

DOCUMENT OF THE INTER-AMERICAN DEVELOPMENT BANK

FOOD SECURITY SECTOR FRAMEWORK DOCUMENT

**ENVIRONMENT, RURAL DEVELOPMENT, AND
DISASTER RISK MANAGEMENT DIVISION**

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This document is being made publicly available simultaneously with its distribution to the Board for information.

CONTENTS

EXECUTIVE SUMMARY

I.	THE FOOD SECURITY SECTOR FRAMEWORK DOCUMENT IN THE CONTEXT OF CURRENT REGULATIONS AND THE INSTITUTIONAL STRATEGY 2010-2020	1
	A. The Food Security Sector Framework Document in the context of existing regulations.....	1
	B. The Food Security Sector Framework Document and the IDB Institutional Strategy.....	2
II.	EVIDENCE ON THE EFFECTIVENESS OF FOOD SECURITY POLICIES AND PROGRAMS	2
	A. Dimension 1: Food availability	6
	B. Dimension 2: Food access	15
	C. Dimension 3: Food utilization.....	20
	D. Dimension 4: Food stability.....	28
III.	MAIN ACHIEVEMENTS AND CHALLENGES IN THE REGION IN RELATION TO FOOD SECURITY.....	31
	A. Dimension 1: Food availability	34
	B. Dimension 2: Food access	36
	C. Dimension 3: Food utilization.....	39
	D. Dimension 4: Food stability.....	42
IV.	LESSONS LEARNED FROM THE BANK’S EXPERIENCE IN FOOD SECURITY	43
	A. Report of the Office of Evaluation and Oversight	43
	B. Lessons learned from IDB operations.....	44
	C. The Bank’s comparative advantages in food security	49
V.	TARGETS, PRINCIPLES, DIMENSIONS OF SUCCESS, AND LINES OF ACTION THAT WILL GUIDE THE BANK’S OPERATIONAL AND RESEARCH ACTIVITIES	49
	A. Targets and principles of the Bank’s work in food security.....	49
	B. Dimensions of success, lines of action, and activities	50

REFERENCES

ABBREVIATIONS

ADD	Acute diarrheal disease
CAISAN	Câmara Interministerial de Segurança Alimentar e Nutricional [Interministerial Council on Food and Nutrition Security]
CCT	Conditional cash transfer
CDC	Centers for Disease Control and Prevention
CONSEA	Conselho Nacional de Segurança Alimentar e Nutricional [National Council on Food and Nutrition Security]
ECLAC	Economic Commission for Latin America and the Caribbean
FAO	Food and Agriculture Organization
FBD	Foodborne disease
FIES	Food insecurity experience scale
GHI	Global Hunger Index
GHP	Good husbandry practices
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IHME	Institute for Health Metrics and Evaluation
IICA	Inter-American Institute for Cooperation on Agriculture
INT	Integration and Trade Sector
kcal	Kilocalorie
LAC	Latin America and the Caribbean
m.a.s.l.	Meters above sea level
NREG	National Rural Employment Guarantee
NSA	Nutrition-sensitive agriculture
OECD	Organization for Economic Cooperation and Development
OVE	Office of Evaluation and Oversight
PAHO	Pan American Health Organization
RND	Environment, Rural Development, and Risk Management Division
SDG	Sustainable Development Goals
SFD	Sector Framework Document
SPH	Social Protection and Health Division
TSP	Transport Division
UNSCN	United Nations System Standing Committee on Nutrition
USAID	United States Agency for International Development
WFP	World Food Programme
WHO	World Health Organization
WSA	Water and Sanitation Division

EXECUTIVE SUMMARY

- (i) The Food Security Sector Framework Document guides the Bank's work on policies aimed at improving food security in Latin America and the Caribbean (LAC). In LAC, food security continues to face considerable challenges. Consequently, achieving food security in LAC must be a priority, with a view to boosting economic growth and sustainable development in the region.
- (ii) **Food security** is defined as the situation "that exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food that meets their dietary needs for an active and healthy life" (Food and Agriculture Organization-FAO, 2006). This Sector Framework Document (SFD) is based on the modern concept of food and nutrition security, which goes beyond the traditional concept of food security that only addressed a country's ability to generate an adequate food supply. The new approach to food and nutrition security is conceived from a food systems perspective, encompassing not only food production but also demand and the nutritional status of the population.
- (iii) The food systems approach takes food security not as a concept limited to cyclical problems (e.g. price variations, natural disasters, shocks) but rather as a structural issue to be viewed as a development objective. Thus, given the multisectoral nature of food security, many of the activities associated with the lines of action are also included in the Bank's other sector frameworks.
- (iv) There are four key dimensions to food security:
 - a. **Food availability:** refers to the supply of food at the national or local level. Food supply may be generated through the country's agricultural production or through trade. Food availability can be increased through interventions aimed at boosting food production at the national, regional, or local level and/or at facilitating food imports.
 - b. **Food access:** refers to the availability of household resources (e.g., financial, physical) for acquiring an adequate amount of food. Food access can be improved through interventions aimed at: (i) boosting income, generating greater household purchasing power to buy food; (ii) increasing agricultural production, generating greater own consumption; and/or (iii) creating jobs.
 - c. **Food utilization:** refers to the food quality required to attain an adequate nutritional status. Food utilization can be improved through interventions aimed at increasing food safety, expanding access to drinking water, improving diet quality, and/or reducing obesity.
 - d. **Food stability:** refers to the ability to have continuous access to the food needed to maintain a nutritional diet at all times. Food stability can be improved through interventions that reduce vulnerability to natural disasters, climate change, or price fluctuations.
- (v) Due to the multidimensional nature of food security, reaching the goal of eliminating hunger requires a multisectoral and interagency strategy. This entails facilitating effective coordination among the various sectors and institutions involved in the food security area. Thus, to improve food security, agricultural interventions must be aligned with health, nutrition, social protection, and water and sanitation projects.

- (vi) Latin America and the Caribbean was the only region to reach the millennium development goal of reducing the percentage of undernourished people by more than half in 2015 with respect to 1990. However, this success is primarily attributable to South America, which was the only subregion that achieved and exceeded this goal. Subsequently, between 2015 and 2016, the number of people with hunger problems rose by 2.4 million, reaching a total of 42.5 million. The most significant challenges facing the region in the various dimensions of food security are:
- a. **Availability: ensure food availability by expanding production through greater agricultural productivity without putting pressure on natural resources, facilitating trade, and improving rural infrastructure.** Trade and agricultural performance have enabled the region to maintain adequate levels of food availability. In terms of agricultural production, the region has maintained an upward trend over time, primarily due to a rise in production in the Southern Cone countries. At the same time, the region continues to deploy relatively high levels of protection against imported products, which can hinder food availability, especially for the low-income population. Support to agricultural producers through market price protection mechanisms, which continue to be among the most common trade protection measures, can raise food prices with respect to international prices, thereby affecting food availability.
 - b. **Access: expand food access for LAC's most vulnerable population by generating income that leads to greater consumption.** Food access in LAC has improved considerably in recent decades, mainly due to a rise in income. However, despite this positive trend in income in the last decades, poverty has increased over the past three years. In fact, poverty rose by 1.3 percentage points in 2015 over 2014 and then a further 0.9 points in 2016. This suggests that the higher income in the region has not benefited the entire population proportionately. As a result, a larger share of the population is now living in poverty, which could have significant repercussions for these households in terms of food access.
 - c. **Utilization: reduce the triple burden of malnutrition and improve food safety.** The region is experiencing the triple burden of malnutrition, which refers to the three simultaneous dimensions of undernourishment, micronutrient deficiencies, and obesity. This problem creates significant economic and social losses, while also imposing a financial burden on healthcare systems due to food-related illnesses. With regard to childhood undernutrition, stunting is the most significant problem. An estimated 13.5% of children under 5 in LAC suffer from this scourge. In addition, overweight and obesity are a growing problem in the region. It is estimated that nearly 58% of the population is overweight, while obesity affects 23%, the highest percentages being in the Caribbean. Furthermore, women tend to be affected by this problem more than men.
 - d. **Stability: make food systems less vulnerable to climate change and natural disasters.** In the last 10 years, LAC experienced 573 disasters affecting 113 million people. Droughts affected the largest share of this total (46%), followed by floods (26%). This shows that agricultural production in the region is highly vulnerable to natural disasters. Climate change has a

crosscutting effect on all dimensions of food security. However, food availability will be the most heavily affected dimension in view of the significant projected changes in temperature and precipitation, alterations in the production cycles, changes in aptitude for agricultural production, and rise in the incidence of plant and animal diseases. All of these factors are expected to substantially reduce agricultural production and productivity in LAC.

- (vii) The proposed lines of action to overcome each of these challenges are as follows: (i) foster mechanisms for intersectoral and interagency coordination to design and implement food security-related policies and projects; (ii) improve agricultural service delivery and infrastructure as a public good, with a view to expanding food availability; (iii) improve farmer participation in global markets and value chains to facilitate trade and food availability, as well as access to quality inputs and innovative technologies; (iv) expand access to productive resources and technical assistance for women and vulnerable population groups; (v) create interventions aimed at reducing food losses in all sections of the food system; (vi) promote productive activities in the agricultural sector and social protection programs to raise the income of the most vulnerable population and consequently increase food consumption; (vii) continue to implement social protection programs with nutrition and health conditionalities, as well as bring about behavioral changes in the population with a view to introducing healthy diets that can reduce overweight and obesity; (viii) expand the scope of agricultural interventions to include nutrition-sensitive actions, considering the needs of the food system in each country; (ix) boost the supply of and demand for safe foods as well as the population's access to water and sanitation services; and (x) foster climate-smart agriculture and actions designed to make food systems less vulnerable to natural disasters.

I. THE FOOD SECURITY SECTOR FRAMEWORK DOCUMENT IN THE CONTEXT OF CURRENT REGULATIONS AND THE INSTITUTIONAL STRATEGY 2010-2020

A. The Food Security Sector Framework Document in the context of existing regulations

- 1.1 This document updates and replaces the Food Security Sector Framework Document approved by the Operations Policy Committee on 17 November 2015, in accordance with paragraph 1.20 of document GN-2670-1, “Strategies, Policies, Sector Frameworks, and Guidelines at the IDB,” which establishes that SFDs are to be updated every three years, on a rolling basis.
- 1.2 The update to this SFD includes new issues and perspectives taken from recent empirical evidence and lessons learned in the project design and execution stages. The main changes are: (i) an analysis of the four dimensions of food security, including a detailed analysis of the stability dimension; (ii) greater emphasis on the effects of climate change and natural disasters on food security; (iii) inclusion of the gender issue in each dimension of food security; (iv) a more comprehensive approach to agrifood systems that includes supply (food production) and demand (food consumption) components and interactions; and (v) a detailed analysis of the lessons learned from Bank projects.¹
- 1.3 The Food Security SFD is one of 20 SFDs prepared under document GN-2670-1, which together provide a comprehensive vision of development challenges in Latin America and the Caribbean (LAC). Given that food security requires a multisector approach, the following documents complement this SFD: (i) the Agriculture and Natural Resources Management SFD regarding the need to boost agricultural productivity while managing the impacts of climate change and without putting pressure on natural resources, and increase rural household income, thus leading to improvements in food availability and access; (ii) the Social Protection and Poverty SFD in terms of providing those living in extreme poverty with access to efficient redistribution programs in support of consumption that will help build their capacity in line with policies to boost economic productivity, thus leading to improvements in food access; (iii) the Health and Nutrition SFD in terms of promoting timely and continuous access to high-quality health and nutrition services, thus leading to improvements in food utilization; (iv) the Water and Sanitation SFD in aspects related to access to quality water and sanitation services, thus leading to improvements in food utilization; (v) the Labor SFD regarding the need to have efficient labor markets in order to create and maintain formal, quality jobs, thus leading to improvements in food access; (vi) the Integration and Trade SFD regarding the need for collective action to help reduce market failures and for regional coordination to facilitate trade flows, thus leading to greater food availability and price stability; (vii) the Gender and Diversity SFD in terms of promoting gender equality and women’s empowerment as well as inclusion of indigenous

¹ This SFD was prepared with input from food security and nutrition experts from international agencies such as the Food and Agriculture Organization (FAO), the International Fund for Agricultural Development (IFAD), the International Food Policy Research Institute (IFPRI), and the United States Agency for International Development (USAID). At a seminar organized for this purpose and held at IDB Headquarters on 22 January 2018, the various experts presented comments, suggestions, and recent literature as their contribution to the preparation of this document. In addition, an internal seminar was organized with specialists from the various divisions related to the topic of food security.

communities, Afro-descendants, and other diverse populations, thus leading to greater food access and better food utilization; (viii) the Transportation SFD regarding the principle of fostering infrastructure development with efficient services that promote productivity and foster regional integration and competitiveness; and (ix) the Climate Change SFD in terms of the challenge involved in including climate considerations to maintain food stability.

- 1.4 This SFD also dovetails with the Bank's five sector strategies, particularly: (i) the Integrated Strategy for Climate Change Adaptation and Mitigation, and Sustainable and Renewable Energy (document GN-2609-1), which is aimed at environmental sustainability and at reducing vulnerability to climate change in LAC; (ii) the Sustainable Infrastructure for Competitiveness and Inclusive Growth Strategy (document GN-2710-5), which is aimed at supporting construction and maintenance of socially and environmentally sustainable infrastructure; and (iii) the Sector Strategy to Support Competitive Global and Regional Integration (document GN-2565-4), which prioritizes lines of action to contribute to the sustainable use of regional public goods.

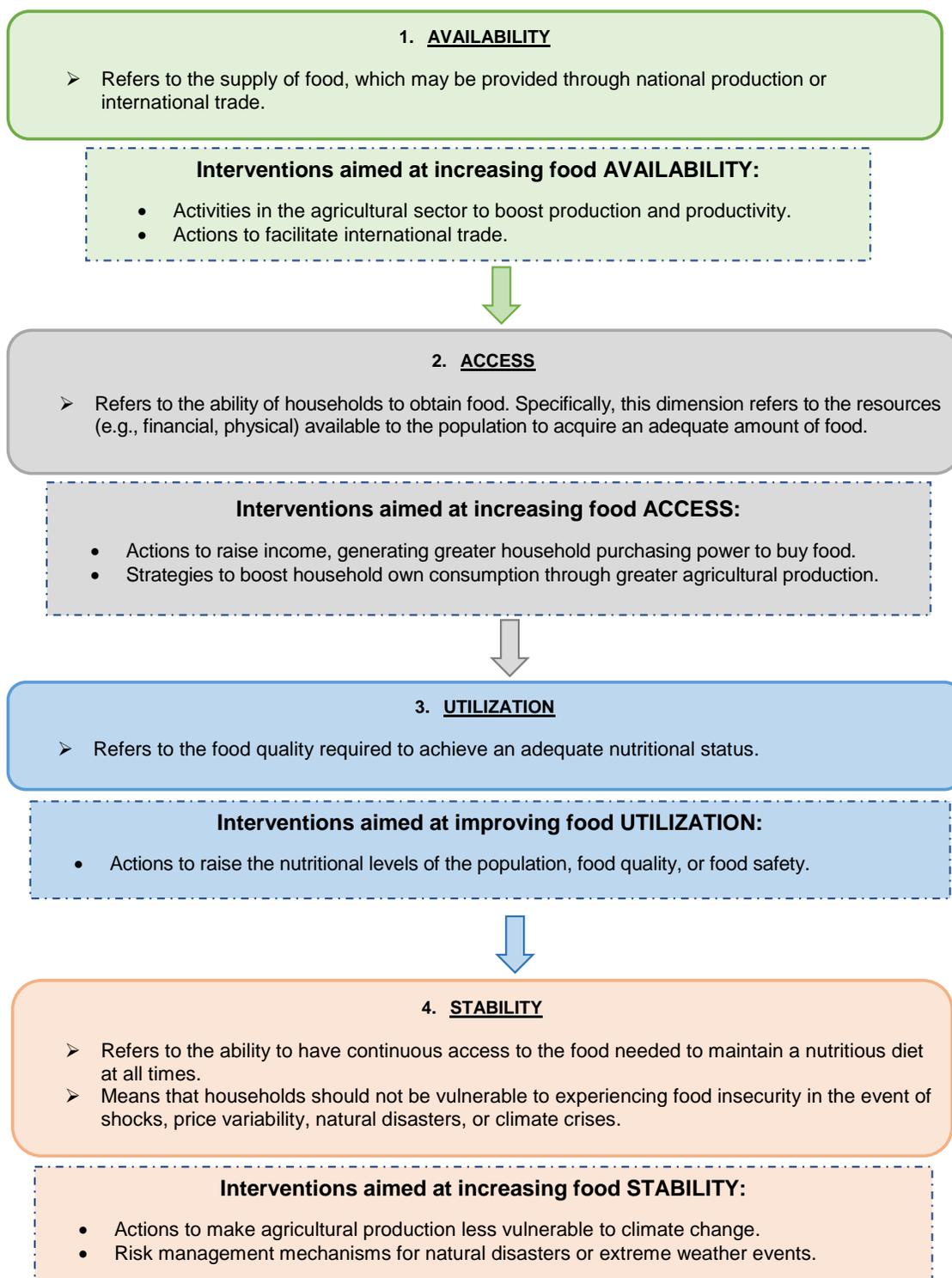
B. The Food Security Sector Framework Document and the IDB Institutional Strategy

- 1.5 This SFD is consistent with the Bank's Update to the Institutional Strategy 2010-2020 (document AB-3008) by contributing to the crosscutting themes of climate change mitigation and improvement of environmental sustainability in the region, fostering of gender equity and diversity, and building of sector institutional capacity, and to the region's three structural challenges: (i) reducing social exclusion and inequality; (ii) boosting productivity and innovation; and (iii) moving forward on regional integration (IDB, 2015).

