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Agriculture and Rurality in a Future of Permanent Change

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"Cultivating tomorrow's agriculture today"

Acronyms	
GDP	Gross domestic product
GHG	Greenhouse gases
IABA	Inter-American Board of Agriculture
ICT	Information and communication technologies
IICA	Inter-American Institute for Cooperation on Agriculture
LAC	Latin America and the Caribbean
MTP	2018-2022 Medium-term Plan (IICA)
SDG	Sustainable development goals
SRI	System of Rice Intensification

1. Introduction

The next Conference of Ministers of Agriculture of the Americas, due to take place 29-31 October 2019 at the Headquarters of the Inter-American Institute for Cooperation on Agriculture (IICA), in San Jose, Costa Rica, will bring together the ministers and secretaries of agriculture of 34 countries in the Americas.

Before the biennial meeting of the Inter-American Board of Agriculture (IABA), IICA's highest governing body, the Conference of Ministers will be holding a specialized technical discussion on the most important, crucial issues facing the agriculture sector, including matters related to productivity, sustainability, natural resources and environment, the incorporation of new technologies, and safety and health as key factors in international trade.

The topics chosen, which will be addressed by three specific panels, are the concerns that the countries of the Americas themselves have identified as the most pressing: the need to increase the production of food, fibers and energy while preserving the environment; and greater and better integration of agricultural and rural actors into local, regional and international markets.

Following intense discussion among IICA's own specialists, the topics were selected via a process that capitalized on one of the greatest assets of the hemispheric agency specializing in rural and agricultural development: its close ties with all the governments of the member countries of the Inter-American System. It was that permanent, meaningful dialogue that enabled the Institute to prepare a synthesis of the concerns and main challenges highlighted by public policymakers and policy implementers. This was the method used to arrive at the three topics proposed for the ministerial discussions.

This synthesis also includes the topics and focal areas that have become a permanent part of IICA's planning of its work and the actions it carries out with its partners, including governments and businesses.

One of these topics is the bioeconomy, which reflects the renewed vision of agriculture to which the Institute has given priority and for which it endeavors to secure stronger political support, as it fosters transformations that promote smart, sustainable production methods underpinned by the continent's enormous biological riches.

The focal areas include work that IICA regards as an integral part of its current mandate, aimed at strengthening agriculture and rural territories. For example, the mitigation of extreme climate effects is strongly connected to the promotion of digital agriculture and the full integration of family farming products into global markets through broad participation in international trade.

IICA fosters such integration not only by supplying and disseminating specific tools and knowledge, but also by constantly promoting the creation of associative enterprises and cooperation among small-scale producers so they can reap the benefits of scaled up operations and participate in sector institutions, increasing their representation and advocacy of specific issues.

This continuous dialogue, now with the active participation of the private sector, is the main instrument that IICA uses to ensure that it stays on course and to continually update its efforts to assist the Member States with the development of agriculture and rural well-being by means of technical cooperation of excellence.

The agenda of the panel discussions also reflects all the challenges that must be addressed to achieve a sustainable future, and the fact that agriculture is the solution most readily available to governments to meet the growing demand for more and better food, energy and other biological products in the context of a burgeoning population and the need to preserve the environment.

Recognition of agriculture's key role on the global agenda increases the importance of the discussion of the issues proposed for this great ministerial forum, making our continent a key guarantor of the world's nutrition and food security and environmental sustainability.

2. Focus of the panels

To foster the analysis and discussion under the aegis of the IABA, the ministers of agriculture of the Americas are invited to consider the following three contextual elements:

- The changes that are reshaping the world suggest that, in coming decades, "business as usual" will no longer be a viable option, and agriculture will be at the epicenter of many of the changes.

- In recent decades, bioeconomy[1] approaches have become established as the basis for a cycle of continuous, positive development that preserves and improves natural capital, while at the same time optimizing resource yields and utilization, and functioning effectively at every scale.

[1] The bioeconomy is the intensive use of knowledge of biological resources, processes, technologies and principles for the sustainable production of goods and services across all sectors of the economy (IICA 2018).

- The world of the future calls for a repositioning of agriculture and the rural milieu, opens up major opportunities for the Americas, and means that the nature of development strategies, and the way in which they are defined and implemented, has to be rethought.

Based on these three contextual elements, the panels of ministers will focus on the following three topics:

- ***Opportunities for rural inclusion in the digital era:*** Universal access to connectivity and greater dissemination of digital technologies will transform the situation in rural areas and the way in which those areas are integrated into the economy and society, and an inclusive approach designed to address inequities will need to be incorporated. In the case of production, this will lead to not only greater economic and environmental efficiency, but also open up the possibility of moving beyond the established boundaries, generating new types of production, and accessing new markets. With regard to social considerations, there is expected to be greater access to social and cultural goods in general, which will help to overcome the isolation that has characterized the rural milieu, so that the advantages of urban areas are spread more widely and new opportunities for rural territories become available. The specific impact of these processes remains uncertain, but it is clear that the opportunities are there and their nature will depend to a great degree on the policies implemented to tap them.

