

DISCUSSION PAPER

Food systems: an outlook from the perspective of agriculture in the Americas¹

1. This document is presented for discussion at the 2021 Food Systems Summit, the main purpose of which is to analyze the different dimensions of agrifood systems and the central role played by agriculture in the Americas. It will be accompanied by a series of 11 technical documents produced by IICA on research and development, soils, digital agriculture, tropical agriculture, sustainable livestock production, "One Health", cooperatives, international trade, bioeconomy, gender and youth and Caribbean agriculture. All of this information will constitute IICA's contribution, which will be channeled through a number of hemispheric, regional and national dialogues.

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1

Introduction

In 1996, at the World Food Summit organized by the United Nations, the member countries agreed to consider food security a fundamental human right, therefore placing it at the center of global development. In other words, the countries agreed to work individually in their own territories as well as collectively in order to eradicate hunger from the world.

This historical commitment placed food security at the highest level of national and international politics. It was fully ratified and implemented in 2015, with the approval of the 17 Sustainable Development Goals (SDGs), which became a roadmap for global development.

The Secretary-General of the United Nations has convened the **2021 Food Systems Summit**. The goal of this conference will be to assess the functioning of the Global Food System and for the international community to propose actions. These actions must be defined at national and international levels, and must be targeted at the construction of more efficient food systems, capable of achieving the multiple goals needed to ensure a nutrition that is inclusive, quantitatively sufficient, safe for human health, nutritionally and environmentally adequate and socially sustainable.

The Inter-American Institute for Cooperation on Agriculture (IICA) is a member of the Summit's Champion's Network, one of the four main support structures of this global meeting, which seeks to represent the voice of farmers in the Americas. Within this framework, **the purpose of this document is to organize the conceptual and political discussion required to make a contribution to the Summit from the perspective of the rural and agricultural sector of the Americas.**

2

Evolution and efficacy of the global food system

The current global food system is in need of a profound transformation, mainly because: a) there continues to be a large number of people who are undernourished; b) current diets are associated with non-communicable diseases such as diabetes, coronary conditions and obesity; and c) environmental problems have not been properly internalized.

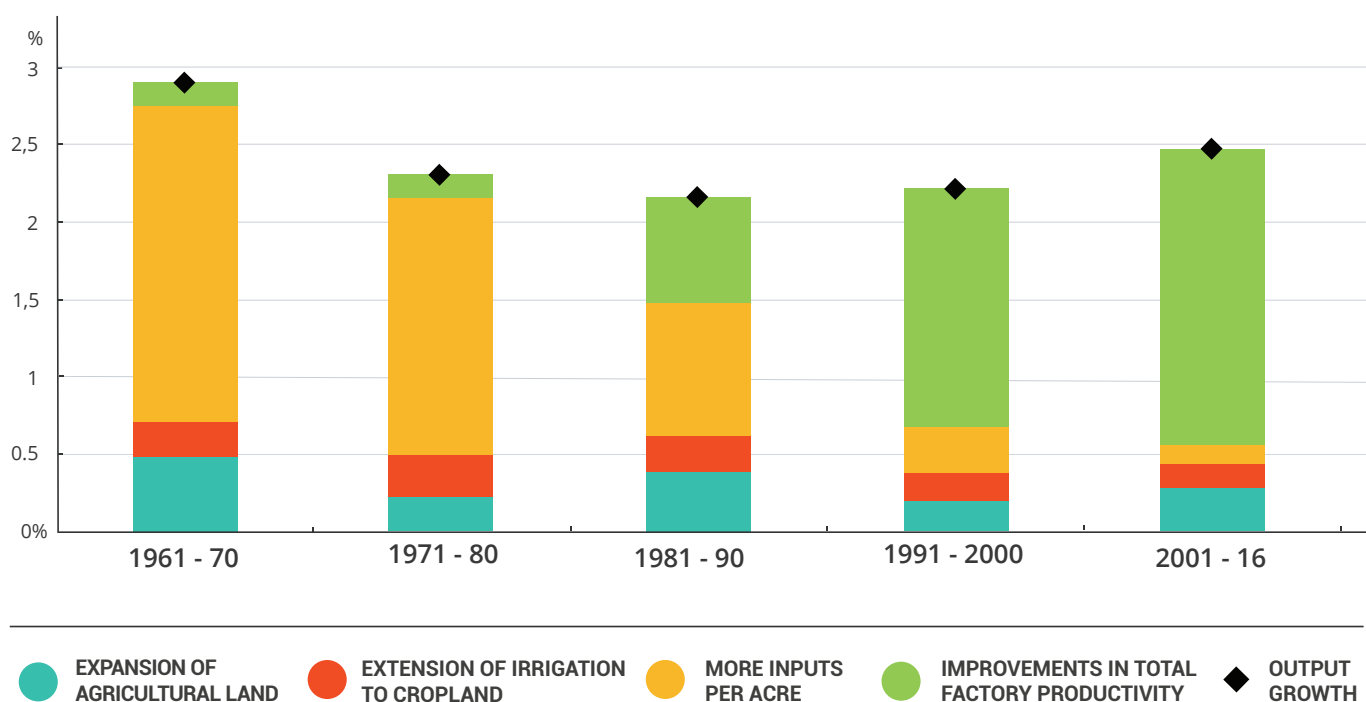
Although there is room for improvement and new challenges have arisen, a fair assessment of the situation indicates that over the past 50 years, the global food system has been capable of increasing production at a rate greater than that of the population growth.

As pointed out by the OECD (2021), the food system was able to increase production to feed a fast-growing population, which has gone from 3 billion people in 1960 to 7.5 billion in 2020. This remarkable increase in food production, in many cases three-fold, was possible thanks to the significant growth in the productivity of certain crops, and in specific regions of the world, as a result of new technologies generated within the so-called green revolution, spearheaded by the Consultative Group on International Agricultural Research (CGIAR).

This larger supply of food is the result of increasingly complex food systems, which have evolved in the last 50 years through biotechnology and genomics, Information and Communication Technologies (ICTs), and other disruptive technological changes, many of which have improved the conditions of family farming (FF) in certain territories. Food systems, on the one hand, have benefitted from more open, deregulated global trade mechanisms. On the other hand, global financial flows have been conducive to more strategic investments in food exporting countries to increase their productive and commercial capacities.

This increase in output began in the nineties, thanks to a significant increase in factor productivity rather than through the expansion of agricultural lands, which is relevant from an environmental perspective (figure 1)

■ **FIGURE 1. SOURCES OF GROWTH IN GLOBAL AGRICULTURAL OUTPUT, 1961-2016.**



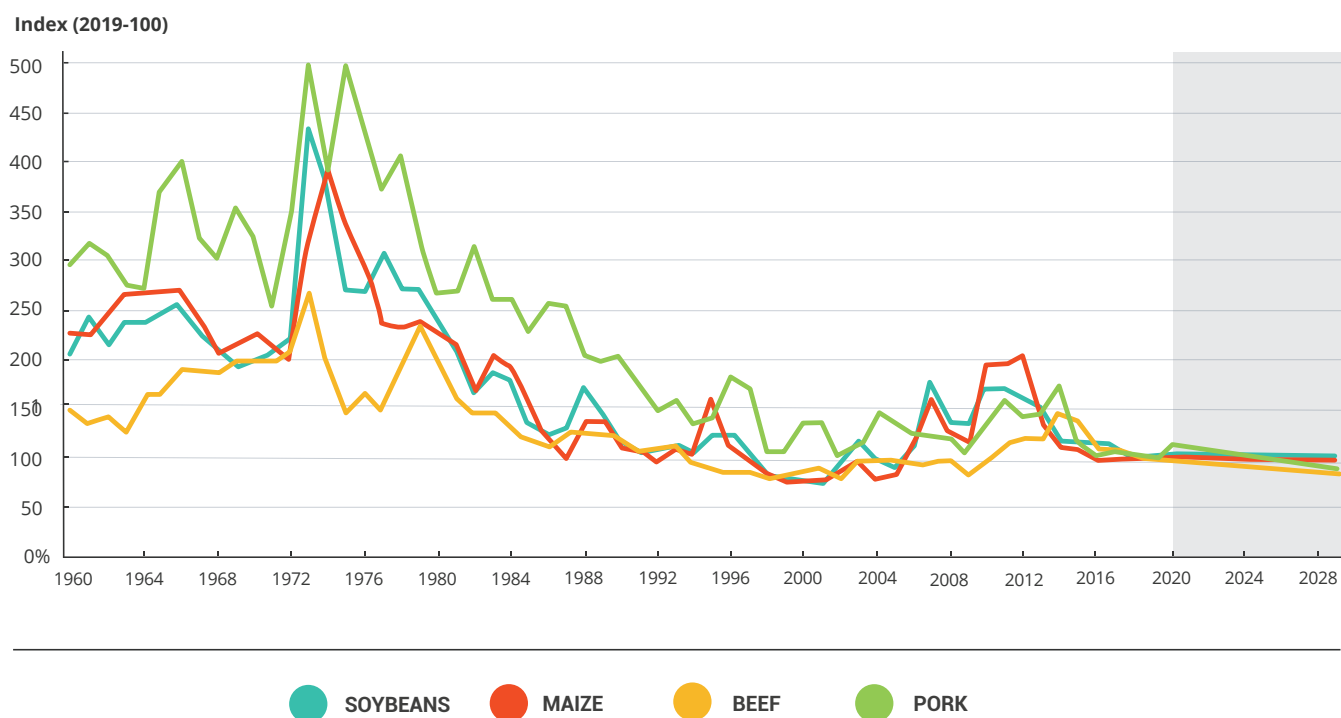
Note: Each bar represents the annual average per cent growth over that period

Source: OECD 2021 based on USDA 2019.