II. EVIDENCE ON THE EFFECTIVENESS OF FOOD SECURITY POLICIES AND PROGRAMS

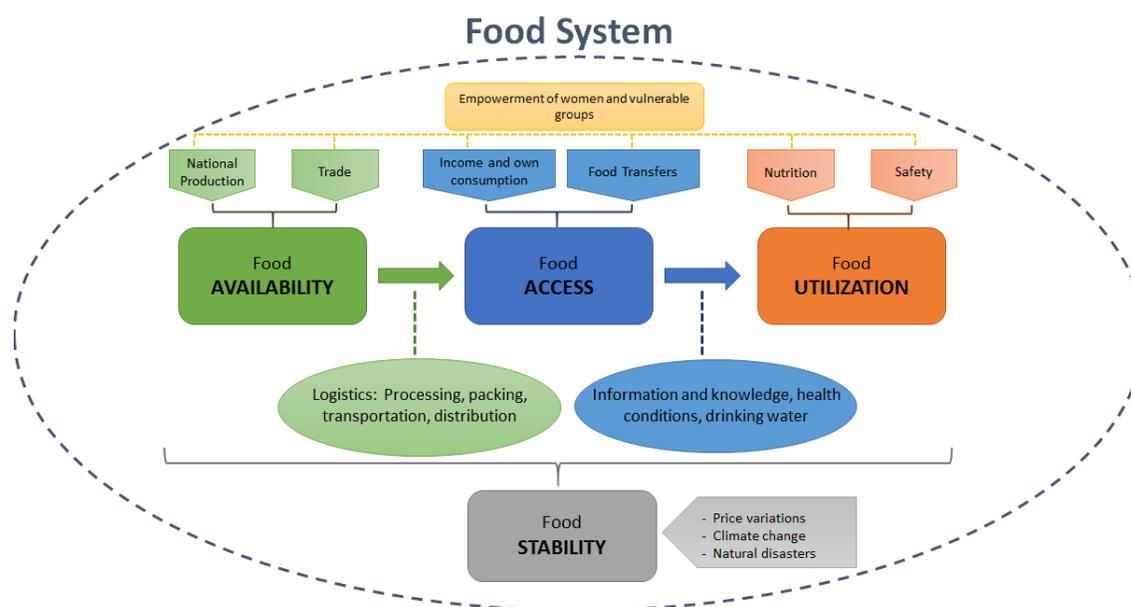
- 2.1 For purposes of this SFD, food security is defined as the situation "that exists when all people, at all times, have physical and economic access to sufficient safe and nutritious food to meet their dietary needs for an active and healthy life" (FAO, 2002; FAO, 2006). This SFD is based on the modern concept of food and nutrition security, which goes beyond the traditional concept of food security that only referred to a country's ability to generate an adequate food supply. The new approach to food and nutrition security is conceived from a food systems perspective, encompassing not only food production but also demand and the nutritional status of the population. Specifically, food systems include all activities needed for planting, harvesting, processing, packing, transportation, distribution, marketing, trade, consumption, and waste removal (United Nations System Standing Committee on Nutrition-UNSCN, 2016).
- 2.2 The food systems approach takes food security not as a concept limited to cyclical problems (e.g. price variations, natural disasters, shocks) but rather as a structural issue to be viewed as a long-term development objective with a multisectoral approach.
- 2.3 Food security has four key dimensions, which this SFD examines in depth: (i) food availability; (ii) food access; (iii) food utilization; and (iv) food stability. Each of these dimensions of food security is defined below (see Figure 1).

Figure 1. Dimensions of food security



- 2.4 Food **availability** refers to the supply of food. However, the fact that food is available does not mean that all households are able to purchase it, since household capacity to generate income may be limited. Food **access** refers to households' ability to obtain food either through purchasing power or through own consumption. However, having an adequate level of food availability and access does not guarantee that households will consume the quality food needed for a sufficiently nutritious and healthy diet. Food **utilization** refers to the food quality required for adequate nutritional status. Lastly, food **stability** refers to the ability to have continuous access to the foods needed to maintain a nutritious diet at all times (see Diagram 1).

Diagram 1. The dimensions of food security and food systems



- 2.5 The concept of food security is complemented by that of food sovereignty, which is neither contrary nor alternative to the concept of food security (FAO, 2013d). Food sovereignty refers to the right of States to set their food policy without external interference, while food security is a general approach based on the goal of reducing hunger and improving nutrition. This SFD focuses on the concept of food security.
- 2.6 Public interventions to increase food security are justified from the perspective of market failures, including: (i) missing markets; (ii) lack of information or asymmetric information; (iii) liquidity restrictions; (iv) negative externalities; (v) lack of markets; and (vi) agent coordination issues. The effects of climate change also justify a public intervention. However, the typology of market failures varies with each context and should therefore be analyzed on a case-by-case basis. It is worth noting that various studies have attempted to quantify the cost of eradicating world hunger, arriving at estimates that range from US\$7 billion to US\$265 billion, depending on the strategies used for this purpose (International Food Policy Research Institute-IFPRI, 2018). Moreover, Laborde (2018) estimates that eradicating hunger could raise global GDP by US\$276 billion by the year 2030 (including benefits of labor productivity).

- 2.7 Due to the multidimensional nature of food security, **reducing hunger requires a strategy of multisectoral and interagency coordination**. This entails facilitating effective coordination among sectors and institutions by means of joint efforts on the part of communities, local governments, academia, governmental agencies, and civil society (Tirado et al., 2013; Lipper et al., 2014; Rasul, 2016). McDermott et al. (2013) emphasize that to improve food security, agricultural interventions need to be aligned with health, nutrition, social protection, and water and sanitation projects. This is also noted by Ruel et al., (2013), who indicate that agriculture and social protection are the two sectors with the greatest potential to support nutrition. Tirado et al. (2013) add that coordination between these two sectors could be a means of integrating nutrition-sensitive actions into climate-resilient sustainable development efforts and thereby reducing the adverse impacts of climate change on food and nutritional security. A key to achieving this coordination is to develop and implement institutional mechanisms at all levels of government to ensure consistency in policy among the various sectors and facilitate coordination, by strengthening complementarities and synergies.
- 2.8 The International Food Policy Research Institute (IFPRI, 2014b) carried out a comparative analysis of developing countries that were successful in reducing food insecurity between 1990-1992 and 2011-2013, including Brazil, China, Vietnam, and Thailand. The results of the analysis of those experiences confirmed that strategies in the agriculture, social protection, and nutrition sectors need to be combined and coordinated in order to tackle hunger and malnutrition. Lastly, with respect to the governance of interagency coordination, a comparative analysis of initiatives on food security and undernourishment in seven developing countries (Brazil, Bolivia, Haiti, Indonesia, Madagascar, Malawi, and Yemen) carried out by the FAO (2014a) also indicates that a key challenge is to improve the effectiveness of coordination among sectors to harmonize and improve the impact of food security interventions.
- 2.9 In LAC, the most common model of institutional organization is the creation of food security and nutrition councils, commissions, or boards. These units are responsible for coordinating, articulating, and in some cases implementing food security policies under an intersectoral approach. For example, in 2006 Brazil established the National Food and Nutrition Security System, consisting of the National Council on Food and Nutrition Security (CONSEA) and the Interministerial Council on Food and Nutrition Security (CAISAN). CONSEA—which includes representatives of civil society and the government—guides and monitors food security and nutrition policies, including the national plan, and promotes integration between food security and nutrition interventions CAISAN, in turn, is the government’s interministerial mechanism for coordination, implementation, and management of the national plan for food security and nutrition. A similar arrangement is in place at the level of states and municipios. Monitoring is a crucial element of food security in Brazil. The federal government and CONSEA have set up an information system to monitor implementation of the national food security and nutrition plan. It is also important to note that the national food security and nutrition plan is put together with the participation of various stakeholders and is supported through the federal budget.
- 2.10 Similar intersectoral coordination strategies have been implemented in other countries, such as El Salvador and Dominican Republic. In 2009, the Government of El Salvador created the National Food and Nutrition Security Council (CONASAN), comprised of the Ministry of Health, the Office of the President’s

Technical Secretariat, the Ministry of Agriculture and Livestock, and the Social Inclusion Secretariat. In addition, the technical committee includes other government ministries as well as the Salvadoran Institute for Women's Development (ISDEMU) and the University of El Salvador, among other members. More recently, in 2016, the National Council on Food and Nutrition Security and Sovereignty (CONASSAN) was created in the Dominican Republic. Reporting to the Office of the President, it is comprised of the government ministries, including the Ministry of Women, among other members.

- 2.11 These intersectoral coordination efforts have been supplemented by specific legislation. Various countries in the region, including Bolivia, Brazil, Ecuador, Guatemala, Honduras, Nicaragua, Dominican Republic, Venezuela, Haiti, Mexico, and Panama, have enacted national laws related to the right to food security or explicitly refer to this issue in their constitutions. In addition, Peru, Costa Rica, and El Salvador are at advanced stages of discussion regarding national legislation on food security or the right to food. This demonstrates the political commitment in LAC countries regarding food security. Despite efforts to address the food security challenges by way of legislation and/or interagency coordination, rigorous evaluations are still needed to measure the effectiveness of these interventions.
- 2.12 According to the food systems approach, the private sector also has an essential role to play in food security. However, it is crucial that governments create the right incentives and rules and regulations so that the private sector can participate in a way that is aligned with food security objectives at the country level. This means that rules and regulations must be established, and ongoing monitoring must be performed, to expand the supply of safe, nutritious products, build capacity among those who produce, package, and distribute food on good practices in food management, and inform consumers in order to bring about behavioral changes and increase the demand for safe, nutritional products in order to sustain the food system and signal the private sector to increase the supply of high-quality food.
- 2.13 The following sections examine the relevant empirical evidence from this and other regions regarding the various policies and interventions related to each of the dimensions of food security.²

A. Dimension 1: Food availability

- 2.14 As indicated above, food availability is one of the dimensions of food security. This dimension refers to the supply of food, which depends on agricultural production or imports. Below is an analysis of the empirical evidence from interventions aimed at expanding the availability of food.

1. Food availability depends on growth in agricultural production and productivity. Agriculture³ plays an essential role in food availability.

² Given the dearth of evidence on some issues in the region, this section presents relevant empirical evidence from both within and outside the region.

³ As in the Agriculture and Natural Resources Management Sector Framework Document, "agriculture" is understood here to include farming activity, livestock, fisheries, and forestry.

Increasing agricultural production allows food availability to respond to population growth and consumer demand.⁴

- 2.15 Sustainably developing the agricultural sector without putting pressure on natural resources is essential to ensuring food availability. To this end, it is very important to increase the productivity of the factors of production, promoting farmers' access to the appropriate technologies, secure land tenure, access to productive assets such as farm machinery, irrigation, the ability to manage risk, and access to financial services, among other things (see Agriculture and Natural Resources SFD for more details).
- 2.16 The literature shows that investments financed with State resources and intended for the provision of rural public goods have a greater impact on agricultural productivity and higher economic returns than public expenditure on private goods (Lopez and Galinato, 2007; Lopez and Palacios-Lopez, 2014; Lopez, Galinato, and Islam, 2011; Sills et al., 2015). In fact, in the case of LAC, a study shows that agricultural income could be raised by 5% by redistributing 10% of the public expenditure intended for private subsidies toward public goods (Anriquez et al., 2016). The rural public goods that have been shown to have greater impact on productivity include: agricultural research, land tenure guarantees, rural infrastructure, and access to irrigation. Agricultural research and extension are key factors in the growth of agricultural productivity. A meta-analysis carried out by Hurley, Rao, and Pardey (2014) analyzes the yield rates of investments in agricultural research and development in 372 studies from 1958 to 2011, reporting an average rate of return of 14%. Furthermore, Navarro and Olivari (2016) emphasize that the structural transformation and technological change that the agricultural sector in LAC is experiencing can generate important positive changes in the availability of food in the region.
- 2.17 **Land access** is crucial for food production; consequently, formal recognition of land tenure is essential. Several studies show that securing land tenure encourages productive and environmental investments, which have positive long-term impacts (Higgins et al., 2018), generating direct positive effects on productivity. In fact, a meta-analysis shows that improvements in de jure security of land tenure boost agricultural productivity by around 40% (Lawry et al., 2017). These positive effects have been evident in various countries, such as Nicaragua, Peru, Cambodia, Vietnam, Ethiopia, and Madagascar (Foltz et al., 2000; Deininger and Chamorro, 2004; Torero and Field, 2005; Markussen, 2008; Do and Iyer, 2007; Van den Broeck et al., 2007; Holden et al., 2009; Jacoby and Minten, 2007). In addition, a land registration and certification program in Ethiopia was shown to have a positive effect on household food availability on the order of 3% per year, and in female-headed households the effect was even greater at 5% (Hagos and Holden, 2013).
- 2.18 **Access to water and irrigation** are also determining factors for the productivity of the land and the stability of agricultural yields. An estimated 40% of global agricultural production comes from irrigated land. However, only 21% of cultivated land worldwide has access to irrigation (AQUASTAT, 2014). This shows that expanding the land area for irrigated crops could have important effects on food

⁴ See the Agriculture and Natural Resources Management SFD for more information on the literature on interventions that boost agricultural productivity.

availability worldwide since the productivity of irrigated land is in fact more than twice that of dryland farming (World Bank, 2008). A global analysis estimated that improving water productivity (food produced per unit of water consumed) could raise production in limited rainfall areas and supply food to roughly 110 million people per year (Brauman et al., 2013).