- ***Toward a new balance between productivity and sustainability:*** Technological innovations and business management show that, by harnessing the new currents in bioeconomy development, it will be possible to resolve the duality between productivity and sustainability in agriculture in a positive way. Science and technology are ever more available, but their benefits have yet to be harnessed completely, as reflected in large gaps in productivity between crops, countries and regions, accompanied in many cases by a clear deterioration in natural resources. Insufficient investment in research and development (R&D) limit the capacity to harness the knowledge economy as a means to achieve leaps in production and productivity, while the use of biological resources makes it possible to attain new levels of value added.

- ***Health, safety and quality for the future of trade:*** Meeting the needs of a growing and increasingly wealthy, urban and demanding population will call for a substantial increase in international trade in new agricultural products and foodstuffs, which in turn will pose major challenges in the areas of health, safety and quality, as well as prevention, given the potential impact of pests and diseases that is varying due to climate change.

IICA addressed these three issues in its 2018-2022 Medium-term Plan (MTP) (IICA 2018), but further discussion of them will do much to ensure that the Institute's work evolves in a way that is consistent with the constant, increasingly rapid changes taking place across the globe. In this way, IICA will have more input for its technical cooperation of excellence designed to meet the needs and priorities of its member countries. Presented below are the key aspects of the new scenarios, followed by the specific issues that each panel will discuss.

3. The main determinants of the new scenarios

As a result of the growth in trade and investment, agriculture and other economic activities in the rural territories of the Americas will be more integrated with the rest of the world. In light of this, their performance will depend to a great extent on an increasingly volatile and changing international context, with economic, political, cultural, social and environmental developments having a bigger impact on the region.

In the decades ahead, major changes will occur in an ever faster and globalized manner. These changes will pose a challenge to the public sector, rural civil society and businesses, and in particular to the agricultural and rural institutional framework, its forms of governance, and its mechanisms for managing and ensuring the quality of the services it provides.

In light of the main trends that are forecast, agriculture and the rural milieu will be repositioned within both the region's economies and the global economy. New opportunities, threats and challenges will require policy frameworks and adequate instruments that should be put in place ahead of time.

With 2050 as the horizon, the ongoing trends are so rapid, enormous and diverse in nature that they are expected to bring about huge transformations in modern society. Since this document is not intended to be an exercise in prospection, it is appropriate to limit the focus on these trends to the overarching categories about which there is already consensus and which define the behavior of fundamental variables. Accordingly, the analysis focuses on the evolution of five major elements:

i. Population and consumption.
ii. Natural resources and environment.
iii. Changes in climate and their crosscutting effects.
iv. Knowledge and technologies.
v. Organization of the economy and efforts to achieve sustainable development.

3.1. Population and consumption

Two confluent trends are observed in this field: a) the growth of the world's population, which is estimated to reach around 9.7 billion in 2050 and more than 11 billion by the end of this century (United Nations 2018). Other demographic changes related to increased urbanization will also occur: 77% of the world's population will live in urban areas (in LAC, the percentage will be 86%) and the biggest proportion of the world's population will be concentrated in Asia and Africa; and b) the demand for food will continue to grow faster than the population as a result of the changes expected to occur (particularly in emerging economies), related to age pyramids, higher income and income distribution: 50% of the world's population will be middle class, with the proportion even higher in developing countries.

Changes are also beginning to occur in consumption patterns related to stricter food safety requirements and their importance for human health and nutrition, environmental issues and socially responsible consumption. These changes are expected to become more marked in the decades ahead. Even if economic and trade growth rates were to change in the future, the evolution

of the population and consumption is still expected to put pressure on production systems. A 60 to 111 percent increase in agricultural production will be required by 2050.

In recent decades, the evolution of production and trade have gone hand in hand with the global transformations (for example, the importance of China and India in the global market, the growth of the middle classes and the new types of consumption associated with that development, and the emergence of biofuels as a factor in the demand for raw materials, among others). In view of this, it is worth asking whether there will be the same response capacity in the future, and which focal areas of work should be prioritized to effectively address the challenges that lie ahead.

3.2. Natural resources and environment

Given the scenarios envisaged, more tensions of all kinds are only to be expected in relation to production system sustainability and natural resource use.

There are already clear indications that, in many cases, the limits of what is sustainable are being reached, with concrete evidence concerning the deterioration in certain strategic resources: forecasts suggest that by 2050 the demand for water will have increased by 50%, 25% less farmland will be available per capita, and 10% of biological species will have been lost. At the global level, the availability of water and arable land is becoming an increasingly important issue, with the situation worsening as a result of intensive, non-environmentally friendly production systems and the deterioration of forests and biodiversity, among other causes. This is increasingly raising doubts about the viability of the production and trade models that have dominated the global economy since the Industrial Revolution.[2] All these aspects will, inevitably, have to be recognized explicitly, both as pivotal elements of public policy and in international negotiations, as will the transnational nature of many environmental issues. A case in point are greenhouse gas (GHG) emissions, water use, agrochemicals and biodiversity, among others. In fact, some of these issues have already begun to be included as determining aspects of competitiveness and market access.