Furthermore, this higher output and intensification of international trade have enabled a better use of the relatively scarce natural resources of the world, and therefore, have promoted a sustained, significant reduction in the price of food, as can be seen in Figure 2.

This has also increased the availability of food for a larger number of people. Although there are still access-related problems resulting from structural poverty and destitution, the main cause continues to be low incomes. Food insecurity is usually associated with this factor, and consequently with the inability to access food that is available in the market. In other words, hunger in the world is more a result of poverty rather than of food scarcity. In this sense, the role of the State is crucial, along with the social protection mechanisms utilized to provide an answer for those who do not have the minimum resources needed to access food and other basic needs.

FIGURE 2. LONG-TERM EVOLUTION OF REAL AGRICULTURAL PRICES



Note: Historical data for soybeans, maize and beef from World Bank, "World Commodity Price Data" (1960-1989). Historical data for pork from USDA QuickStats (1960-1989).

Source: OECD 2021 based on OECD/FAO 2020

The increase in morbidity and mortality as a result of non-communicable metabolic diseases is not only the result of diet-related factors, but is also related to consumption, recreation and work patterns, typically observed in wealthy societies, along with sedentary lifestyles.

Between 1950 and 2020, **life expectancy has risen** from 46 to 72 years approximately. These numbers, which account for a global average, cover up major differences between the countries. National averages show a life expectancy of 52 years for certain poor countries; on the contrary, the life expectancy in developed countries is at almost 84 years, as is the case in Italy, Spain or Japan, for instance, and even reaches a high of 90 years in Andorra. In most developed countries, life expectancy oscillates between 75 and 83 years. It is precisely in these countries where current diets include a significant amount of nutritionally questionable products, such as animal-based products, sugar and flours used in highly-processed industrial foods. Although medicine, sewage systems, running water and other advances of civilization can partially explain this increase in the average longevity, this would not have happened if food had not been adapted to the biological needs of human beings.

When the sole focus is placed on the deficiencies or malfunctioning of food systems, it becomes easy to lose sight of economic disparities, the ill-distribution of wealth and the unequal access to resources. **The problem of hunger is mainly derived from having insufficient income or no income at all, which prevents people from having sustained, regular access to a minimum amount of food.** Investing in social policies geared towards the redistribution of income can contribute to reducing structural poverty and as a result, improving access to food and diets with the necessary amount of calories, protein and fat. At the same time, the States must implement policies focused on information, education and adjustments, as well as cultural awareness programs to promote healthier, more well-balanced diets whenever possible.

In conclusion, when millions of people rise out of poverty, **the demand for food is boosted, food systems respond positively and the supply of calorie- and protein-rich products** necessary for human health increases.

MESSAGE 1. The global food system has successfully met the growing demand for food resulting from population growth and higher income per capita. The number of people suffering from food insecurity has decreased, and diets have become significantly more global and diverse in many regions of the world. Although there are still many shortcomings and challenges, the food system is in a position to provide the necessary solutions.

3

The Food System: the importance of agriculture

According to the United Nations (2021a), a food system is defined as a system that embraces all activities related to the production, processing, distribution and consumption of food. Food systems affect all aspects of human existence.

The global food system is highly complex, and comprises national food systems which involve many private stakeholders who develop activities such as production, transportation, logistics, food processing, and national and international

commercial activities, under a regulatory framework established by the public sector. These systems, from varying economic sectors, include a wide and complex range of companies of different types, sizes, and specializations. If there is a concrete demand, which can be expressed and can pay for the products, and if there are favorable regulations in place geared towards unleashing their full potential in the markets, these companies will seek to maximize their profit, and will therefore invest and increase the supply of products, foods and services, which will directly benefit food systems and consumers.

Within this complex scenario, primary agricultural production is a crucial element for the entire food system, both in terms of level, number and variety of actors and with respect to productive and technological production. In other words, **without agriculture, there can be no food systems.**

MESSAGE 2. Agriculture is the indispensable, central element of the food system. Without agricultural production there is no raw material to transform into food, which puts food security at risk.

The wide range of national food systems is closely interrelated, mainly through international trade: **about 20% of the food consumed in the world comes from imports.**

However, country-to-country relations within the global food system is not limited to international trade. The global impact of local food production also includes at least three additional dimensions: a) **environmental sustainability**, especially in terms of global warming resulting from greenhouse gas (GHG) emissions, water and soil contamination; b) the potential **transmission of animal and human diseases**; and c) the **nutritional impact of food** affecting all countries intervening in the globalization process.

MESSAGE 3. The growing inter-dependency between global production and food consumption requires that a series of conditions related to productive efficiency, environmental and social sustainability and human health be met by the global food system.

4

Food demand as an independent experience: the right to choose

In the modern world, food production continues to be differentiated and physically distant from the food consumption of the majority of the population. As a result, diets are not based on what individuals produce but rather on what they desire and can acquire in the market. Therefore, food demand is an independent event that depends on the personal decisions of millions of consumers who choose how much and what to consume based on their subjective preferences, which in turn are determined by cultural patterns and personal taste, their purchasing power and the relative price of food, which is also a result of the advertising of food and beverages.

Globalization, which was very incipient at first and which has grown exponentially in the past 50 years, includes trade but also human migration and tourism. Globalized information has internationalized the consumption of certain foods which are quickly and extensively accepted. Wheat (and its byproducts, such as bread or pasta), rice, corn, potatoes and coffee, and to a certain extent animal-based products, are examples of food whose consumption has become widespread globally. These products have become the main components of the diet in a vast majority of countries and regions. Furthermore, this standardization of global diets has been accompanied by two additional factors: a) the increase in consumption of foods with some level of industrial processing and b) a higher and growing portion of food consumption prepared outside of the household.

The ultimate impact of these factors has been the incipient universalization of certain culinary traditions that have become the dietary guidelines of a large portion of the world population. This trend will surely intensify over time, which will strengthen global value chains, both for primary and processed products, and will generate more food trade in the world.

This evolution in **consumption patterns or trends is the result of the individual decisions of consumers**, who are exercising their right to choose, and this must be respected.

In this sense, possible and necessary public policies geared towards modifying consumption habits must acknowledge the fact that decisions regarding what and how much to consume are very unique for each consumer. Within this framework, the actions of the State must be focused on two main areas of work:

a. Consumer education in schools and through public information campaigns to promote healthy, well-balanced diets in keeping with sound scientific knowledge.

b. Information on the nutritional qualities of food, especially those of processed and ultraprocessed products, so that consumers can make an informed decision regarding what they choose to consume. To this end, it is necessary to develop and implement an **adequate labeling system** for processed products, which should be the result of a standardized international agreement. This will prevent labeling from becoming a barrier to exports for small- and medium-sized agroindustrial companies

These two public policy instruments should focus on **channeling consumer demands in keeping with valid, science-based nutritional guidelines**. This does not mean that the State cannot implement economic policies geared towards providing incentives or applying taxes to compensate the positive and negative external factors that could be associated with certain forms of production.

MESSAGE 4. Consumer decisions constitute a right that must be respected. The State, through its public health systems, must educate and provide information on the qualities, advantages and disadvantages of different foods and develop prevention campaigns. Furthermore, this information must be science-based and regularly updated.