- 2.19 **Food losses affect food security by reducing the availability of food.** However, the evidence is mixed regarding the magnitude and causes of these losses, which occur with respect to food intended for human consumption along the various stages of the production chain, from initial production to household consumption (FAO, 2018). FAO (2011) estimates that approximately one third of the food produced in the world (1.3 billion tons per year) for human consumption is lost before consumption; this is equivalent to US\$680 billion in economic losses for developed countries and US\$310 billion for developing countries. These losses occur because of problems in handling, distribution, storage, and consumer behavior (FAO, 2014). Some estimates show that in LAC, food losses reach 127 million tons per year. Approximately 85% of this total is lost between production and market sale, while the rest is lost due to waste on the part of consumers (FAO, 2011). In LAC, the food groups where most losses take place are grains, followed by fruits and vegetables (Gustavsson et al., 2011). However, there is still no general consensus in the literature as to the magnitude and/or the main causes of this problem. In fact, some studies indicate that measuring food losses is problematic, and in some cases postharvest losses may be overestimated due to calculation and valuation methodologies, as well as to problems of adjustment in the utilization of agricultural production, such as household own consumption (Affognon et al., 2015; Rosengrant et al., 2015). In conclusion, the assessment of food losses requires further analysis before a consensus can be reached on the most appropriate methodologies for estimating the magnitude and identifying the causes of this problem.
- 2.20 Reducing postharvest losses is one way of increasing the availability of food in rural households, since lower losses are associated with greater consumption of own production and higher income from sales of production (World Bank, 2011c). Postharvest technologies have proven effective in reducing losses. A study consisting of a regional analysis of five food groups shows that introducing cutting-edge cost-effective technologies for food packaging can reduce losses at all stages of the production chain (FAO, 2014). Similarly, Kumar and Kalita (2017) find that, in developing countries, 50% to 60% of grains are lost during the storage period. Therefore, the authors estimate that postharvest losses can be reduced to 2% or less with appropriate storage technologies. In addition, several studies examine the impact of adopting hermetic storage technologies (i.e., metal silos and hermetic bags) on food security (Bokusheva et al., 2012; De Groote et al., 2013; Tefera et al., 2011). For example, De Groote et al. (2013) show that metal silos and hermetic bags contributed significantly to lowering postharvest losses in Kenya and reducing the presence of insects in maize without the use of chemicals. In El Salvador, Guatemala, and Honduras, Bokusheva et al. (2012) found that silos contributed to food security by increasing the availability of maize. Furthermore, this technology helped to boost the profits of small producers by facilitating the storage of surplus production with a view to obtaining higher prices. Similarly, interventions in rural infrastructure, especially roads, play an essential role in reducing food losses, since

- they increase connectivity between producers and markets and reduce the time and cost of transporting agricultural products, making it easier to sell them.
- 2.21 **Fish output has fallen while demand has risen.** According to the FAO, the average person consumes 19.7 kilograms of fish per year around the world (FAO, 2016a). In Latin America and the Caribbean, fish consumption is set to grow by 22% between 2015 and 2025, to an average rate of 12 kilograms per person per year. This evolution in the demand for fish stands in contrast to fishing catches (saltwater and freshwater) in the region. Although more than 20 million tons of fish were harvested in the region in 2000, this figure has fallen by 41% to 11 million tons of fish over the past 15 years (World Bank, 2018). Moreover, the downward trend in the catch rate is not expected to reverse. The pressure to harvest marine populations has had major adverse effects on several commercial species (e.g. anchovies, herring, mackerel, sardines, etc.) (FAO, 2014d). Overfishing and population collapse must be regarded as serious problems in the region with the potential to affect food availability.
- 2.22 Rising demand for fish products is expected to be met by steady growth in the aquaculture sector in Latin America and the Caribbean. Aquaculture production in the region has more than doubled in 15 years, growing from 872,000 tons in 2000 to 2.7 million tons in 2015 (World Bank, 2018). In fact, the aquaculture is the fastest growing segment of the food and livestock sector in Latin America and the Caribbean (FAO, 2014). However, until aquaculture is able to meet the growing demand for fish products, the region will continue to rely on imports. It is estimated that fish imports to the region will climb by 35% by 2025, compared with a rate of 21% globally, which could have negative effects on food availability.
- 2. Women play a key role in food availability. However, gender inequality in access to productive resources is a significant constraint. Therefore, narrowing the gender gap regarding access to productive inputs and resources can boost the availability of food and reduce hunger.**
- 2.23 Women's contribution to agricultural production is essential. In fact, it is estimated that women account for 43% of the labor force in the agricultural sector of developing countries and 21% in LAC (FAO, 2011). However, the disparity between men and women in terms of access to productive resources (i.e., work, land, irrigation, and technology) generates significant inefficiencies that reduce agricultural productivity and therefore limit food availability (Kumase, Bisseleua, and Klasen, 2008; Horrell and Krishnan, 2009). On average, the productivity of plots farmed by women is estimated to be 25% lower than that of plots farmed by men (Peterman, Quisumbing, and Behrman, 2010). Furthermore, Kilic et al. (2015) show that in Malawi, although plots managed by women have lower productivity than those managed by men (they are approximately 25% less productive), 82% of this difference is attributable to differences in the supply of productive resources and inputs, since women have less access to fertilizer and labor. Similar results are found in Ethiopia (Kilic et al., 2015). In addition, studies show that reducing gender disparity and bolstering women's empowerment increases productive technical efficiency (Seymour, 2017). Therefore, narrowing the gender gap in agriculture can generate significant gains for society. Specifically, a simulation exercise conducted by FAO demonstrates that narrowing the gender gap in terms of access to productive resources could boost

agricultural production from 2.5% to 4% in developing countries, reducing the number of hungry people in the world by 12% to 17% (FAO, 2011).

3. Food availability could be seriously affected by natural disasters and climate change. Consequently, it is crucial to implement risk management and adaptation measures ex ante with a view to making agricultural production less vulnerable to these events.⁵

- 2.24 Food availability can also be affected by natural disasters and climate change. In the last 10 years (2008-2018), LAC experienced 573 disasters affecting 113 million people. Droughts affected the largest share of this total (46%), followed by floods (26%).⁶ This shows that the region's agricultural production, given its high exposure to droughts and floods, is highly vulnerable to natural disasters. Using data from 94 countries (68 of them developing countries), Loayza et al. (2009) estimated that in the period 1961-2005 agricultural growth declines by 2.2% and 0.8%, respectively, due to serious droughts and storms.
- 2.25 In terms of the effect of climate change on food availability, numerous studies project declines in agricultural productivity (Descheemaeker et al., 2018; Hristov et al., 2017; Myers et al., 2017; Economic Commission for Latin America and the Caribbean-ECLAC, 2014 and 2013; Fernandes et al., 2012). In Latin America, maize, wheat, soy, and rice export earnings are forecast to suffer significant losses by 2020 (Fernandes et al., 2012). This study identifies changes in temperature and precipitation, shorter production cycles with concomitantly less time for grain filling, and declining availability of water as the causes of the loss in productivity. Regarding livestock productivity, climate change is projected to affect the quantity and quality of fodder (e.g., protein content and digestibility) as well as the fertility of dairy cattle and the animals' energy for productive activities; negative effects are expected with the rise in temperatures (Hristov et al., 2018).
- 2.26 In addition, food availability may be affected by potential changes in aptitude for agricultural production (Ovalle-Rivera, 2015; Bouroncle et al., 2015; Laderach et al., 2009; Pinto et al., 2008). In global terms, high temperatures may cause elevations of less than 1,000 meters above sea level (m.a.s.l.) 5°-10° from the equator to lose their aptitude for growing Arabica coffee (Ovalle-Rivera, 2015). Changes in aptitude for the production of maize, beans, and coffee are also expected in Central America. A study conducted for various climate change scenarios estimates that, by 2020, maize production in this subregion could decline by 4% to 9%, the most heavily affected countries being El Salvador, Costa Rica, and Nicaragua. Estimates for 2050 suggest that declines in maize yields could range from 4% in Guatemala to 14% in Panama. The same study shows that, by the end of the century, the estimated yield declines in the region would be 35% in the case of maize, 43% in the case of beans, and 50% in the case of rice (Central American Integration System, 2013). In fact, Bouroncle et al. (2015) estimate that 81% of the municipios where beans are currently grown in Honduras may lose their aptitude by 2030. In Nicaragua, the optimal altitude for growing coffee could change from the current 800-1,400 m.a.s.l. to 1,200-1,600 m.a.s.l. in 2050 (Laderach et al., 2009). These

⁵ See the Climate Change SFD for more information on the role of agriculture in climate change.

⁶ March 2018 query of the EM-DAT database: The Emergency Events Database - Université Catholique de Louvain (UCL) - CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium.

effects on productive aptitude affect food and nutrition security not only via the amount of food available, but also via income and price variability.

- 2.27 The link between climate conditions and the incidence of pests and disease in plants and animals is widely documented and also threatens the availability of food (Adedayo et al. 2014; Lau et al., 2013). In fact, climate change favors the proliferation of certain pests (Huot et al., 2017; Evans et al., 2014; Ghini et al., 2011), the emergence or reemergence of infectious diseases, and alterations in the geographic locations in which they appear (Van den Bossche and Coetzer, 2008). This results in losses and a decline in the quality of agricultural production (Ovalle-Rivera, 2015; Chakraborty and Newton, 2011). In Central America, higher temperatures may have contributed to the rust epidemic that caused a drop of up to 25% in the 2012-2013 coffee harvest (ECLAC, 2014). Similarly, in Colombia, the incidence of pests and diseases in bananas, plantains, coffee, potatoes, cocoa, maize, and yucca is expected to intensify as a result of climate change (Lau et al., 2010). In animals, the distribution of pathogens and non-vector-borne diseases (such as foot-and-mouth disease) will be affected by changes in temperature and humidity (Van den Bossche and Coetzer, 2008).
- 2.28 Similarly, the warming of the oceans could result in a decline in maximum fishing potential in several LAC countries (Cheung et al., 2010). Fishery resources are being affected by ocean acidification and a rise in sea temperature and level, among other factors (Ding et al., 2017; Allison et al., 2009). Forecasts project a redistribution of fish resources, boosting the fishing potential by more than 30% in high latitude zones and reducing it by up to 40% in the tropics (Cheung et al., 2010). This would increase vulnerability, particularly in the coastal areas of countries with high levels of food insecurity. In fact, the vulnerability of food security to the impacts of climate change on fish resources is particularly high in developing countries that rely on these resources both in economic terms and as a source of protein (Ding et al., 2017, Allison et al., 2009).
- 2.29 To address the effects of natural disasters and climate change on food availability, it is important to encourage the implementation of risk reduction and adaptation measures that make production less vulnerable to climate events. Such measures include irrigation, adoption of agroforestry crops, use of improved varieties, and agricultural insurance, among others (Fernandes et al., 2012; Vergara et al., 2013). Irrigation is a promising alternative for confronting problems of reduced water supply and productivity in LAC (Inter-American Institute for Cooperation on Agriculture-IICA, 2007). For example, an impact evaluation of the National Irrigation Program with a Watershed Approach (PRONAREC), which financed the construction of community irrigation systems promoting integrated and participatory management of water resources in Bolivia, showed 60% increases in the value of small-scale farm production, as well as positive effects in the use of complementary technologies such as improved seeds and greater farm investments (López and Salazar, 2017). Similar results were observed in Nicaragua when evaluating the effects of a program that covered part of the cost of acquiring an irrigation technology, which was found to have increased income by approximately 44% while expanding the irrigated production area by 42% (Mullally and Chakravarty, 2017). In addition, the implementation of agroforestry systems has the potential to boost production, reduce greenhouse gas emissions, and improve carbon capture capacity in agricultural soils (Winters et al., 2010; Gonzalez et al., 2009). For example, in

- Nicaragua, significant increases in agricultural production were observed due to the implementation of the Socioenvironmental and Agroforestry Development Program (POSAF), which promoted natural resource management at the farm level by fostering agroforestry and silvopasture systems (De los Santos-Montero and Bravo-Ureta, 2017).
- 2.30 Regarding the adoption of improved technologies for climate change adaptation, such as improved seed varieties or livestock breeds, the empirical evidence confirms positive effects on yields, income, and nutrition (Mishra, Khanal, and Pede, 2017; Kebebe and Korji, 2017). In the case of Peru, it was found that producers who adopted an improved potato variety resistant to the late blight fungus, the effects of which largely depend on climate variations, obtained higher yields and lower harvest losses (Salazar et al., 2009). Similar results in potato farming in Peru show that improved varieties increased farmers' yields and profits (Pradel et al., 2017). Positive impacts from adopting improved varieties on the food security of agricultural households are also confirmed in Zambia and Gambia (Khonje et al., 2015).
- 2.31 Agricultural insurance is a means of offsetting variability in production from the effects of natural disasters and climate change. In fact, one study in Peru demonstrated that access to agricultural index insurance raised yields by 20% to 60% (Boucher and Mullally, 2010). However, the ex ante adoption of financial protection instruments to reactivate the agricultural sector following a disaster is still limited, particularly on the part of small and medium-sized producers in family farms. In fact, the penetration rate of agricultural insurance in LAC as a share of agricultural GDP is estimated at only 0.6%, compared to 1% in Europe and 5% in North America (Swiss Re, 2016). In addition, the greatest concentration is in medium-sized and large-scale commercial agriculture in Brazil, Mexico, and Argentina. Despite this, the agricultural insurance market has been developing quickly, and the volume of premiums has doubled every five years since 2000, reaching US\$1.6 billion (Swiss Re, 2016).
- 4. Trade plays an essential role in food availability worldwide. Therefore, policies aimed at facilitating trade flows can generate positive impacts on food security by reducing the volatility of domestic supply and boosting agricultural production.⁷**
- 2.32 Trade plays a crucial role in food security, especially in countries where agricultural production is constrained by a lack of access to productive resources (i.e., land and workers). For example, in the case of the Caribbean countries, it is estimated that the share of available food originating in imports went from 45% in 1995 to 67% in 2011 (FAO, 2016). Increased food trade helps to mitigate fluctuations in domestic food supply, as global production of a food product is much less variable than production in individual countries (Gillson and Fouad, 2015). In addition, the evidence suggests that trade liberalization benefits food security by increasing food production and agricultural productivity, thus helping to improve global food availability and price stability (Dorosh, 2001; Pyakuryal et al., 2010). In Chile, a country which has undergone significant trade liberalization over the last few decades, Fleming and Abler (2013) estimated that greater trade exposure—which facilitates access to cutting-edge technologies—can boost crop yields by up to 44%.

⁷ See the Integration and Trade SFD for more information on the role of trade in economic growth.