3.3. Changes in climate and their crosscutting effects

There is growing concern over the changes in climate taking place and their connection with agricultural production, in terms of both the contribution that current production systems make to global GHG balances, and the need to establish systems that are more resilient to the frequent severe weather events.

The long-term changes in climate will oblige producers to turn to new products, while events linked to changes in normal weather conditions (such as the increase in temperature variation and

[2] Although the region has some of the planet's largest water reserves, access to water varies and more than 22% of soils are in highly or very highly degraded areas. In Mesoamerica and the Caribbean, the figure is over 48% and it is estimated that, were agricultural land use to remain unchanged in LAC, roughly 50% of the land will be subject to processes of desertification by 2050.

extreme precipitation over a specific period) are leading to a higher incidence of pests and diseases in agriculture[3].

The new scenarios that are to be expected call for faster, closely coordinated responses, especially with regard to agricultural health measures and the components of technical assistance for production systems and value chains.

In the short and medium terms, one key aspect that should be considered is the effect that agricultural health conditions will have on global trade. What could be called "health intelligence" systems will be required, to ensure, on the one hand, greater preparedness and surveillance with regard to outbreaks of diseases that have already been eradicated and the emergence of new pests and diseases as a result of climate variability; and, on the other, greater efforts and new research designed to achieve effective and reasonably inexpensive sanitary control.

3.4. Knowledge and technologies

In this area, the transformations are broad in scope. Advances in the field of biology are repositioning the role played by biological resources, improving our ability to understand and take full advantage of the opportunities they offer. In recent decades, these advances have highlighted the full potential of the intrinsic value of Nature and biological processes.

The impact of these trends, which are transformative in themselves, is augmented by the interaction among them, what is beginning to be referred to as "technological convergence." By interacting with each other, different disciplines — biology, biotechnology, chemistry, nanotechnology, data science, information and communication technologies (ICT), engineering, etc. — are driving the progress of each specific field, blurring the traditional boundaries between sectors of the economy and changing the competitive advantages of countries and their businesses.

ICT and digitalization are becoming determinants in the organization and competitiveness of economies. Widespread connectivity, satellite technologies, data science and artificial intelligence mechanisms, robotics, autonomous systems (cars, planes, ships, drones, agricultural implements, etc.), electronic and biological sensors, virtual and augmented reality, the Internet of Things and blockchain apps are building an increasingly interconnected world in which the role of space and business models in the various sectors of the economy is being redefined. It is also becoming increasingly possible to predict climate phenomena, foresee their consequences and generate risk management programs to better deal with the consequences and monitor their impact, which will undoubtedly reduce management costs.

Through the use of such groundbreaking science and technology, the bioeconomy makes it possible not only to improve the productivity and sustainability of biological resources by developing more productive, disease-resistant and environmentally friendly varieties of plants and animals, but also to take advantage of biomass (including waste and residues) to generate new bioproducts with high value added, such as foodstuffs, bioenergy and other biological materials

[3] It is estimated that, in the medium term, yield losses caused by plant pests will be in the order of 21.5% for wheat, 30% for rice, 22.5% for corn, 17.2% for potatoes and 21.4% for soybeans, much of which will be associated with emerging or reemerging pests and diseases (Savary *et al.* 2019).

used by the cosmetic, pharmaceutical, chemical and other industries. Furthermore, it generates a range of new services (applied to human, plant and animal health, environmental bioremediation and a number of preexisting activities) and attaches greater value to biodiversity.

The new productive options offered by science and technology are opening up a wide range of possibilities for integrating young people into bioeconomy enterprises.

Pathways to capitalize on the bioeconomy

In general, the pathways for the productive use of the bioeconomy are:

- Utilization of biodiversity resources.
- Eco-intensification (or sustainable intensification).
- Biorefineries and bioproducts.
- Biotechnological applications.
- Increased efficiency of value chains.
- Ecosystem services.

It is important to emphasize that there is no single formula for the utilization of the bioeconomy in LAC agriculture. Road maps need to be developed to take advantage of specific potentialities. This will depend both on the factors that chains and territories possess, and on the use that agents make of them.

Source: IICA 2019.

Technological convergence is one of the trends making the biggest contribution to the renewed, modernized vision of agriculture, value added chains and international trade, especially because of young people's technological skills — which far exceed those of previous generations — and the need to halt the migration of young people from rural territories to more urbanized areas. These new technological scenarios are already beginning to be reflected in agriculture, agribusiness and the rural milieu, and are increasingly perceived as offering the basis for the development of "sustainable intensification."[4] Furthermore, they are expected to have significant effects on production and the ways in which agricultural production is organized, rural employment and equity in rural territories, etc.

In the case of production, technological convergence leads to more efficient use of inputs and the factors of production, and opens up the possibility of moving beyond the traditional boundaries of production.

With regard to social aspects, it creates conditions that afford rural dwellers access to social and cultural goods that transform rural spaces and the way in which they are integrated into society. The direction and results of these processes have yet to be defined, but it is clear that their ultimate impact will depend on whether the countries and territories develop the public goods needed for their peoples to gain access to, and tap, such technologies. The great challenge lies in ensuring access to the new spaces full of opportunities, which will require that R&D investment strategies be reviewed.

