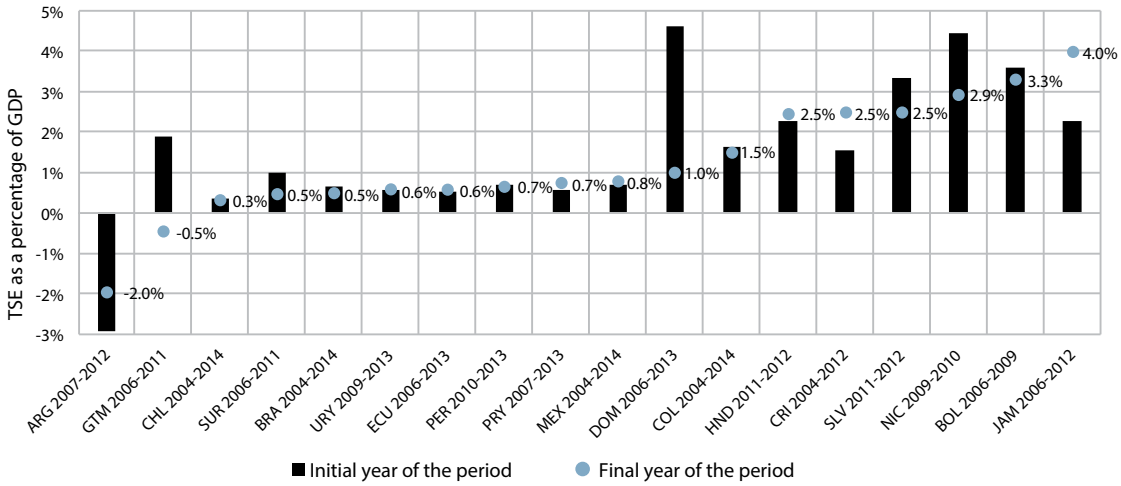
Source: IICA (CAESPA), with data from IDB 2017.

One way of measuring how much a country invests in agriculture is by calculating the total support estimate (TSE) as a percentage of gross domestic product (GDP), which is the sum of producer support, consumer support and transfers to general services. In countries like the USA and those of the European Union, the TSE is equivalent to 0.5 percent and 0.7 percent of GDP, respectively. Figure 3 shows the TSE for LAC countries in different years, according to the most recent data available. The figure shows that eight LAC countries invest percentages similar to those of the USA and the European Union, while the TSE of seven other countries exceeds 2 percent of their GDP. A third group of countries, made up of Argentina and Guatemala, has negative levels of TSE for the last year of analysis available, suggesting that those countries in some way "tax" the agricultural sector to the benefit of other sectors of their economies.

Around the world, emerging economies like Brazil and the countries of Eastern Europe are gradually moving from negative levels of investment in agriculture[3] (what has been called negative agricultural bias) to positive levels of investment (making them net supporters of agriculture). This suggests that as countries develop and more public resources become available, they reassess the value of their agriculture sector and attach greater importance to programs for its development.

3 Through explicit or implicit taxes on the sector.

Figure 3. Total support estimate for the agriculture sector: value as a percentage of GDP in 18 Latin American and Caribbean countries.



Source: IICA (CAESPA) with data from IDB 2017.

Policies have shifted towards integrated risk management approaches

As direct support for agriculture is reduced[4] and the effects of climate change become more pronounced, farmers are left more exposed to climate and economic risks.[5] To help producers cope with the risks of their activity, integrated risk management policies have been actively promoted in recent years, although in the case of small-scale agriculture they are still at the embryonic stage. The innovations in this area include a range of instruments and methods for protecting farmers against losses stemming from falls in prices, yields, income (prices and yields) and margins (income minus costs), as well as insurance covering losses caused by climate effects.

The principal obstacle to the implementation of this kind of policies and their respective instruments is the need to ensure that risk transfer mechanisms are sustainable and viable for governments (given the limited public funding available) and profitable for the private sector, without undercutting the proactive role that farmers should play in dealing with risk themselves. For an examination of the sources of risk in agriculture and the combination of ex-ante and ex-post strategies and policies that governments can use for risk management, see ECLAC *et al.* (2015).

4 Which guarantee minimum prices or underpin producers' income, among other measures.

5 Losses due to price and income variations.

In recent years, countries have adopted two main approaches to support risk management. The first involves insurance programs that cover risk for a short period of time, normally one year or the period between planting and harvesting. As these are short-term programs, the decision whether to take out insurance may change each year, depending on the outlook for prices and yields at the time of planting. Farmers must pay the insurance premium themselves, although in practice the State usually subsidizes part of the cost.

The other type of instrument that countries have used to support risk management are multi-year support programs, usually designed to support crop and livestock production by compensating farmers for recurring losses due to variations in prices, yields or income during two or more harvests. In the USA, for example, instruments of this kind are implemented through price loss coverage (PLC) or agriculture risk coverage (ARC) programs. The former kick in when market prices dip below the reference price, and the latter when revenue drops below the five-year benchmark. Farmers receive assistance without paying premiums for multi-year risk insurance, complemented with annual cover under harvest insurance programs (Zulauf and Orden 2014). Canada and the European Union have similar programs (Arias 2017).

In LAC, yield and harvest insurance are the most common types used for risk management in agriculture. Argentina, Brazil and Mexico account for nearly 85 percent of such premiums in the region (Hatch *et al.* 2012), although the agricultural insurance market remains very small. Only 0.2 percent of agricultural land is insured in the Andean subregion, 0.02 percent in the Central subregion, and 18.2 percent in the Southern subregion (Hatch *et al.* 2015).[6] Normally, yield insurance is divided into four categories: a) single risk insurance, which provides cover against one risk or a maximum of two; b) multi-peril insurance, which offers protection against two or more risks, such as hail, drought, frosts, floods, etc.; c) integral insurance, which covers against all natural hazards for a single crop; and d) whole-farm integral insurance, which covers against all natural hazards (CMCC 2014). The USA has the largest insurance program, although the growth in China since 2007 has been significant; that county's market is now second in importance,[7] followed by Spain. In LAC, insurance markets are growing substantially, especially in Mexico and Brazil.

Despite the importance of protection against variations in prices (ECLAC *et al.* 2015, Haile *et al.* 2015), coverage for such risks is more common in developed countries. Most developing nations do not have a good reference of market prices, such as those offered by the futures markets in Argentina, Brazil, the USA and Canada, or are not able to predict the prices expected for the following year's harvest. For example, in Canada agricultural insurance is offered at the provincial level with support from the federal government. The AgriInsurance program includes price insurance known as the spring price endorsement (SPE) in Alberta (AFSC 2016), which provides protection when the difference between the insured spring price and the fall market price is 10 percent or more. Farmers also receive compensation whenever there is a price increase and, at the same time, a fall in yields, thanks to the variable price benefit (VPB) program. As price insurance is normally complemented with yield loss insurance, farmers in Canada are protected against variations in income.

6 In the Northern subregion, the figure is close to 90 percent.

7 Growth that was encouraged by the financial support and willingness of the government to expand the coverage, supervision and control, and the participation of foreign capital in insurance programs (China convertida en… 2014).

In LAC, put options are a private alternative form of price risk management (though they may receive State support) that are more feasible to implement. These instruments are common in the USA, Canada, Mexico and Chile, and their introduction has recently been under discussion in Peru. They are easier to adopt than the alternative of hedging in futures markets, especially for countries that do not have or are not included in futures exchanges. In Chile, under the government-subsidized AgroSeguros program, since 2013 corn and wheat farmers have been able to fix a minimum price in local currency, combining a put option on futures contracts with an exchange rate option (since the international price is in dollars). The list of commodities covered is limited to those that have an international reference market, such as the Chicago corn and wheat exchange, where there is a close correlation between futures prices and local Chilean prices, liquidity and the high volume of transactions (AgroSeguros 2016).

Finally, a pronounced international trend that is beginning to take shape in LAC countries is State intervention to protect farmers against disaster or systemic risks. Cases in point in LAC are disaster insurance (SAC) in Peru and the Component for Dealing with Natural Disasters in the Agriculture and Fisheries Sector (CADENA) in Mexico. When the risk is correlated or shared with a large number of producers or economic agents, it is considered systemic. In general, systemic risk can cause damage on such a scale that State intervention is required, because the private sector is not in a position to deal with or offer profitable instruments for protection against such risk. Agriculture, in particular, is very exposed to systemic risk, due to its vulnerability to natural disasters (droughts, excessive precipitation, strong winds) that can affect territories or contiguous communities (ECLAC *et al.* 2015).

The progress made with integrated risk management policies can be monitored, country by country, through the Observatory for the Integrated Management of Risks and Agricultural Insurance launched recently by IICA (IICA 2017).

Countries have promoted the intensification of agriculture in agronomic, economic and environmental terms

A third trend in public policies for agriculture observed in the region relates to the promotion of more intensive and sustainable agriculture. Although there are various opinions and concepts regarding the sustainable intensification of agriculture, in general its objective is to increase the output obtained per unit of resource involved in time and space, without causing further deterioration of natural resources, which calls for greater agronomic, economic and environmental efficiency.

In LAC, one historical type of State intervention designed to achieve this goal has been the establishment of direct support policies based on the improvement of input use. On many occasions, this has resulted in a de facto policy of input subsidies (mainly for the application of fertilizers), which is contrary to what experts recommend and to the global trend (Bioversity International *et al.* 2012; OECD 2017b). The Agrimonitor database (IDB 2017) shows that in at least 7 of the 18 countries for which data is available, a significant percentage of the transfers to producers are direct support based on inputs. The predominant types of support used in the region are those related to variable inputs (energy, fertilizers and seeds, which are important in Ecuador, Brazil, Chile and Mexico), the promotion of investment in the physical assets of farms (soils, drainage, irrigation systems, etc.) and on-farm services (training, extension and technical assistance, which are important in Chile, Peru, Paraguay and Uruguay). State support based

on inputs will have differentiated effects on production, markets and the environment, depending on the type of input involved. For example, public spending to support the application of fertilizers is much smaller than what is allocated for other inputs; furthermore, this type of support is used in very few countries, since public incentives for the use of fertilizers is not sustainable, generates fiscal pressure and damages the environment.

Another form of State intervention is the promotion of access to, and the use of, quality seeds. The SDG (target 2.5) recognize the importance of maintaining the genetic diversity of seeds as a means to end hunger, achieve food security, improve nutrition and promote sustainable agriculture (goal 2). Undoubtedly, the rate of change in agricultural performance (productivity) depends primarily on the innovations introduced by seed suppliers, and definitely depends on the conditions required for farmers to adopt high-quality seeds (one being creditworthiness). The use of certified seeds in LAC is very low in comparison with the USA and the European Union, where 90-95 percent of the seeds used are certified (OECD 2017). This is one of the reasons why agricultural productivity is lower in the LAC countries.

In the Americas, the adoption of policies designed to support access to, and the use of, seeds depends on the productive specialization and the priorities of the country's agricultural policy. Some examples are in order. Canada's farmers benefit from the Seeds Act and its implementing regulations, which guarantee that seeds sold domestically are registered, labeled and adequately represented in the marketplace, with the Canadian Food Inspection Agency (CFIA) assigned responsibility for ensuring compliance. Brazil offers its farmers subsidized loans to cover operating expenses, including the purchase of seeds (Arias 2017). In Colombia, in 2015 the government launched the so-called *"Plan Semilla"* for the renewal of 17 crops (250 000 hectares per year) that are very important for the country's food security and smallholder agriculture. In Bolivia, since the creation of a state-owned enterprise called the Empresa de Apoyo a la Producción de Alimentos (EMAPA) in 2007, subsidized seeds are distributed to small and medium-scale producers. In 2016, Ecuador created an agricultural subsidy that includes the distribution of seeds when emergencies caused by El Niño occur. In addition to direct support for the use of seeds, the State plays a key role in the development of new varieties, the registration of varieties and the control of seed quality. The good regulatory practices documented by the World Bank (2017) that are being implemented in some LAC countries include: a) the existence of straightforward, modern regulations for the protection and registration of seeds (Uruguay); b) guarantees for the protection of property rights over genetic materials, without discrimination based on nationality (Chile); c) an up-to-date catalogue of varieties available online that specifies the agro-ecological zones to which each variety is suited (Peru); and, d) a law requiring the labeling of seed containers and penalizing the fraudulent sale of seeds (Bolivia).

Another form of State support for the intensification of agriculture is the promotion of mechanization as a key driver of agricultural development, productivity and the sector's links with the services market (input suppliers, repair shops, spare parts, etc.). Unfortunately, most LAC countries have a long way to go in incorporating machinery and new technologies into the agricultural sector, with the situation varying considerably depending on the production systems involved, farm size, the agroecological conditions and producers' socioeconomic status. Mechanization policies also have an impact on the agricultural machinery sector. They may act as either a help or hindrance, depending on the efficiency with

which governments design and implement legislation and regulations governing the purchase and use of agricultural machinery (World Bank 2017).

There are a number of reasons for these disparities in the use of machinery in agriculture, ranging from public policies to financial and technical constraints. The technical factors include the lack of machinery suited to the ecological and topographical conditions of many countries, and especially to production in remote areas, small-scale and hillside farming and horticulture, which require more expensive, specialized machinery. One of the financial considerations is the fact that small farmers tend to lack sufficient resources to purchase the machinery they require and have difficulty obtaining loans (IFPRI and IICA 2016). In the case of policies, regulations play a key role in promoting the smooth functioning of the agricultural machinery market.

Few LAC countries employ good regulatory practices like those documented by the World Bank (2017). Denmark, South Korea and Nigeria, for example, do not require businesses to register as importers of machinery beyond meeting general importation requirements. In LAC, Colombia is conspicuous for not requiring businesses to obtain a permit each time they import machinery, and for establishing requirements that are quick and inexpensive to meet. Other regulations call for technical inspections to ensure that machinery continues to be safe to operate, as well as tests and evaluations to ensure that imported machinery is suited to the country's edaphoclimatic conditions (World Bank 2017).

In LAC, agricultural mechanization is promoted mainly through programs that provide access to credit and tax exemptions. The Ministry of Agriculture, Livestock and Aquaculture of Ecuador makes tax-free machinery available to farmers and grants producers' organizations access to flexible credit with low rates of interest for the purchase of equipment. In Peru, imported agricultural machinery and equipment pay no duties and producers can obtain a general sales tax rebate in advance (at the time of writing, the tax is estimated at 18 percent). In Guatemala, mechanization is being promoted through the 29 risk units in operation since the 1970s, which makes it possible to combine efficient water use practices with the adoption and utilization of machinery and equipment (IFPRI and IICA 2016). In Costa Rica, the development banking system offers producers subsidized credit as working capital for machinery and equipment purchases (OECD 2017).

A trend that is gathering momentum in LAC and across the globe, is close collaboration between producers and machinery manufacturers, distributors and service providers. Mechanization services are recognized as key to producers adopting cutting-edge technologies. Farmers are accessing modern machinery under temporary contracts that include technical assistance and also serve as a mechanism for risk sharing and financing. LAC producers are leasing and renting out machinery, using service centers more frequently, and utilizing mobile phone mechanization apps.

Countries in LAC have increased their participation in global agreements on climate change to achieve the Sustainable Development Goals

All the countries of LAC, with the exception of Nicaragua, have signed the Paris Agreement on Climate Change (UNFCCC 2015), and most of them have ratified it in keeping with their respective legislative processes. Most countries in the region have included actions or references to the agricultural sector in their Intended Nationally Determined Contributions (INDC), in which the sector is addressed with

a focus on adaptation, and which includes mitigation goals that are directly or indirectly associated with agriculture and livestock (Witkowski and Medina 2016, Witkowski *et al.* 2016).