5

Globalization of food consumption patterns

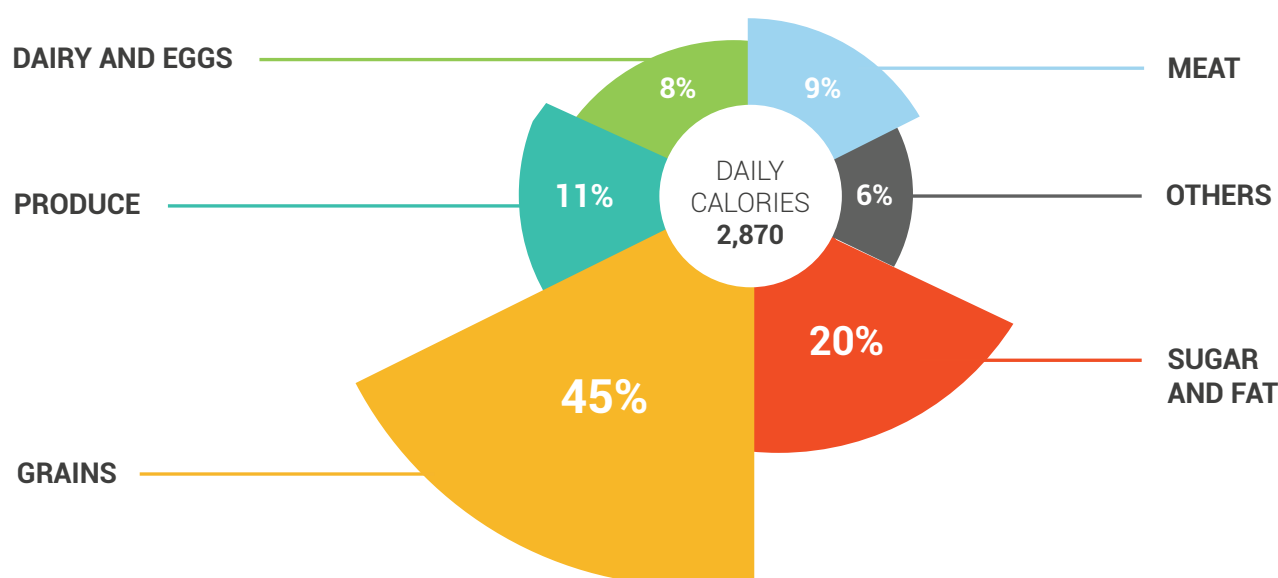
The goal of eliminating hunger is still far from being attained. Despite global efforts to increase agricultural production and productivity, and partially due to the pandemic, about 1 billion undernourished people currently suffer from structural food insecurity. Therefore, **increasing food production at a sufficiently rapid rate constitutes a central challenge for global food systems today**. On the one hand, it is paramount to increase production in order to tackle the problem of hunger. On the other, the additional demand resulting both from population growth and

higher income per capita will need to be addressed. Meeting this demand will place additional pressure on agriculture, which constitutes the link in the production chain that depends on the use of scarce resources, such as soil and water, which can only be partially substituted by technology and capital.

One of the consequences of increased agricultural production and the globalization of consumption patterns has been a diet mainly based on a handful of products which are a natural source of calories. **Grains, sugars and fat account for 65% of the total diet** (figure 3).

■ FIGURE 3. COMPOSITION OF THE GLOBAL DIET

What does the world eat?



Source: National Geographic 2014.

The composition of the current diet has been challenged, mainly due to the existing imbalance in the proportions of the different food categories that are consumed.

Within the context of the Food Systems Summit, the need has arisen to establish food consumption guidelines that are more in keeping with human health and environmental sustainability requirements (United Nations 2020, Global Panel on Agriculture and Food Systems for Nutrition 2020).

In order to analyze the most frequent issues surrounding current diets, it is necessary to define and agree upon different interrelated topics:

- a.** Dietary changes necessary from the perspective of human health. Whereas consumption needs to be increased among the population segments with the lowest income, it should be rationalized among people with higher incomes. This new balance in the consumption of protein of animal origin should be accompanied by a reduction in the consumption of processed and ultraprocessed foods with a high content of flour, sugar and salt, and an increase in the intake of fruits and vegetables.
- b.** The impact of certain preferred products on current diets and the way in which they are produced from the viewpoint of the health of the planet.
- c.** The terms and speed of the process to adjust the nutritional quality of diets without increasing global food insecurity. On the contrary, efforts must be geared towards promoting agricultural systems that promote innovation and the application of good practices and mitigate environmental impact.

5.1 Adequate diets for human health

The relationship between diet and human health has been clearly established by science. Recent estimations show that 20% of premature deaths can be attributed mainly to coronary diseases, diabetes and conditions caused by overweight and a nutritionally imbalanced diet (Global Panel on Agriculture and Food Systems for Nutrition 2020).

Nutritional imbalances are defined by three main components:

- a.** Excess of animal protein associated with coronary diseases.
- b.** Excessive consumption of ultraprocessed products with a high amount of sodium, sugar or saturated fats, which are high in calories and are associated with diabetes and overweight.
- c.** An insufficient intake of fruits and vegetables, which contain vitamins, essential minerals and cellulose: all these are important elements of a well-balanced diet.

The consumption of animal protein is an important component of diets in most high-income countries. Scientific evidence suggests that the excessive consumption of animal-based products (meat and dairy products) is associated with cardiovascular diseases. How much is considered "excessive"? The answer

to this question is still being discussed. Contrarily, consumption of animal-based foods in many developing countries is scarce and undoubtedly below the amounts needed to ensure an adequate diet in terms of the essential aminoacids that humans need to thrive normally. The ARMB (2018) has argued that pregnant and nursing women and children need to include animal-based products into their diets, and therefore advise against vegan diets for this segment of consumers, which accounts for 30% of the world population.²

On the other hand, consumption of animal protein is unequally distributed in the different regions of the world. In Asia and some parts of Africa, the consumption of animal-based products is extremely rare. This is mainly due to poverty and the high price of meat and dairy products in comparison with other foods. Undoubtedly, this level of consumption is far below what consumers would like to eat if they could surmount the economic difficulties facing them, and is also lower than the recommended consumption levels from a nutritional perspective.

MESSAGE 5. The consumption of animal protein in reasonable amounts is beneficial for human health. The possibly excessive consumption observed in a limited number of high-income countries should be addressed by means of education and information, through public health campaigns based on the prevention of the mentioned pathologies.

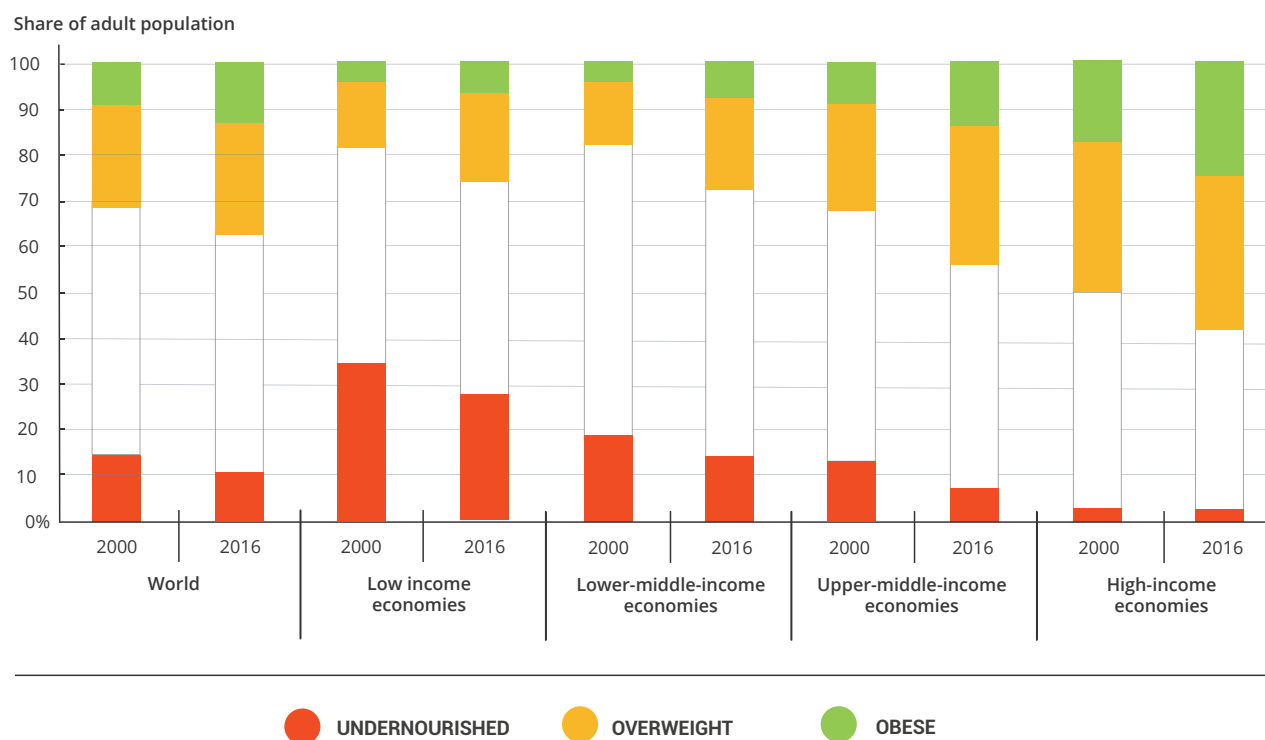
Excessive consumption of sugar and fat. The intake per capita of cereal-based products and sugar has been historically high. The main cause of this is their low production cost, which has resulted in these products also having a relatively low price per calorie unit.