- Along the same lines, Huang et al. (2007) showed that China's agricultural production rose considerably between 2000 and 2005, following the country's accession to the World Trade Organization.
- 2.33 Trade openness also supports food security in small countries as a result of an increase in the availability of food at lower prices. In countries such as Uganda and Mozambique, which have consistently maintained open trade policies for basic foodstuffs, food security has improved over the last two decades.
- 2.34 Dorosh (2001) showed that in Bangladesh, trade liberalization in 1994 made it possible to increase rice imports from India after periods of scarcity in 1997-1999, substantially improving food availability and contributing in the short term to food security. Similarly, Pyakuryal et al. (2010) analyzed the impact of trade liberalization in Nepal. The authors found that, in the aggregate, trade liberalization had positive impacts on food security, although gains varied from region to region. Moreover, at the aggregate level, the authors noted several positive impacts in terms of food availability and undernourishment.
- 2.35 Some countries have preferred to opt for policies of self-sufficiency in food instead of trade openness. The objective of these policies is to reduce the dependence on international markets for meeting food needs and thus lower the risk of an insufficient food supply due to volatility in international prices. The argument in favor of self-sufficiency is contradicted by the clearly stabilizing effect of free trade. Although price shocks can be attenuated through limited integration, as well as through limited transmission of international market prices to domestic ones, self-sufficiency would still leave markets susceptible to internal shocks and price fluctuations caused by variability in domestic production (Organization for Economic Cooperation and Development-OECD, 2013). Self-sufficiency may work against food security when it results in inefficient and costlier food production, which limits access to food.
- 2.36 At the same time, Timmer (2015) highlights the inefficiency of government policies aimed at stabilizing prices through market interventions. Government efforts to nationalize grain markets and regulate their prices have the effect of eliminating private sector participation in the storage and marketing of these goods, resulting in high fiscal costs and regressive effects. In addition, Abbott (2012) points out that domestic shocks are more frequent and more serious, on average, than international ones. At the same time, there is evidence that when governments isolate their domestic food markets from international price fluctuations, they may be contributing to greater fluctuations in international prices (Anderson and Nelgen, 2012), and this behavior, in turn, has a negative impact on global food security. In fact, several studies argue that such measures become ineffective because of a collective action problem. The latter creates a domino effect that pushes world food prices higher still and leads more countries to protect their markets, thus perpetuating high food prices (Anderson and Nelgen, 2012; Martin and Anderson, 2012; Rutten et al., 2011). For example, following the food crisis in 2008, many governments implemented trade policies aimed at isolating domestic prices from international ones. This resulted in substantial increases in international prices for products such as rice, maize, wheat, and others, leading to a rise in poverty (Chavas et al., 2014). This type of vicious circle can create greater food insecurity by reducing food availability and food access worldwide.

- 2.37 Countries that isolate their domestic markets heighten instability in international markets, particularly where they are major food producers or consumers. Magrini et al. (2013) estimated the marginal impact of distortions in agricultural trade on food security during the recent price increases. The analysis shows that countries with the greatest propensity to adopt restrictive trade policies have lower food availability. The food price crisis (2006-2008) was aggravated by restrictions on the export of wheat (by Argentina, Kazakhstan, Russia, and the Ukraine) and rice (by Vietnam, India, and China) in an attempt to delink domestic markets from world markets and maintain low domestic prices. In the case of Russia, a temporary prohibition was placed on exports of wheat, barley, rye, and maize from August 2010 through the end of June 2011 in response to a rise in cereal prices. As a result, farmers reduced their harvest by almost 37% compared to the 2009 crop. This led to a fall in exports of almost 12 million tons compared to initial projections for the year (World Bank, 2011b). These types of measures influence farmers' production and investment decisions, affecting food availability.⁸
- 2.38 Complementing policies that favor the flow of trade in foodstuffs, there are market instruments for managing food price risks (i.e. price variability); these include the futures and options markets, wholesaler promissory notes, and disaster index insurance. According to Gillson and Busch (2015), the cost to trade and public resources of these instruments is small, and they have the capacity to guarantee a supply of food should local production drop. They are also an alternative to physical food reserves, which the literature has shown have a high opportunity and fiscal cost for managing price risk (FAO, 2011). However, these instruments are not yet widely developed in countries that are more susceptible to food insecurity.

5. Access to public infrastructure increases food availability by reducing transaction costs and facilitating market access.⁹

- 2.39 The development of infrastructure services (e.g., roads, communications, logistics, energy) affects food availability by reducing transaction costs, transportation time from the place of harvest to the point of consumption, and, in turn, lowering food prices (Le Cotty et al., 2017; Shively and Thapa, 2017; Casaburi, Glennerster, and Suri, 2013). For example, using the hedonic pricing method to study the effects of proximity to markets among small-scale bean producers in Nicaragua, Ebata et al. (2017) estimate that, on average, each additional minute of travel is associated with a farm-level price reduction of 2.5 cents per quintal. Investments in infrastructure services are particularly important for isolated communities within a country or region (Qin and Zhang, 2016; Gollin and Rogerson, 2014; de Janvry and Sadoulet, 2006). In addition, it is estimated that improvements in rural road infrastructure boost agricultural production and lower transport costs to market, increasing food availability (Hine et al., 2016; Tong et al., 2013; Dorosh et al., 2012; Khandker, Bakth, and Koowal, 2009).

⁸ In this context, the OECD countries have reduced their level of protection and their use of instruments to restrict trade in the agricultural sector over the last 25 years. An analysis of the impact of OECD policies on the welfare of developing countries concluded that most developing countries would stand to gain if OECD countries liberalized their markets. Similarly, the analysis presented the results of various studies estimating gains from trade liberalization of US\$24 billion to US\$350 billion in the agricultural sector alone, contributing to greater food availability (OECD, 2006).

⁹ See the Transportation SFD for more information on the literature in that sector.

- 2.40 Tamru (2013) examined the cereals market in Ethiopia to determine whether the development of roads and communications infrastructure has been a catalyst for reducing transaction costs. In Ethiopia, cereal production more than doubled in the 2004-2011 period, while insertion in wholesale markets for wheat and maize rose by 16% (measured by the rate of price transmission between markets) and transaction costs fell by 30%. Moreover, a recent study of agricultural chains in Central America shows that between 29% and 48% of cereal import prices are accounted for by logistic costs, principally ground transportation; this factor may restrict food availability and access in those markets (World Bank, 2012). In Africa, the poor condition of the road system was identified as the main impediment to market insertion, with transportation costs accounting for 50% to 60% of total marketing costs (German Agency for Technical Cooperation-GTZ, 2010). In locations with a very low level of infrastructure development, a 1% increase in road density can help to increase trade flows by 0.1% to 0.7% (Bouët and Roy, 2008). Market access through investments in rural infrastructure (i.e., rural roads) can also help to increase the adoption of technologies (Aggarwal, 2014; Jack, 2013; Ali, 2011), agricultural productivity (Asher and Novosad, 2016; Dorosh et al., 2012; Stifel and Minten, 2008), and food diversity (Abay and Hirvonen, 2017; Hirvonen et al., 2017; Sibhatu and Qaim, 2017; Stifel and Minten, 2017). This demonstrates the importance of reducing transportation costs to boost food availability.
- 2.41 In summary, the evidence shows that agricultural policies aimed at increasing agricultural productivity and narrowing the gender gap, combined with favorable policies that expand the commercial flow of farm products and strengthen the development of infrastructure services (making it possible to shorten transport time, reduce costs, and improve logistical services) are effective strategies for boosting food availability and consequently improving food security.

B. Dimension 2: Food access

- 2.42 The preceding section presents empirical evidence supporting the effectiveness of interventions that increase food availability for the population. However, even when there is enough food available in the local or national economy, households can face food insecurity if they lack capacity to access food, whether through consumption of their own production, income, cash or in-kind transfers, or any other means. In LAC, the most commonly used policy instruments to increase food access are direct food delivery programs and/or programs aimed at raising income. At the same time, food access can be indirectly promoted through policies that boost own consumption on the part of households by increasing production or that raise agricultural income and consequently increase food consumption. Below we analyze the evidence from the various actions aimed at increasing food access.

1. Agricultural programs improve food access for rural households through a rise in agricultural production, which is reflected in greater own consumption, and/or through higher income, which increases food consumption.

- 2.43 Although the literature suggests a positive correlation between agricultural production and food security (Maxwell, 1998), agricultural production programs have not been broadly recognized as policy instruments for improving food security. The reason for this is that most such programs focus on measuring impacts on agricultural production, which only relate to the availability dimension, without

documenting the impact on the food access or utilization dimensions (Salazar et al., 2016). In addition, very few studies have assessed the direct impact of these programs on food security (Ruiz-Arranz et al., 2006). In this regard, worth highlighting is the analysis of the impacts of the agricultural technologies adoption program in Bolivia (Direct Support Program for the Creation of Rural Agrifood Initiatives-CRIAR), which measured effects on food security for beneficiary households both in general and in the specific dimensions of availability and access (Salazar et al., 2016). The results showed that access to agricultural technologies increased the beneficiary households' likelihood of having food security by 32%. More specifically, the results show that beneficiary households are less likely to lack food for a whole day (10%), skip a meal (14%), and have a low-variety diet (17%). These improvements are attributable to an increase in access to food—household income having increased by 36%—and to an increase in food availability—productivity having increased by 92%.

- 2.44 Other interventions in the agricultural sector, such as investments in irrigation, land titling, and/or improved varieties, have also proven effective in improving food access for rural households. For example, a study in Malawi showed that the annual agricultural income of an irrigation project's beneficiaries rose by 65% and their daily per-capita calorie consumption increased by 10%. In addition, the study found that the annual agricultural income of female-headed households rose by 86% (Nkhata et al., 2014). Dillon (2011) finds that small farmers in Mali increased their consumption by 27% to 30% as a result of investments in irrigation. Similarly, Kuwornu and Owusu (2012) found that access to irrigation also increased household consumption in Ghana. Similar results were arrived at in Benin, where access to modern irrigation through solar panels raised the income of small farmers as well as the production and consumption of fruits and vegetables (Alaofè et al., 2016). Similarly, interventions designed to secure land tenure in rural areas generate positive effects on household income and consumption (Torero and Field, 2005; Deininger et al., 2007; Do and Iyer, 2007; Keswell and Carter, 2014). In fact, a recent meta-analysis estimates that interventions of this type create a rise in income or consumption on the order of 15% (Lawry et al., 2017). The empirical evidence also confirms that improved varieties generate positive effects on the food security of rural households, expanding food access through improvements in income and consequently increasing consumption (Ahmed et al., 2017; Verkaart et al., 2017; Shiferaw et al., 2014).

2. Social protection programs are effective tools to increase food consumption. In particular, the evidence shows that conditional cash transfer programs and food voucher programs are cost-effective. However, proper targeting, monitoring, and verification of conditionalities continue to be significant challenges on the path to ensuring the contribution of these programs to food security.¹⁰

- 2.45 LAC has been at the forefront in implementing social protection policies, particularly through the use of conditional cash transfer (CCT) programs (Social Protection and Poverty SFD). A study conducted by Stampini and Tornarolli (2012) estimates that, in 2013, approximately 137 million people in 17 countries in the region were

¹⁰ See the Social Protection and Poverty SFD for more information on the literature.

- receiving transfers representing 20% to 25% of their household income. These programs seek to reduce poverty by means of income transfers granted on the basis of compliance with health, nutrition, and education conditionalities (Ibarrarán et al., 2017). The impact of CCT programs on food security has been manifested through a combination of income increases, food consumption, and nutrition improvements.
- 2.46 In general terms, the results of several impact studies show that CCTs have helped to reduce poverty and increase food consumption in beneficiary households. Evidence of these improvements has been observed in Colombia, Mexico, Ecuador, and Nicaragua, among other countries (Fiszbein and Schady, 2009; Ibarrarán et al., 2017; Hoddinot and Weismann, 2010). In addition, a meta-analysis carried out by Hidrobo et al. (2018), using a sample of 58 impact studies of social protection programs implemented since 1994 in 25 countries (in different regions, including LAC countries),¹¹ shows that the social protection programs in the region raised caloric intake by 7% and food consumption by 13% in the beneficiary households. These programs primarily increased the consumption of grains (14%) and animal protein (10%). However, the effectiveness of these programs largely depends on the implementation of monitoring strategies to ensure their transparency, on the identification of effective targeting criteria to ensure that the beneficiaries are the poorest population groups, and on the deployment of conditionality verification systems (Ibarrarán et al., 2017).
- 2.47 In addition to benefits linked to food consumption, there is some evidence that CCTs can help finance productive investment and expenditure, which can strengthen the capacity of beneficiary households to purchase food as a result. Although there is no generalized evidence in this regard, Todd et al. (2010) showed that the “Oportunidades” program in Mexico increases the value and variety of food consumed, as well as land use, livestock ownership, and spending on agricultural inputs. Gertler et al. (2012) also indicated that participation in the program is linked to an increase in land use and animal ownership. Veras Soares et al. (2010) showed that Paraguay’s “Tekoporá” program boosted agricultural investment, particularly in the case of households in extreme poverty.
- 2.48 In-kind direct transfer programs are another tool to ensure food access on the part of a specific segment of the population. However, in LAC, there are few direct food transfer programs, except for the case of school feeding programs or emergency situations.
- 2.49 Few studies have analyzed the effectiveness of cash transfer programs compared to in-kind transfers (Hidrobo et al., 2014). An example in Mexico, which used a randomized methodology to assign households to in-kind transfer programs, cash transfer programs, and a control group, found that both types of program increased calorie intake (Cunha, 2014). With respect to specific food groups, this study found that in-kind transfers increased dairy and micronutrient consumption to a greater extent, while cash payments increased fruit and vegetable consumption to a greater extent. At the same time, neither of the two types of program increased alcohol or sugar consumption to any significant degree. In general, the study shows that there are no major differences between the two types of program in terms of food

¹¹ LAC countries analyzed include Ecuador, Mexico, Honduras, Colombia, Nicaragua, Bolivia, Peru, and Paraguay.

- consumption. However, the distribution cost differential is a very important variable to consider since in-kind transfer programs have substantially higher costs, which in this case are approximately 20% of the cost of the in-kind transfer, compared to 2.4% in the case of cash payments (Cunha, 2014; Caldés, Coady, and Maluccio, 2006).
- 2.50 Similar results in terms of distribution costs are found in Honduras, Nicaragua, and Bangladesh (Caldés, Coady, and Maluccio, 2006; Ahmed et al., 2009). Similarly, an experiment conducted in northern Ecuador, which compared three types of food assistance, including food vouchers, cash transfers, and in-kind transfers, showed that all three types of assistance raised food consumption per capita, caloric intake, and food diversity (Hidrobo et al., 2014). Furthermore, in-kind transfers led to a larger increase in caloric intake, while the vouchers led to a larger increase in dietary diversity (consumption of vegetables, proteins, etc.). In addition, the authors performed a cost-effectiveness analysis showing that food vouchers are the most cost-effective arrangement for increasing food consumption and quality, while direct food transfers are the least cost-effective.
- 2.51 Lastly, public employment programs offer immediate jobs that increase the income of the poorest population in rural areas in exchange for their help in building public infrastructure at the local level. In 2005, India launched the National Rural Employment Guarantee (NREG), which provides a minimum of 100 days of employment with a guaranteed salary within the locality. One of the most recent evaluations shows that the program had positive impacts on caloric intake and protein consumption (Deininger and Liu, 2013). In the case of employment programs with payment in food, the evidence is less convincing. In Ethiopia, for example, an evaluation of a public work program that included cash and in-kind payments showed that it did not change dietary diversity, nutritious food consumption, or child nutrition (Berhane et al., 2017). In Indonesia, employment programs providing for in-kind payment were implemented to reduce the prevalence of micronutrient deficiencies after the crisis of the 1990s, which increased the prevalence of anemia. However, an analysis of these initiatives did not find the expected nutritional impacts (Moench-Pfanner et al., 2005). Moreover, a study in Ethiopia showed that a similar program had effects on child nutrition by increasing weight for height (Quisumbing, 2003).
- 3. Climate change and natural disasters can reduce food access. However, direct food distribution, food voucher, and/or cash transfer programs and climate insurance can counteract the lack of food in the event of natural disasters and soften consumption.**
- 2.52 Considering various greenhouse gas emission trajectories as well as economic and population growth scenarios, Nelson et al. (2010) estimate considerable increases in the real prices of maize (87%-106%), rice (31%-78%), and wheat (44%-59%) by 2050. This increase in food prices tends to be negatively associated with dietary diversity (Brinkman et al., 2009) and related to an increase in poverty and food insecurity in developing countries (Myers et al., 2017; Anderson et al., 2014; Ivanic and Martin, 2014). For example, simulations for these countries indicate that a 10% increase in food prices raises poverty by 0.8 percentage points (Hallegate et al., 2016; Ivanic and Martin, 2014), which is associated with a reduced ability to access food. Similarly, an increase in temperature may translate into higher food prices since refrigeration is required for the storage and transportation of certain products (Fanzo et al., 2017).