In recent years, the role of agriculture has been increasing in global negotiations on climate change and other conventions derived from the Earth Summit. Nevertheless, positioning this topic remains a vital issue, as is the articulation of actions with the environmental sector (Kalfagianni and Duyck 2017, IICA 2014, IICA 2012).The direct relationship between adaptation and the need to ensure food security in light of climate change was explicitly included in the Paris Agreement on Climate Change (UNFCCC 2015). At the time of writing this document, the impact of the withdrawal by United States from the agreement on the commitments undertaken, and the relationship between signatory countries remained unclear, although it must be noted that the exit process will take several years.

The countries in the region have begun to develop instruments and national plans to implement actions regarding agriculture and climate change. These measures include sectoral adaptation plans, development strategies for low-carbon emissions, nationally appropriate mitigation actions (NAMA) and a large number of programs and projects with coverage ranging from the regional to the territorial levels (Rodriguez *et al.* 2015). The NAMA for Bovine Livestock in Costa Rica (MAG 2015) is an example of a national strategy to promote the use of practices, technologies and measures aimed at developing climate-smart, profitable, productive and socially sustainable livestock.

In order to obtain an effective response for the challenges and opportunities brought about by climate change, many obstacles must be overcome in terms of planning and development of the institutional framework within in the sector. Certain common elements must be addressed, such as the development of indicators and monitoring systems, reporting and verification of actions, improvement in the articulation and communication of results at the national level, appropriate channeling of technical and financial resources and the integration of science-based decision-making tools to guide and prioritize adaptation (Medina *et al.* 2017).

Policies are being updated to promote sustainable management of natural resources and deal with the effects of climate change and variability.

Over time, policies improve the balance between mandatory, conditional and voluntary programs for the sustainable management of natural resources (Arias 2017). In some countries, the conflict between environmental protection and agriculture is associated with tensions between regulations and voluntary incentives. In most of the United States, there has been resistance to implementing regulations for agriculture, especially with regard to the use of pesticides, endangered species, management of nutrients in certain regions and the use of water. Despite this resistance, the sector must include regulations based on scientific knowledge that will allow the countries to develop new food systems and reduce their environmental footprint.

In view of this situation, the ministries of agriculture of LAC countries have made a commitment to develop public policies and instruments that will ensure that agriculture is not detrimental to the natural resources, and that it is less harmful to the environment. This has resulted in more interaction between the ministries of agriculture and other ministries, especially the ministries of the environment, and although these processes are currently in place, they are still in their early stages. Although there is limited experience in LAC with respect to environmental conditionality[8], this principle

could gain relevance in the future, primarily due to the successful experiences with organic production standards, international standards and other processes promoted by the private sector. Payments for ecological services (PES) are incipient in LAC (Costa Rica has the most emblematic experience in the region), but have enormous potential to promote positive environmental externalities by transferring financial resources from those who make use of ecological services to those who provide these services or manage natural resources. The general principle is that the agricultural sector and the natural resources sector can be compensated for services such as the mitigation of greenhouse gas emissions (carbon reduction, absorption, fixation and storage); the protection of water for urban, rural or hydroelectric use; the protection of biodiversity (for conservation and for sustainable scientific and pharmaceutical use, research and genetic breeding) and the protection of ecosystems, life forms and the natural beauty of landscapes (for tourist and scientific purposes, and to maintain agroforestry).

Although PES have contributed to reducing deforestation, their cost/benefit ratio is still in need of improvement, due to the fact that the sum invested is very high when compared with the results obtained. The main challenge is to better select the program beneficiaries by choosing those owners who are in the most vulnerable socioeconomic position (Robalino and Villalobos 2014).

In addition to public policies that support sustainable management of natural resources, markets are also evolving towards regulations that promote a more rational use of natural resources in production systems. Examples of this include the water, environmental and carbon footprints, which are expected to be included in the demands made by the EU to all countries wishing to export their products to that region. This will require countries in LAC to adopt policies that comply with market requirements. For instance, the Ministry of Agriculture of Chile, together with the private sector, is currently establishing protocols and regulations to deal with *free riders*[9] and is supporting private certification processes that will allow the sector to quickly respond to the new requirements imposed by the market.

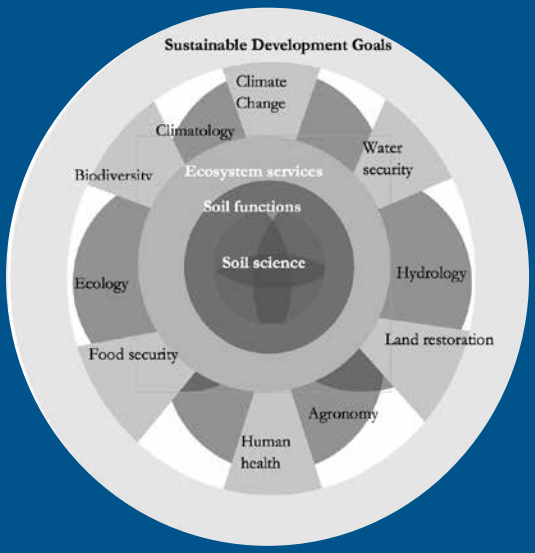
The policy instruments and standards mentioned will have a greater impact if applied with an integrated approach to the sustainable management of natural resources, so as to better distinguish between short and long term efforts aimed at increasing agricultural productivity, sustainability and competitiveness. These approaches combine the main instruments to support production, financing and agricultural insurance, within a framework of policies aimed at making better use of the soil (see chart on soil contribution to SDGs), agricultural zoning and regulations for biofuels. The agricultural zoning experience in Brazil is a good example that shows how innovation can help manage natural resources more efficiently (especially soil) and channel operating loans and investments toward small farmers, based on their geographical location, risks and expected yields. In order to ensure that farmers comply with regulations imposed by agricultural zoning, the granting of loans is subject to compliance with the conditions established in the policy;

8 Conditionality refers to support from the States that are subject to compliance with certain requirements to maintain both lands that are under production, as well as those that are not being used for production, in good agricultural and environmental condition. Generally speaking, the rules refer to cultivation systems, use of soils, crop rotation, cultivation practices, water management, etc.

9 Opportunists who benefit from a product or service for free.

therefore, if a farmer wishes to obtain a loan, he must present evidence of compliance with agricultural zoning regulations. At the time of writing this document, Brazil had included 27 commodities in the agricultural zoning regulations over a period of seven years (Arias, 2017).

Box 2. Contribution of soils to achievement of the Sustainable Development Goals (SDGs).



Source: Keesstra *et al.* 2016.

Global economic growth trends and population dynamics all point to the need to make changes in agricultural production, current consumption patterns and management of natural resources to promote sustainable development in the countries (FAO 2017). In this sense, the 2030 Agenda for Sustainable Development, approved by the United Nations General Assembly, is an action plan on behalf of people, the planet and prosperity.

In terms of sustainability, soils have an important contribution to make. While it is true that goal number fifteen of the 2030 Agenda refers specifically to the fight against desertification and land degradation, the contribution of soils goes much further.

Soils contribute to food security, water security, land management (including its restoration), human health, climate change and the preservation of biodiversity (Keesstra *et al.* 2016).

With regard to food security, in order to respond to the growing demand for food, more sustainable production is required. It must be noted that the basis for production of the majority of foodstuffs (95% of the total) is the land (Weigelt *et al.* 2015, FAO 2015), which highlights the importance of soil for food production (SDG 1 and 2). In spite of this, UNEP estimates that more than 22% of soils in LAC are in highly or very highly degraded areas, a major challenge for the region as the potential breadbasket of the world.

With respect to water security (SDG 6 and 7), half of the water cycle takes place in the soil. This means that soil management can significantly affect the quantity and quality of the fresh water available. Furthermore, given that soil is an excellent reservoir for humidity and that it serves as a medium for water carriage, this strengthens the integrated linkage between soil, water and vegetation (IICA and CATIE 2017).

America must make strategic adjustments in response to the new trade agenda.

The withdrawal of the United Kingdom from the EU (Brexit) and of the United States from the Transpacific Partnership (TPP), as well as the renegotiation of the North American Free Trade Agreement (NAFTA), have triggered numerous discussions regarding the current and future state of economic integration. Over the next few years, the world will witness the evolution of these processes and their impact. For the time being, the response from LAC countries has been diverse but overall, the region has sought to develop new economic relations, both intra-regionally and with Asia and Europe, and to expand existing ones.

The economic integration agenda in LAC will focus mainly on widening the bonds between members of the Pacific Alliance, a free trade initiative that includes Chile, Peru, Colombia and Mexico, and will incorporate Australia, Canada, New Zealand and Singapore as associate states, thus strengthening the Asia-Pacific relationship[10]. It will also focus on the association between the Pacific Alliance and the Southern Common Market (Mercosur), which comprises Argentina, Brazil, Paraguay and Uruguay; and between Mexico and the rest of the LAC countries. Additionally, the 11 remaining countries that make up the TPP will revise the agreement based on the decision made during the Summit of Asia-Pacific Economic Cooperation, held in May 2017 (The Economist Intelligence Unit 2017).

Apart from promoting free trade, the Pacific Alliance is expected to include more countries such as Costa Rica and Panama and increase trade and investments mainly with countries of the Asia-Pacific region. Trade relations between the Pacific Alliance and Mercosur will also be strengthened by the wave of market-friendly policies and in response to new protectionist measures. Examples of progress in this direction include the new agreements signed between Argentina and Brazil on sanitary and phytosanitary standards, as well as lines of action that the Pacific Alliance and Mercosur defined during a meeting held in April 2017 on issues of customs cooperation and development of regional value chains.

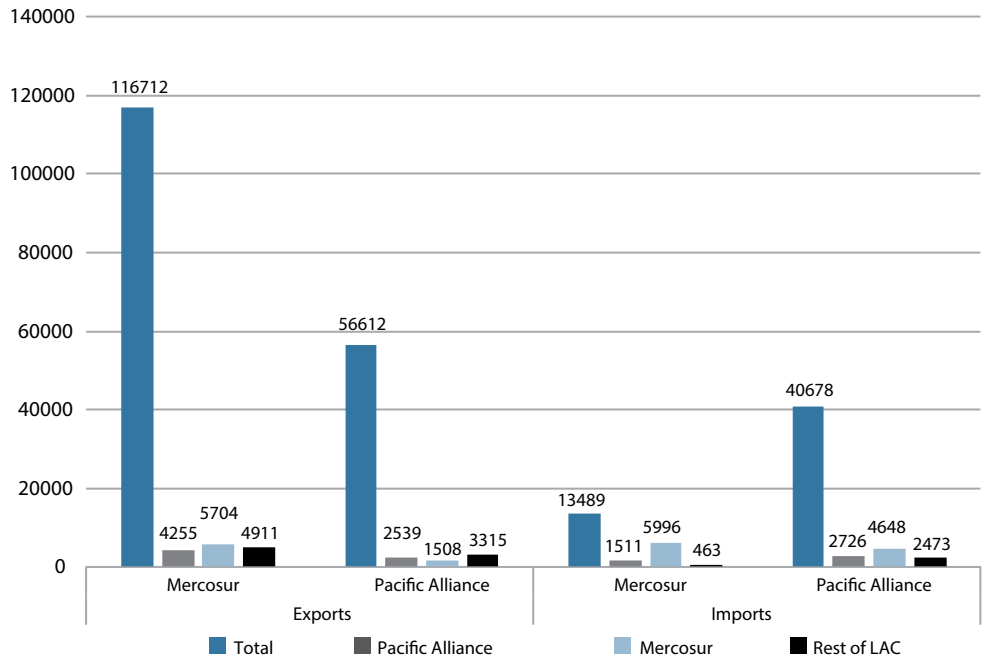
The opportunities to strengthen commercial relations between Mexico and other LAC countries are the result of the NAFTA renegotiation, which put this country in a position to seek new commercial partners including Brazil and Argentina. Indeed, Argentina and Mexico started discussions on this issue in 2016, and hope to reach a bilateral agreement by the end of 2017.

On the other hand, many opportunities have arisen to further develop intra-regional trade, as a result of the low percentage of agrifood trade between the Pacific Alliance, Mercosur and the rest of the LAC countries (Figure 4). Exports from Mercosur to LAC in 2015 amounted to just 13%, and those from the Pacific Alliance were also in the same proportion. With respect to imports, the situation varies considerably: LAC accounts for 59% of agrifood imports from Mercosur (with Mercosur itself representing 44%), while 24% of agrifood imports into the Pacific Alliance comes from LAC. The main destinations for Mercosur exports are Asia-Pacific and the EU, with 38% and 20% respectively. Moreover, the main destinations for exports from the Pacific Alliance are Asia-Pacific[11] and the United States, with a share of 48% and 16% of total agrifood exports respectively.

10 Countries that could also be included in the Pacific Alliance as ''associate states" and which are part of the TPP, are Malaysia, Brunei, Japan and Vietnam.

11 Asia-Pacific: Australia, Brunei Darussalam, Canada, China, South Korea, Philippines, Hong Kong, Indonesia, Japan, Malaysia, New Zealand, Russia, Singapore, Thailand, Vietnam. To avoid duplication in the analysis of the trade destination, Chile, Mexico, Peru and the United States were excluded.

Figure 4. Mercosur and the Pacific Alliance: destination and origin of agrifood trade in 2015 (in millions of USD).



Source: CAESPA with data from United Nations, Comtrade.

NAFTA will be renegotiated

At the time of writing this document, the three signatory countries of NAFTA (Canada, United States and Mexico) had already agreed to begin a process of review of the treaty, in order to modernize it and transform it into a more valuable instrument for trade integration. The renegotiation process was officially announced in July 2017 through a notification letter sent to the United States Congress by the trade representative of the US.

Overall, the agricultural sectors of all three countries agree that NAFTA has been beneficial for them in that it has promoted agrifood trade based on the complementarity of the agricultural economies of each country, mainly the United States and Mexico. Since the implementation of NAFTA in 1994, trade between the three countries grew by 279%, moving from USD 290 billion in 1993 to USD 1.1 trillion (Wharton University of Pennsylvania). Investments and the GDP increased, prices fell and consumers have enjoyed an extended supply of higher-quality products.

The modernization of NAFTA will entail the inclusion of topics that were not a priority 23 years ago, but that have become relevant today, such as information and knowledge technologies, e-commerce, rules of origin, protection of intellectual property, trade facilitation, technical barriers to trade, and environmental and labor standards. Furthermore, regulations must be more

precise in order to promote fair competition with other markets, and better reflect recent technological innovations.

The renegotiation will be an opportunity to increase harmonization and standardization of regulations, define science-based rules, address risks and eliminate any unnecessary obstacle that may increase transaction costs and slow down the movement of products. It will also help define regulations that will not only focus on commodities but also on value chains, covering the entire spectrum of agrifood products.

One possible complication for the NAFTA negotiations may be how to tackle trade imbalances. A possible solution would be to impose restrictions or trade barriers (such as border-adjustment taxes), which undoubtedly would have a negative effect on participating countries, could cause controversies with the World Trade Organization (WTO) and may trigger reactions and retaliations by the countries affected by said measures. Therefore, the mechanism to resolve these disputes will be an important topic to be negotiated in the new treaty.

In light of this situation, Mexico could make certain adjustments to its trade strategies. For example, it could import corn from Argentina and Brazil, or wheat from Russia, and export meat to Russia or honey, vegetables and fresh fruit to Europe.

Other aspects that must be considered for the NAFTA renegotiation are monetary transactions and the establishment of new rules to prevent partners from manipulating their currencies. Likewise, the renegotiation of NAFTA may lead to a possible renegotiation of free trade agreements (FTA) between the United States and Chile, Colombia, Peru and Central America, and the cessation of other potential FTAs such as the one with Argentina, for example.