The possibility of having low cost diets with high caloric content has been a key factor in significantly reducing global food insecurity over recent years.

Furthermore, the demand for these foods has recently increased and diversified through new products offered by the food processing industry. Products such as potato chips and cookies have high palatability and are easy to manipulate and preserve, which makes them very convenient for the new dietary habits of urban dwellers.

2. Children under 14 represent, according to the World Bank, about 25% of the world population. Pregnant and nursing women represent approximately 4% of the world population (estimation by the author).

■ **FIGURE 4. UNDERNOURISHMENT, OVERWEIGHT AND OBESITY, 2000-2016.**



Source: OECD 2021 based on WHO 2019.

As can be observed in figure 4, the problem of overweight has increased significantly in recent years in broad sectors of the world population. The percentage of overweight people is rising quickly and has surpassed the number of people suffering from food insecurity. The figure also shows that differences are more or less significant depending on the income level of the country, and that this problem worsens as the income per capita increases. Be that as it may, this is also associated with population segments with lower education and socioeconomic levels.

Overweight and its related diseases can be associated with certain characteristics of modernity, such as sedentary lifestyles and new dietary habits. Additionally, medicine has underscored the negative impact of diets with a high content of flour, sugar and fat.

The consumption of products with a high caloric value and the aforementioned diseases are closely tied to the **intake of processed products** rather than to the direct consumption of grains and oilseeds, which were predominant in the diet of most cultures of the world and thanks to which the modern world was able to develop.

Therefore, carbohydrate-rich diets with an excess of salt are mostly based on processed foods and not on the direct consumption of primary products. Consequently, public policies should mainly focus on reducing the consumption of these processed products rather than limiting the primary production of grains and oilseeds. If the production of raw materials and basic foods is reduced, large sectors of the low-income population will be doomed to hunger and deprived of access to a calorie-, protein- and fat-rich diet.

MESSAGE 6. The excessive consumption of grains, sugar and fat contained in processed and ultraprocessed foods is mainly responsible for non-communicable diseases and undesirable food habits among certain sectors of the population. Efforts must be placed on educating consumers to avoid the consumption of these products, rather than on trying to limit the production of primary goods, which are necessary for food security.

Increasing the intake of fruits and vegetables is a science-based recommendation and should be part of the long-term goals of every country. However, significantly boosting the consumption of these foods is not a simple task, for it requires adapting national food systems to this new potential demand. In order to transform this subjective demand into consumption, fruits and vegetables must be more widely available in geographical terms, and have a lower relative price than at present, considering that they are now notably more expensive than other foods such as grains or oilseeds.

5.2 Consumption trends and the health of the planet

The global food system has undergone deep transformations over the past fifty years. This change has been supported by scientific and technological progress, institutions and public policies. Within the framework of productive transformations, the expansion of agricultural production calls for sustainable practices that ensure a more efficient use of resources, and which can mitigate environmental impacts. In turn, the fundamental role of family farming in the social dynamics of rural territories must be fully recognized.

a. Meat production is questioned because of its environmental impact, but the balance between the emission and sequestration of GHGs in the different production schemes must be considered.

According to Viglizzo *et al.* (2019) and Ricard and Viglizzo (2020), criticism towards livestock farming merges all production systems together based on their carbon emissions, without considering the differences that exist between intensive confinement systems (mostly seen in the northern hemisphere) and extensive pastoral systems (as is the case in many countries of the Southern Cone), which also capture significant volumes of carbon. Based on these differences, it would be possible to infer many different types of “carbon footprint” not only based on emissions but also on the carbon sequestration ability of each production system. Furthermore, although the methane emitted by steers and cows has been qualified as a gas with potential warming effects, it only remains in the atmosphere for ten years as opposed to other gases such as carbon dioxide and nitrous oxide, which last 1000 and 100 years respectively.

b. Conservationist agriculture, based on practices that contribute to environmental sustainability, minimizes pressure on natural resources.

The use of coverage crops, crop rotation, inter-harvest practices and no tillage are key in preserving soil and water. These practices contribute to environmental sustainability and help increase agricultural productivity and the integration of farming, livestock production and forestry.

The management practices that preserve residues on the surface, such as no-till farming, increase the efficiency of water use with respect to conventional tillage and avoid soil losses caused by erosion. Direct seeding, based on the cultivation of the land with no prior plowing, emerged as a technical response to the problem of degradation in tilled and eroded soils (INTA, 2013). Its widespread use in various countries of the Southern Cone, for example, mainly responded to economic reasons, such as the need to reduce the use of fossil fuels and its operational simplicity. When the land is not plowed, the organic matter becomes less oxidized, thus achieving greater stability of soil aggregates. In turn, the dense coverage of debris present on the surface protects the soil from the impact of raindrops, reduces water run-off, and extends the permanence time on these residues for better infiltration. To preserve the soils, direct seeding must be accompanied by fertilization, crop rotation and diversification. For example, soy must alternate with other grains such as wheat, maize and barley.

For their part, agroecological approaches and organic agriculture aim to optimize the interactions between the different components of the agroecosystem and minimize the use of external inputs from the chemical industry (fertilizers and agrochemicals) and other traditional approaches to combat pests and insects, diseases and weeds. These systems can prove useful if they respond to

the demands of a specific segment that prioritizes environmental issues; however, they present some restrictions when addressing food insecurity and the demand for food of a population that will continue to grow for several decades.

From a prospective approach, the value and potential of the principles that feed these positions are recognized and, given the current advances in the field of science and technology, particularly in the biological sciences, data science and ICTs, it would be important to promote the search for common ground between the different approaches, so that production systems can reach a new and more solid balance between the necessary increases in productivity and the assurance of their sustainability.

MESSAGE 7. Agricultural production must move towards production systems that are environmentally friendly and strike a balance between the emission and sequestration of carbon. Science and technology contribute to the harmonization of agricultural production with the health of the environment and ecosystems.

5.3 Terms and speed of the adjustment: competition between food security measured in calories and other attributes of the food system

The rapid expansion of food production achieved over the past 50 years was made possible thanks to the extraordinary growth in output, which was attained thanks to the green revolution. This expansion includes a handful of primary products, mainly rice, corn, wheat, barley, potatoes and soybeans and, to a lesser extent, legumes such as beans, chickpeas and lentils that are consumed directly. This limited number of primary products made possible not only an increase in production, but also a decrease in the price of food, which fell significantly over the years, although with a certain degree of variability (figure 2).

At present, the diets of most of the world's consumers are based on a high consumption of flours, sugar and fat, transformed by the industry into highly palatable, convenient foods, but whose consumption is associated with overweight. An important advance is the promotion of diets where the consumption of these caloric products, especially those of industrial origin, is replaced by a greater proportion of fruits and vegetables.

However, from an economic point of view, it is not so simple to actually carry out the proposed substitution. The production and transport of fruits and vegetables are much more complex and difficult, and due to their rapid perishability, losses are much more significant than with other products. Therefore, the consumer price per calorie is much higher in the case of fruits and vegetables than in that of traditional crops and, therefore, their substitution would entail a significant increase in the average cost of food. **Recent estimates suggest that a nutritionally adequate diet would cost about five times more than a traditional cereal-based diet³.**

To achieve this transformation, changes in the food culture of consumers and significant changes in production systems will be required, especially in disadvantaged regions with a scarcity of agricultural natural resources. These transformations should be primarily aimed towards reducing losses, both during the post-harvest phase and in the distribution and consumption process.

This has **major implications on investments, both public and private.** The transport of fruits and especially vegetables that travel long distances requires heavy investments in cold chains, logistics and conditioning, and even so the losses can be enormous. For its part, public investment policies in infrastructure, goods and services are the responsibility of the states or involve associations between the public and the private sector. In this sense, the transformation of agriculture and food systems to increase produce supply requires significant investments from both sectors in areas such as biotechnology, genomics and water and irrigation management, so as to relocate crops and offer comparative advantages where none existed.