- 2.53 Loss of or interrupted access to productive assets due to extreme weather and geological events is associated with a short-term reduction in per capita income, thus affecting consumption (Baez et al., 2010). In addition, several studies indicate that natural disasters cause the poorest households to give up part of their food consumption as a survival strategy, resulting in significant short- and long-term negative impacts (Carter et al., 2006). In general, these shocks affect women to a greater extent because they have more limited access to financial resources to face the emergency and their social roles make them more vulnerable (Kumar and Quisumbing, 2014).
- 2.54 In addition, a decline in agricultural productivity as a result of climate impact and other natural disasters leads to a decrease in income, which affects access to food (Met Office and World Food Programme-WFP, 2012). For example, it is reported that the 2010 floods in Pakistan caused farmers to lose more than half of their expected income, while about 49,000 agricultural jobs and 20,000 formal jobs in nonagricultural sectors were lost during the 1991-1992 drought in Southern Africa (FAO, 2015). Additionally, extreme weather events and high temperatures deteriorate transportation infrastructure (Fanzo et al., 2017), limiting food distribution and access due to difficulties in bringing products and/or people to market (FAO, 2008).
- 2.55 Various types of interventions, such as climate insurance, food or cash transfers, and food vouchers, are available to counteract the negative effects of climate change and natural disasters on food access. Weather index-based insurance seeks to reduce income variability among small-scale farmers, thus limiting consumption variability in the case of adverse weather events.¹² For example, in Mexico, a study of the CADENA program, which insures small-scale farmers against weather events, shows that the insurance payments allow farmers in beneficiary municipalities to farm larger tracts of land and have higher spending and income levels after the covered event (de Janvry, Ritchie, and Sadoulet, 2016). Similar results are observed in other countries, where it is evident that agricultural insurance serves as an effective mechanism to soften consumption and maintain food access in the face of weather events (Janzen and Carter, 2017; Karlan et al., 2014). However, the existence of a network of quality meteorological stations and the availability of historical weather data are essential if measures of this type are to work successfully (Hellmuth et al., 2009).
- 2.56 Cash and in-kind transfer programs are also used to reduce variability in terms of food access and soften consumption in the wake of a catastrophic event. Cash transfer programs have proven effective in improving access to food and basic services in the case of a disaster, when the markets continue to operate and are able to provide goods and services to the population (Bailey and Harvey, 2015). These programs have some advantages over in-kind transfers, keeping decisions on consumption at the household level, bolstering the markets, and reactivating means of subsistence (Gore and Patel, 2006). In addition, they have lower logistic costs than direct food transfers (Bailey and Harvey, 2015). However, when the disaster is of great magnitude and affects the availability of food in the market, direct food transfers are required, even in the form of humanitarian aid. In this case, it is

¹² Under such insurance, claim payments are linked to a weather index (e.g., precipitation, humidity, temperature) rather than to actual losses (Hellmuth et al., 2010).

important to have preidentified mechanisms in place so that this support can be targeted to prioritize the most vulnerable population groups (Morris et al., 2002). Such mechanisms include single beneficiary registries and national targeting systems (such as Cadastro Único [single registry] in Brazil and/or SISBEN in Colombia), which are useful instruments for this purpose.

- 2.57 In short, the evidence shows that agricultural programs targeting small producers play an important role in terms of food access by fostering higher production and income that translate into improvements in rural household consumption. In addition, social protection programs, notably including CCTs due to their role in the region, have given rise to significant reductions in poverty, improving income, consumption, and even productive capacity in the poorest households. Lastly, there is a need for tools designed to maintain access to food in adverse weather events. In this regard, weather-indexed insurance, as well as food and cash transfers, are effective instruments that reduce vulnerability and stabilize consumption.

C. Dimension 3: Food utilization

- 2.58 The factors determining food availability and access described above demonstrate that supply and the ability to purchase food are crucial aspects of food security. However, food availability and access alone are not enough to ensure a supply and utilization of nutritional food of sufficient quality to lead a healthy life. A study of the relationship between economic growth and nutrition, using information from 154 developing countries (34 in LAC), showed that economic growth is a necessary but insufficient condition for improving the nutritional status of the population, particularly the nutritional status of children and undernourishment caused by insufficient consumption of micronutrients (Heady, 2011). In addition, a recent study of data from developing countries showed that a 10% increase in GDP is associated with a 6% drop in stunting in children (low height for age) and an 11% reduction in poverty (measured as US\$1.25 per day), but it is also associated with a 7% increase in the prevalence of obesity or overweight in women (Ruel et al., 2013). This section presents evidence regarding the effectiveness of various interventions aimed at enhancing food quality and improving food utilization.

1. Agricultural interventions can have positive effects on household nutrition. These effects are strengthened when coupled with specific nutrition-sensitive activities that also promote gender equality.

- 2.59 Despite the scarcity of empirical evidence documenting the relationship between agricultural programs and nutrition (Ruel, Quisumbing, and Balagambwala, 2017), there has been a growing tendency in recent years to measure the effects of these interventions on diet and nutrition in rural households. The evidence suggests that agricultural programs aimed at increasing production can in fact have direct and indirect impacts on diet and nutrition. For example, an effort to document the nutritional impact of agricultural programs in eight African and Asian countries shows that agricultural programs generally improve dietary diversity and child nutrition (Carletto et al., 2015). In Nigeria, for example, Dillon, McGee, and Oseni (2015) found that agricultural income is related to differences in dietary composition and increases food diversity. In Zambia, Kumar, Harris, and Rawat (2015) showed that agricultural production and crop diversity increase food diversity and reduce undernourishment in children ages 2 to 5. In addition, in Nepal, Malapit et al. (2015) showed that diversity of production is strongly associated with maternal and child

- dietary diversity as well as with a reduction in child undernourishment. Lastly, Pandey, Dev, and Jayachandran (2016) reviewed the existing literature in South Asia and concluded that agricultural interventions are in fact associated with nutritional outcomes. More specifically, the production of nutrient-rich crops, home vegetable gardens, and diversification of the agricultural production system to include fruits, vegetables, and aquaculture can improve nutritional indicators. In addition, they concluded that households with vegetable-based production systems are less deficient in vitamin A, iron, and vitamin C. They also provided evidence that an increase in crop diversity leads to greater dietary diversity, especially for mothers, and improves the intake of calories and nutrients.
- 2.60 It has been documented that interventions aimed at increasing livestock production also have significant potential to reduce poverty and contribute to food security, since they bring about a rise in animal protein consumption, reducing hunger and improving nutrition (Zezza et al., 2016). In Nicaragua, an impact evaluation of a cattle transfer and technical assistance project focusing mainly on women in rural areas found positive effects on income from livestock sales as well as increases in own consumption of food and a decrease in food shortages. In addition, this study found evidence of positive effects on animal protein consumption (Salazar, Fahsbender, and Kim, 2017). Similarly, an impact assessment of an integrated program in Ethiopia, Ghana, Honduras, India, Pakistan, and Peru that combines livestock transfers, consumption support, production training, and savings promotion confirmed that this type of intervention increases monthly per capita consumption and food security in the beneficiary households (Banerjee et al., 2015). In Rwanda, an impact study of a livestock asset transfer and training program for low-income farmers also confirmed that beneficiary households raised their milk production and consumption levels (Argent, Augsburg, and Rasul, 2014).
- 2.61 Positive effects resembling those of other livestock transfer programs with nutritional training were found in Nepal (Miller et al., 2014; Darrouzet-Nardi et al., 2016). With respect to livestock ownership, Slavchevska (2015) showed that, in Tanzania, access to livestock in rural areas reduces the likelihood of child undernourishment. Similar effects were found in Uganda, where Azzarri et al. (2015) showed that livestock ownership increases consumption of animal source foods and the presence of small livestock reduces child undernourishment. Hoddinott, Headey, and Dereje (2015) found that, in Ethiopia, cattle ownership increases milk consumption, increases height for age, and reduces impaired growth in children. Lastly, an analysis conducted in several rural villages in Sub-Saharan Africa found a clear relationship between livestock ownership and dairy consumption (Hetherington et al., 2017). However, the relationship with child nutrition is not so clear since patterns vary among types of food and communities. Despite the existing evidence on the effect of these interventions on nutrition, few studies have evaluated the long-term sustainability of these interventions or carried out cost-effectiveness analyses in comparison with other types of intervention (e.g., money transfers, food vouchers).
- 2.62 Nutrition-sensitive agriculture (NSA) refers to agricultural sector interventions designed with a nutritional approach to address the underlying factors determining household diets (Ruel and Alderman, 2013). This new emphasis reflects the need to transform the food systems and make them more nutrition-sensitive, considering that interventions in the agricultural sector have focused on boosting productivity,

which, while necessary for reducing undernutrition and hunger, is not sufficient for improving the nutritional status of the population (Ruel and Alderman, 2013). An analysis of rigorous impact evaluations of recent (i.e., since 2014) NSA interventions found that such interventions are effective in improving dietary diversity, access to nutritional foods, and nutritional outcomes for children and women, particularly when designed to empower women (Ruel, Quisumbing, and Balagamwala, 2017). The benefits are greater when the interventions include actions to improve health and access to water as well as small livestock transfers (Meinzen-Dick et al., 2011). However, knowledge gaps remain with regard to the cost-effectiveness, monitoring, and sustainability of these interventions.

- 2.63 Creating family vegetable gardens is another type of NSA intervention that has had a significant impact on nutrition. It has recently been argued that interventions that improve the nutritional content of food and the planting of family vegetable gardens can have a positive effect on the quality of the diet consumed in a household. In general, the literature shows that interventions of this type have positive effects on dietary diversity in the nutritional status of children, primarily when they include women's empowerment activities (Ruel, Quisumbing, and Balagamwala, 2017; Ruel and Alderman, 2013).¹³ An impact evaluation of a family vegetable garden program in South Africa shows that participation reduced food insecurity in households by 41.5% (Tesfamariam et al., 2017). In addition, studies conducted in Nepal, Zambia, Burkina Faso, Bangladesh, and other countries have documented positive effects in terms of nutritional food consumption and nutrition outcomes for children and women (Osei et al., 2017; Kumar et al., 2017; Olney et al., 2016; Schreinemachers et al., 2016). In a review of the evidence, Ruel (2001) finds that these gardens are more successful when combined with education and social communication strategies that promote changes in behavior.
- 2.64 The promotion of biofortified crops¹⁴ is another example of NSA. Interventions of this type focus on the reproduction and adoption of plants high in essential micronutrients by the rural population (Ruel and Alderman, 2013). FAO et al. (2015) estimate that 2 billion people (i.e., 1 out of every 4) have micronutrient deficiencies. Biofortified crops are a viable and cost-effective solution for expanding access to micronutrients on the part of the population and reducing nutritional deficiencies, such as vitamin A, iron, and zinc deficiencies (Bouis and Saltzman, 2017). In Zambia, the adoption of vitamin-A biofortified maize increased the concentration of beta-carotene in children (Palmer et al., 2016). De Brauw et al. (2013) found that the introduction in Mozambique and Uganda of sweet potato biofortified with vitamin A resulted in an assimilation level of around 60% in targeted households, as well as in improved knowledge regarding the benefits of vitamin A, almost doubling the average dietary intake of this micronutrient. In addition, Jones and De Brauw (2015) showed that the use of this variety of sweet potato in Mozambique reduced the prevalence and duration of diarrhea in children.

¹³ One example is the projects financed by Helen Keller International, which target women and include family vegetable gardens, gender equality awareness, and women's empowerment. Depending on the context, these interventions are combined with transfers of small livestock and water and sanitation activities (Meinzen-Dick et al., 2011).

¹⁴ The biofortification of foods refers to the introduction of micronutrients into plant genetic material.

2.65 In LAC, biofortified bean, maize, yucca, and yam crops have started to gain popularity. In addition, countries such as Colombia and Panama have included the development and adoption of biofortified crops in their agriculture and nutrition sector development plans (Bouis and Saltzman, 2017). It is estimated that at least 10 LAC countries are beginning to develop and disseminate these crops (HarvestPlus, 2016). However, ensuring the mass adoption and sustainability of these technologies requires educating and informing consumers in rural and urban areas on the nutritional potential of these crops and thus creating changes in the food system through greater demand for foods with high nutritional content (Bouis and Saltzman, 2017). Moreover, for interventions of this type to be effective in reducing undernourishment, several conditions must be met: (i) crops must have high micronutrient concentrations to satisfy the daily requirements of the population; (ii) the environmental and biological conditions must be suitable for people to retain the micronutrients; and (iii) producers must adopt the biofortified varieties and use them for consumption in sufficient quantity (Ruel and Alderman, 2013).

2. Empowering women and improving their status is a necessary condition for agricultural interventions to be effective in improving the nutritional status of the population.

2.66 The fact that higher income levels do not necessarily translate into greater food security suggests that other factors influence household decision-making regarding the consumption of nutrients. It is therefore important to study the internal household dynamics that determine the use of resources (Van den Bold, Quisumbing, and Gillespie, 2013). The literature forcefully asserts that, to increase their nutritional effectiveness, agricultural interventions should include measures that strengthen women's empowerment and improve their status (nutritional, economic, and social) (Ruel, Quisumbing, and Balagamwala, 2017; Ruel and Alderman, 2013; Van den Bold, Quisumbing, Gillespie, 2013). Pandey, Dev, and Jayachandran (2016) also recognize that women's empowerment and nutritional knowledge are important elements of the nexus between agriculture and nutrition. In fact, it has been shown that comprehensive interventions that include agricultural activities with nutritional goals and a gender approach have significant positive effects on the nutritional status and health of children and women (Ruel, Quisumbing, and Balagamwala, 2017). For example, an impact evaluation of a program that offered inputs and training to create family vegetable gardens targeting women and children in Burkina Faso found a reduction in anemia, diarrhea, and undernourishment among children in beneficiary households (Olney et al., 2015). In addition, positive effects were found in terms of women's dietary diversity and quality as well as women's empowerment (Olney et al., 2016). A similar project in Nepal, which also included agricultural activities with gender sensitization and targeting women, reduced child anemia and underweight in women (Osei et al., 2017). In general, the empirical evidence shows that there is a positive association between women's empowerment and nutrition (Quisumbing, 2003; Salazar and Quisumbing, 2009; Yoong, Rabinovish, and Diepeveen, 2012).

2.67 Although most studies have shown that increasing the participation of women in agriculture and expanding their access to productive resources has positive effects on food security, it is important to assess the impact on women's workload since this can have consequences on the nutritional status of women and/or children (Komatsu, Malapit, and Theis, 2015; Van den Bold, Quisumbing, and Gillespie,

2013). In particular, agricultural interventions should analyze the effect on women's use of time since changes in workload may have positive or negative consequences on the nutritional status of children. For example, a study conducted in Bangladesh, Cambodia, Ghana, and Nepal shows that, in Ghana, additional workload in women's agricultural activities has a negative impact on the quality of women's diets. However, women who worked in agriculture in Mozambique improved their own diets and, in Nepal, the diet of children. This confirms that the impact of agricultural interventions on women's workload is specific to each context (Komatsu, Malapit, and Theis, 2015).