Brexit: agriculture in the United Kingdom will open up to the world, which will bring about opportunities and challenges for agricultural trade in LAC

In March 2017, England invoked article 50 of the EU Constitution, with the purpose of beginning negotiations to withdraw from this political and economic union. This process was widely known as Brexit. The United Kingdom considers that this exit from the EU will bring about more economic and political certainty and will allow the country to have more control over its own legislation, gain new control over the migration flow, negotiate new trade agreements outside the EU and create a more favorable environment for science and innovation.

The United Kingdom will face multiple consequences and challenges as a result of its withdrawal from the common market, especially when considering that the EU is the destination for 60% of British agricultural exports, and that for some products this percentage surpasses 80%, as is the case of lamb meat and beef, oilseeds and grains (Hind 2017, UK Parliament-European Union Committee 2016). The EU also exports significant amounts of products to the UK, such as pork meat (100%), dairy (98%), chicken (95%) and beef (93%), among others.

The manner in which the United Kingdom faces these multiple challenges during the Brexit process will affect its competitiveness in international agricultural markets, whether they are bilateral markets established with the UK or third-party markets. This is quite important for LAC.

In the absence of an FTA with the EU, the United Kingdom will have to face the challenge of paying the common external tariff (CET) to export to the EU. To cite a few examples, the CET for fresh beef cuts is between 8% and 12% + EUR 3034/t; for fresh cut flowers it is 8.5% to 12% depending on the season; for

wheat, it is EUR 94/t and for fresh potatoes it is 11.5%. In addition to CETs, other measures also apply, such as barriers and non-tariff restrictions. Furthermore, the United Kingdom could impose its own tariffs on imports, with a significant impact on its economy given this country's history as a net food importer. However, in order to remain competitive, the UK must avoid imposing higher tariffs than the ones currently applied by the EU.
Another challenge that the United Kingdom will face after Brexit will be that of managing its policies in support of the agricultural sector that are in keeping with the goals and objectives of the country, and which are adapted to its conditions and needs. These policies must be more market-oriented, must encourage investments, protect farming activity, minimize trade risks and diversify the destinations for exports and the origin of imported products.

Finally, the UK will need to maintain the migration flow needed to cover the labor needs of the agricultural sector. Historically, migrants have accounted for 38% of the contracted workforce in the food sector, although this percentage has recently dropped to 14% (Hind 2017).

The United Kingdom sees Brexit as an opportunity. One of these opportunities is to compete globally based on the potential of the UK as an exporting country. For LAC, this will translate into more competition between third-party markets for agrifood exports from the United Kingdom, but will also bring about more chances to export to the United Kingdom, given the country's need to import food.

After Brexit, the EU may be more willing to negotiate new trade agreements, which is an opportunity that could be seized to reactivate negotiations and reach an agreement with Mercosur. However, countries like France, Ireland and Poland have expressed their concern regarding the possible competition with agricultural imports from Mercosur and the potential drop in their market share in the EU (The Economist Intelligence Unit, 2017). Another sensitive issue to consider in the event of a negotiation between the EU and Mercosur is the recent incident regarding sanitary standards in meat packing plants in Brazil.

LAC countries make progress in the implementation of agricultural monitoring and evaluation systems

Although agriculture has not been a pioneering sector in the monitoring and evaluation of policies, efforts in this regard have increased significantly in recent years. More and more, the countries of the region are evaluating their agricultural policies with a view to enhancing their effectiveness and ensuring that they contribute to the stated objectives.

Among the most significant internal factors that have contributed to increasing follow-up and monitoring of agricultural policies is the interest that countries have in strengthening their accountability processes and improving efficiency in public spending on agriculture. Other external factors have also contributed, such as the interest in belonging to blocs of countries with good practices in terms of policies (such as the OECD), and the need to monitor progress with respect to international commitments that have been undertaken (such as the 2030 Sustainable Development Goals).

Mexico and Colombia are the countries with the greatest tradition of evaluating their agricultural policies. The progress made by both countries in this area confirms that there are no single remedies, and that the institutional models for evaluating agricultural policies need to be in keeping with the institutional framework and needs of each country.

In the case of Mexico, all agricultural policies and rural territories are assessed by the National Social Development Policy Evaluation Council (CONEVAL). Agricultural policy evaluation is a legal requirement. The type of evaluation to be carried out will depend on the stage at which the policy is (assessment of new programs, design consistency, processes, impact, etc.). As part of the joint process with the managers of agricultural policies, in Mexico the results of evaluations serve as the basis for undertaking commitments to improve the policies evaluated. During the evaluation processes, weaknesses and threats are identified, which are later used to improve the policies (CONEVAL 2016).

In the case of Colombia, the National System for the Evaluation of Management and Results (SINERGIA) is responsible for spearheading the evaluation processes for agricultural policies. Unlike Mexico, where there is a legal obligation to evaluate the full slate of agricultural policies, in Colombia an agenda/ schedule is created based on the requests for evaluation received from the institutions that regulate the policies. Based on the premise that "the implementing entity is the one that knows the policy best", a participatory approach has been adopted with respect to evaluation of the agricultural policies included in the agenda. SINERGIA is in charge of the methodological evaluation processes, and the implementing institutions participate in the recreation of the theory of a change in policy, in defining the evaluation questions, in selecting the sources of information, in validating the results, etc. As in the case of Mexico, Colombia seeks to feed the results of the assessments into the management of the agricultural policies that have been evaluated. In order to do this, all the evaluations include a 'plan for transfer and implementation of recommendations', which is complemented by a matrix of actions to be undertaken by the National Planning Department (DNP) of Colombia in order to drive the adoption of the recommendation in the assessed policy (DNP 2014).

In addition to Mexico and Colombia, over the last five years, other LAC countries have made rapid progress in the construction of assessments for public policies in agriculture. Notable among these are the efforts of some countries such as Chile, Uruguay and Costa Rica, which, although they do not yet have an institutionalized system for evaluating policies in agriculture, the lead institutions for agricultural policies (ministries of agriculture) are resorting more and more to evaluation of policies with two main objectives: a) highlight the functioning of public interventions in agriculture, which not only provides a justification for the use of public funds, but also increase interventions with higher-level impact, and b) improve the design and implementation of interventions that are focused on the sector. In the three countries, small working groups have been created in the units at the ministries that are responsible for coordinating the assessment of agricultural policies. In this manner, over the past three years, more progress has been made than at any other time, and as part of the efforts, baselines and evaluations have been carried out of design, processes, and impacts of policies that focus on topics such as resilience to climate change, water, rural development, family farming, agricultural productivity, short circuits, sustainability of agricultural soils and State purchasing from small farmers, among other things[12].

Although the progress is noteworthy, the countries of the region continue to face great challenges in institutionalizing evaluation

12 Information on the policies evaluated was drawn from the PowerPoint presentations made by the participants at the regional workshops on good practices in monitoring and evaluation systems for agricultural policies in LAC (2016), and on evaluation of agricultural policies (2017), both held in Montevideo, Uruguay.

within the agricultural policy cycle, especially in making the results of the evaluation useful for the assessed policy. With this object in mind, for the past two years, IICA has been working along with the countries of LAC to identify good practices in agricultural policy assessment, and to strengthen capacities in the topic through horizontal cooperation. As a result of this effort, technical documents have been produced, international workshops and seminars have been held, and in the upcoming months, a training program will be launched (for greater detail see http://bit.ly/2l1kybq).

Recommendations

In order to advance toward meeting the goals associated with the SDGs, a set of coherent, multi-objective, effective and efficient policies are required that are managed at various levels of intervention.

This set of policies will make it feasible to take advantage of the enormous potential of agriculture to contribute to achieving the SDGs of Agenda 2030 by providing nutritious food, generating income, protecting the environment and acting as a pillar of rural development.

On the one hand, the objectives of the policy should be clearly defined, recognizing that some of them may be conflicting, while others may be complementary. The challenge is to increase productivity and make agriculture more competitive, while responding effectively to problems relating to poverty, employment, income distribution, food security, food safety, nutrition and environmental sustainability. The strong interaction between these objectives demands coherent policies to guarantee their efficiency and effectiveness.

Given the complexity that this represents for policy management, the approaches to evidence-based policies should be strengthened, by generating and using fully and efficiently all the existing information and knowledge, including the best available evidence of what works and what does not work in the management of public agricultural policy. The systems for follow-up, monitoring, and evaluation of policies (analyzed above) are fundamental in order to generate, manage and systematize information and scientific evidence. This tends to be abundant and originate from many sources, which makes it difficult for policy decision-makers to consider and assess their contribution to policy management in agriculture.

Informed, or evidence-based policy management is facilitated by the promotion of collaborative knowledge management networks which, when accompanied by the design of information platforms, have proven to be innovative ways of creating opportunities for different stakeholders to come together (entrepreneurs, government personnel, academics, consultants, producers, etc.). This makes it easier to improve understanding of problems and find shared solutions through a systemic approach, by using to the fullest all the existing useful information, even if it is tacit or coded. The stakeholder networks created around the National Livestock Information System of Uruguay (Zurbriggen y Sierra 2017), whose success gave rise to the establishment of the National Agricultural Information System (SNIA)[13], are an example of this type of experience.

On the other hand, coherence should be sought between policies at different levels of intervention: the farm (supply side), the consumer (demand side), the rural territory (which connects agriculture with the non-agricultural economy), and the agricultural chains (which deal with the flow of products,

13 For more information visit: http://www.snia.gub.uy.

supplies, equipment, investments and services related to the activities of primary production, processing, transportation and marketing of agricultural products). All these levels of intervention are subsumed under the general economy and by governance, institutions, policies, investments, and regulations throughout the country, (Díaz-Bonilla 2015; Arias 2017).

Achieving that coherence means reconciling interests between stakeholders at the different levels of intervention of the policies, which requires effective mechanisms for dialogue, consensus-building, and decision making. Aside from the collaborative knowledge management networks mentioned above, the organizations of agricultural chains are an instrument that has shown great potential in LAC for including in the process of design of agricultural policies the greatest number and level of interested like-minded parties in agricultural production, distribution, value added, and trade. Such organizations constitute a forum for Government and industry to undertake joint activities and promote the adoption of shared proposals that are of value and meet the needs of the domestic and world markets, which change so rapidly.

Effective and efficient policies must be made available to assist small and medium sized producers in meeting market challenges

All countries in the region, regardless of their level of development, are responsible for ensuring that their producers attain a dignified standard of living, for developing mechanisms that protect them in the face of eventualities derived from global political and economic changes, and for generating the conditions necessary to respond to market signals. This will enable them to make the best decisions regarding what, when and how much to produce, to adopt technologies and to create innovations that make it possible for them to compete equally with producers from more advanced regions.

The foregoing can be achieved by increasing investment in the generation of public goods. To this end, it is essential to invest in research and development as this constitutes one of the most efficient ways in which to improve competitiveness and achieve agricultural sustainability. As was previously mentioned, more than half of the LAC countries allocate more than 50% of their agricultural budgets to providing direct support for production. However, it is urgent for countries to change their policies in order to reassign their agricultural budgets, so that they cease being directed toward private goods (direct support) and are geared instead toward the generation of public goods. Empirical evidence demonstrates that investment in public goods benefits the society more that the investment in private goods.

Another investment of great benefit to the society is investment in conservation programs, including those aimed at increasing what is put aside for conservation and related programs that deliver extensive environmental benefits to a country. These types of policies apply in the European Union; for example, the common agricultural policy includes a compulsory greening component, through which support for agricultural practices that benefit the climate and the environment is provided. More countries will voluntarily offer incentives and payments to producers for adopting agro-environmental practices.
What should also be pointed out is the investment in rural infrastructure, which

14 Market development consists of expanding the market of a product, company or country; identifying a new geographical or social segment of the market; discovering new uses or users of a product and promoting an increase in current demand.

constitutes one of the most important areas for promoting economic growth, competitiveness and sustainability of agricultural activity, as well as development of the rural territories (López *et al.* 2017). The main challenge in this area is to find an adequate balance between the investment directed toward rural infrastructure, the investment geared to other sectors and the fiscal capability of the States. The public resource gap will force the governments to seek innovative policy mechanisms in order to attract private investment. This topic will be expanded further on in the recommendations on market integration.

A second mechanism of government support for small and medium scale producers that must continue to be strengthened in the region are the agricultural insurance programs, both for insuring crops and for dealing with catastrophes. In the event of losses, that insurance provides the farmers with basic support to enable them to return speedily to their normal activities. However, significant challenges will continue to be faced in terms of broad dissemination in three areas: the design of the programs, cost and funding from the perspective of the public sector, and reliability of the data and meteorological information systems. In the agricultural insurance programs, it is fundamental to differentiate between the roles and responsibilities that the State and the private sector should assume. The States should provide support for the adoption of agricultural insurance and allocate economic resources to deal with pressing situations, and mitigate the effects of an agricultural emergency by allocating funds in the budget, by buying coverage, or through other mechanisms.

The involvement of the private sector in integrated risk management in agriculture is just as crucial as that of the public sector and should manifest itself mainly in two areas: a) the creation and development of strong financial sectors for transfer of risks, the insurance industry, without which the efforts for integrated risk management would not bear fruit, and b) consideration of the implicit risk from activities and processes to be developed when planning and programming production, in order to adequately foresee the risks.

A third mechanism relates to actions in order to develop[14], strengthen, and make the markets (including institutional markets such as those related to school feeding programs) more inclusive and reduce transaction costs, so that producers and consumers alike can benefit. Even when other countries artificially maintain prices above world levels (Arias 2017), this should not be taken as a reference for good practices. Rather, they should endeavor to invest fewer public resources in price support policies and more in the development of their wholesale markets and retail markets. Additionally, they should pay closer attention to policies that support marketing and promote an increase in transparency and efficiency in domestic markets. Access to information, particularly information relating to markets is key, since reducing the disparities and gaps in information has significant impact on the ability of farmers to secure higher prices (López *et al.* 2017). The experiences of Argentina, Chile, and Costa Rica attest to the highly positive impact of associative investments by the State in its productive and exporting performance, in the improvement of access to information and in the creation of entrepreneurship as well as small and medium enterprises (Estevadeordal 2017). This will help to increase the comparatively low levels of participation by small and medium enterprises in LAC in production and international trade, for which an attractive option is to take advantage of the opportunities offered by market niches (see chapter on Agriculture) that develop as a result of changes in demography and in the tastes and preferences of the consumers (for example, markets for organic products, nutraceuticals, "fair trade", etc.).

A fourth support mechanism is related to measures to improve inclusion and equity in agriculture. A simple and effective instrument for achieving this is land titling in order to

guarantee that small producers, especially women, young people and indigenous populations, have land rights that will facilitate their access to credit and to making more sustainable decisions. In turn, land titling creates the conditions necessary for developing a lease market similar to that of the United States and Argentina, where nearly 40% of the land is rented. This expands options and promotes more efficient use of available land, increases the scale of production and generates incentives for more investment and financing in agriculture (Arias 2017). Furthermore, land titling solves the problem of exclusion of a significant number of producers (many living in poverty) who are not subjected to State policies or eligible for aid.

One of the measures for ensuring greater inclusion in agriculture, even if the problem of land titling is resolved, is to clearly define who the beneficiaries of government programs are, such as those relating to direct payments or subsidies. When the real producers are not the beneficiaries, those programs begin to be seen more as assistance that have little or nothing to do with agriculture. Furthermore, there tends to be controversy with respect to the beneficiaries who own the land and those who are renting it, since the latter tend to be interested more in short-term profits, while the owners are more concerned with the long term. When the farmer and the owner of the farm are the same person, the policies can address equity and efficiency at the same time, whereas if the farmer is not the owner of the farm, the policies can create distortion by benefiting the owner of the farm and not the farmer (Arias 2017).