[4] Thought of as a means to increase production through more efficient and sustainable use of inputs, including water, and help achieve the objective of reducing GHG emissions.

3.5. Organization of the economy and efforts to achieve sustainable development

Parallel to the trends described above, at the global level the discussion has begun to focus on the circular economy and, in particular, the bioeconomy, as new approaches that promote the sustainable growth of agriculture and rural territories in line with environmental sustainability and the expectations of well-being of today's societies.

By making more efficient and sustainable productive use of resources, ICT and the bioeconomy offer new solutions to segments of the population that have historically been left behind and today could benefit from the greater productive opportunities available.

A case in point are women living in rural territories who are involved in agriculture in a wide range of ways and use environmentally friendly practices. Many innovative enterprises operated by women point to the progress being made.

These new visions are already being accepted as the basis for the design and implementation of more equitable and sustainable development approaches that provide an effective response to today's challenges. These processes are already under way and, far from losing momentum, are set to become consolidated as processes of a global nature. More and more countries, including several in the region, have begun to incorporate these concepts into the design of their strategies for meeting the commitments assumed under the 2030 Agenda and the SDG framework.[5]

4. Agriculture and rural territories of the Americas: heterogeneity and vulnerability as persistent factors

The agriculture and territories of the region, as in other parts of the world, are being impacted by the trends described in the previous paragraphs. Although LAC is one of the regions best placed to cope with the new demands (since it possesses nearly one third of the world's land that could be used to increase the cultivated area and 35% of all freshwater reserves), it lags behind in areas that have historically increased the vulnerability of agriculture and other economic activities in rural territories. Failure to make sufficient use of its biological riches, climate variability, limited investment in science and technology, the high segmentation of the productive structure, and the concentration of governance in value chains are only some of the factors that have long plagued the region and limited its performance and international importance.

While LAC's biological riches are among its major comparative advantages over the rest of the world, their utilization is limited and inefficient.

Although the biodiversity on which the region's agricultural activity is based is enormous, in most cases it is little used, unrecognized and even taken for granted. Historically, this has been reflected in the marked tendency in LAC to produce and export commodities. However, it should be emphasized that in recent decades changes have occurred in the structure of agricultural production characterized mainly by an increase in the relative weight of livestock farming within total

[5] For an in-depth discussion of the nature of the opportunities that the bioeconomy offers the region, and the progress made with these processes in different countries in recent times, see ECLAC *et al.* (2019).

agricultural production (its share rose from 38% in 1980 to 42% in 2012), poultry production's growing importance in the category of animal protein (the percentage for poultry farming doubled, while the figure for meat and milk production fell from 70% to 54%) and the makeup of crop production changed (cereals and oilseeds accounted for 27% of the total in 1980 and 41% in 2012, while the percentage for fruits, coffee and sugarcane fell from 57% to 45% in the same period (Nin-Pratt *et al*. 2015).

More than two thirds of the region's agricultural production units are operated by family farmers. 70% of them are poorly integrated into agricultural markets.

In socio-productive terms, LAC's agricultural and rural sector is characterized by marked segmentation, with economic units that differ greater in terms of access to resources, productive conditions and market integration. Nearly 16.2 million of the region's estimated 21 million agricultural production units fall into the family farming category, while the other 4.8 million are medium-sized and large businesses specializing in agriculture. Almost 70% (some 11.75 million) of family farmers are not totally integrated into agricultural markets, the bulk of their production is used for personal consumption and they depend mainly for their subsistence on remunerated work in the local job market. For the most part, these farmers are an aging population with low levels of schooling, with women running many of the farms.[6] They also tend to operate on land that is very vulnerable in terms of both soils and climate, and in places where the roads to urban centers are poor, among other limitations. Family farms exist across the region, but account for a larger proportion of the total in certain regions of Central America and the Caribbean countries.

In the case of commercial agriculture, the high concentration of governance in value chains is reflected in the fact that producers receive a small percentage of the prices paid by the end-consumer.

One of the biggest constraints in the case of production units that are fully integrated into agricultural markets has to do with the concentration of governance in agricultural value chains, which has led to a permanent reduction in the percentage of the final prices that producers receive. A few decades ago, LAC agricultural producers received between 30% and 50% of the final price, a figure that now stands at between 8% and 15% (CAME 2019).

The recent coffee price crisis is a clear example of these trends. The situation is no different in the United States, where, according to Schnepf (2015), in 2013 producers received only 10.5% of the price paid by consumers, with the rest being absorbed by marketing systems, retail sales and processing, packaging, refrigeration, handling, labeling, publicity, financial and other costs. In the case of grains and oilseeds the percentage is as low as 5%, while for other products, such as eggs, the figure is 56%.