- 2.68 In general, the evidence shows that the way in which agricultural interventions include/exclude women can have a positive or negative effect on nutrition through: (i) impacts on women's status (social and economic) and empowerment (positive or negative effects, depending on how the intervention affects women's access to and control over productive resources); (ii) changes in how women use their time through participation in agricultural activities (positive or negative effects, depending on the context); and (iii) changes in women's nutritional and health status (positive or negative effects depending on whether the activities increase/reduce exposure to toxic substances or reduce/increase agricultural diversification) (Ruel and Alderman, 2013). In general, the evidence consistently shows that targeting women and integrating activities to narrow the gender gap are success criteria for agricultural interventions to have a positive impact on nutrition. However, there are few studies that measure the impact of agricultural programs on the empowerment of women (Quisumbing, 2013). One tool to solve this problem is the Women's Empowerment in Agriculture Index, which measures the level of inclusion and empowerment of women in agriculture through five dimensions: (i) decisions about agricultural production; (ii) access to and decision-making power over productive resources; (iii) control over the use of income; (iv) leadership in the community; and (v) time use (IFPRI, 2012).

3. Conditional transfer programs can have impacts on nutrition. However, the evidence shows mixed results.¹⁵

- 2.69 Conditional cash transfer programs (CCTs) are an alternative strategy that has been used extensively in LAC to influence household consumption decisions (for greater detail, see the Health and Nutrition SFD and the Social Protection SFD). However, the evidence regarding the impact of CCTs on nutritional status is mixed (Ibarrarán et al., 2017; Fiszbein and Schady, 2009). Some assessments find improvements in the anthropometric indicators for children or in the morbidity of certain groups (Barber and Gertler, 2008; Gaarder, Glassman, and Todd, 2010). For example, Rasella et al. (2013) find that the Bolsa Familia program in Brazil lowered infant mortality due to diarrhea or undernourishment. In addition, a systematic review by Manley, Gitter, and Slavchevska (2012) of the effects on child nutrition of cash transfer programs with a nutrition component shows that although outcomes are generally positive, they are greater in more disadvantaged areas, in the case of girls, and in countries with weaker health systems. However, other studies find minor or negligible impacts on nutritional status-related variables (Gaarder, Glassman, and Todd, 2010).

¹⁵ See the Social Protection and Poverty SFD for more information on the literature.

2.70 In general, these conditional transfer programs are targeted at women with the additional goal of increasing women's empowerment and their control over resources, thereby improving the nutritional status of children. However, few studies measure the impact of CCTs on empowerment, with the exception of some studies in Mexico, Brazil, and Nicaragua that find positive changes in decision-making and balance of power in the household (Handa et al., 2009; Rubalcava, Teruel, and Thomas, 2009; De Brauw, et al., 2013; Gitter and Barham, 2008). Thus, there is a need for more CCT evaluations that can document the relationship between women's empowerment and nutritional status.

4. Obesity is a growing problem not only in the higher-income population but also in middle- and low-income countries. The evidence shows that mixed interventions combining physical activity with nutrition education and targeting children and adolescents are the most effective.¹⁶

2.71 Food insecurity is often seen as a problem of hunger and undernourishment stemming from a lack of food. However, malnutrition, which includes lack of micronutrients and obesity, is also a limiting factor for food security. Obesity is primarily caused by the consumption of foods high in caloric density but low in nutrients. It is estimated that, worldwide, obesity is the sixth-highest risk factor for death, with a mortality rate of approximately 3.4 million people per year (WHO, 2013b). According to the WHO, in 2016, 39% of adults were overweight and 13% were obese. In addition, that year there were more than 340 million overweight or obese children and adolescents (ages 5 to 19) (WHO, 2016). A study examining 42 countries in Asia, the Middle East, Africa, and Latin America shows that the problem of obesity is not associated with higher-income households. On the contrary, it is also shifting toward lower-income households (Popkin et al., 2012).

2.72 In general, the empirical evidence shows that mixed interventions that combine several strategies for the prevention of childhood overweight and obesity are effective. Specifically, a systematic review of 21 studies in LAC to determine the effectiveness of educational interventions that seek to reduce overweight in school-age children shows that, in general, there is sufficient evidence to back up the effectiveness of these policies (Navarrete et al., 2015). The authors find that mixed interventions that combine different strategies (i.e., nutrition education, policy changes, increased physical activity) are generally the most effective in reducing obesity and overweight in children and adolescents aged 5 to 16. Similarly, a meta-analysis of 55 studies confirms that programs for the prevention of overweight and obesity in children have positive effects in reducing adiposity and body mass index (Waters et al., 2011). However, the authors underscore that there is little evidence to identify which specific interventions are more effective or sustainable in the long term.

2.73 Behavior change strategies play an important role in individual choices in favor of more nutritious diets and healthier lifestyles (FAO, 2013a). A nutrition education experiment involving U.S. adults with at least one child in the household showed that the frequency of meal planning increased by 29%, the ability to identify nutrient-rich foods by 35%, and the use of shopping lists by 11%. As a result, this improved the overall quality of participants' diets in terms of the consumption of fruits, whole

¹⁶ See the Health and Nutrition SFD for more information on the literature.

grains, saturated fats, and calories (Glanz et al., 2012). Barreiro-Hurlé et al. (2010) also found that the use of nutrition labels improves consumption of healthier food in Spain. In addition, an evaluation of an educational intervention that offered nutrition information to children ages 9 to 15 reported positive outcomes in terms of knowledge of healthy eating habits (Rodríguez et al., 2013). Recent data relating to a behavior change intervention in Bangladesh also reported a 30% increase in the proportion of children consuming a diverse diet (Sanghvi et al., 2016). In LAC, some countries have implemented regulations that restrict access to sugary drinks and control food advertising and labeling. However, a study published by the FAO and PAHO emphasizes that these measures should be complemented with interventions in the food systems to boost the supply of and access to fresh foods and safe water, strengthen family farming, deploy short food production and marketing chains, and implement food and nutrition education programs (FAO and PAHO, 2017).

- 2.74 School feeding programs that provide healthy food, information about healthy eating habits, and/or physical activity are another mechanism widely used in LAC with the goal of improving child nutrition. The evidence shows that these programs are generally effective in achieving this goal. In Chile, a study that examines the effects of school feeding programs shows that children have lower body mass index and weight for height, which indicates a healthier diet (Villena, 2013). Again in Chile, an evaluation of a program that combines the provision of healthy foods (by installing kiosks), physical activity, and nutrition information found a reduction in the prevalence of obesity, an increase in the consumption of fruits, fish, and legumes, and a drop in the consumption of soft drinks among beneficiary children (Ratner et al., 2013). Lastly, in Peru, an evaluation of a program that provides school breakfasts in rural schools in the high Andean region shows that this intervention increases iron levels in children, reducing the probability of anemia as measured by hemoglobin levels. However, given that the intervention was performed late in the lives of children (over 6 years of age), no effects were found in other indicators such as height for weight, weight for age, or body mass index (Cueto et al., 2000).

5. Interventions that promote food safety as well as water and sanitation services improve food security.¹⁷

- 2.75 The evidence suggests that a lack of water services and food safety gives rise to diseases (foodborne diseases (FBD) and acute diarrheal disease (ADD)) that can drastically affect people's health and reduce the absorption of nutrients and micronutrients. Therefore, interventions that help to provide safe foods, drinking water, and sanitation also improve food security.
- 2.76 Food safety concerns all actors in the food handling chain, including producers, packers, transporters, and consumers. Lack of food safety leads to the presence of chemical and biological agents that can affect the health of consumers through FBDs. The World Health Organization defines FBD as diseases caused by agents that enter the body through the ingestion of foodstuffs. Foodborne diseases are complex, and this poses a challenge in terms of estimating their economic impact. In the United States alone, the Centers for Disease Control and Prevention (CDC) estimate that each year approximately 1 in 6 Americans falls ill (almost 50 million

¹⁷ See the Agriculture and Natural Resources Management SFD and the Water and Sanitation SFD for more information on the literature

- persons), 128,000 are hospitalized, and 3,000 die as a result of foodborne diseases (CDC, 2014). A FAO study in Central America estimates that FBD generate annual costs of approximately US\$11.25 million in Costa Rica and US\$15 million in El Salvador (FAO, 2009).
- 2.77 The implementation of good agricultural practices and good husbandry practices, as well as traceability systems, are interventions aimed at increasing the safety of foods. In general, the evidence shows that good agricultural practices are effective in raising income and reducing the use of pesticides. Specifically, a study that analyzes data from 85 good agricultural practice projects implemented over the last 20 years in Asia and Africa confirms that these interventions lead to a reduction of approximately 30% in the use of pesticides (Pretty and Bharucha, 2015). In LAC, studies conducted in Bolivia, Colombia, and Ecuador confirm the effectiveness of this type of practices in reducing the use of pesticides and improving the quality of production (Jørs et al., 2016; Aristizábal, Lara and Arthurs, 2012). The implementation of good husbandry practices is primarily aimed at maintaining an adequate level of safety in the production and handling of animal source foods. Despite the importance of animal food safety, the empirical evidence on this subject is scarce. An essential element in ensuring food safety is the implementation of food traceability systems (for both animal and plant foods) that make it possible to monitor and track agricultural products all along the supply chain, from the farm to the end consumer. These traceability systems have become an essential factor in the agrifood sector, as several studies show that millions of people are affected by foodborne diseases (Sarig, 2003, Rocourt, 2003). In addition, although traceability systems are developed mainly to avoid health problems, they are also an opportunity to boost productivity and create spaces for differentiating products with greater value added (Regattieri et al., 2007, Golan et al., 2004). Thus, not only do consumers benefit from the delivery of safe foods but producers can also benefit by earning greater profits through certifications, quality seals, and other mechanisms.
- 2.78 As with food safety regulations, water and sanitation are critical for the success of food security in development interventions. The consequences of waterborne diseases or ADD are similar to those of FBD, including income losses from a reduction in the number of days worked and lower nutrient absorption by those who are ill (Gerter, Martinez, and Sturzenegger, 2016). Waterborne diseases are particularly harmful to human capital development in early childhood: diarrheal diseases are the second leading cause of death (approximately 760,000 children per year) and the main cause of malnutrition among children under 5 (WHO, 2013).
- 2.79 Lack of drinking water and sanitation also affects undernourishment, by reducing nutrient absorption (Spears and Haddad, 2015). In 2012, a study for a group of 145 low- and middle-income countries estimated that 502,000 diarrhea deaths were caused by inadequate drinking water, 280,000 deaths due to inadequate sanitation, and approximately 297,000 deaths due to inadequate hand hygiene (Prüss-Ustün et al., 2014). This same study estimated that 842,000 diarrhea deaths are caused by this set of risk factors, which accounts for 1.5% of the total disease burden and 58% of diarrheal diseases. In children under 5, 361,000 deaths could be prevented, which is equivalent to 5.5% of deaths in that age group (Prüss-Ustün et al., 2014). In addition, it is estimated that lack of access to water and sanitation services, as well as inadequate hand washing and personal hygiene practices, are responsible for approximately 90% of cases of diarrhea in children. To avoid these problems, the

implementation of water, sanitation, and hygiene (WASH) interventions that have proven effective in reducing waterborne diseases is crucial. In Kenya, for example, the implementation of water, sanitation, and hygiene in schools is associated with a 56% lower likelihood of diarrhea (Freeman et al., 2012). Positive effects of interventions implemented to improve hygiene and access to quality water have also been found in Peru and Argentina (Galiani et al., 2012; Galiani et al., 2005).

- 2.80 In short, the use of food is related to the quality and nutritional content of household food consumption. The evidence shows that agriculture plays a key role in improving the nutritional status of the population through interventions with specific nutrition-sensitive activities that can narrow the gender gap and empower women. However, there is a need to solve the methodological problems that stand in the way of being able to demonstrate impacts on nutritional indicators, such as anthropometric measures (Ruel, Quisumbing, Balagamwala, 2017). In addition, interventions that improve food safety and/or increase water quality and sanitation reduce the prevalence of FBD and ADD, lower the mortality rate of children under 5, and contribute to better absorption of nutrients. Lastly, obesity has become a growing problem in recent years. Therefore, the design and implementation of interventions that promote changes in behavior, increase physical activity, and provide nutrition education are strategies for the prevention of overweight, especially in children and adolescents. However, it is crucial to raise the number of rigorous impact evaluations making it possible to identify the most cost-effective activities that generate long-term improvements.

D. Dimension 4: Food stability

- 2.81 Food stability implies that the supply of food to the population is not threatened by unexpected variations in external factors such as prices or climate change. Measures to ensure a stable flow of food are particularly important with a view to ensuring the wellbeing of the most vulnerable population groups, which are generally the most heavily affected by such unexpected changes since they lack effective protection mechanisms to soften food consumption.

1. Price fluctuations affect food security in various ways, depending on the characteristics of the food systems.

- 2.82 Price increases can affect food access in the poorest households, particularly in urban areas in which such households are net food buyers. For these households, a rise in food prices is equivalent to a reduction in real household income, limiting food access and potentially leading to lower food consumption. At the same time, an increase in food prices can enhance the wellbeing of food producing households by increasing household income. On the other hand, a fall in food prices could discourage production in rural areas, while boosting food demand in urban areas as a result of the rise in real income. The poor, who spend a larger share of their income on food, are particularly vulnerable to these fluctuations. In developing countries, the share of household expenditure allocated to food purchases is estimated to be high: 50% to 60% on average (OECD, 2013).
- 2.83 The evidence also shows that the uncertainty created by food price fluctuations affects the poorest population groups more heavily (Dukpa and Minten, 2010, Meng et al., 2013, Ivanic and Martin, 2008; Ivanic et al., 2011). Along the same lines, a study on the impact of an increase in food prices in Ethiopia and Bangladesh shows

that female-headed households are more heavily affected by such changes (Kumar and Quisumbing, 2013). Specifically, female heads of household are more likely to suffer negative changes in wellbeing and a decline in asset ownership. In addition, the evidence shows that women are generally more susceptible to changes in food prices since they tend to reduce food consumption to a greater extent to soften the consumption of other members of the household (Kumar and Quisumbing, 2013). This suggests the need to design and implement policy instruments that specifically target the most vulnerable population groups (e.g., women, low-income population, indigenous communities, Afro-descendants) and are designed to mitigate the short-term consequences of food price fluctuations.

- 2.84 Increases in food prices affect both rural and urban populations, the latter of which are almost exclusively net purchasers of food. In LAC, Robles and Torero (2010) estimate that the food price crisis in the 2006-2008 period contributed to an increase of one percentage point in poverty rates in Guatemala, Honduras, and Peru, while in Nicaragua the effect was four percentage points. In LAC, a large share of the population is concentrated in urban areas, which is where most of the negative impact of increases in food prices are felt. These mainly affect the urban poor (World Bank, 2011a). In a simulation based on urban household survey data from Colombia, Rodríguez-Takeuchi and Imai (2013) showed that following the price shocks of 2006-2008 the highest quintile suffered welfare losses of 1.68%, while the number was higher for the lowest quintile (7.9%), which spent 36% of its budget on food.

2. Climate change and natural disasters are significant causes of food instability since they create uncertainty in food production, access, and utilization.¹⁸

- 2.85 Natural disasters and climate change degrade the stability of food and nutritional security by creating changes in productivity and seasonality of production, an increase in food production and supply risks, and greater uncertainty about food supply (FAO, 2016a). Specifically, declines in agricultural yields, increases in food prices, decreases in water availability, disruptions in the supply chains, alterations in storage conditions, damage to infrastructure, and inaccessibility of public services are some of the climate change effects that impact the stability of food and nutritional security (FAO and PAHO, 2017). Consumption stability is also affected by changes in income arising from weather-sensitive activities, including agriculture (WFP, 2014). Similarly, food trade volumes and patterns can be altered by the impact of this phenomenon on production, prices, transportation, logistics, and the supply chain (Ahammad et al., 2015). Climate change impacts are also expected to lead to greater conflict over the use of natural resources and migrations, in turn resulting in a rise in undernourishment (Myers et al., 2017).
- 2.86 In fact, the agricultural sector accounted on average for 22% of the total losses from natural disasters in the world, 25% if only weather events for the 2003-2013 period are included. Estimated losses in the sector amount to US\$80 billion (including impacts on productivity, trade flows, and value added), equivalent to 333 million tons of grains, legumes, meat, milk, and other products (FAO, 2015). In the case of LAC, this study estimates that losses from natural disasters totaled US\$11 billion, which is equivalent to approximately 3% of production. Likewise, it is estimated that, on

¹⁸ See the Climate Change SFD for more information on the literature.