MESSAGE 8. The desirable and necessary increase in the consumption of fruits and vegetables will only be made possible by applying major efforts towards the production and trade logistics of these products, to make them more competitive and facilitate access to them.

3. "In today's economies, healthy diets can cost, on average, five times more than diets that simply provide enough calories" (United Nations, 2020).

6

Dimensions of the food system: production and productivity, safety, nutritional qualities and environmental and socioeconomic sustainability

National food systems and their participation in the global food system: interrelations and trade-offs.

The global food system is made up of national food systems intertwined primarily through trade, but also through other economic, biological and environmental relationships.

National food systems are different from each other and have evolved over time according to the cultural and economic contexts of each country and the natural resources they possess. **These national systems have different dimensions and attributes that define their productive characteristics, economic and social sustainability, relationship with the environment and natural resources, and safety conditions and nutritional qualities.**

The qualitative characteristics of national food systems, defined by their dimensions or attributes, have been developed according to the natural resources of each country, their culture, the development goals identified and their economic policy.

From a global and regulatory perspective, the global food system, while made up of national food systems, should respond to the food demands and needs of the world's consumers in a well-balanced manner. This primary objective may come with its contradictions and trade-offs both between the different dimensions / attributes of the global food system, as well as with the particular objectives of each country. Therefore, it requires negotiations and agreements in order to implement global policies that serve the well-being of all humanity.

The five dimensions or attributes defining the global food system

In order to have an efficient and evenly distributed development of national and global food systems, five dimensions or attributes that emerge as major social demands must be considered:

a. The global food system must have the capacity to produce the quantity and variety of healthy and nutritious foods necessary to satisfy world demand at reasonable and stable prices over time.

Achieving food security, eradicating hunger in the world and adequately supplying the population as a whole, have been aspects of special concern for humanity throughout its history, both for economic and productive reasons, as well as for its ethical dimension. Efforts to increase production have met with considerable success, but problems and shortcomings persist. On the one hand, it will be necessary to increase production by approximately 2.6% per year to meet the expected increase in demand. On the other hand, there is the future challenge of how to sustain and increase such food production by using the scarce natural resources scattered throughout the world efficiently. The attempt to achieve efficiency requires a comprehensive use of the resources available in the world with a high level of specialization, especially in the most productive agroecological areas.

For this, adequate economic and productive policies and very significant investments in technology and infrastructure will be required to increase the productivity and sustainability of the natural resources used. Additionally, a regulatory framework for international trade is necessary to facilitate adequate access to food, together with a global research and action program aimed at reducing the losses and waste that occur throughout the food system, which are estimated at close to a third of the total food produced, although in some regions and segments of the system these losses are significantly higher (Global Panel on Agriculture and Food Systems for Nutrition 2020).

b. Food production must be environmentally sustainable and its impact on global warming must be minimized

Concern regarding the impact of agriculture on the deterioration of natural resources (mainly water, agricultural land, forest areas, wetlands and other fragile habitats) is long-standing. This deterioration is a consequence of the intensification of production and the insufficient use of conservation practices. Additionally, in the 1990s, the evidence of global warming introduced a new dimension to environmental concerns by linking food production with the emission of greenhouse gases (GHGs).

Based on the interrelationships between food production and the health of the planet, it is urgent to promote agronomic and productive practices throughout the entire food system that ensure sustainability and minimize the negative effects on production and productivity.

Based on these needs, it is necessary to improve the measurements of net GHG emissions and determine the impact on the different productive practices, in order to develop environmental standards that facilitate the economic recognition of good agricultural practices.

c. The food system must ensure food safety and health and address potential links between zoonoses and human health.

Possible contamination with active chemicals or microorganisms harmful to human health has been a food safety concern. This has led to the establishment of trade regulations that are particularly relevant in international trade.

There are also other animal diseases of concern which have negative economic impacts, such as foot-and-mouth disease, or others that can also be contracted by humans, such as brucellosis or spongiform encephalomyelitis ("mad cow").

The Covid-19 pandemic calls for a new dimension to address food health and safety and the possible impact on the global food system, particularly with respect to trade and the spread of diseases. This new urgency has given rise to the concept of One Health, which applies an integrated analysis of health-related aspects in order to define comprehensive global policies (IICA 2021a).

d. The composition and nutritional quality of diets must be adequate for human health.

Diets, especially in the urban population, have evolved rapidly and adapted to new living conditions and to the cultural patterns and personal preferences of consumers.

As indicated above, three characteristics of modern diets are being questioned from the perspective of medical science: a) the elevated consumption of animal protein by high-income consumers in certain countries and regions; b) the impact on certain non-communicable human diseases, such as diabetes and others linked to overweight, caused by the consumption of carbohydrates, fat and salt, mainly as a consequence of the intake of processed foods; and c) the insufficient consumption of fruits and vegetables that is observed in some societies.

The public and private sectors should generate knowledge about the nutritional qualities of diets and promote educational campaigns to disseminate the scientific information available that provides consumers with benchmarks for better decision-making.

e. Food production must be economically and socially sustainable over time

About 40% of the planet's economic activity is associated with food systems (United Nations 2020b). This has to do with the fact that the economic agents that participate in the production process must receive sufficient remuneration to remain part of the production process. In other words, the profitability

of agricultural producers is a pre-requisite for effective and sustainable participation in food systems.

In short, a well-balanced development of the global food system requires the consideration of these five dimensions or attributes. Their simultaneous achievement entails both synergies and major contradictions. Therefore, there are trade-offs that must be taken into account when implementing policies and programs, and according to each region and country.

MESSAGE 9. The five dimensions or attributes that define the global food system are: the capacity to increase food production and variety; environmentally sustainable production; health and safety; nutritional composition and quality; and economically and socially sustainable production. The balances and trade-offs will be different in each country and sub-region.

7

The role of international trade in the global food system

International trade plays a key role in the world's food security. Many regions and countries do not have the natural resources required to produce the necessary amount of food in a sustainable way and at a reasonable cost. The situation is worsening, especially in the Middle East and in Asia, where population growth and the rise in the demand for food emerges from an increased per capita income. In this regard, international trade plays a fundamental role, since it contributes to—so far—20% of the food consumed around the world. In addition, **it may offset geographical differences between production and consumption, serving as a stabilizer of international prices.**

Current diets include a significant percentage of grains, vegetable oils, animal products and, to a lesser extent, legume seeds—all easily transportable, and the main products in the global market from a quantitative perspective. A well-organized international trade system, in keeping with WTO regulations, and which has an adequate infrastructure in place is central to an efficient global food system that would allow for a wider and more diverse food supply that can fully meet consumer demand.

The terms of international trade have been improved, even though there are still many restrictions in place despite efforts carried out by the World Trade Organization (WTO).

The building of a “global food system”—by aggregating regional and national food systems and subsystems—should be carried out within the WTO’s regulatory framework, by liberalizing agricultural trade and eliminating unfair competition. This must be a space where internal support measures for agriculture are taken into account—especially in developed countries (the European Union above all)—in order to prevent environmental, labor, sanitary, phytosanitary, food safety and public health regulations from becoming covert obstacles or non-tariff barriers to trade. Conditions imposed on agricultural trade should be based on scientific evidence. In that sense, **trade barriers and agricultural protectionism constitute a risk for global food security.**

Notably, the WTO’s Agreement on Sanitary and Phytosanitary Measures (SPS) establishes regulations in terms of food safety and sanitary controls on animals and plants, and seeks to avoid unnecessary hurdles to international trade. For that reason, the SPS Agreement is based upon principles such as scientific evidence and transparency, and it requires member countries to provide verifiable scientific proof that justifies the adoption of such measures.

Furthermore, there is a risk of creating new non-tariff barriers following the growing environmental imperatives. In particular, through different initiatives like the European Green Deal and Farm to Fork, the European Union is pushing its trade partners to conform to ambitious environmental standards and regulations. The greater number of environmental standards and requirements for the entry of imported products pose numerous challenges for productive systems, hindering market access and the flow of international trade.

MESSAGE 10. International trade is key to achieving an efficient global food system. It must abide by the WTO's regulatory framework, with the aim of promoting agricultural liberalization and reducing tariff and non-tariff barriers.

The UN Food Systems Summit is promoting measures to achieve significant changes in food consumption patterns, which would lead to healthier diets (United Nations 2020a). More precisely, it calls for greater consumption of fruits and vegetables, less intake of processed products that are high in sugar and flour, and for striking a balance in the consumption of animal protein.