There are huge disparities and differences in the amounts spent on investment and development in science, technology and innovation. While LAC invests an average of USD 1 in R&D for agriculture per USD 100 of agricultural production, the figure in the United States is around USD 3.2. There are also major disparities within the region, with the level of investment of most

[6] This comment is not meant to suggest that the contribution of family farming is any less important, it simply points up the need to review the figures that have been used in the hemisphere to argue for programs in support of farmers of this kind.

countries being totally insufficient to meet the needs. For example, in countries where agriculture makes up an important part of the economy, average public investment in R&D tends to be less than 0.4% of agricultural gross domestic product (GDP). The level of private sector investment in R&D, one of the key components for the effective mobilization of new knowledge, is also very low.

Low levels of investment in R&D for agriculture, in comparison with other regions of the world, have limited growth in the factors that affect the region's agricultural productivity.

The lags and disparities in the region's investment in science, technology and development are reflected in major gaps in the productivity of factors and yields of its main agricultural crops and livestock. Over the last 10 years, agricultural production in LAC has grown by 2.7% annually, placing it slightly above the world average and significantly higher than more developed regions and countries. However, other regions of the world that are major competitors of LAC (e.g. Sub-Saharan Africa and Asia) have achieved higher annual growth rates in their agricultural output, a situation further aggravated by the following elements:

a) LAC's agricultural output, measured by total factor productivity (TFP), grew at a lower rate than the global average, and in the countries of so-called developed regions (i.e. Europe, North America and Oceania) the increase in factor productivity grew to such an extent that it compensated (substantially) for the fall in the use of inputs.
b) In the last 10 years, annual growth of agricultural production in LAC has been lower than during the first decade of the 2000s (2.7 % versus 3.4 %) and even lower than during the 1990s (3.2 %).
c) Not only has the annual growth rate of agricultural production declined, but also the contribution of productivity to growth. In the first decade of this century, over 75 % of the expansion in agriculture was explained by an increase in the productivity of factors, but now that contribution is close to 50 %.[7]

Although they play an essential role in agriculture and other rural economic activities, women and rural youth are "invisible" and underestimated, a situation that has limited their access to services and assets for production.

In terms of the participation of rural women and youth in agricultural development, LAC lags far behind, a situation largely explained by the ineffectiveness of traditional approaches that continue to ignore their significant contribution. In the case of rural women, and according to figures from ECLAC *et al.* (2019), despite the increase in their participation in the workforce (which reached 43 % in 2017), 54% of rural women in Latin America are categorized as "inactive", a figure that does not reflect their true participation in the labor market. In comparison with men, women work more hours, if we take into account unpaid work such as household chores and childcare (reproductive role). The invisibility or underestimation of rural women in official statistics excludes them from access to production resources, financial services and even land ownership or inheritance. The proportion of women landowners in the region ranges between 7.8 % and 30.8 % (FAO 2019a). Enhancing their participation in the new currents of agriculture will translate into

[7] A more detailed analysis may be found in the two latest editions of the report "The Outlook for Agriculture and Rural Development in the Americas: A perspective on Latin America and the Caribbean" (ECLAC *et al.* 2019).

an increase in the sector's contribution to countries' national GDP and to the development of rural areas.

Climate variability, together with an increase in the intensity and frequency of extreme climate events, has become one of the main sources of risk and vulnerability for the region's agriculture.

A final aspect to be considered is climate vulnerability and its effects, both on the stability of production and on the emergence of pests and diseases that affect crops and livestock.[8] Whether these conditions will be transient or permanent is a matter of debate, but the effects on agriculture are evident and unavoidable. The implications are more serious for the Central American countries, particularly in the so-called Central American Dry Corridor,[9] and in the Caribbean countries, where the effects of extreme events, such as highly destructive storms and hurricanes, periods of drought, high temperatures, etc. have significant and unpredictable effects on agriculture, fisheries and aquaculture. The FAO (2019b) notes that six of the 31 countries in the world with the most vulnerable marine ecosystems are located in the Caribbean. The effects of climate change are also evident in the extreme cold experienced in the Andes and the scarcity of water along the Pacific coast of South America and in northeastern Brazil, to mention only some of its manifestations, on which prompt, concrete and decisive action is required.[10] For example, it is estimated that by 2050, more than 17 million people in LAC will have migrated from their countries, due to the devastation of agriculture, the absence of freshwater or rising sea levels caused by the effects of climate change (these migrants have been termed "climate migrants") (Rigaud *et al.* 2018).

Such conditions are closely linked to the persistence of rural poverty in many countries of the region, even those where progress has been made in reducing this indicator. Associated with poverty is the phenomenon of migration, both the endemic migration flows toward the cities and those of an international character. This issue must be taken into account in the design of any future strategy to take advantage of the opportunities arising from the scenarios discussed in previous sections.