Finally, the coverage provided by conditional cash transfers should be expanded (mainly for food and inputs), so that it includes small farmers (especially the poorest) and the rural population. This will stimulate aggregate demand in rural areas, especially demand for food, help to achieve both efficiency and equity in agriculture, and reduce public spending considerably. In order to increase the efficiency and effectiveness of public spending, such transfers should be complemented with policies to promote production, which will generate a new approach to socio-productive inclusion (combination and coherence of policies arising from the social and productive institutional framework).

Domestic market development policies should support regional integration and vice versa

In order for economic integration policies to be positive and serve as allies to domestic integration policies, they should improve the income of farmers and stakeholders across the entire value chain. Without this direct relationship, agricultural policies tend to run contrary to the process of integration. This will make agriculture ministers more inclined to promote regional integration, rather than oppose it. The challenge is to redefine future integration processes so that they serve the specific needs of agricultural producers in terms of infrastructure, transportation and services (for example, trade information) and the complexity of regulations.

Reducing transportation costs should be a priority, both domestically and internationally (Estevadeordal 2017). In Colombia, it is estimated that reducing internal transportation costs by 1% would increase agricultural exports and manufacturing by 8%. The economic and social impact would be much greater if internal transportation costs from more remote areas were reduced. In Peru, for example, improving access routes in the departments of Sierra and Selva would lower transportation costs by 15% and 40%, with impacts of 10% and 23% on exports from the country. With respect to international transportation, it is estimated that for most of the countries in LAC, reducing transportation costs between countries would have a greater impact than reducing tariffs. In South America, reducing freight costs by

10% would increase intraregional exports by 30-40%, while reducing tariffs by the same proportion would generate a gain of less than 10% (Estevadeordal 2017).

Another priority is trade facilitation, which can have significant domestic and regional impacts. It is estimated that if shipments were inspected and dispatched from customs in the same day, Uruguay would increase its exports by 5.9% (Estevadeordal 2017). One of the measures that must be applied in order to lower trade costs at customs is the establishment of a single window, which is already the situation in 20 countries throughout the region (Estevadeordal 2017). These efforts will have greater multiplier effects at the regional level if there are established mechanisms that permit greater coordination and cooperation among the single windows in the countries of the region (for example, exchange of information and technologies), which already exists between the member countries of the Pacific Alliance.

Finally, the cumulative and complex number of regulations, many of them overlapping and generated by the negotiation of multiple trade agreements, must be disentangled as this will lower the administrative and unforeseen costs of the agreements[15]. This problem is a complex one to resolve, since the situation is different based on the matter negotiated. Among the most important regulations are the rules of origin (given their linkage with the application of other trade rules). These could be standardized if were possible to negotiate a single set of rules of origin among the countries of the region that have signed broad bilateral agreements which, in the expert opinion of Estevadeordal (2017), is viable based on the similarity among the current rules of origin.

Monitoring and evaluation of agricultural policies should be included as an integral part of the policy cycle

Monitoring and the evaluation of policies should not be isolated efforts that limit the use of the evaluation results (Chavarría *et al.* 2017), but should be an integral part of the policy cycle. This will make it possible for monitoring and evaluation tools to respond to the questions that fuel the processes of formulation, implementation and scaling-up of a policy: Is there public interest in the policy? What is the origin and cause of agricultural issue to be dealt with? Is the selected intervention the best way of resolving the problem identified? Is the intervention meeting the objectives for which it was designed? Can management of the intervention be improved for better functioning? Which impacts can be attributed to the intervention?

Several conditions should be met in order to provide feedback and to enable the evaluation results to re-orient and improve agricultural policies (Chavarría *et al.* 2017):

- Promote a culture of accountability in the public institutions related to agriculture, in which evaluation is not only seen as an exercise in audit and control, but rather as a mechanism that contributes to analyzing public problems, to comparing possible interventions, and to identifying risks in the implementation of policies.

- Build capacities for the formulation and implementation of policy evaluation systems since, given the complexity of the issue, it is necessary to take advantage of international cooperation and the capacities of other State institutions that are more established (for example, the ministries of planning, the national directorates of planning, etc.).

15 Because the combination of rules might be impeding trade instead of promoting it.

- Conduct agricultural policy evaluations from the beginning, especially with respect to the use of their results. As stated by Patton (2012), the evaluation will be useful only if it responds to the need for the policy itself. To this end, it is essential that all those involved in policy management are fully convinced of the use of the evaluation as a tool for improvement and optimization of the policies. It is also necessary to have active participation from the institutions that regulate the policy to be evaluated, so that the questions to be answered during the evaluation help to solve the issues relating to the policy itself. Finally, it is necessary to ensure that the information generated from the evaluation is robust, truthful, and timely, which means that there must be solid evaluation methodologies and means of information and verification that are of excellent quality.

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Chapter 5
Food systems and the 2030 Agenda:

The 2030 Agenda as an integrative framework for policymaking to strengthen food system competitiveness, inclusiveness and sustainability


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

Introduction

This chapter aims to provide a framework for the development of integrated policies to strengthen food system competitiveness, inclusiveness and sustainability, with reference to the 2030 Agenda for Sustainable Development (2030 Agenda).

The 2030 Agenda was adopted in September 2015 by the 193 Member States of the United Nations. It sets out 17 Sustainable Development Goals (SDGs) with 169 targets, encompassing economic, social and environmental elements. A set of 231 indicators have been developed for monitoring purposes.

A food system comprises the set of activities a society carries out in order to meet its basic food needs. This document refers to modern food systems involving activities that lie between food production and consumption (processing and packaging, distribution and marketing) and concerned not only with food security but also with environmental security and social well-being more widely. It is from this that the concept of a sustainable food system originates. The concept is a multidimensional and multisectoral one, which means that policies to strengthen food systems need to foster integration and synergies. The 2030 Agenda provides just such a policy framework.

The framework proposed to support the design of public policies for the food system, taking the 2030 Agenda as a frame of reference, relies on network analysis and is based on the identification of relationships between elements belonging to the system and to the Agenda. The units of analysis in the 2030 Agenda are the 169 targets associated with the 17 SDGs, while those in the food system are the four activities and their three outcomes, with the four dimensions of food security (availability, access, stability and use) being considered separately.

A set of indicators and priority targets are identified on the basis of the linkages posited between the 2030 Agenda targets and the elements of the food system. Although this is a hypothetical exercise, its conclusions are relevant and illustrate the usefulness of the approach in supporting policymaking within the framework of the 2030 Agenda, in this case to strengthen food system competitiveness, sustainability and inclusiveness. The exercise aims to be representative for the regional context, but is not intended to be prescriptive in policy terms for specific national situations.

The chapter is organized into five sections. Sections I and II present the main elements of the 2030 Agenda and the sustainable food system concept; section III discusses the linkages between the targets of the 2030 Agenda and the elements of the food system; section IV identifies policy areas and targets relevant to efforts to strengthen the food system, with reference to the 2030 Agenda and the linkages posited in section III; and section V discusses the implications for policy design.

The document emphasizes that:

- The activities and outcomes of a sustainable food system are relevant to the targets of all the SDGs.
- Network analysis is a useful tool for supporting food system policymaking within the framework of the 2030 Agenda.
- Policies to strengthen the food system with reference to the 2030 Agenda can be grouped into two major areas: (a) sustainable consumption and production, and (b) food security and social well-being.

- The targets of the 2030 Agenda serve to identify policies in the productive, social and environmental spheres that help make the food system more competitive, sustainable and inclusive.
- A major food system policymaking challenge in the context of the 2030 Agenda is the development of sustainability indicators.

I. The 2030 Agenda for Sustainable Development

The 2030 Agenda for Sustainable Development is a universal, integrated and indivisible framework for addressing the great challenges of sustainable development

The 2030 Agenda sets out 17 SDGs with 169 targets encompassing economic, social and environmental elements. There are also 231 follow-up indicators. The goals are as follows:

- **Goal 1:** End poverty in all its forms everywhere.
- **Goal 2:** End hunger, achieve food security and improved nutrition and promote sustainable agriculture.
- **Goal 3:** Ensure healthy lives and promote well-being for all at all ages.
- **Goal 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.
- **Goal 5:** Achieve gender equality and empower all women and girls.
- **Goal 6:** Ensure availability and sustainable management of water and sanitation for all.
- **Goal 7:** Ensure access to affordable, reliable, sustainable and modern energy for all.
- **Goal 8:** Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
- **Goal 9:** Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.
- **Goal 10:** Reduce inequality within and among countries.
- **Goal 11:** Make cities and human settlements inclusive, safe, resilient and sustainable.
- **Goal 12:** Ensure sustainable consumption and production patterns.
- **Goal 13:** Take urgent action to combat climate change and its impacts.
- **Goal 14:** Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
- **Goal 15:** Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.
- **Goal 16:** Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.
- **Goal 17:** Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.

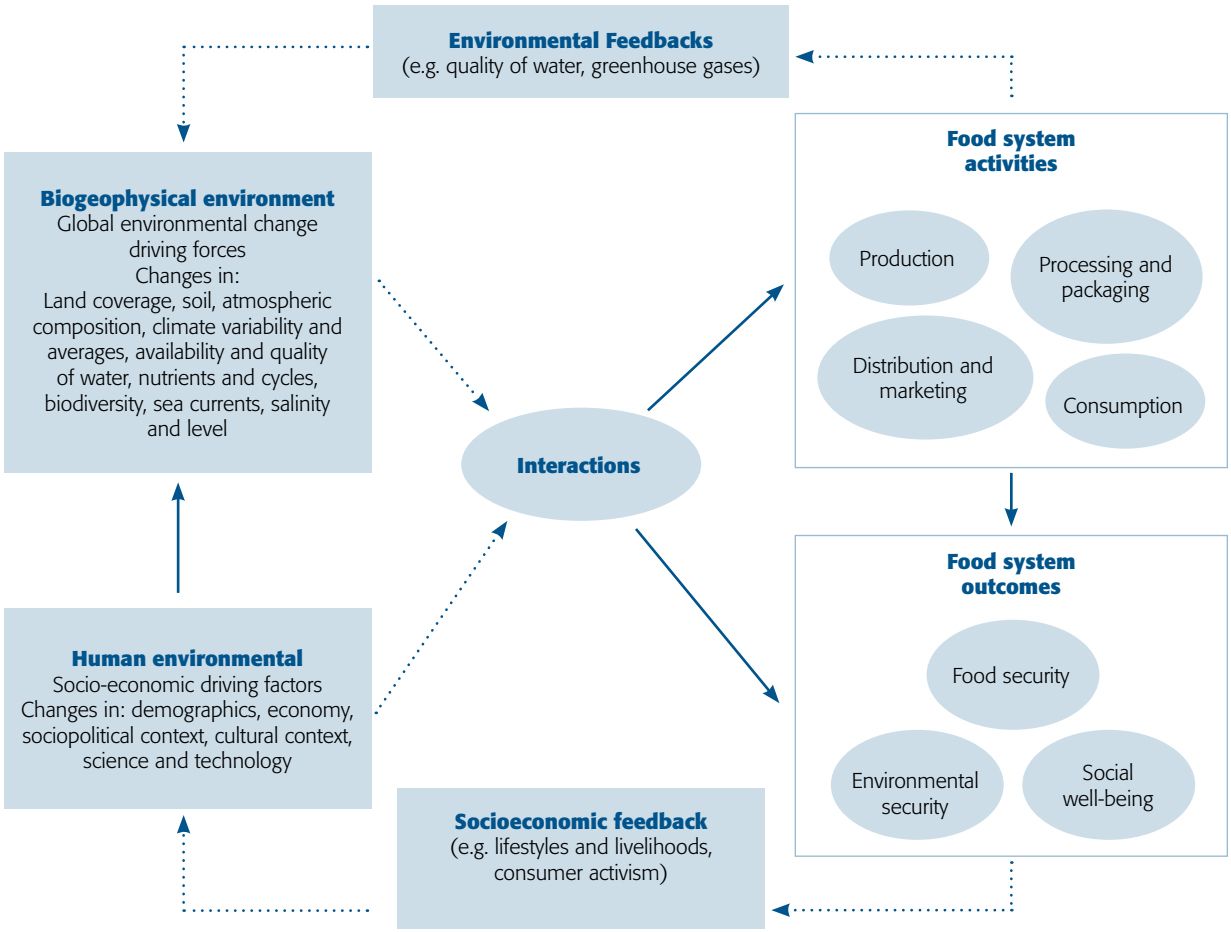
II The food system concept

Food system activities and outcomes are influenced by dynamics arising in the biophysical and human environments

A food system includes activities and outcomes. Activities range from food production to consumption, and their most important outcome is the provision of food security to the population. However, the food system can also generate outcomes in the areas of environmental security and social well-being, depending on the way its activities are conducted in terms of environmental impact. A sustainable food system is one that ensures appropriate outcomes in terms of food security, environmental security and social well-being.

Food system activities and outcomes are influenced by dynamics arising in both the biophysical and human environments, as

Figure 1. The food system and its elements



Source: Prepared by the authors on the basis of Ericksen (2008) and Ericksen and others (2010).

figure 1 illustrates. A useful conceptualization for the purposes of this chapter is the one developed by Ericksen and colleagues (Ericksen, 2008; Ericksen, Ingram and Liverman, 2009; Ericksen and others, 2010). Recent applications of this analytical framework include Moragues-Faus, Sonnino and Marsden (2017) in the analysis of policies in the European Union, and Salgado-Sánchez and Castro-Ramírez (2016) as a framework for a study on Mexico City.

The concept highlights the interactions between activities and outcomes and the factors of change in the geophysical environment (e.g., climate change influences food production, which in turn impacts soil and water quality and generates greenhouse gases) and the socioeconomic environment (e.g., demographic and income changes affect food security by way of food access and use, while use can influence nutrition outcomes).

The physical and economic separation between food production and consumption increases the importance of processing-packaging and distribution-marketing activities

The activities of any modern food system include food production, processing and packaging, distribution and marketing, and consumption. ***Production*** involves a combination of elements in the biophysical environment (e.g., soil, water and biodiversity) and elements of the human system, mainly access to technology and land, integration between traditional and modern knowledge, and the way knowledge and technology combine with other production factors such as labour and land.

Processing and packaging are increasingly important in more modern food systems, as the physical distance between food production and consumption increases. They include all activities that alter the appearance, shelf life, nutritional value or raw material content of foods, ranging from processes as ancient as the fermentation of wheat to make beer to those undertaken to extract functional elements from foods so that they can be consumed in capsule form. Fundamental determinants of processing and packaging activities are changes in consumption patterns associated with socioeconomic factors such as urbanization and increased female participation in the labour market. Also important are changes induced by advertising and innovations in food technology, as well as food safety regulations.

The separation between production and consumption has also increased the importance of ***transport and distribution,*** encompassing all processes whereby foodstuffs are taken from the place of production or processing to wholesale centres and retail outlets. Factors that are important for these activities include: (a) appropriate transport infrastructure (to reduce food losses and prevent supply disruptions, for example); (b) trading regulations (covering imported foods, for example); (c) labelling standards; (d) storage requirements to ensure food safety; (e) industrial organization in the retail market (e.g., supermarket chains); (f) advertising and marketing strategies.

Food ***consumption*** is the ultimate activity of any food system, from the most traditional to the most modern. Food consumption is determined by the cost of food and people's purchasing power and involves decisions about ways of preparing and consuming foods that are influenced by sociocultural traditions and values, education levels and, increasingly, factors such as advertising, marketing strategies and the structure and concentration of the retail market.