The proposed diet includes a greater share of fruits and vegetables, which are products whose production, transportation and trade is much more complex in five aspects: a) compared to other sectors of agricultural production, fruits and vegetables require a more intensive use of land and water; b) there are greater transportation demands, including the need for cold chains in some cases; c) there is a smaller bulk storage capacity, and therefore greater packaging and conditioning requirements; d) sanitary standards are more complex and harder to comply with; e) there is a higher rate of food perishing between harvesting and first sale; f) losses are more significant during transportation and trade. All these conditions result in a significant increase in production costs, and thus, in products' unit prices. Larger investments and financing would allow for more operational conditioning, conservation, transportation, packaging, and distribution services, making them more efficient and competitive. As a consequence, fruit and vegetable prices would be more accessible for consumers, which would lead to their massive consumption.

MESSAGE 11. A more balanced food system will require an investment plan to develop transportation and logistics technology and infrastructure at a large scale. In order to make these investments effective, countries must design and execute strategic, medium-term plans that forge public-private partnerships. The State would be responsible for investing in basic infrastructure and public services, which would serve as a basis for the private sector to develop its own investments.

8

Agriculture in the Americas: contributions to the global food system and internal challenges

Agriculture in the Americas features a diverse, complex and large productive system that encompasses environmental, historical, cultural and social aspects. Three markedly different areas can be singled out, although all of them have important factors in common. The agriculture of each area can be described as follows:

- a. Agriculture in the northern and southern ends of the hemisphere, mostly in temperate plains.** The north is comprised of Canada, the United States and the north of Mexico. The south is comprised of Brazil, Paraguay, Argentina, Uruguay, part of Chile, and the lowlands of Bolivia, which share these features: high ecological homogeneity; corporate agriculture centered on the production of grains, livestock, and fruits and vegetables; a high level of industrial integration; and a strong focus on agricultural exports.
- b. Agriculture in the tropical belt of the hemisphere (south of Mexico, countries in Central America, Surinam, Guyana, Venezuela, Colombia, Ecuador, Peru and Bolivia).** Its characteristics are widely varied, both in terms of social conditions (native ethnicities, small producers facing problems in terms of access to resources and markets, and different kinds of corporate agriculture), and in terms of climate, strongly affected by orographic conditions, with practices ranging from agriculture for self-consumption to successful exports, mainly of tropical products (coffee, cocoa, fruits, sugar cane, and other specialty crops).
- c. Agriculture in insular Caribbean countries.** Based on small-scale units requiring food imports, given the scarce natural agricultural resources available in most countries that are part of this subregion.

In this context, the hemisphere has become a key agent for global food security, since it produces healthy and nutritious food and provides solutions to mitigate and adapt to the effects of climate change. In future scenarios, agriculture in this area may present solutions to transform food systems into more sustainable and resilient structures, given the richness of its natural resources, production systems, innovative agricultural enterprises, and technological and scientific development. In addition, the Americas play a strategic role in the sustainable deve-

lopment of countries in the region, besides being, in many cases, one of the main sectors generating exports and contributing to a significant part of the domestic product. In spite of this outlook, the region is not free of challenges—environmental as well as economic and social—, given the fact that many of its countries endure poverty and inequality, which are far-from-solved, persistent problems.

8.1 Contribution of the Americas to global food security

The American hemisphere is the greatest net exporter of food in the world. Particularly, exports from Latin America and the Caribbean (LAC) amount to 14% of the exports of agricultural products in the world, which is why this area is **central to global food and nutrition security** (IICA 2021b). The trade surplus of these products in the region rose from USD 35 billion in 2000 to almost USD 138 billion in 2019. Agricultural exports grew from USD 45 billion to USD 193 billion over the same period of time, while imports climbed from USD 20 billion to USD 55 billion (FAO 2020). Moreover, this region includes some of the main net food producing and exporting countries, which are key suppliers of “provisions” for the whole world. According to the food export index, the countries that stand out are Argentina, Brazil, Chile, Costa Rica, Ecuador, Paraguay and Uruguay (Arias et al. 2020).

This region's participation in international food trade is concentrated on products such as grains, oilseeds, sugar, coffee, poultry and meat. Likewise, LAC is a crucial global producer of fruits and vegetables. One third of the fruit production and a fourth of the vegetable production in LAC are exported (IICA and CAESPA 2021). In only a few years, the region has become a key stakeholder in global fruit and vegetable markets, and is contributing to ensuring more nutritious diets and to food and nutrition security. However, meeting the increasing demand for agricultural and food products will require a significant increase in trade, and will give rise to major challenges in health, food safety, and quality. In this context, the new international standards and regulations on this topic will require new capacities from LAC food system agents to adequately implement such regulations.

The agricultural sector is an important foreign currency supplier, accounting for one fourth of all exports in the region while creating numerous jobs and generating a significant percentage of the domestic product. The average share of agriculture in the gross domestic product (GDP) was 4.7% in 2019—a little over 2% in Panama and over 15% in countries such as Nicaragua and Haiti. Agriculture amounted to 5% of the GDP in 20 countries of the region (World Bank, 2020). In spite of this, since the multiplying effects and

all related activities were not taken into account, the conventional way of measuring the agricultural sector's contribution to the domestic product could indicate an underestimation. When national percentages are calculated, most of the post-harvesting value adding activities are not considered agricultural activities; they are classified as manufacturing activities or services, which overshadows their relationship to the food system and their dependency on agriculture. For example, whereas the contribution of the agricultural sector to the GDP of Peru, Chile and Mexico was 7.3%, 3.8%, and 2.9%, respectively, if other associated activities are taken into consideration, the contribution amounts to 11.3%, 6.4%, and 11.9%, respectively (in 2007, 2008, and 2012). In conclusion, **the contribution of food systems is significantly higher when the related activities are contemplated**, namely producers, input suppliers, agricultural traders, major importers and exporters, food processors and manufacturers, the industry of food services, and food retailers.

8.2 Contributions to global environmental sustainability

In the case of LAC countries, the contribution of agriculture to food systems is possible due to the region's unrivaled natural and biological resources. LAC has 16% of the agricultural soils, 33% of the surface suitable but not used for agriculture, 23% of the forest surface, 50% of the biodiversity and 31% of the fresh water on the planet (ECLAC et al., 2019). Resources constitute a major opportunity and also involve many responsibilities in terms of conservation and sustainability. The region is the largest provider of ecosystem services on the planet, including carbon sequestration, and is the main biodiversity reserve in the world. Consequently, its role is fundamental for **environmental sustainability** and for mitigating the effects of climate change (World Bank 2020).

The development and modernization of agricultural production in the region has occurred in line with a stronger sustainability paradigm, which calls for a form of development that can meet the needs of present generations without compromising the possibilities of future ones (United Nations, 1987). Efforts to render sustainability operational and measurable over time have required the application of complex and challenging public policies.

The concept of sustainability is being incorporated into the vision of food systems, within a paradigm shift that includes the fight against climate change, the conservation of natural resources and the protection of biodiversity (IICA 2021c). The region is committed to implementing action programs that ensure the fulfillment of its global responsibilities, through its participation in international agreements such as the United Nations Convention on Climate Change.

The production systems of LAC can grow alongside environmentally friendly schemes that strike a balance between carbon emissions and sequestration. The region is moving towards more sustainable practices, by capturing emissions through extensive pastoral systems, as well as through programs for the reforestation of native forests and implantation for the production of wood and cellulose, among others. The application of modern technology not only makes it possible to take advantage of previously unused resources (biomass, feces and other organic waste), but can also reduce its impact on the environment and collaborate in the fight against climate change through localized application, minimum tillage systems and efficient use of water. In short, the vast biological richness of LAC reveals the great untapped potential of the region for biomass generation.

MESSAGE 12. LAC contributes to global food and nutrition security by being the main food exporting region, as well as the largest provider of ecosystem services and the most important biodiversity reserve. In addition, it plays a fundamental role in environmental sustainability and in mitigating the effects of climate change.

8.3 Social and economic sustainability in the region

The food systems of LAC are complex, but their common objectives include supplying high-quality food at affordable prices for consumers. These systems comprise: the private sector in its different forms, scales and roles within the system; the public sector, whose political action seeks to satisfy the needs, health and quality of life of the population; and the international community, which has established objectives, goals and standards of behavior in relation to the sustainable development of humanity. All of them must harmonize strategies, instruments and coordination actions to achieve their objectives. Sufficient, safe, high-quality food is essential for these global strategies and necessary to achieve the sustainable development commitments, such as the conservation of natural resources, water and the environment.