5. Ministerial panels

All the aforementioned trends, together with the region's heterogeneities and vulnerabilities, suggest that greater tensions will arise in all the relevant dimensions, basically driven by the need to address the growing demands and expectations of a much better informed and more interconnected society, but based on much more austere conditions, which will inevitably be reflected in distribution patterns, inter-sectoral relations and in the organization of the economy. However, it is also possible to anticipate that the world will have the capacity to deploy instruments

[8] According to estimates by Eckstein *et al.* (2018) in the Global Climate Risk Index (level of exposure and vulnerability to extreme events), 5 of the 10 countries that have been most affected by extreme events in the last 20 years are in LAC: Puerto Rico, Honduras, Haiti, Nicaragua and Dominica. LAC went from 82 meteorological, hydrological and climatological events in the 1980s to 177 in the last decade (Munich RE 2019). According to ECLAC *et al.* (2015) the frequency of natural disasters in Central America has increased by 6 % annually in the last three decades with respect to the 1970s.

[9] The Pacific coastal strip that stretches from Chiapas, in Mexico, to western Panama and that passes through the arid lands of Guatemala, El Salvador, Honduras, Nicaragua and part of Costa Rica.

[10] This same situation is repeated in other regions of the Americas outside of LAC, such as the southwestern United States.

to respond to the anticipated changes. But whatever the future scenario of agriculture, LAC will play a strategic role in efforts to achieve a balanced development model that not only facilitates the sector's growth and economic development, but also the promotion of environmental sustainability and new productive and social opportunities in the rural territories.

It is time to leave behind the old concept of agriculture as a mere supplier of commodities and fibers and begin to rethink our development models, based on an efficient and sustainable use of biological resources and principles that will enable us to produce the goods and services needed by society.

The challenge lies in how to mobilize that potential and determine which institutional and policy adjustments must be made, at both the national and international level, to take full advantage of the opportunities arising from the new scenarios, as well as how to minimize any negative impacts of those future probabilities, whether on the environment, social relationships or the spaces in which young people and rural women participate. This discussion is, precisely, the central focus of the panels proposed below.

Panel 1: Opportunities for rural inclusion in the digital age

The new technologies not only augur new productive and economic scenarios, but also major changes in the criteria that affect population settlement patterns and economic activity, as well as other related social processes. The processes and parameters that shape the socio-spatial construction of rural territories already differ substantially from those of the last century, and will be even more different in future.

From the region's perspective, those scenarios are of particular importance. On the one hand, it would appear that whichever path the global economy takes, the region will continue to play a strategic role in preserving global balances, both in environmental aspects (water, biosphere, genetic pool) and in production. It is clear that the region is obliged to go much further than the mere production of food or fibers, since it has the potential to position itself in value chains of bioproducts for the energy, cosmetics, medicine, pharmaceutical and chemical industries, among others. Its natural and institutional capital in several areas essential for the new developments allow us to make this assertion.

The new alternatives emerging from the use of biological resources and the potential territorial or area-based structure of economic activity, provide a valid and powerful strategy for addressing the region's specific challenges, such as hunger, poverty, sexual inequalities, lack of opportunities for young people and the fact that this region has the worst income distribution indices in the developing world (ECLAC 2016).

Although recent decades have seen major progress on all these fronts, the imbalances continue, especially in rural areas. Many of these are strongly linked to the fact that agriculture and the rural milieu have been associated with traditionalism and "backwardness", while industry, services and the city have been linked with "progress", implicitly promoting the idea that the latter represent the lodestar that guides development. This notion has formed the basis for many migratory processes from the countryside to the cities, resulting in a loss of competitiveness in rural areas (lack of human resources and limited capacity to attract investment, a situation aggravated in many cases by the lack of social, productive and logistical infrastructure, a weakened State presence and public insecurity in the face of organized crime, among many other problems). All these factors have led to extreme poverty and exclusion taking root in these territories.

Information and communications technologies (ICTs) are decisively shaping the profiles of relationships, both within and between rural territories. The concept of *everyone connected all the time* forces us to rethink the categories of "urban" and "rural", and even to question whether these concepts are still useful to adequately define development policies. The old image of an isolated and backward rural milieu is no longer valid and will become increasingly outmoded. Connectivity and the virtual world are rapidly changing that image, probably in a far more dramatic way than we ever imagined – and opening up the possibility of positively transforming many of the negative trends that have affected rural areas until now.

Digital agriculture in LAC's rural areas

Despite an increase in the number of households in LAC connected to the Internet (62.1 % of LAC inhabitants used the Internet in 2017), there are major differences between urban and rural households, with gaps averaging 28 % (ECLAC 2018).

In Uruguay and Chile alone, 15 % of the connections have a speed above 15 Mbps. Having access to broadband is an essential element to be able to take advantage of the advances of the digital age, i.e. those associated with the operation of digital platforms, sensors, Internet of Things (IoT), robots, drones, big data, cloud computing, artificial intelligence (AI) and blockchain.

Source: ECLAC *et al.* 2019.

The combined impact of ICT and the opportunities afforded by the bioeconomy on the processes of agriculture, livestock and forest production have already brought about dramatic and positive changes in the characteristics and conditions of agricultural and rural employment in the region. For a wide range of rural stakeholders – from the production-business sector, to traditional rural workers and operators of equipment and machinery etc. - demand for education, training and intellectual development has multiplied.