A sustainable food system ensures good outcomes not only for food security but also for environmental security and social well-being

A food system has results for food security, environmental security and social well-being (figure 1). Since the 1996 ***Food Summit*** (FAO, 2006), food security has been deemed to exist when *"all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life"*. This definition highlights four dimensions of food security:

a) ***Availability*** of food: the existence of sufficient amounts of food of adequate quality, supplied from the country's own production or by imports (including food aid);

b) ***Acces*** to food: people being able to afford appropriate foods that provide a nutritious diet;

c) ***Use*** of foods: biological utilization of foods involving an appropriate diet, drinking water, sanitation and medical care to achieve a state of nutritional well-being in which all physiological needs are met; and

d) ***Stabilit*** in the availability of and access to appropriate foods at all times.

Environmental security outcomes depend on how food production, processing, distribution and consumption take place and impact the environment. A sustainable food system is one in which the negative environmental impact is minimized so that the natural functions required for food production are preserved, examples being nutrient and carbon flows and stocks, ecosystem services such as pollenization, and the health of natural capital, chiefly soil and water. Institutional aspects affecting land tenure are also crucial.

Social well-being outcomes are determined both by the way the activities of the system are conducted (in respect of job creation and income generation, for example, which increase access to a more diversified food supply) and by the dynamics affecting the dimensions of food security (e.g., instability in the supply of basic foods and increases in their prices can lead to situations of political and social disruption).

Food production and consumption are activities that are carried out in all food systems and are directly associated with food security outcomes via the food availability (supply) and use (demand) components. They are also essential to the attainment of environmental security and social well-being outcomes. Food processing and packaging and food distribution and marketing, like the access and stability components, become relevant when production and consumption activities are geographically and economically separated (because of urbanization, for example) and the market takes on an important role.

The access and stability components, being determined by factors exogenous to food production and consumption, widen the range of food security policies, with appropriate management of macroeconomic, trade, reserves and infrastructure policies and good governance in general being important to ensure that *"all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food"*.

III. The links between food system elements and the SDG targets

The activities and outcomes of a sustainable food system are relevant to targets associated with all the SDGs

The activities and functions of a sustainable food system are relevant to the targets of all the SDGs. A structure of relationships between the elements of the food system and these targets is posited, with details given in the annex. The nature and significance of these relationships will now be briefly described.

- **Goal 1: End poverty in all its forms everywhere**

  The main link is between consumption and the availability, access and stability elements of food security. All these are important for the poverty reduction targets (1.1, 1.2 and 1.3), considering that lack of food is the key dimension of poverty. Meeting these targets is also important for social well-being. The attainment of the targets for vulnerability and resilience (1.4 and 1.5) is likewise important both for food production and consumption and for food security, and particularly for the stability of access and availability.

- **Goal 2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture**

  This SDG is the key to the relationship between the 2030 Agenda and the elements of a food system. Food production and consumption activities, together with the food security components, are essential for attaining the goals relating to the reduction of hunger and malnutrition (2.1 and 2.2), which in turn is important for social well-being. The food security component relating to food use is particularly important if good nutritional outcomes are to be attained. At the same time, achieving the other goals relating to sustainable food production (2.3, 2.4 and 2.5) is important for production and consumption activities and for the attainment of food security and environmental security outcomes.

  This SDG also includes targets relating to the implementation of international cooperation (2.a) and market functioning (2.b and 2.c). Fulfilment of the international cooperation target is important to strengthen the activities of the food system (e.g. investment, research and development, better rural infrastructure, access to genetic resources) and to obtain results in respect of environmental security and food security. Attainment of the goals relating to the functioning of food markets (domestic and international) is important for distribution and marketing activities and for consumption, and to ensure stable food availability and access.

- **Goal 3: Ensure healthy lives and promote well-being for all at all ages**

  Food consumption is essential for the targets associated with mortality reduction (3.1, 3.2 and 3.4), and stable access and good use need to be guaranteed accordingly. In particular, food consumption ensures good nutrition, which translates into good health. As regards the targets for implementation, it is particularly important to strengthen the countries' early warning and risk management capacity (3.d) for production

and consumption functions, and for the attainment of environmental security and stable food availability outcomes.

Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

The relationship between a proper diet and the attainment of good learning outcomes is well known: a well-nourished child is better equipped to learn. Consequently, food production and consumption activities, together with food security components, are important for the achivement of educational attainment targets (4.1 and 4.2; 4.6 and 4.7).

Goal 5: Achieve gender equality and empower all women and girls

The main link between this SDG and the attainment of a sustainable food system is through the target relating to equal access to economic resources, including in this case access to land and production financing (5.a). This could impact food production by women, increasing consumption options; from the point of view of food security, it could also improve availability and access, especially for households headed by women producers.

Goal 6: Ensure availability and sustainable management of water and sanitation for all

A number of the targets of this SDG (6.1, 6.2, 6.3 and 6.4) are important for food production and processing activities and also for consumption, particularly from the point of view of the use dimension of food security and environmental security outcomes. In particular, having access to drinking water under appropriate conditions of pricing, stability and quality is relevant to proper food use, since it ensures better nutrition outcomes by removing the possibility of infection with waterborne diseases. From the production point of view, the availability and quality of water for irrigation is essential for food production, particularly in a context of greater climate variability.

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all

All the targets associated with this indicator are important in terms of increasing the efficiency of food system activities and improving outcomes. Access to affordable, reliable and modern energy services (7.1) is important for food production and, especially, for good food use. In particular, it means that food can be cooked in a way which reduces emissions within the home, a product of traditional energies such as firewood. Better food cooking leds to better nutritional outcomes.

Increased renewable energy use (7.2) and improved energy efficiency (7.3) help reduce the carbon footprint of food production, processing, distribution and consumption activities and thence bring about better environmental security outcomes. Furthermore, the goal of boosting renewable energy creates opportunities for agriculture, whether in the form of energy crop production or through the use of the waste biomass generated by production, processing and consumption activities (Rodríguez, Mondaini and Hitschfeld, 2017).

Lastly, increased international cooperation (7.a), for example in the area of research or access to new technologies, and expanded infrastructure for energy services provision (7.b) also help to create food systems that are more sustainable from the perspective of production and consumption and ensure better food use outcomes.

Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

There are various links between this goal and the food system. Attaining the targets for economic growth (8.1) and decent work (8.5) should help to improve pay and thereby food access. At the same time, policies on technological innovation (8.2), production development (8.3; e.g., support for small and medium-sized enterprises), resource efficiency (8.4), protection for labour rights (8.8), sustainable tourism (8.9) and access to resources (8.10) can help further the modernization and diversification of food production, processing and distribution. Likewise, they can help improve the environmental impact of these activities and promote more sustainable consumption patterns (8.4).

This SDG includes a target for promoting sustainable tourism and local culture and products (8.9). This target can be important for food systems linked to local economies with particular characteristics, an example being when tourism is tied to sustainable food production and the showcasing of local products and cuisines, generating local development processes that improve the welfare of communities.

Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

This goal groups three areas of equal importance to the proper functioning of a food system. The availability of adequate infrastructure (9.1) is essential to all food activities. Furthermore, improving market access conditions for producers and reducing marketing bottlenecks could make the food supply more stable in terms of both availability and prices, which would improve access conditions. All this would lead to better outcomes for food security, environmental security and social well-being.

The targets for industrialization (9.2) and support for SMEs (9.3) should favour the development of food processing activities and thereby increase the range of foods available for consumption. Furthermore, the development of new production activities in the processing industry creates scope for the development of SMEs. At the same time, infrastructure upgrading and the retrofitting of industries in pursuit of greater sustainability, efficiency and innovation (9.4) should favour food processing and distribution activities and their environmental performance.

Goal 10: Reduce inequality within and among countries

Reducing inequality is essential to strengthen food security and social well-being, particularly because it enhances the access of the poorest to food. At the national level, higher incomes for the most disadvantaged (10.1) and wage and social protection policies (10.4) are central to the effort to enhance food security in respect of access, while fiscal policies (10.4) are also important for price stability, and thus for the stability of food availability and access.

Also important for food security are international actions relating to special and differential treatment (10.a) in accordance with World Trade Organization (WTO) agreements, encouragement for official development assistance (10.b) and the reduction of remittance transaction costs (10.c). Official development assistance, especially if oriented towards agricultural research, innovation and technological

development (2.a), can promote sustainable food production, thereby enhancing food availability and thus food security. Likewise, reducing the cost of remittances gives their recipients greater purchasing power and frees up resources that they can spend on production activities, including food production.

Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable

Protecting food security is a necessary condition for the inclusiveness, security, resilience and sustainability of cities and human settlements. Likewise, human settlements with these characteristics are more likely to have properly functioning food systems.

Three of the targets for this goal are considered relevant to food systems: those concerning protection for the world's cultural and natural heritage (11.4), reduction of losses and damage from disasters (11.5) and adoption of integrated policies and plans towards inclusion, resource efficiency and resilience, among other things (11.b).
A society's cultural and natural heritage includes its cuisine, eating habits and traditional foods; consequently, protecting and safeguarding this heritage (11.4) is essential both for food security, especially in traditional societies, and for the environmental security of food production systems, especially those producing traditional foods.

Again, risk management (11.5 and 11.b) should be a fundamental part of food security strategies, especially to ensure stable access to foods for those most vulnerable to disasters. It is also vital as a way of forestalling significant disruptions in food production and distribution, ensuring a more stable supply.

Goal 12: Ensure sustainable consumption and production patterns

This goal, together with SDG 13, is crucial for ensuring the sustainability of food systems by promoting environmental security. It is the equivalent of SDG 2 in the area of food security and SDG 1 in that of social well-being.

Most of the targets of this SDG are relevant to different elements of food systems. The first five (12.1 to 12.5) are important, in differing degrees, for the sustainability of food production and, in some cases, for processing and packaging activities (12.3 to 12.5) and consumption (12.1, 12.3 and 12.5). In this last case, the main link with sustainability is food use.

The targets relating to enabling factors (12.a, 12.b and 12.c) are also important. Support to strengthen scientific and technological capacity (12.a), supplemented by similar targets for other SDGs (2.a and 10.b), will help to improve sustainability, especially in primary production and in consumption. Furthermore, the development and application of sustainable tourism instruments (12.b), together with the rationalization of subsidies that encourage wasteful consumption (12.c), have repercussions for all activities in the food system.

Goal 13: Take urgent action to combat climate change and its impacts

Action on climate change is essential to secure all activities in the food system and ensure it produces the required outcomes. Efforts to strengthen resilience and adaptive capacity (13.1), integrate climate change measures into national agricultural policies, strategies

and planning (13.2) and improve human and institutional capacity on climate change mitigation and adaptation (12.3) are essential to ensure the viability of food systems in a context of climate change and increased climate variability. Likewise, it is important for developed countries to meet their obligations under the United Nations Framework Convention on Climate Change (FCCC), particularly as regards financing (13.a), and for planning and management capacity to be increased (13.b), if food systems are to be well managed in the face of climate change, especially in the least developed countries.

Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Marine ecosystems are the basis for production of a substantial portion of the foods in a modern diet. According to FAO (2016), fish accounted for about 17% of the animal protein ingested by the global population and 6.7% of the total protein consumed in 2013, besides being a major source of long-chain omega 3 fatty acids, vitamins, calcium, zinc and iron. Consequently, most of the targets associated with this SDG are important for different parts of the food system.

Targets for preventing pollution from land-based activities (14.1), sustainably managing and protecting marine and coastal ecosystems (14.2), preventing acidification (14.3) and applying international law on the protection of coastal and marine areas (14.5) are particularly important for ensuring sustainable production. Again, regulating fishing (14.4) is not only conducive to sustainable production but can also contribute to food security by helping to make the supply of marine products more stable.

Fishing subsidies can contribute to the creation of excess fishing fleet capacity and to overfishing. It is possible that eliminating such subsidies (14.6) might contribute in the short term to higher prices for marine products, with implications for food security in terms of affordability. However, such subsidies do not always lead to lower prices for consumers, and even if they did, it would be at the expense of long-run sustainability. Indeed, it is more likely that overproduction will create supply instability, with negative effects for food security because of limitations on food access.

When fishing subsidies are eliminated, there needs to be special and differential treatment for the least developed countries (14.6), in particular to forestall possible negative effects on small-scale and artisanal fishers. Supplementing such actions with measures to increase the benefits from fishing (14.7) and facilitate artisanal fishers' access to marine resources and markets (14.a) will contribute to the development of more inclusive and sustainable food systems.

Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss

The conservation, restoration and sustainable use of ecosystems (15.1) and efforts to combat desertification (15.3) and limit the destruction of threatened habitats, including agrobiodiversity (15.4), are all key areas for the convergence of policies on environmental protection and production development in agriculture (e.g., agroenvironmental policies) designed to ensure the sustainability of food production.

A number of the targets for this SDG, besides having environmental benefits, are also important to enhance the social well-being function played by food systems. This is the case with targets that create scope for actions to protect and conserve mountain ecosystems (15.4), promote fair and equitable sharing of the benefits arising from the utilization of genetic resources associated with agriculture (15.6) and prevent the introduction of invasive alien species (15.8). These are all areas that deeply involve rural communities and indigenous peoples, who often play a role in safeguarding agrobiodiversity and of whose livelihoods these resources are an integral part.

Again, actions aimed at reducing poaching (15.7, 15.c) and integrating ecosystem and (agro)biodiversity values into poverty reduction strategies (15.9) not only bring environmental benefits but can also be important for food consumption, particularly in terms of food access and availability for isolated rural communities and indigenous peoples (e.g., regulated hunting to improve animal protein consumption, or a greater share of traditional foods in diets).

Goal 16: Promote just, peaceful and inclusive societies

The link between this SDG and the food system arises mainly from the importance of stable access to food in reducing the likelihood of acts of violence (resulting from high food prices or scarcity, for example) and in lowering mortality rates in vulnerable populations (16.1).

Goal 17: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

This goal is relevant to agricultural and food policies in a number of areas. In the area of financing, it is essential to put in place official development assistance (17.2), pursue appropriate debt management actions (17.4) and boost investment (17.5).

In the area of technology, all the targets proposed (17.6, 17.7 and 17.8) are important for enhancing technological development and innovation in agriculture, with a view to sustainably increasing productivity in food production. North-South and South-South cooperation in this area is important as a cooperation mechanism (17.6), particularly that oriented towards the provision of global public goods (17.8). In the area of capacity-building (17.9), furthermore, goal 17 is important for all food system activities and outcomes.

The issue of trade remains important for the least developed countries, particularly as regards completion of the Doha Development Agenda negotiating round (17.10) and application of WTO rules designed to protect the most vulnerable countries (17.12), where agriculture continues to play a large economic and social role. Lastly, in the area of data, monitoring and accountability, there is a particular need to provide support for capacity-building to increase the generation of high-quality, timely and reliable data, particularly those on food production, stocks, flows and prices (17.18).

IV. Identifying policy areas, relevant targets and indicators

Network analysis is a useful tool to support food system policymaking in the framework of the 2030 Agenda

Network analysis is applied to support integrated policymaking for the food system, with reference to the 2030 Agenda. The basis for constructing networks is the establishment of links between the elements of the food system and the SDG targets, following the lines laid down in the previous section (see annex). There are two types of relationships of interest: (a) targets relevant to food system activities and outcomes and (b) activities and outcomes relevant to the targets. Rodríguez (2017) can be consulted for the methodological details.

This analysis serves to identify two types of groupings that can support public policy design:

a) ***Clusters:*** These are sets of related elements grouped by common elements in the relationship (between targets and food system elements, for example); in this case, each element belongs to only one grouping.

b) ***Subnetworks[2]:*** These are developed by agglomeration around groups of interrelated elements (e.g., groupings of targets with elements of the food system); in this case, an element may be linked to more than one of the groups of related elements.