Without agriculture, there is no food supply and no food system. National food systems are built from the rural territories of LAC, where agricultural and livestock production units are located. **Latin American agricultural producers are at the center of food systems**, as they can contribute to meeting the growing demand for more and better food. Diversity is present at the sub-regional level as well as within the countries of the region, and productive units operate under a

range of climates from temperate to tropical. There are also numerous agricultural cooperatives, from large grain traders to small, local fresh produce cooperatives (IICA 2021d, IICA 2021e).

Rural economic units are heterogeneous, and organize their production systems by combining the main factors of production (land, capital and labor) in very different ways. Rural territories feature, on the one hand, **large-scale producers with strong economic and commercial capacity**. The predominant production factors used by large agricultural companies are mostly capital and, to a lesser extent, productive land. Producers have now developed entrepreneurial skills and work to achieve their main objective (to produce food and maximize profits) based on market signals. These producers need regulations and public policies that generate a stable and predictable economic environment for their activities, as well as competitiveness resulting from the behavior of macroeconomic variables. They also require strategic investments in transportation infrastructure, communications and commercial activity.

On the other hand, there is a different way of organizing productive systems and factors of production, where work, particularly family work, is maximized to achieve more productivity. Other factors such as land and capital, in that order, are necessary to sustain the economic activity of these medium- and small-scale **family farming units**, with two main objectives:

- a. Meeting the dietary needs of the family, for which they naturally diversify the production areas on their farms.
- b. Generating income to buy inputs and consume goods and services.

To this end, these family farms incorporate cash crops on their farms (establishing commercial ties with other economic units of the system, both industrial and commercial) and then sell their surplus production in either a systematic or random way. Specifically, family livestock producers require the same policies as the larger-scale ones. However, these small units also need **differentiated policies** in terms of public goods and services to compensate for their lack of scale and capital and to provide security in land access and tenure, along with appropriate technologies, timely and high-quality technical assistance, adequate financing, strategic information, and stimulus policies to become part of cooperative companies where they can operate more effectively throughout value chains and markets. Differentiated policies seek to favor the inclusion of family productive units into markets.

One of the main guiding principles, which is supported by the reality of rural territories of the region, is that **small and medium-scale or family farming is not synonymous with poverty**. Its productive units require clear signals from an effective State that provides them with timely and relevant public goods and services. In addition, the governments must facilitate access to innovations, technical assistance and credit to improve and diversify the production

of these smallholder farms and therefore increase their resilience. These public policies must focus on productive inclusion.

Family farming represents one of the essential social actors in rural territories. Its importance in LAC is unquestionable. Therefore, rethinking a new generation of policies within the framework of a modern, integration-oriented regional agenda will help reinforce its importance and that of its organized associations. Family farming is undoubtedly a fundamental part of the solution for the development of rural territories, due to its role in short marketing circuits and in the supply of healthy foods.

There are other cross-cutting policies within production systems and areas of economic activity, focused on encouraging young people to become agricultural producers or rural entrepreneurs. The youth must receive fiscal support, access to land and other goods and equipment for production, as well as special financing conditions and training, among other instruments (IICA 2021f).

Another much-needed, cross-cutting policy is one that recognizes the civil, social and economic rights of **rural women**. These policies must ensure the protection and encourage the participation of these women, especially in their role as entrepreneurs and heads of economic agricultural units. These policies must also be geared towards transformation, commercialization and unrestricted access to public policies for productive inclusion.

Furthermore, as occurs in urban territories, rural areas are home to disadvantaged populations and agricultural production units that are unable to meet their basic food needs. This broad segment is made up of historically marginalized sectors, indigenous peoples, and communities with specific ethnicities or of African descent. In order to mitigate the deficiencies of the most vulnerable social sectors, the State must design **policies focusing on social protection**, food security, health, and education, by granting economic subsidies and even by directly supplying food. The State must address the pressing needs of the population suffering from severe poverty as an ethical and moral obligation, by means of policies focusing on social protection rather than on productive inclusion.

There are sectors of the rural population which stand on a middle-ground between poor producers and those capable of responding positively to policy and market signals. This middle-ground should be the focus of state policies and instruments for social protection and productive inclusion to effectively overcome poverty.

The **economic and social sustainability of food systems in LAC** should be built on this interpretation and analysis of reality.

8.4 The need to consider the specific characteristics of Caribbean countries

The Caribbean is a geographically small, predominantly insular subregion located in the Caribbean Sea. It includes the Greater Antilles⁴, and nine other nations with small territories and populations⁵. There are only three mainland countries: Belize, Guyana and Surinam. The region comprises relatively open and middle-income economies and imports 80% of the food it consumes⁶. Except for Haiti, food insecurity is fairly low. Tourism is a highly relevant activity, where a high percentage of imported food use is concentrated.

For a long time, Caribbean countries have focused on growing specific products, like bananas and sugar. However, their farmlands include mostly small-sized family units with low returns, whose production usually goes for domestic consumption, especially fruits and vegetables. The lack of major rivers and the scarcity of land set clear limitations to the region's agricultural expansion (FAO 2019).

Serious logistic limitations are caused by the region's insular condition, which hampers vertical integration and increases costs, especially in transportation. The case of Haiti is different and much more critical given its high poverty rates, structural shortages, ineffective institutions and a relatively large population (about 11 million people in 2020).

The Caribbean subregion is highly vulnerable to the effects of climate change: it is one of the hardest hit regions with frequent devastation caused by natural disasters, such as hurricanes and severe tropical storms, which affect the agricultural production as well as the infrastructure and the living conditions of the local population. The FAO (2019) estimates that Caribbean islands are, on average, 34% more prone to be hit by environmental problems and climatic events than the rest of the continent.

In that sense, the main challenge for the region is to increase its internal food production in a more sustainable and resilient way in the face of climate and weather factors. While natural resources are limited, it is possible to increase food supply in the region if technological and productive developments are implemented. Intra-regional trade must be boosted, and greater economic integration with the rest of Latin America must be achieved.

4. Cuba, Dominican Republic, Haiti and Jamaica.

5. Trinidad and Tobago, Antigua and Barbuda, The Bahamas, Barbados, Dominica, Grenada, Saint Kitts and Nevis, Saint Lucia, and Saint Vincent and the Grenadines.

6. These statistics do not include Cuba.

MESSAGE 13. Agricultural producers are at the center of LAC's food systems; there is a wide variety of subsystems, subregions, and production schemes, including family farming. Productive inclusion policies are related to economic sustainability, whereas social protection policies address the disadvantages of the most vulnerable sectors.

8.5 Main public policy instruments

8.5.1. Institutional framework

Food systems articulate a complex group of consumers and economic, productive and commercial actors, who share certain strategies and goals. Within these systems, there are several subsystems with contexts, goals and strategies of their own. **A strong public institutional framework**—or the way in which LAC countries organize themselves to promote, foster and regulate this group of systems to attain greater productivity, competitiveness and economic efficiency—requires the articulation of multiple institutional agents and the combination of their policies, instruments and resources.

From an institutional perspective, the **ministries of agriculture** are crucial yet insufficient institutions, since, among other things, their vertical structure does not match the systemic and cross-cutting nature of food systems. Certain areas of competence and institutional capacities suffice; however, in order for food systems to operate and maximize their effectiveness and efficiency, and hence, their results, States must organize themselves to create sustainable conditions for an increase in productivity and competitiveness of agricultural production units so that they can act in accordance with market signals and demand, specifically, and the markets in general. These policies mainly entail public investment in infrastructure and communication—public goods and services to ensure the competitiveness of the territories. In addition, institutional quality should be improved in rural areas, with the aim of strengthening transparency and ensuring a level playing field through justice, avoiding corruption and ensuring the enforcement of legal rights (in terms of abiding by contracts and respecting their validity). Countries with stronger institutional quality are able to attract more foreign and local investments.

Ministries of agriculture are necessary, but not sufficient to transform the region's food systems. In the face of the new reality of local, national, regional and global food systems, several aspects should be revised: their competencies and statutory function, their technical capacities as regards budgets and equipment, and their organization in terms of management, especially of new areas. Excellence in design and application of sanitary, phytosanitary, food safety, science, technology, and innovation policies should be guaranteed, as well as technical support, rural expansion, and monitoring of regulations imposed on food exporting companies to enter and remain in the market.

MESSAGE 14. Ministries of agriculture are necessary to transform food systems, but they must expand their scope of action and mandates and improve their technical and scientific capacities to achieve a smoother articulation at the different State levels.

Taking into account the strategic role played by ministries of agriculture in the governance of food systems, States should seek efficient mechanisms to articulate policies, instruments, actions and competencies at all levels. To achieve this, they should integrate their three levels of organization (national, regional and local), the different ministries and the public companies that provide specific goods and services for the development of food systems.