The incorporation of computer technology into agricultural, dairy, beef, poultry, fruit and forestry production chains, as well as into the management, processing and conservation of products, creates more skilled jobs that will help retain young people in rural areas. This will require us to rethink the education and training needs of agricultural and rural agents. Various dynamics, including the creation of new jobs that are attractive to rural youth, are already undergoing a process of change.

The challenge ahead is to take advantage of the opportunities offered by ICT to create new conditions of systemic competitiveness for agriculture, so that rural areas – until recently, the points of origin of internal migrations - become attractive living spaces for the new generations.

For this to happen, it is essential to consider other complementary challenges, such as promoting rural connectivity, in order to bring about a real and effective democratization of information and knowledge and to ensure that the new extension systems develop the necessary skills in rural stakeholders and production chains to take full advantage of their potential.

Use of biodiversity

Despite the region's high level of biodiversity, 56% of the value of its agricultural exports currently comes from 10 products.

However, LAC's agriculture sector experienced a constant evolution during the period from 1995-2016, when **16 %** of the growth in agricultural exports in LAC came from the export of new products.

Source: ECLAC *et al.* 2019.

The following points are offered by way of a synthesis:

a) New technologies will promote availability of and access to information and knowledge, as well as to social goods, which will redefine urban-rural relationships and the very concept of the rural space itself.

b) The dissemination and use of technologies will not only help to halt the endemic exodus of populations to urban areas, but will also attract new skills and economic activities to rural areas. These technologies are changing the social and economic context in rural areas, a trend that will be further consolidated in future, though at present we only perceive some of the more marginal effects.

c) Given the solid nature of this trend, any decisions taken in relation to rural areas and agriculture must consider this scenario as a highly decisive factor. Thus, the implementation of connectivity infrastructure and training programs to ensure that workers of all levels develop the skills required to take full advantage n of emerging opportunities, must be a political responsibility at the highest level.

Based on these considerations regarding the present and future scenarios for rural areas and agriculture, the following motivational questions are proposed for the panel:

- What actions should be promoted, at the national and international level, to take full advantage of the opportunities offered by the digital age for the rural milieu and agriculture?

- What are the main barriers, institutional or otherwise, that must be overcome to obtain maximum benefit from these opportunities?

- What should be the priorities of international cooperation to respond to the needs of the countries and the region, so that they can take full advantage of the opportunities afforded by ICT for the development of rural areas and agriculture?

Panel 2: Toward a new balance between productivity and sustainability

A dilemma that has prevailed for a long time is the dichotomy between productivity (achieved in large measure through intensification) and sustainability in agriculture. We have been led to believe that these goals are very difficult to reconcile, and that it is impossible to increase the former without affecting the quality of natural resources.

The new scenarios in science and technology suggest that the dichotomy between productivity and sustainability is no longer valid; and, while recognizing its limitations, technological development offers many more options for production based on biological resources than are being utilized at present.

However, the significant increase in the productivity of grains and oilseeds in some southern countries of the continent, the major advances achieved in soil improvement and conservation and the cases of certain tropical products, such as rice, with commitments to environmentally sustainable management, prove that this dichotomy is not entirely true.[11]

In the search for a balance between productivity and sustainability, the bioeconomy is being consolidated as the biological component of the new circular economy that is more respectful of natural resources. It aims to move a step further, since it is no longer a matter of maintaining energy resources (basically, fossil fuels) in the production cycle for as long as possible, but rather of replacing those strategic original resources with alternatives based on renewable carbon (biomass). This offers a promising alternative that allows for new and renewed relationships between production and the environment. In addition to recirculating resources, the bioeconomy promotes value-added processes that result in benefits for the populations involved in these new enterprises.

Beyond traditional primary agriculture, the bioeconomy is changing the pathways for the integration of agriculture, industry and other sectors of the economy and creating opportunities that call for a new balance between productivity and sustainability.

The "technological convergence" is accelerating these processes and reorganizing the relationships between different sectors of the economy and also between the economic, social and environmental dimensions.

The new technologies represent a concrete opportunity to break the cycles of low productivity and poverty. However, the region

Productivity in LAC

Although increases in productivity have driven the growth of agricultural production, there are significant differences between countries and regions.

In recent years (2011-2015), the average annual growth rate of production was 2.5 % (2011-2015), while the average annual growth rate of productivity was1.3 %, which is lower than the1.4 % average annual growth rate in the world (Fuglie and Rada 2019).

In 2018, the partial productivity of agricultural factors per agricultural worker in LAC averaged USD 7,200, above the world average of USD 3,170, but much lower than in countries such as the United States (USD 79 108) and Canada (USD 93 110) (World Bank 2019).

Source: ECLAC *et al.* 2019.

[11] A specific example is the System of Rice Intensification (SRI), whose results in Colombia and the Dominican Republic have been shown to produce higher yields (up to 25 %) and significant savings in the use of seed (up to 96 %) and water (up to 45 %) than the traditional systems. This, together with savings in costs averaging 10 % in both countries, has generated larger profits for the Dominican Republic and Colombia (up to 43 % and 68 %, respectively).

does not appear to be taking full advantage of these opportunities, partly because of the huge investment gaps that exist between countries and with respect to other parts of the world, and partly because of the failure to recognize and value the contributions of groups such as women and rural youth, whose participation in production is rendered "invisible." Moreover, the bulk of investment in R&D is concentrated in a small number of countries (the largest ones), while the rest of the economies (most of them very small), are barely capable of covering their most immediate needs, and much less of investing in research that would enable them to take full advantage of the opportunities offered by the new scenarios.