Groupings of the first type are relevant for determining the affinity between the targets of a particular SDG and the elements of the food system, while those of the second type are useful for identifying policy areas.

A very important concept in network analysis is centrality. Two centrality measures were used in preparing this chapter. The first is so-called betweenness centrality, which measures the importance of each element in the network as a "bridge" to other elements. The second is degree centrality, which measures the number of links each element has. Degree centrality can be measured forwards (out-degree) and backwards (in-degree). We shall generally be referring to this measure in terms of the number of connections. Centrality analysis is supplemented by a measure of the relevance of the network elements produced using the PageRank indicator developed by Larry Page (one of the founders of Google) to classify websites by reputation.

The network from which the results presented below are generated comprises 110 concepts, of which 10 are food system elements and 100 are 2030 Agenda targets (equivalent to 37% of all the targets).

Two major groupings are identified by the affinity between food system elements and 2030 Agenda targets: one associated with sustainability and the other with food security and social well-being

Affinity analysis allows two major groups to be identified (table 1). The first group, which we have called ***sustainability of food***

2 Subnetworks are a type of grouping by motif known as cliques; other groupings are fans and D-connectors (Rodríguez, 2017).

system production activities, includes food production, processing and distribution activities, environmental security outcomes and the food security element; it also highlights the presence of targets related to SDG 6 (water and sanitation), SDG 7 (affordable and clean energy), SDG 9 (industry, innovation and infrastructure), SDG 12 (sustainable consumption and production) and SDG 13 (climate action).

The second group, ***consumption, food security and social well-being,*** includes consumption activity, social well-being outcomes and food security elements related to the proper functioning of the food market (availability, access and stability), with particularly relevant targets being the ones relating to SDG 1 (poverty), SDG 2 (hunger), SDG 3 (health), SDG 4 (education), SDG 5 (gender equality), SDG 10 (inequality between countries) and SDG 16 (security).

Table 1. Affinity between the SDGs and food system elements

Dimensions, activities and outcomes		
Description	**Sustainability of food system production activities dimension**	**Consumption, food security and social well-being dimension**
Activities	Production Processing and packaging Distribution and marketing	Consumption
Outcomes	Use Environmental security	Availability Access Stability Social well-being
SDGs with greatest affinity in each dimension	• SDG 6 (targets 6.1, 6.3, 6.4, 6.5, 6.6 and 6.a) • SDG 7 (targets 7.2, 7.3, 7.a and 7.b) 1 • SDG 9 (targets 9.2, 9.3, 9.4, 9.a and 9.b) • SDGs 12 (targets12.1, 12.2, 12.3, 12.4, 12.5, 12.a, 12.b and 12.c) • SDG 13 (targets 13.1, 13.2, 13.3 and 13.a)	• SDG 1 (targets 1.1, 1.2,1.3, 1.4 and 1.5) • SDG 3 (targets 3.1, 3.2, 3.4 and 3.d) 2 • SDG 4 (targets 4.1 and 4.2) • SDG 5 (target 5.a) • SDG 10 (targets 10.1, 10.4, 10.a, 10.b and 10.c) • SDG 16 (target 16.1)
SDGs with targets in both dimensions	• SDG 2 (targets 2.a and 2.b) • SDG 8 (targets 8.2, 8.3, 8.4 and 8.8) • SDG 11 (target 11.4) • SDG 14 (targets 14.1, 14.2, 14.3, 14.5 and 14.c) • SDG 15 (targets 15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.8 and 15.b) • SDG 17 (targets 17.6, 17.7 and 17.8)	• SDG 2 (targets 2.1, 2.2, 2.3, 2.4, 2.5 and 2.c) • SDG 8 (targets 8.1, 8.5, 8.9, 8.10 and 8.a) • SDG 11 (target 11.b) • SDG 14 (targets 14.4, 14.6, 14.7 and 14.b) • SDG 15 (15.7, 15.9 and 15.c) • SDG 17 (targets 17.2, 17.4, 17.5, 17.9, 17.10, 17.11, 17.12 and 17.18)

Source: Prepared by the authors.

Notes: (1) targets 7.1 and 9.1 in the second group; (2) target 3.9 in the first group.

In addition, a number of SDGs have several targets in both groups:

- SDG 8 (decent work and economic growth): in the first group, targets relating mainly to innovation and production; and in the second group, targets relevant to job creation and income generation, which are also important for the access to food security component.
- SDG 11 (human settlements): in the first group, a target for safeguarding the natural heritage in food production; and in the second, a target for promoting inclusion policies.
- SDG 14 (water resources) and SDG 15 (land resources): in the first group, targets for the production, processing and distribution of food and for sustainability; and in the second group, targets for food consumption.
- SDG 15 (land resources): targets for food production, food processing and distribution and sustainability, and for food consumption.
- SDG 17 (means of implementation): a group of targets of relevance to the sustainability of production, processing and distribution activities; and another group relevant to food security and social well-being.

Policies to strengthen the food system, with reference to the 2030 Agenda, can be grouped into two major areas: (a) sustainable consumption and production, and (b) food security and social well-being.

A subnetwork is a grouping defined by a group of linking elements and a set of elements related to that group. On the basis of the relationships posited in the annex, two subnetworks that can be associated with major policy areas are identified:

- ***Sustainable production and consumption,*** linked by production (PROD), processing and packaging (PRCP) and consumption (CONS) activities, the environmental security (ENS) function and the international cooperation for capacity-building target (17.9).
- ***Food security and social well-being,*** linked by the use (USE) and access (ACC) elements of food security, the social well-being function (SWB) and the hunger eradication target (2.1).

Availability (AVA) and stability (STA) are linked with both groups, while distribution and marketing (DISM) activity is linked to the sustainability subnetwork. There are 54 targets relating to both groups of linking elements, 17 targets linked to one of them and indirectly to the other (through the AVA, STA and DISM elements) and 29 targets that are not of interest because they present zero betweenness centrality.

The targets of greatest interest in public policy terms are those linked to both groups. These form the basis for policymaking to support food system activities and outcomes, with the 2030 Agenda as a reference framework. They are also the basis for identifying a set of monitoring indicators. Details are shown in table 2.

Table 2. 2030 Agenda targets of relevance to food system policymaking

SDG	Targets	SDG	Targets
SDG 1	1.4, 1.1, 1.2, 1.5, 1.3	SDG 9	9.1, 9.a
SDG 2	2.1, 2.2, 2.3, 2.c	SDG 10	10.b, 10.4, 10.1
SDG 3	3.1, 3.4, 3.2	SDG 11	11.5, 11.b
SDG 4	4.2, 4.1	SDG 12	12.b, 12.3, 12.5, 12.c, 12.1
SDG 5	5.a	SDG 13	13.b, 13.3
SDG 6	6.1, 6.3, 6.4, 6.a	SDG 14	14.b, 14.6, 14.7
SDG 7	7.1, 7.2, 7.a, 7.b, 7.3	SDG 15	15.9, 15.7, 15.4, 15.6
SDG 8	8.10, 8.3, 8.9, 8.4	SDG 17	17.9, 17.5, 17.6, 17.7, 17.8

Source: Prepared by the authors.

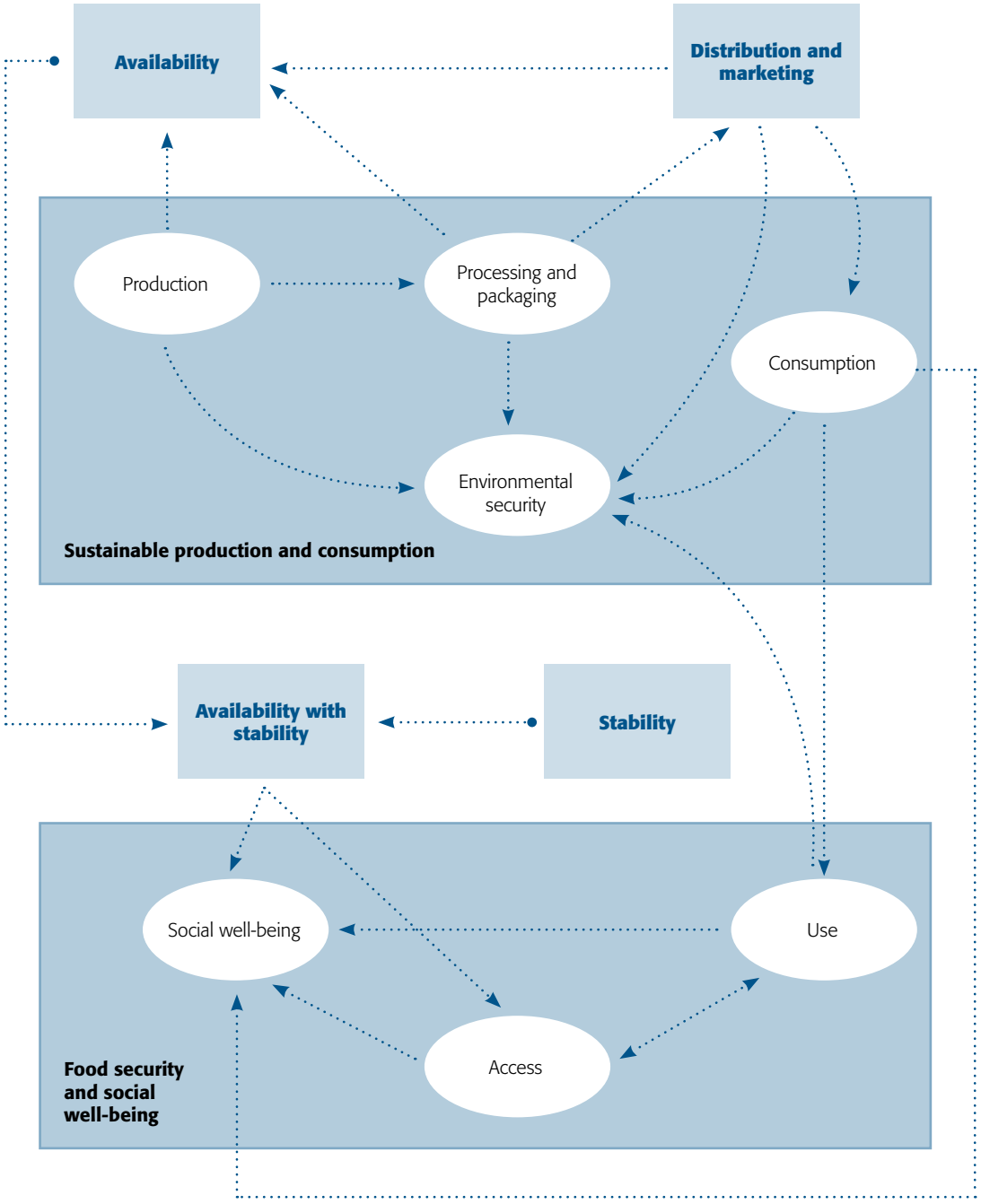
Note: The targets for each SDG are ordered by betweenness centrality value (see Rodríguez, 2017).

The group of interest contains targets belonging to 16 of the 17 SDGs (all except SDG 16). They include all the targets of SDG 1, SDG 4, SDG 6 and SDG 7 and most of those of SDG 2 and SDG 12, for which relationships with elements of the food system are posited. Figure 2 illustrates the relationships established between food system elements on the basis of the configuration of the two policy dimensions identified.

Two links are established between the two dimensions. The first arises from the relationship between consumption and the use component of food security, while the second is between production, processing and distribution activities and the availability component of food security.

It is important to stress that the food security components relating to the food supply (availability and stability) are associated with both policy dimensions, in one case through activities connected to stable food provision and in the other because a stable food supply is conducive to access and social well-being.

Figure 2. Relationship between food system elements and the policy dimensions identified



Source: Prepared by the authors.

Note: the dotted lines show relationships between food system elements, while the solid lines show relationships between policy dimensions.

Food system policymaking conducted with reference to the 2030 Agenda can be based on a small set of targets and indicators

To prepare a set of priority targets, all those corresponding to SDG 2 were selected from the set identified in table 3, along with a supplementary set based on a combination of their betweenness centrality values (positive and high values) and PageRank values (high values).

A total of 30 targets were identified, taking in 16 SDGs (all of them except SDG 16). Details are shown in table 2. Indicated in each case is the tier each indicator belongs to according to the classification prepared by the United Nations Statistics Division (UNSD) in the light of their level of conceptual and methodological development and the existence or otherwise of information for preparing the indicator concerned:

- ***Tier I:*** The indicator is conceptually clear and follows an internationally established methodology, the standards are available and the data are produced regularly by countries for at least 50% of the countries and population in regions where the indicator is relevant.

- ***Tier II:*** The indicator is conceptually clear and follows an internationally established methodology and the standards are available, but the data are not produced regularly by countries.

- ***Tier III:*** There are no internationally established methodologies or standards for the indicator, but the methodology/standards are being or will be developed or tested.

The 30 targets selected have 43 associated indicators, one of which (10.b) has a Tier I component (official development assistance) and a Tier II component (foreign direct investment). Consequently, there can be considered to be 44 indicators, 16 of them Tier I (36.4%), 13 Tier II (29.5%) and 15 Tier III (34.1%). In the case of the targets of SDG 3 and SDG 4, indicators attributable to outcomes in the areas of health (3.1.2) and education (4.2.2) that are unconnected to the food system were excluded.

Most of the Tier I indicators are associated with social well-being (1.1.1, eradication of extreme poverty; 1.2.1, poverty reduction) and food security (2.1.1 and 2.1.2, ending hunger; 2.2.1 and 2.2.2, ending malnutrition) and with enabling conditions for the fulfilment of SDG 2 (2.a.1, official development assistance; 2.b.1 and 2.b.2, producer support). Also included are indicators relating to official development assistance (10.b.1) and South-South cooperation (17.9.1), cargo transport infrastructure (9.1), clean energy consumption (7.2.1) and access to financing (8.10.1 and 8.10.2).

The Tier II indicators are associated with factors related to multidimensional poverty (1.2.2), the conservation of genetic livestock resources (2.5.2), food price stability (2.c.1), health outcomes (3.1.1), gender issues (5.a.1), water availability (6.4.2), the creation of non-agriculture employment (8.3.1) and the impact of natural disasters (11.5.1, deaths; 11.5.2, losses).

Tier III represents the greatest challenge, since these are indicators for which no internationally established methodologies or standards exist. The challenge is particularly great in the present case, since most of the indicators are associated with the role of family farming (2.3.1 and 2.3.2), food system sustainability aspects (2.4.1 and 2.5.1, for food production; 12.3.1, 2.5.1 and 12.b.1, for food consumption), measures to deal with climate change in agriculture (13.3.2, climate action for mitigation and adaptation) and the management of marine resources (14.7.1 and 14.b.1) and biodiversity (15.9.1).

In summary, there is a good base of information for following up food system outcomes related to fundamental aspects of food security and social well-being, but not sustainability aspects.