- average, each disaster affected the growth of the sector by 2.7% (i.e., value added of agriculture) (FAO, 2015). Despite this, very few countries have a financial strategy for disaster risk management in the agricultural sector. Specifically, the Index of Governance and Public Policy in Disaster Risk Management (iGOPP), calculated by the IDB for 22 LAC countries, shows that only 10 countries have some type of financial protection mechanism against disaster risk specifically for the agricultural sector (IDB, 2017). This highlights the need to strengthen climate resilience at the national and local levels taking disaster reduction and management considerations into account, as well as to improve capacities and information and data available for the planning, design, and implementation of measures.
- 2.87 There is empirical evidence that analyzes the effect of climate change on caloric and nutritional consumption. In particular, the evidence shows that there is a tendency to reduce the nutritional quality of children's diets in response to climate shocks (Hallegate et al., 2017 in Sub-Saharan Africa). In addition, there is a decline in nutritional status after extreme weather events (Baez et al., 2010 in Central America, Africa, and Asia). Damage to transportation, water, and sanitation infrastructure caused by climate change has an impact on nutrition, diets, and food systems (Fanzo et al., 2017). In fact, effective assimilation of food is harmed by this phenomenon through its impact on food safety, as well as on the incidence of diseases, particularly vector-, water-, or food-borne diseases. (Fanzo et al., 2017; Schmidhuber and Tubiello, 2007). In the case of food safety, aflatoxin contamination of maize and wheat increases with temperature, posing a challenge in terms of food storage (Fanzo et al., 2017).
- 2.88 To reduce the food system's vulnerability to natural disasters and climate change, the following actions should be considered, among others: climate-smart agriculture, development of and access to inputs that favor climate resilience (e.g., resilient varieties and breeds), availability of and access to agricultural services (e.g., irrigation, risk management and transfer, credit, technical assistance, water, and health), postharvest and processing activities (electricity, water, and storage infrastructure and access), market access (resilient transportation infrastructure, among others), and early warning systems (Fanzo et al., 2017). Other key actions include observation and monitoring of weather phenomena, climate risk analysis, risk reduction actions, including coordination of disaster risk management with climate change adaptation, and disaster preparedness, assistance, and response mechanisms (Andean Community, 2009).
- 2.89 The importance of implementing adaptation and mitigation measures aimed at food security has been recognized by many countries in the region, which list such measures in their Nationally Determined Contribution submitted to the United Nations Framework Convention on Climate Change. Also, the literature has variously documented the effectiveness of these measures. For example, the implementation of climate-smart agriculture, market access and properly operating markets, and an efficient transportation system contribute to the resilience of food and nutrition security in the face of natural disasters (Hallegate et al., 2017). Evidence from producers in Pakistan indicates that the use of adaptation measures is associated with an 8%-13% increase in food security and a 3%-6% reduction in poverty (Ali and Erenstein, 2017). In Uganda, households that introduced improved breeds of dairy cows showed a 16% rise in food expenditure as well as a reduction in impaired growth (Kabunga et al., 2017).

- 2.90 An area identified as in need of strengthening is the compilation of empirical evidence at the household level quantifying the causal relationship between natural disasters and climate change on one hand, and nutritional conditions on the other. At present, such data are limited (Phalkey et al., 2015).
- 2.91 In short, price variability and climate change can threaten food stability and thus food security. Counteracting these shocks requires policies that boost agricultural productivity, improve climate change adaptation, and facilitate trade flows. This lowers the risk of a reduction in food availability in periods of internal or external crisis. In addition, complementary measures to help increase resilience are needed in order to ensure the wellbeing of the most vulnerable population groups.

III. MAIN ACHIEVEMENTS AND CHALLENGES IN THE REGION IN RELATION TO FOOD SECURITY

- 3.1 Latin America and the Caribbean was the only region in the world to have achieved the Millennium Development Goal of reducing the population suffering from hunger to less than half between 1990 and 2015 (FAO, IFAD, and WFP, 2015). However, this success is mainly due to South America, which is the only subregion that accomplished and then exceeded this goal (FAO, IFAD, and WFP, 2015). Since then, between 2015 and 2016, the number of people contending with hunger has increased by 2.4 million,¹⁹ reaching a total of 42.5 million, nearly 90% of whom experience severe food insecurity as measured by the food insecurity experience scale (FIES) (FAO et al., 2017; FAO and PAHO, 2017). This has raised alarms, since one of the Sustainable Development Goals (SDG) is to eradicate hunger by 2030.²⁰
- 3.2 There are currently many factors transforming food systems in LAC, including urbanization, changes in diet, international trade, and technological intensification (FAO, 2017b). In LAC, caloric intake has increased by 27% since the early 1960s and by 12% since the early 1990s (Anríquez, Foster, and Valdés, 2017; FAO, 2017b). However, this increase has not always been translated into nutritional improvements. Anríquez, Foster, and Valdés (2017) indicate that although the rise in caloric intake was driven in part by an increase in animal protein consumption, the consumption of sugars and other sweeteners is largely responsible for the increase in calorie consumption. Also, although the consumption of nutritious foods such as fruits and vegetables has increased in recent decades, processed food consumption has expanded more rapidly worldwide (FAO, 2017a).

¹⁹ The percentage of people living in hunger refers to people with insufficient caloric intake, malnutrition, or undernourishment.

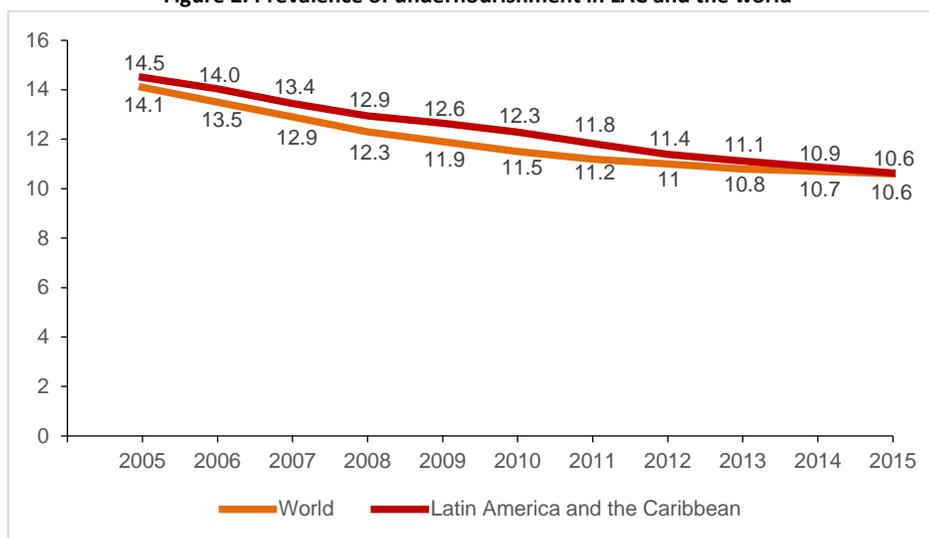
²⁰ Latin America and the Caribbean's strong performance in food security will contribute to Sustainable Development Goal (SDG) 2 on "ending hunger" by 2030. The SDGs were adopted by the United Nations General Assembly in September 2015.

- 3.3 According to the Global Hunger Index (GHI),²¹ the region is in the low food insecurity category compared to other world regions (von Grebmer et al., 2017). The GHI groups countries according to the following five categories of food insecurity: low, moderate, serious, alarming, and extremely alarming. All LAC countries are in the low or moderate categories, with the exception of Guatemala and Haiti, which are in the serious category. In the case of Haiti, the score is very close to falling into the alarming category (IFPRI, 2017). On the other hand, Peru, Brazil, and Panama have made the greatest strides in reducing hunger. In general, all of the countries have improved or maintained their situation, except Venezuela, which is the only country that has seen its situation worsen, having gone from low to moderate food insecurity.
- 3.4 However, certain challenges persist and have intensified over the last decade. In general, the region's main challenges are to: (i) strengthen and maintain an adequate supply of food, reducing the vulnerability of food systems in the face of climate change and natural disasters; (ii) create incentives to increase food diversity in terms of production and consumption; (iii) provide the conditions needed to enable the most vulnerable population groups to have access to sufficient and nutritious food; (iv) implement policies to reduce the triple burden of malnutrition that affects the population in LAC (i.e., undernutrition, overweight and micronutrient deficiencies); and (v) develop and implement institutional mechanisms at all levels of government that guarantee that policies are consistent across the different sectors and that facilitate coordination, by strengthening complementarities and synergies.
- 3.5 In LAC, there was a considerable improvement in the prevalence of undernourishment in the 2000-2010 period, followed by stagnation. In the 2000-2010 period, the region showed a considerable improvement in the prevalence of undernourishment, an indicator that measures the proportion of the population that does not meet the minimum dietary energy requirements for a healthy life (FAO and WHO, 2017). Specifically, the region went from having 16.4% of its population in a state of undernourishment in 2000 to 12.3% in 2010. However, there is evidence that this reduction has stagnated since 2012 (FAO and WHO, 2017). Currently in LAC, 10.6%²² of the population is undernourished. This shows that the region is converging to the world average (see Figure 2).

²¹ The index aggregates data on the percentage of the population that is undernourished (i.e., insufficient calorie intake), the prevalence of stunting in children under 5 (i.e. low height for age), the prevalence of wasting in children under 5 (i.e. low weight for height), and the proportion of children who die before age 5 (i.e. fatal correlation between insufficient food intake and unhealthy environment). Each indicator has the same weight. Scores range from 0 to 100. The higher the index, the higher the level of food insecurity. One weakness in the index is that it does not provide an absolute number of persons suffering from food insecurity. For this reason, data on malnutrition is also provided, both as a number and as a percentage (IFPRI, 2014a and 2015).

²² This percentage includes Haiti, Mesoamerica (El Salvador, Guatemala, Belize, Honduras, Nicaragua, Costa Rica, Panama, and Mexico), the Caribbean (Jamaica, Trinidad and Tobago, Suriname, Guyana, Barbados, Bahamas, and Dominican Republic), Southern Cone (Argentina, Uruguay, Paraguay, Brazil, and Chile), and the Andean countries (Venezuela, Colombia, Peru, Ecuador, and Bolivia).

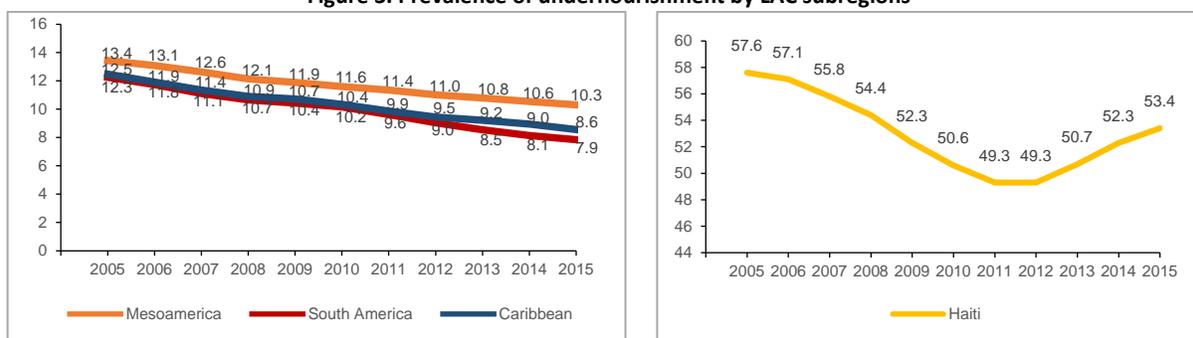
Figure 2. Prevalence of undernourishment in LAC and the world



Source: World Development Indicators (2017) and FAOSTAT (2017).

- 3.6 A comparison among LAC subregions in 2015 shows that the Central America and Mexico subregion has the highest prevalence of undernourishment, with 10.3% of the population lacking the dietary energy requirements. At the other extreme, South America and the Caribbean have lower undernourishment prevalence rates than the world average: 8.6% and 7.9%, respectively. The case of Haiti is the most worrisome, since the prevalence of undernourishment has been rising over the last five years and, as of 2015, 53% of the population is undernourished (see Figure 3).
- 3.7 In terms of the trends in the last three decades, South America is the subregion with the greatest improvements in the prevalence of undernourishment, which went from 12.3% in 2000 to 7.9% in 2015. In the Caribbean subregion, the prevalence of undernourishment has steadily declined, from 12.5% in 2005 to 8.6% in 2016. Lastly, in Central America and Mexico, the prevalence of undernourishment has gradually decreased from 13% in 2005 to 10% in 2016 (FAOSTAT, 2017) (see Figure 3).

Figure 3. Prevalence of undernourishment by LAC subregions

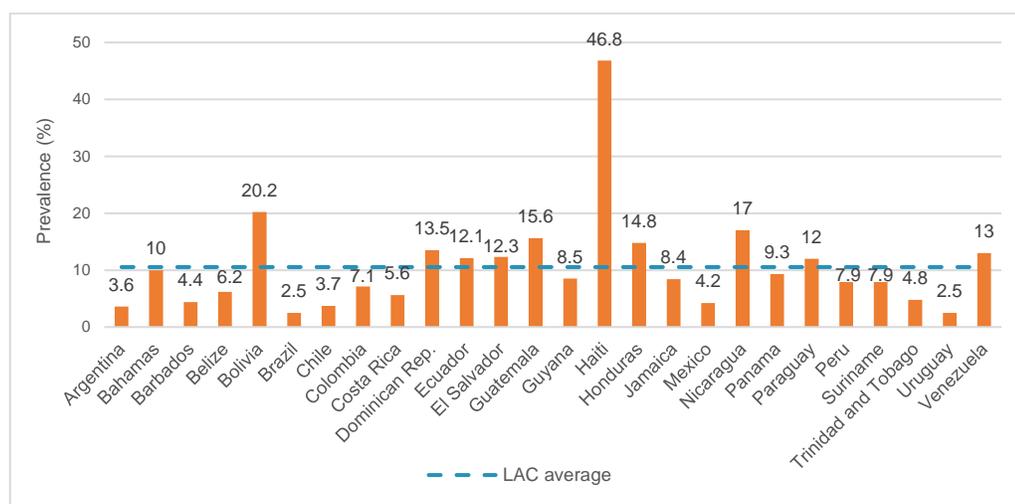


Source: World Development Indicators (2017) and FAOSTAT (2017).

- 3.8 **The prevalence of undernourishment varies extensively across LAC countries.** The differences in undernutrition or undernourishment are even more

pronounced when the analysis is conducted at the country level. Specifically, for the 2014-2016 period, Brazil and Uruguay are the only countries with a prevalence of undernourishment of less than 2.5%. Conversely, according to the FAO, the countries with a prevalence of undernourishment exceeding the regional average are: Haiti (47%), Bolivia (20%), Nicaragua (17%), Guatemala (15.6%), Honduras (15%), Dominican Republic (13.5%), El Salvador (12%), Ecuador (12%), and Paraguay (12%) (see Figure 4).

Figure 4. Prevalence of undernourishment in LAC by country (average 2014-2016)



Fuente: FAOSTAT (2017).