Moreover, certain critical actors are key in the coordination between State institutions, including regional and local authorities and public companies that provide goods and services, which are within the scope of the ministries of agriculture. LAC States have devised these articulation and coordination mechanisms; however, such mechanisms are still unable to meet the demands of food systems, and will have to be reviewed. This will require as much political representativeness and technical and scientific excellence as possible.

8.5.2. Science, technology and innovation

Science, technology and innovation (STI) are key in addressing the multidimensional nature of food security and food systems. The current stage of science and technology development offers opportunities to achieve unprecedented changes. New and emerging technologies in the fields of life sciences, information and communication, data sciences, artificial intelligence, and related digital applications are significantly improving the production and productivity of crops

and livestock, food quality and biomass. Moreover, they allow for the reduction of waste and use of resources, and they create mechanisms for overall economic organization by improving trade competitiveness and financial services (Basso and Antle 2020, Saiz-Rubio and Rovira-Más 2020, ECLAC *et al.* 2019, HLPE 2019, Trigo and Elverdin 2019, Rose and Chilvers 2018).

Fully leveraging these opportunities is closely linked to the emergence of new devices, applications and forms of connectivity, which are increasingly affordable and part of everyday life, and which uproot many of the pre-existing barriers by allowing new knowledge and technology to massively reach those who most need them. In this sense, the **globalization of connectivity and the wider dissemination of digital technologies** will enable the transformation of the reality of rural areas and the ways in which they participate in the economy and in society. As for the productive aspect, this will not only increase economic and environmental efficiency, but will also help overcome current barriers by creating new products and accessing new markets. From a social perspective, this will help expand overall access to social and cultural goods, and reduce the isolation that has historically affected rural areas. For this reason, connectivity and the access to quality Internet service are essential to unleash the potential of rural territories.

This idea has been widely recognized over the last few decades, and there is currently solid evidence of significant success in different areas involving not only traditional and export crops (fruits and vegetables, crops grown under cover, etc.), but also the application of biotechnology in agriculture, conservation and regenerative agriculture, sustainable livestock systems, and agrosilvopastoral practices, among others (ECLAC *et al.* 2019, HLPE 2019, Trigo and Elverdin 2019).

In terms of biotechnology, the region has spearheaded the adoption of agricultural biotechnology (International Service for the Acquisition of Agri-biotech Applications, ISAAA). There have been successful public-private initiatives that resulted in developments closely related to the market as regards strategic crops like soybeans, common beans, potatoes, wheat, and more recently, rice, by means of the application of genetic-engineering technology (ECLAC *et al.* 2019).

In the case of conservation and regenerative agriculture, the entire region has seen an increase in reduced tillage practices, although this technique has been applied mainly on grain and oilseed production in Argentina, Uruguay, Paraguay and the south of Brazil. There has been a burst of initiatives implemented in climate-certified production systems for strategic crops such as coffee in Colombia, Central America and Mexico. Crops have also been diversified by means of local varieties, which constitutes a strategy to face climate change, improve nutrition and increase resilience (ECLAC *et al.* 2019).

In spite of these vital developments, the outlook is worrisome, as difficulties to fully leverage the opportunities embedded in the region's new technological landscapes persist. This is due to the fact that most of the LAC countries,

especially the smallest ones, continue to face considerable difficulties, mainly with regard to investment in financing and human capital (IICA 2021h). As for investments, five countries (Argentina, Brazil, Chile, Colombia and Mexico) concentrate more than 90% of the regional investment, while the remaining 10% is distributed among the rest of the countries for which information is available. This can also be observed when investment volumes are presented in terms of their contribution to the agricultural GDP of each country. Only six countries—Argentina, Brazil, Chile, Colombia and Mexico—and the English-speaking Caribbean countries invest more than 1%, while the rest of the countries, especially the smallest ones in the tropical belt, invest significantly below that level. Similar problems have been noted as regards human resources. The solutions to these limitations constitute an unquestionable priority for the region to effectively tap into the potential offered by new technologies, which would enable them to move forward in the transformation of food systems and attain the United Nations SDGs (Trigo and Elverdin, 2019, Stads et.al. 2016).

8.4.3. The development of bioeconomy

Within the region, the vision of the circular economy and, particularly, **of bioeconomy, has emerged as a new approach to rethink the historical duality between productivity and sustainability in agriculture and promote sustainable growth in rural territories** (IICA/ ICABR 2021 and FAO et al. 2019). Thanks to science and technology, it is now possible to increase food, fiber and energy production through environmentally friendly systems that strike a balance between carbon emissions and carbon sequestration. The region has increasingly moved towards more sustainable forms of production, where the capture of emissions is promoted through extensive pastoral systems, reforestation programs for native forests and implantation for wood and cellulose production, among others. The use of bioeconomy promotes a more efficient and environmentally sustainable biomass production, while reducing losses and adding value. In this sense, it promotes the diversification of agricultural production and a greater use of bio-inputs as well as the diversification of the energy matrix and of environmental services, and reduces dependence on fossil fuels and promotes a smarter use of biological resources, science and technology. Finally, it constitutes a tool for mitigating climate change (Ministry of Agronomy of Argentina, 2016).

In the agribusiness sector of LAC, there are about 127 million tons of food waste generated each year. This constitutes an unrivaled platform for the production of new bioproducts and other high value-added products for agriculture and for the food, energy, chemical, pharmaceutical and construction industries (Hassan et al., 2018 and Macias et al. 2018). These new industries have the potential to contribute to the mitigation of climate change and the promotion of environmental sustainability of productive commercial activities, through the reduction of

waste from production processes, the substitution of fossil-based products with a high carbon footprint and the transformation of the energy matrix. Moreover, they offer new and more sustainable livelihoods in rural areas, as a result of the opportunities for innovation and investment they provide.

Due to its biological wealth and potential for biomass generation, the region has comparative advantages for leveraging bioeconomy as a model for growth and development. However, countries must implement policies, regulations, and market development instruments to execute and promote new bioeconomy-based approaches and ensure their sustainability and safety. A number of countries have already advanced in formal strategies to profit from these resources, and are now recognizing the opportunities and limitations posed by the characteristics of natural and institutional resources available in each case. It is now possible to say that the region is consolidating its position as a global leader in this type of initiative (Trigo et al. 2010).

MESSAGE 15. New scientific and technological development constitutes a strategic opportunity to move towards a more productive and sustainable agriculture through greater precision and efficiency. Bioeconomy, digital inclusion and investments in research and development (R&D) are key elements within this new scenario.

9

The road ahead

The transformation of food systems to ensure global food security in a sustainable manner is, undoubtedly, an imperative need. The magnitude of its impact both on the planet's economy, as well as on environmental issues and climate change, reveal that attaining the SDGs by 2030 will be very difficult if no substantive changes are made to the way in which we produce, transform, trade and consume our food. In this spirit, the United Nations Food Systems Summit (UNFSS)

constitutes a priceless opportunity to lay the foundations for the economic and political processes essential to achieving the necessary transformations.

Within such context, this document presents a series of discussion points to ensure a fruitful debate. On the one hand, systems constitute a solid basis for facing the future. There is undoubtedly room for improvement if the goal is to articulate the system with the realities of this time and the expectations of a society that seeks to be better, fairer and more inclusive, by displaying more positive behaviors with respect to its natural environment. In this sense, modern food systems have been able to effectively respond to the demands of an increasingly urban and constantly growing population and have therefore managed to improve their living conditions.

On the other hand, the role of agriculture emerges as a fundamental component of the food system along with the necessary elements to guide future discussions. Individual decisions must be given the importance they deserve, taking into account that there is no one-size-fits-all approach, but rather a need to build new systems by respecting the idiosyncrasies and heterogeneity of each subregion, form of production, culture and tradition. Likewise, public decisions and policies that contribute to achieving more sustainable, healthy and equitable systems must be based on scientific evidence.

The hemisphere must approach this discussion from a dual perspective: on the one hand, it must consider its fundamental role in long-term food and environmental balance, being the main actor in international food markets and home to an immense wealth of natural resources. On the other hand, however, the region's leaders must fully acknowledge that many of these countries face a reality of extreme economic and social inequity which is incompatible with the notion of progress fueling discussions in preparation for the Summit.

This document has presented concepts that may prove useful in preparing the participation of the Americas in the Summit. Special emphasis is placed on the need to listen to the voice of producers and build an institutional framework in keeping with the specific challenges encountered, the role of international trade, and the need to fully leverage the opportunities offered by modern science and technology as the basis to drive the required transformations forward.

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