Table 3. Relevant indicators for monitoring food system policies from the perspective of the 2030 Agenda

No.	Target	Indicators	UNSD code	Tier
1	1.1 By 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than US$ 1.25 a day	1.1.1 Proportion of population below the international poverty line, by sex, age, employment status and geographical location (urban/rural).	C010101	Tier I
2	1.2 By 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions	1.2.1 Proportion of the population living below the national poverty line, by sex and age	C010201	Tier I
		1.2.2 Proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions	C010202	Tier I
3	1.4 By 2030, ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, appropriate new technology and financial services, including microfinance	1.4.1 Proportion of the population living in households with access to basic services	C010401	Tier III
		1.4.2 Proportion of total adult population with secure tenure rights to land, with legally recognized documentation and who perceive their rights to land as secure, by sex and by type of tenure	C010402	Tier III
4	2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round	2.1.1 Prevalence of undernourishment	C020101	Tier I
		2.1.2 Prevalence of moderate or severe food insecurity in the population, based on the Food Insecurity Experience Scale (FIES)	C020102	Tier I
5	2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons	2.2.1 Prevalence of stunting (height for age <-2 standard deviation from the median of the World Health Organization (WHO) Child Growth Standards) among children under 5 years of age	C020201	Tier I
		2.2.2 Prevalence of malnutrition (weight for height >+2 or <-2 standard deviation from the median of the WHO Child Growth Standards) among children under 5 years of age, by type (wasting and overweight)	C020202	Tier I
6	2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment	2.3.1 Volume of production per labour unit by classes of farming/pastoral/forestry enterprise size	C020301	Tier III
		2.3.2 Average income of small-scale food producers, by sex and indigenous status	C020302	Tier III

(Continuation Table 3)

No.	Target	Indicators	UNSD code	Tier
7	2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	2.4.1 Proportion of agricultural area under productive and sustainable agriculture	C020401	Tier III
8	2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed	2.5.1 Number of plant and animal genetic resources for food and agriculture secured in either medium- or long-term conservation facilities	C020501	Tier II
		2.5.2 Proportion of local breeds classified as being at risk, not-at-risk or at unknown level of risk of extinction	C020502	Tier II
9	2.a Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries	2.a.1 Agriculture orientation index for government expenditures	C020a01	Tier II
		2.a.2 Total official flows (official development assistance plus other official flows) to the agriculture sector	C020a02	Tier I
10	2.b Correct and prevent trade restrictions and distortions	2.b.1 Producer support estimate	C020b01	Tier II
		2.b.2 Agricultural export subsidies	C020b02	Tier I
11	2.c Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility	2.c.1 Indicator of food price anomalies	C020c01	Tier II
12	3.1 By 2030, reduce the global maternal mortality ratio to less than 70 per 100,000 live births	3.1.1 Maternal mortality ratio	C030101	Tier II
13	4.2 By 2030, ensure that all girls and boys have access to quality early childhood development, care and pre-primary education so that they are ready for primary education	4.2.1 Proportion of children under 5 years of age who are developmentally on track in health, learning and psychosocial well-being, by sex	C040201	Tier III
14	5.a Undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance and natural resources, in accordance with national laws	5.a.1 (a) Proportion of total agricultural population with ownership or secure rights over agricultural land, by sex; and (b) share of women among owners or rights-bearers of agricultural land, by type of tenure	C050a01	Tier II
		5.a.2 Proportion of countries where the legal framework (including customary law) guarantees women's equal rights to land ownership and/or control	C050a02	Tier III

(Continuation Table 3)

No.	Target	Indicators	UNSD code	Tier
15	6.1 By 2030, achieve universal and equitable access to safe and affordable drinking water for all	6.1.1 Percentage of the population using safely managed drinking water services	C060101	Tier I
16	6.4 By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity	6.4.1 Change in water-use efficiency over time	C060401	Tier III
		6.4.2 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources	C060402	Tier II
17	7.1 By 2030, ensure universal access to affordable, reliable and modern energy services	7.1.1 Proportion of population with access to electricity	C070101	Tier I
18	7.2 By 2030, increase substantially the share of renewable energy in the global energy mix	7.2.1 Renewable energy share in the total final energy consumption	C070201	Tier I
19	8.3 Promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage the formalization and growth of micro-, small and medium-sized enterprises, including through access to financial services	8.3.1 Proportion of informal employment in non-agricultural employment, by sex	C080301	Tier II
20	8.10 Strengthen the capacity of domestic financial institutions to encourage and expand access to banking, insurance and financial services for all	8.10.1 Number of commercial bank branches per 100,000 adults	C081001	Tier I
		8.10.2 Proportion of adults (15 years and older) with an account at a bank or other financial institution or with a mobile-money-service provider	C081002	Tier I
21	9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	9.1.1 Proportion of the rural population who live within 2 km of an all-season road	C090101	Tier III
		9.1.2 Passenger and freight volumes, by mode of transport	C090102	Tier I
22	10.b Encourage official development assistance and financial flows, including foreign direct investment, to States where the need is greatest, in particular least developed countries, African countries, small island developing States and landlocked developing countries, in accordance with their national plans and programmes	10.b.1 Total resource flows for development, by recipient and donor countries and type of flow (e.g., official development assistance, foreign direct investment and other flows)	C100b01	Tier I (ODA)/ Tier II (FDI)
23	11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations	11.5.1 Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	C200303	Tier II
		11.5.2 Direct disaster economic loss in relation to global gross domestic product, including disaster damage to critical infrastructure and disruption of basic services	C110502	Tier II

(Continuation Table 3)

No.	Target	Indicators	UNSD code	Tier
24	12.3 By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses	12.3.1 Global food loss index	C120301	Tier III
25	13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning	13.3.2 Number of countries that have communicated the strengthening of institutional, systemic and individual capacity-building to implement adaptation, mitigation and technology transfer, and development actions	C130302	Tier III
26	14.7 By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism	14.7.1 Sustainable fisheries as a percentage of gross domestic product in small island developing States, least developed countries and all countries	C140701	Tier III
27	14.b Provide access for small-scale artisanal fishers to marine resources and markets	14.b.1 Progress by countries in the degree of application of a legal/regulatory/policy/institutional framework which recognizes and protects access rights for small-scale fisheries	C140b01	Tier III
28	15.9 By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts	15.9.1 Progress towards national targets established in accordance with Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011-2020	C150901	Tier III
29	17.5 Adopt and implement investment promotion regimes for least developed countries	17.5.1 Number of countries that adopt and implement investment promotion regimes for least developed countries	C170501	Tier III
30	17.9 Enhance international support for implementing effective and targeted capacity-building in developing countries to support national plans to implement all the SDGs, including through North-South, South-South and triangular cooperation	17.9.1 Dollar value of financial and technical assistance (including through North-South, South-South and triangular cooperation) committed to developing countries	C170901	Tier I

V. Some implications for public policies to strengthen food systems

The 2030 Agenda targets selected serve to identify policies in the productive, social and environmental spheres that can help make food systems more competitive, sustainable and inclusive

The set of targets identified as priorities (on the basis of the relationships posited in the annex) can be used to identify a set of policies for strengthening the competitiveness, inclusiveness and sustainability of food systems, such as food and nutrition policies, policies to increase productivity, policies to promote sustainable production and consumption, policies to promote the production and consumption of renewable energy, production development policies (e.g., for financing, trade, technical assistance and infrastructure), environmental management and climate change policies and market access policies (table 4).

Table 4. Relationship between food system policies and policies in related areas, in the light of the priority targets identified in the 2030 Agenda

Food system policies	Area of development			Related policies
	Inclusion	Sustainability	Productivity	
Food and nutritional security	1.1, 1.2 2.1, 2.2 3.1 4.2 6.1 7.1			Inclusion and social protection Education Health (e.g., food and nutrition)
Increased agricultural productivity		2.3	2.3, 2.4, 2.a 6.4	Production development and innovation
Sustainable production and consumption		2.4, 2.5 12.3, 12.5, 12.b	2.4, 2.a	Production development and innovation Environmental education Recovery of waste
Renewable energy production and consumption		7.2	7.2	Renewable energy Recovery of waste
Productive diversification			8.3	Production development and innovation
Access to assets, financing, trade, technical assistance, infrastructure	2.a 5.a 8.10, 8.a 10.b	2.a	1.4 2.a, 2.b, 2.c 5.a 6.4 8.10, 8.a 9.1 10.b 17.9	Production development and innovation
Environmental and climate change management in agriculture	2.5 11.5 15.9	2.3, 2.5 11.5 13.3 15.9 17.9	11.5 13.3	Climate change Risk management
Market access for small producers	2.3 14.7, 14.b			Production development and innovation
International cooperation	17.9 10.b	2.a 17.9	8.a 10.b 17.9	Development cooperation

Source: Prepared by the authors.

The 2030 Agenda enables links to be established between these policies (which are fairly standard in the area of agriculture and food and nutrition security) and other policy areas of greater scope, examples being social protection and inclusion policies, production development and innovation policies, policies for the recovery of agricultural and agroindustrial waste and policies on cooperation for development. Table 4 illustrates

these links, singling out the targets through which the relationships are established.

The links identified in table 4 show the importance of policy coordination and linkage in different sectors, mainly between the agricultural sector and the financial and trade, health and education, water and energy, and environmental sectors. This coordination is important in the context of the 2030 Agenda and is particularly relevant for food system policies within this framework.

Not all food system policies are covered by the 2030 Agenda

It is important to emphasize that the analysis leaves out policy areas that may be relevant to the food system but that do not fall within the purview of the 2030 Agenda, examples being policies on the right to food, on food reserves and on genetically modified organisms. Some of these policies are addressed in the CELAC Plan for Food Security, Nutrition and Hunger Eradication 2025, for example, in areas related to the strengthening of institutional legal frameworks for food and nutrition security, school meals, the link between public procurement programmes and family farming, and food reserves for emergencies.

A major policy design challenge for the food system in the context of the 2030 Agenda is the development of sustainability indicators

Generally speaking, a good base of information is available to follow up food system outcomes relating to fundamental aspects of food security and social well-being. Conversely, there are no internationally agreed indicators for monitoring sustainability aspects. Lastly, a number of the indicators on enabling factors and the workings of the market fall somewhere in between. This means there are major challenges for public policy and the scientific community, both when it comes to furnishing resources for the gathering of new information and to generating and agreeing on new indicators as required to monitor the sustainability of food system activities and outcomes.

The 2030 Agenda facilitates the design of policies consistent with the goals of the 10-Year Framework for Programmes on Sustainable Consumption and Production Patterns

The first dimension, sustainable production and consumption, ties directly in to SDG 12 and creates scope for food system sustainability topics, for example, to be more explicitly included in the 10-Year Framework for Programmes on Sustainable Consumption and Production Patterns (10YFP) led by the United Nations Environment Programme (UNEP). The second subnetwork, food security and social well-being, relates to the essence of food security policies, represented in the SDG 2 target of eliminating hunger and providing access to food for all, especially the poor and those in vulnerable situations (2.1).

The 10YFP is a global action strategy for promoting international cooperation with a view to speeding up the transition towards sustainable production and consumption systems in both developed and developing countries. The 10YFP promotes capacity-building and enhancement and facilitates developing countries' access to technical and financial assistance to support them in this transition. It is noteworthy here that the SDG target associated with this subnetwork in fact relates to the increasing of international cooperation for capacity-building (17.9). The 10YFP has programmes in the areas of consumer information, sustainable lifestyles and education, sustainable public procurement, sustainable tourism (including ecotourism) and sustainable buildings

and construction. In addition, it recently implemented an additional programme on sustainable food systems.

The results of our analysis indicate that policies to enhance the sustainability of the food system, taking the 2030 Agenda as their framework, also contribute to the 10YFP sustainable production and consumption goals. Furthermore, working within the context of the 2030 Agenda allows links to be established between the 10YFP and food security.

Network analysis is a useful tool for supporting policymaking consistent with the 2030 Agenda goals and targets

The application of network analysis to support public policy design is underpinned by the relationships posited between the areas of interest, in this case the food system (as a policy implementation area) and the 2030 Agenda (policy framework). With the relationships once defined and agreed on, the tools available allow an objective analysis to be undertaken to reduce complexity to a level that is appropriate from a public policy standpoint. In the analysis conducted in the present chapter, this complexity is reduced to two major policy areas involving 25 targets associated with 11 SDGs that give rise to 36 indicators.

The analysis can be applied on different levels. The approach followed in this chapter seeks to address the issue from a regional perspective, giving the same weighting to all the relationships (i.e., they are all considered equally important). In applications in different national contexts, not all the relationships proposed here are necessarily relevant, and there may be some that are more so than others, an aspect that can be captured using different weightings in accordance with the importance assigned to each link.

The approach followed in this chapter has also been used (Rodríguez, 2017) to analyse the CELAC Plan for Food Security, Nutrition and Hunger Eradication 2025 from the perspectives of the sustainable food system concept and the 2030 Agenda. What comes out strongly in that analysis is the importance of four targets that can be seen as strategic in the two policy dimensions identified (targets 2.1, 2.2, 2.c and 9.1), and of targets related to SDG 12 (12.3 in the CELAC plan and 12.5 in the 2030 Agenda) and SDG 13 (13.1 in the CELAC plan and 13.3 in the 2030 Agenda).

Other areas of relevance to the food system in which integrative policies are required are the water, energy and food (WEF) nexus and the bioeconomy. The WEF nexus approach has been proposed as an integrated way of dealing with issues of water security, energy security and food security. This approach connects directly with SDG 2 (food), SDG 6 (water) and SDG 7 (energy). Meanwhile, the bioeconomy has been proposed as a conceptual framework for the development of policies focused on addressing the major social challenges and sustainable development concerns set out in the 2030 Agenda for Sustainable Development (El-Chichakli and others, 2016).

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Annex: Mapping of links proposed among targets of Agenda 2030 for Sustainable Development and elements of the food system

Activities	
Production	PROD
Processing and packaging	PRCP
Distribution and commercialization	DISM
Consumption	CONS

Results	
Food security / availability	AVA
Food security / Access	ACC
Food security/ stability	STA
Food security / use	USE
Social welfare	SWB
Environmental security	ENS

Food system	SDG Target		Food system
SDG 1 - End poverty in all its forms everywhere			
CONS ACC - AVA - STA	1.1	by 2030, eradicate extreme poverty for all people everywhere, currently measured as people living on less than $1.25 a day	BSO
CONS ACC - AVA - STA	1.2	by 2030, reduce at least by half the proportion of men, women and children of all ages living in poverty in all its dimensions according to national definitions	BSO
CONS AVA STA	1.3	implement nationally appropriate social protection systems and measures for all, including floors, and by 2030 achieve substantial coverage of the poor and the vulnerable	BSO
	1.4	by 2030 ensure that all men and women, particularly the poor and the vulnerable, have equal rights to economic resources, as well as access to basic services, ownership, and control over land and other forms of property, inheritance, natural resources, appropriate new technology, and financial services including microfinance	PROD - CONS AVA - STA - ACC
	1.5	by 2030 build the resilience of the poor and those in vulnerable situations, and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	CONS AVA - ACC - STA
SDG 2 - End hunger, achieve food security and improved nutrition, and promote sustainable agriculture			
PROD - CONS ACC - STA - AVA USE	2.1	by 2030 end hunger and ensure access by all people, in particular the poor and people in vulnerable situations including infants, to safe, nutritious and sufficient food all year round	BSO
PROD - CONS ACC - STA - AVA USE	2.2	by 2030 end all forms of malnutrition, including achieving by 2025 the internationally agreed targets on stunting and wasting in children under five years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women, and older persons	BSO
	2.3	by 2030 double the agricultural productivity and the incomes of small-scale food producers, particularly women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets, and opportunities for value addition and non-farm employment	PROD - CONS ACC - AVA - STA

(Continuation Annex)