In order to boost the region's strategic role in global food and environmental security and also take full advantage of technological advances to embark on new processes that utilize biological resources for the production of high value-added goods and services, the following actions are proposed:

a) Incorporate the bioeconomy as a spearhead for strategies and plans to develop agriculture, promote the equitable distribution of its benefits and internalize the environmental dimension as a source of competitiveness in international markets.

b) Promote a new generation of governance systems and public policies that will guarantee public and private investment levels, particularly in R&D activities required to achieve an optimum balance between productivity and sustainability in agricultural production.

c) Create renewed mechanisms for hemispheric cooperation with the participation of all relevant public and private stakeholders.

Based on these considerations in the search for a new balance between productivity and sustainability, the following questions are proposed to guide the discussion of the panel:

- What actions, at the national and international level, should be promoted to make better use of the opportunities to achieve a balance between productivity, well-being, equity and sustainability?

- What barriers, institutional or otherwise, must be overcome to obtain maximum benefits?

- What should be the priorities for international cooperation to respond to the needs of the countries and the region in their quest for a balance between productivity and sustainability?

Panel 3: Health, safety and quality for the future of agricultural trade

LAC is currently a strategic player in the international trade in food, fibers and energy, and it is highly likely that this role will be strengthened in the context of the growing demand and more limited resources anticipated in the coming decades (even more so if the new technologies succeed in closing the productivity gaps that affect the competitiveness of much of regional production). Faced with these opportunities, it is important to consider changes in consumption patterns, particularly those driven by the growth in incomes, increased environmental concerns and socially responsible consumption, and by the impacts of climate change on the geography of production, which will very likely result in changes in the composition of agricultural production and the pests

and diseases that affect them. It is also hoped that LAC will use its biological potential to produce non-traditional products and services that will facilitate linkages with other high-value industries.

The increase and diversification of production, together with new criteria in response to demands for better safety and quality, make it necessary to reconsider many of the current strategies.

The conditions imposed on trade, associated with environmentally sustainable management, CO_2 emissions and the protection of natural resources (water, soils, biosphere, forests, natural fauna and even animal well-being), are transforming what initially began as consumer trends or guidelines, into private and public trading standards for products, to be respected in order to access and retain markets.

Not only is it necessary to review investment levels, but also regulatory issues and certification and traceability systems to reflect the larger volume and diversification of products. It is also essential to address, in a verifiable manner, considerations of a sanitary and phytosanitary nature and ensure that consumers' new interpretations of product quality are applied throughout the value chain. Moreover, the acceleration of the processes involved calls for proactive approaches. It is no longer a matter of responding to immediate problems: market intelligence now requires prospective surveillance and monitoring of pests and diseases in order to anticipate outbreaks and thereby prevent their propagation. In this regard, the participation of young people in early warning systems is one of the options for improving compliance with current and future standards. This component will acquire greater importance in the future development of "sustainable competitiveness."

In addition, the performance of the region's agriculture has been very uneven; consequently, domestic consumption patterns and imports and exports of agricultural products have varied considerably from country to country, and over time. While some countries have developed a strong agricultural export sector, others are becoming extremely dependent on imports of primary and processed products. In particular, it should be noted that agrifood exports have a lower value-added than agrifood imports. This poses the great challenge of not only increasing value-added, but also enhancing its generation in rural areas and ensuring that the benefits are shared with producers.

An unavoidable challenge is to ensure that countries have the necessary institutional and production capacity not only to ensure the health, quality and safety of their current products, but also to anticipate those that may appear as a result of the new scenarios and to facilitate the development and use of innovative products based on "biologicals" made possible by the new frontier of science and technology.

LAC accounts for **14 %** of the world's agrifood exports and is an international market leader in products such as oilseeds, chicken, coffee and fruits.

Source: IICA, with data from ITC; WTO 2019.

The creation of the following programs is proposed:

a. Comprehensive agricultural health programs that not only safeguard current conditions, but also work proactively to address emerging challenges related to pests and diseases.

b. Agricultural health and food safety systems that satisfy the requirements of exports and national production, recognizing the differentiated needs of the various sectors.

c. Strengthened hemispheric research programs on prospective agricultural health, focusing especially on an intensified trade in products and population flows.

In line with the above proposals related to health, safety and quality for the future of trade, the following questions are suggested to guide the panel's discussion:

- What actions should be promoted, at the national and international level, to take full advantage of trade opportunities, taking into account all stakeholders, including women producers and the young population?

- What are the main barriers, institutional and otherwise, that must be overcome?

- What should be the priorities of international cooperation to respond to the needs of the countries and the region in order to maximize the trade benefits associated with the exchange of agricultural products and new products of the bioeconomy?

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