Food system	SDG Target		Food system
	2.4	by 2030 ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters, and that progressively improve land and soil quality	PROD - CONS STA - AVA ENS
	2.5	by 2020 maintain genetic diversity of seeds, cultivated plants, farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at national, regional and international levels, and ensure access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge as internationally agreed	PROD - CONS AVA ENS
	2.a	increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development, and plant and livestock gene banks to enhance agricultural productive capacity in developing countries, in particular in least developed countries	PROD - PRCP DISM - CONS AVA ENS
	2.b.	correct and prevent trade restrictions and distortions in world agricultural markets, including the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect in accordance with the mandate of the Doha Development Round	DISM AVA - STA
	2.c.	adopt measures to ensure the proper functioning of food commodity markets and their derivatives, and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility	DISM - CONS ACC - STA - AVA
SDG 3 - Ensure healthy lives and promote well-being for all at all ages			
CONS ACC - STA - USE	3.1	by 2030 reduce the global maternal mortality ratio to less than 70 per 100,000 live births	
CONS ACC - STA - USE	3.2	by 2030, end preventable deaths of newborns and children under 5 years of age, with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1,000 live births and under-5 mortality to at least as low as 25 per 1,000 live births	
CONS ACC - STA - USE	3.4	by 2030 reduce by one-third pre-mature mortality from non-communicable diseases (NCDs) through prevention and treatment, and promote mental health and wellbeing	
PROD	3.9	by 2030 substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water, and soil pollution and contamination	ENS
	3.d	Strengthen the capacity of all countries, in particular developing countries, for early warning, risk reduction and management of national and global health risks	PROD - CONS AVA - STA ENS
SDG 4 - Ensure inclusive and equitable quality education and promote l ife-long learning opportunities for all			
CONS ACC - AVA - STA USE	4.1	by 2030, ensure that all girls and boys complete free, equitable and quality primary and secondary education leading to relevant and effective learning outcomes	
CONS ACC - AVA - STA USE	4.2	by 2030 ensure that all girls and boys have access to quality early childhood development, care and pre.primary education so that they are ready for primary education	

(Continuation Annex)

Food system	SDG Target	Food system
SDG 5 - Achieve gender equality and empower all women and girls		
	5.a undertake reforms to give women equal rights to economic resources, as well as access to ownership and control over land and other forms of property, financial services, inheritance, and natural resources in accordance with national laws	PROD CONS - AVA ACC
SDG 6 - Ensure availability and sustainable management of water and sanitation for all		
	6.1 by 2030, achieve universal and equitable access to safe and affordable drinking water for all	PROD - CONS USE - BSO
	6.3 by 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater, and increasing recycling and safe reuse by x% globally	CONS USE ENS
	6.4 by 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity, and substantially reduce the number of people suffering from water scarcity	PROD - PRCP CONS USE BSO
	6.5 by 2030 implement integrated water resources management at all levels, including through transboundary cooperation as appropriate	PROD - PRCP
	6.6 by 2020 protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes	PROD ENS
	6.a by 2030, expand international cooperation and capacity-building support to developing countries in water and sanitation related activities and programmes, including water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies	PROD - PRCP CONS USE
SDG 7 - Ensure access to affordable, reliable, sustainable, and modern energy for all		
	7.1 by 2030 ensure universal access to affordable, reliable, and modern energy services	PROD - CONS USE
PROD - PROE CONS	7.2 increase substantially the share of renewable energy in the global energy mix by 2030	PROD - PRCP DISM - CONS USE - ENS
	7.3 double the global rate of improvement in energy efficiency by 2030	PROD - PRCP DISM USE
	7.a by 2030 enhance international cooperation to facilitate access to clean energy research and technologies, including renewable energy, energy efficiency, and advanced and cleaner fossil fuel technologies, and promote investment in energy infrastructure and clean energy technologies	PROD - PRCP DISM - CONS USE ENS
	7.b by 2030 expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, particularly LDCs and SIDS	PROD - PRCP DISM - CONS USE ENS

(Continuation Annex)

Food system	SDG Target		Food system
SDG 8 - Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all			
	8.1	sustain per capita economic growth in accordance with national circumstances, and in particular at least 7% per annum GDP growth in the least-developed countries	ACC
	8.2	achieve higher levels of productivity of economies through diversification, technological upgrading and innovation, including through a focus on high value added and labour-intensive sectors	PROD - PRCP
	8.3	promote development-oriented policies that support productive activities, decent job creation, entrepreneurship, creativity and innovation, and encourage formalization and growth of micro-, small- and medium-sized enterprises including through access to financial services	PROD - PRCP ACC
	8.4	improve progressively through 2030 global resource efficiency in consumption and production, and endeavour to decouple economic growth from environmental degradation in accordance with the 10-year framework of programmes on sustainable consumption and production with developed countries taking the lead	PROD - PRCP CONS USE ENS
	8.5	by 2030 achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value	ACC
	8.8	protect labour rights and promote safe and secure working environments of all workers, including migrant workers, particularly women migrants, and those in precarious employment	PROD - PRCP DISM
	8.9	by 2030 devise and implement policies to promote sustainable tourism which creates jobs, promotes local culture and products	PROD - CONS AVA - BSO
	8.10	strengthen the capacity of domestic financial institutions to encourage to expand access to banking, insurance and financial services for all	PROD - PRCP AVA - ACC
	8.a	increase Aid for Trade support for developing countries, particularly LDCs, including through the Enhanced Integrated Framework for LDCs	DISM - CONS AVA - STA
SDG 9 - Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation			
	9.1	develop quality, reliable, sustainable and resilient infrastructure, including regional and trans-border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all	PROD - PRCP DISM - CONS ACC - STA - AVA BSO - ENS
	9.2	promote inclusive and sustainable industrialization, and by 2030 raise significantly industry's share of employment and GDP in line with national circumstances, and double its share in LDCs	PRCP AVA
	9.3	promote inclusive and sustainable industrialization, and by 2030 raise significantly industry's share of employment and GDP in line with national circumstances, and double its share in LDCs	PRCP AVA
	9.4	by 2030 upgrade infrastructure and retrofit industries to make them sustainable, with increased resource use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, all countries taking action in accordance with their respective capabilities	PRCP - DISM ENS

(Continuation Annex)

Food system	SDG Target		Food system
	9.a	facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, LDCs, LLDCs and SIDS	PROD - PRCP DISM - CONS ACC - AVA
	9.b	support domestic technology development, research and innovation in developing countries including by ensuring a conducive policy environment for inter alia industrial diversification and value addition to commodities	PROD - PRCP AVA
SDG 10 - Reduce inequality within and among countries			
	10.1	by 2030 progressively achieve and sustain income growth of the bottom 40% of the population at a rate higher than the national average	CONS ACC - BSO
	10.4	adopt policies especially fiscal, wage, and social protection policies and progressively achieve greater equality	CONS STA - AVA
	10.a	implement the principle of special and differential treatment for developing countries, in particular least developed countries, in accordance with WTO agreements	CONS STA - AVA
	10.b	encourage ODA and financial flows, including foreign direct investment, to states where the need is greatest, in particular LDCs, African countries, SIDS, and LLDCs, in accordance with their national plans and programmes	PROD - CONS AVA - ACC - STA
	10.c	by 2030, reduce to less than 3% the transaction costs of migrant remittances and eliminate remittance corridors with costs higher than 5%	ACC
ODS 11 - Make cities and human settlements inclusive, safe, resilient and sustainable			
	11.4	strengthen efforts to protect and safeguard the world's cultural and natural heritage	PROD - CONS USE - ENS
ENS	11.5	by 2030 significantly reduce the number of deaths and the number of affected people and decrease by y% the economic losses relative to GDP caused by disasters, including water-related disasters, with the focus on protecting the poor and people in vulnerable situations	CONS AVA - ACC - STA
	11.b	by 2020, increase by x% the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, develop and implement in line with the forthcoming Hyogo Framework holistic disaster risk management at all levels	PROD - CONS AVA - BSO ENS
SDG 12 - Ensure sustainable consumption and production patterns			
	12.1	implement the 10-Year Framework of Programmes on sustainable consumption and production (10YFP), all countries taking action, with developed countries taking the lead, taking into account the development and capabilities of developing countries	PROD - CONS USE ENS
	12.2	by 2030 achieve sustainable management and efficient use of natural resources	PROD - ENS
	12.3	by 2030 halve per capita global food waste at the retail and consumer level, and reduce food losses along production and supply chains including post-harvest losses	PROD - PRCP DISM - CONS USE - ENS
	12.4	by 2020 achieve environmentally sound management of chemicals and all wastes throughout their life cycle in accordance with agreed international frameworks and significantly reduce their release to air, water and soil to minimize their adverse impacts on human health and the environment	PROD - PRCP ENS

(Continuation Annex)

Food system	SDG Target	Food system
	12.5 by 2030, substantially reduce waste generation through prevention, reduction, recycling, and reuse	PROD - PRCP DISM - CONS USE - ENS
	12.a support developing countries to strengthen their scientific and technological capacities to move towards more sustainable patterns of consumption and production	PROD - CONS ENS
	12.b develop and implement tools to monitor sustainable development impacts for sustainable tourism which creates jobs, promotes local culture and products	PROD - CONS ACC - USE ENS
	12.c rationalize inefficient fossil fuel subsidies that encourage wasteful consumption by removing market distortions, in accordance with national circumstances, including by restructuring taxation and phasing out those harmful subsidies, where they exist, to reflect their environmental impacts, taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities	PROD - PRCP DISM - CONS USE - ENS
SDG 13 - Take urgent action to combat climate change and its impacts (acknowledging that the UNFCCC is the primary international, intergovernmental forum for negotiating the global response to climate change)		
	13.1 strengthen resilience and adaptive capacity to climate related hazards and natural disasters in all countries	PROD - PRCP DISM - CONS STA - AVA - ENS
	13.2 integrate climate change measures into national policies, strategies, and planning	PROD - PRCP DISM - CONS STA - AVA - ENS
	13.3 improve education, awareness raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning	PROD - PRCP DISM - CONS USE - ENS
	13.a implement the commitment undertaken by developed country Parties to the UNFCCC to a goal of mobilizing jointly USD100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible	PROD - PRCP DISM - CONS STA - AVA ENS
	13.b Promote mechanisms for raising capacities for effective climate change related planning and management, in LDCs, including focusing on women, youth, local and marginalized communities	PROD ACC - AVA ENS
SDG 14 - Conserve and sustainably use the oceans, seas and marine resources for sustainable development		
	14.1 by 2025, prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities, including marine debris and nutrient pollution	PROD ENS
	14.2 by 2020, sustainably manage, and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience and take action for their restoration, to achieve healthy and productive oceans	PROD ENS
	14.3 minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels	PROD ENS

(Continuation Annex)

Food system	SDG Target	Food system
	14.4 by 2020, effectively regulate harvesting, and end overfishing, illegal, unreported and unregulated (IUU) fishing and destructive fishing practices and implement science-based management plans, to restore fish stocks in the shortest time feasible at least to levels that can produce maximum sustainable yield as determined by their biological characteristics	PROD - CONS AVA ENS
	14.5 by 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on best available scientific information	PROD ENS
	14.6 by 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, and eliminate subsidies that contribute to IUU fishing, and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the WTO fisheries subsidies negotiation[1]*	PROD - CONS AVA - ACC ENS
	14.7 by 2030 increase the economic benefits to SIDS and LDCs from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism	PROD - CONS ACC - AVA ENS
	14.b provide access of small-scale artisanal fishers to marine resources and markets	PROD - DISM - CONS AVA - ACC - STA BSO
	14.c ensure the full implementation of international law, as reflected in UNCLOS for states parties to it, including, where applicable, existing regional and international regimes for the conservation and sustainable use of oceans and their resources by their parties	PROD ENS
ODS 15 - Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss		
	15.1 by 2020 ensure conservation , restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements	PROD ENS
	15.2 by 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests, and increase afforestation and reforestation by x% globally	PROD ENS
	15.3 by 2020, combat desertification, and restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land-degradation neutral world	PROD ENS
	15.4 by 2030 ensure the conservation of mountain ecosystems, including their biodiversity, to enhance their capacity to provide benefits which are essential for sustainable development	PROD BSO ENS
	15.5 take urgent and significant action to reduce degradation of natural habitat, halt the loss of biodiversity, and by 2020 protect and prevent the extinction of threatened species	PROD ENS
	15.6 ensure fair and equitable sharing of the benefits arising from the utilization of genetic resources, and promote appropriate access to genetic resources	PROD BSO ENS

(Continuation Annex)

Food system	SDG Target	Food system
	15.7 take urgent action to end poaching and trafficking of protected species of flora and fauna, and address both demand and supply of illegal wildlife products	PROD - CONS ACC - ENS
	15.8 by 2020 introduce measures to prevent the introduction and significantly reduce the impact of invasive alien species on land and water ecosystems, and control or eradicate the priority species	PROD ENS
	15.9 by 2020, integrate ecosystems and biodiversity values into national and local planning, development processes and poverty reduction strategies, and accounts	PROD - CONS ENS - ACC - AVA
	15.b mobilize significantly resources from all sources and at all levels to finance sustainable forest management, and provide adequate incentives to developing countries to advance sustainable forest management, including for conservation and reforestation	PROD ENS
	15.c enhance global support to efforts to combat poaching and trafficking of protected species, including by increasing the capacity of local communities to pursue sustainable livelihood opportunities	PROD - CONS AVA ENS
ODS 16 - Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels		
ACC STA	16.1 significantly reduce all forms of violence and related death rates everywhere	BSO
ODS 17 - Strengthen the means of implementation and revitalize the global partnership for sustainable development		
Finance		
	17.2 Developed countries to implement fully their official development assistance commitments, including the commitment by many developed countries to achieve the target of 0.7 per cent of ODA/GNI to developing countries and 0.15 to 0.20 per cent of ODA/GNI to least developed countries; ODA providers are encouraged to consider setting a target to provide at least 0.20 per cent of ODA/GNI to least developed countries	ACC - STA
	17.4 assist developing countries in attaining long-term debt sustainability through coordinated policies aimed at fostering debt financing, debt relief and debt restructuring, as appropriate, and address the external debt of highly indebted poor countries (HIPC) to reduce debt distress	ACC - STA
	17.5 adopt and implement investment promotion regimes for LDCs	PROD - PRCP - CONS ACC BSO ENS
Technology		
	17.6 enhance North-South, South-South and triangular regional and international cooperation on and access to science, technology and innovation, and enhance knowledge sharing on mutually agreed terms, including through improved coordination among existing mechanisms, particularly at UN level, and through a global technology facilitation mechanism when agreed	PROD - PRCP CONS USE ENS
	17.7 promote development, transfer, dissemination and diffusion of environmentally sound technologies to developing countries on favourable terms, including on concessional and preferential terms, as mutually agreed	PROD - PRCP CONS USE - ENS

(Continuation Annex)

Food system	SDG Target	Food system
	17.8 fully operationalize the Technology Bank and STI (Science, Technology and Innovation) capacity building mechanism for LDCs by 2017, and enhance the use of enabling technologies in particular ICT	PROD - PRCP CONS USE ENS
Capacity building		
	17.9 enhance international support for implementing effective and targeted capacity building in developing countries to support national plans to implement all sustainable development goals, including through North-South, South-South, and triangular cooperation	PROD - PRCP DISM - CONS AVA - ACC -STA USE - ENS - BSO
Trade		
	17.10 promote a universal, rules-based, open, non-discriminatory and equitable multilateral trading system under the WTO including through the conclusion of negotiations within its Doha Development Agenda	AVA STA
	17.11 increase significantly the exports of developing countries, in particular with a view to doubling the LDC share of global exports by 2020	AVA STA
	17.12 realize timely implementation of duty-free, quota-free market access on a lasting basis for all least developed countries consistent with WTO decisions, including through ensuring that preferential rules of origin applicable to imports from LDCs are transparent and simple, and contribute to facilitating market access	STA
Systemic issues		
Data, monitoring and accountability		
	17.18 by 2020, enhance capacity building support to developing countries, including for LDCs and SIDS, to increase significantly the availability of high-quality, timely and reliable data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts	STA

The website www.agrirural.org provides access to the statistical annexes of the chapters, and includes other information resources of interest to users, such as historical reports, technical newsletters, executive summaries, infographics and videos.

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