3.9 The food insecurity experience scale (FIES), which measures individual or household access to food and complements the undernourishment prevalence indicator, shows that for the 2014-2016 period, 5.1% of the population in South America (21 million) and 5.7% of the population in Mesoamerica (9.9 million) experienced severe food insecurity.²³ In addition, El Salvador and Guatemala have rates exceeding 10% while Brazil, Chile, Costa Rica, and Mexico have rates of less than 5% (FAO and PAHO, 2017).²⁴

A. Dimension 1: Food availability

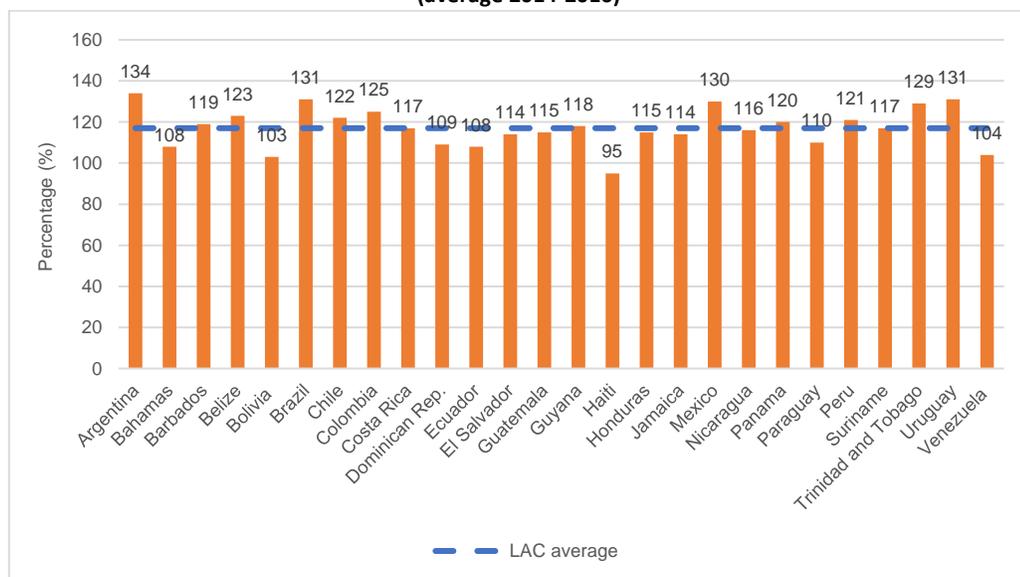
3.10 **Agricultural performance and intraregional trade have allowed the region to maintain adequate levels of food availability.** Food availability plays a central role in food security since maintaining an adequate supply is a necessary condition for ensuring access to food (FAO, 2013a). In fact, it is estimated that the availability of food in the region is more than sufficient to cover the requirements of the population in terms of calories. This food availability is confirmed when analyzing the average

²³ The FIES measures individual or household access to food based on a set of questions that capture the constraints on people's capacity to obtain sufficient food. It provides estimates of the share of the population that has difficulty accessing food with varying degrees of seriousness, based on data compiled through direct interviews (<http://www.fao.org/3/a-bl354s.pdf>).

²⁴ The FIES is a recent indicator, created by the FAO. At present, it has only been calculated for countries in South America and Central America (FAO, 2017).

food energy supply indicator, which measures how adequate the food supply is in terms of calories. We see that LAC has a 117% sufficiency rate, compared to 140% in OECD countries. This means that, on average, the supply of food in LAC is sufficient in calorie terms (>100%). In this case, Haiti is the only country with a food supply of less than 100% (see Figure 5).

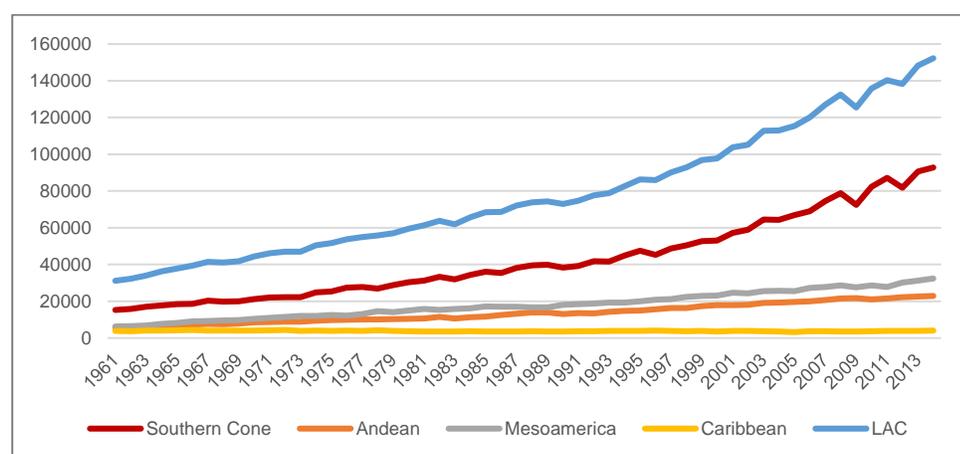
Figure 5. Sufficiency of average food energy supply (%)
(average 2014-2016)



Source: FAOSTAT (2017).

- 3.11 The positive performance in terms of food availability is largely due to the increase in agricultural capacity, particularly in the production of oilseeds, fruits, vegetables, tubers, legumes, cereals, milk, and meat (FAO, 2017b). With regard to food supply, in South America, the national production of oilseeds, fruits, cereals and meats exceeds the level required to cover the national demand for food. This is also the case in Central America and Mexico with regard to vegetable and fruit production, while, in the Caribbean, only fruit production is sufficient to cover the national demand for food (FAO, 2017b). This shows that, although agricultural production plays an essential role, international trade is also a key factor in terms of food availability.
- 3.12 With regard to agricultural production, the region has maintained a growth trend over time (see Figure 6). This scenario is primarily attributable to production increases in the Southern Cone, where 61% of the food in LAC is produced. Central America and Mexico produce 20% of the region's food, the Andean countries produce 16%, and the Caribbean produces 3%.

**Figure 6. Value of agricultural food production (1961-2014)
(2004-2006 constant prices in US\$ millions)**



Source: FAOSTAT (2017).

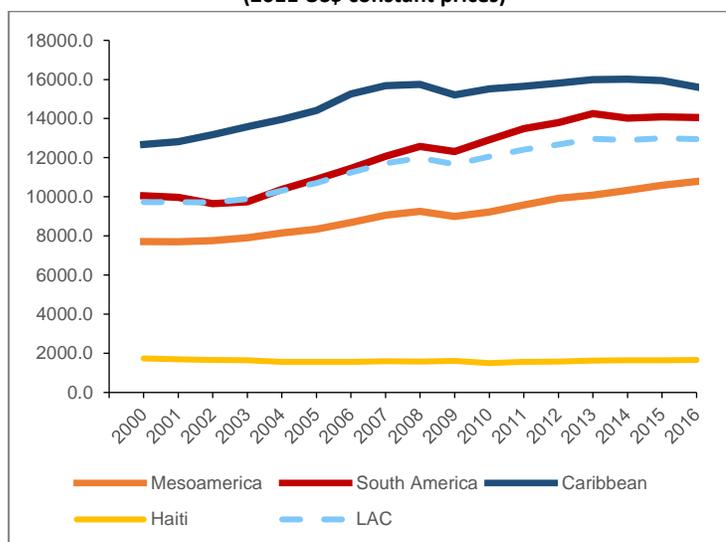
- 3.13 **The region continues to have relatively high levels of protection against imported products, which may impair food availability, particularly for the low-income population.** For example, the nominal protection coefficient for Mexico, Brazil, Colombia, Chile, and Costa Rica (countries with a tradition of economic openness) is greater than 1 in all analyzed periods based on the information available at Agrimonitor. Over the last 30 years, the general trend in these countries has been to reduce protection levels. However, there is still room to expand trade in strategic foods for food security in the region.
- 3.14 **In addition, producer support in the form of market price protection mechanisms is the most commonly used agricultural policy measure in the region. This type of measure raises food prices in relation to international prices through border interventions (such as tariffs, import quotas, specific taxes, and other nontariff measures).** With the exception of Argentina (which shows negative market price supports up to 2014), 42% of the producer support estimate (PSE) for the region consisted of market price supports in the last three years (Agrimonitor, 2017).²⁵ This producer support is not adequately offset through consumer supports, and consumers pay higher prices than they would in the absence of agricultural public policy interventions. For the last three years for which information is available, the consumer support estimate for the region averaged -11.07%. This means that, on average, LAC consumers paid 11% more for agrifood products than they would have paid in the absence of agricultural public policies (Agrimonitor, 2017).
- B. Dimension 2: Food access**
- 3.15 **Food access in LAC has improved considerably in recent decades. However, poverty has increased in recent years, which is expected to have significant**

²⁵ Most recent year with available information: Argentina (2014), Bolivia (2009), Brazil (2016), Belize (2014), Chile (2016), Colombia (2016), Costa Rica (2016), Dominican Republic (2015), Ecuador (2012), Guatemala (2011), Guyana (2014), Honduras (2012), Haiti (2012), Jamaica (2014), Mexico (2016), Nicaragua (2010), El Salvador (2012), Paraguay (2013), Peru (2013), Suriname (2014), Trinidad and Tobago (2015), and Uruguay (2013).

implications for this dimension. The most vulnerable populations are those facing greater constraints on maintaining adequate access to food since they allocate a greater share of income to food consumption, thus increasing their vulnerability to changes in income. To study the capacity of the population to access food, we examine income per capita and depth of the food deficit, two of the indicators used by the FAO to analyze this dimension.²⁶

3.16 The importance of income in ensuring food access in LAC is indisputable. In fact, it is estimated that the LAC population spends more than a quarter of its income on food access, Brazil being the country that allocates the lowest share of income to the purchase of food (20%), followed by Chile (22.5%) and Uruguay (25%) (Winters et al., 2015). At the opposite end, the countries that allocate the highest share of income to food access are Nicaragua (40%), Guatemala (47%), and Haiti (59%) (Winters et al., 2015). These figures contrast with those of countries such as Canada or the United States, where the population spends less than 10% of its income on food (World Economic Forum, 2016). With regard to annual per capita income, LAC has shown a significant improvement in recent decades. However, its 2016 figure (US\$12,950) is equivalent to 30% of the average in Western European countries (US\$42,896) (FAOSTAT, 2017). With regard to income level, LAC has been growing at an average of 1.8% per year since 2000, with most of the growth occurring in the South America (2.15%) and Central America and Mexico (2.13%) subregions (see Figure 7).

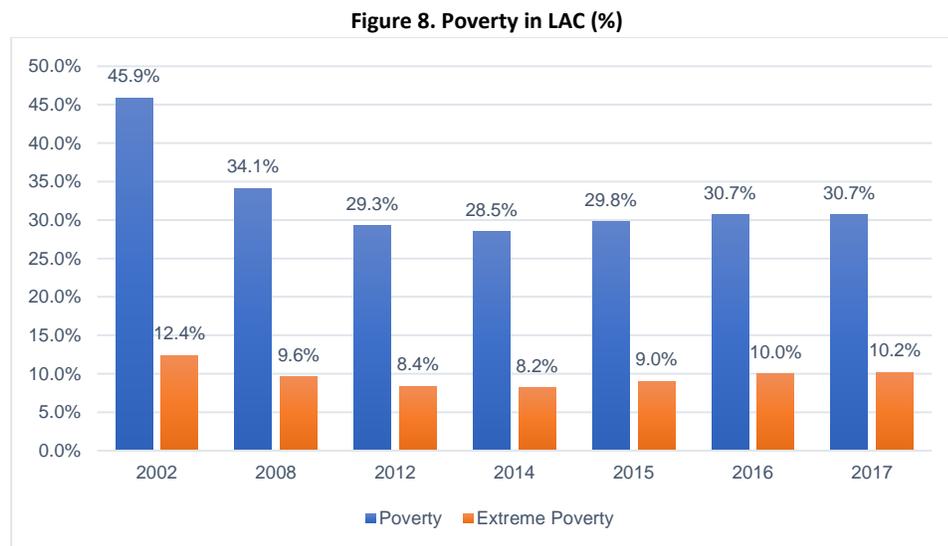
**Figure 7. Income per capita
(2011 US\$ constant prices)**



Source: FAOSTAT (2017).

²⁶ The countries that have been included in each subregion are: Caribbean: Jamaica, Suriname, Trinidad and Tobago, Bahamas, Barbados, Dominican Republic, and Guyana. South America: Bolivia, Argentina, Chile, Paraguay, Peru, Uruguay, Venezuela, Colombia, and Ecuador. Central America: Costa Rica, Honduras, Mexico, Nicaragua, El Salvador, Panama, Guatemala, and Belize. In view of the high values shown for Haiti, this country has been analyzed separately.

3.17 In 2002, according to the updated version of ECLAC estimators (2018), nearly half (45.9%) of the population of Latin America was living in poverty and more than 12% was living in extreme poverty.²⁷ These rates subsequently declined until 2014, when the poverty rate was 28.5% and the extreme poverty rate was 8.2%. However, the decline in poverty rates and the expansion of the middle class, which had been the prevailing trends for more than a decade, suffered a reversal. This meant that, between 2014 and 2016, nine million people joined the ranks of the poor and four million ceased to be part of the middle class (Duryea and Robles, 2017). This suggests that the rise in income in the region has not benefited the entire population proportionally and that, as a result, a larger share of the population is living in poverty, which could have significant repercussions on food access (see Figure 8).

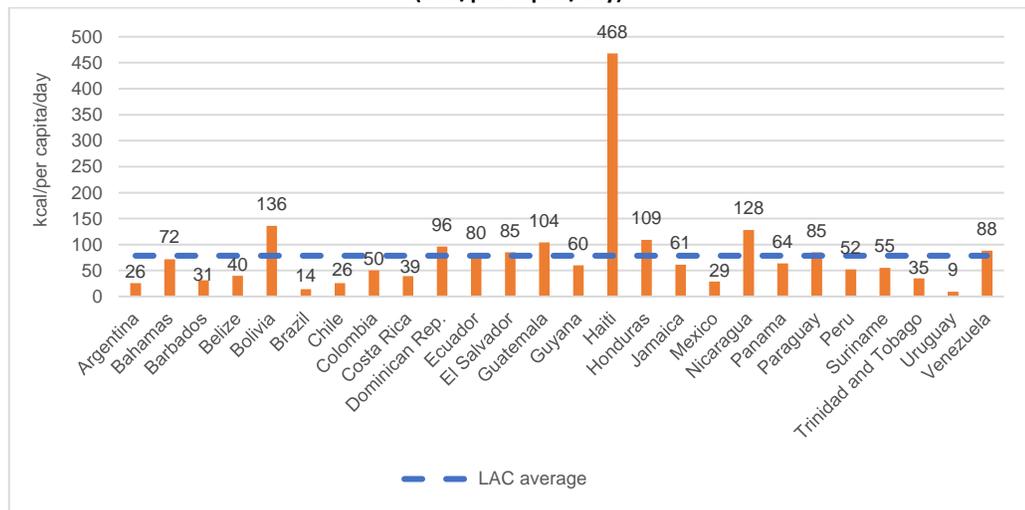


Source: ECLAC (2018).

3.18 Depth of the food deficit refers to the number of calories needed to lift the undernourished population from this status, all other things being constant. With regard to the depth of the food deficit for the 2014-2016 period, it is estimated that the region has an average food deficit of 78 kilocalories (kcal) per capita per day. The subregion with the largest food deficit is Mesoamerica (77 kcal), followed by South America (56 kcal) and the Caribbean (52 kcal). The countries with a food deficit exceeding 100 kcal are Haiti (468 kcal), Bolivia (136 kcal), Nicaragua (128 kcal), and Guatemala (104 kcal) (see Figure 9).

²⁷ Living in poverty refers to people who are below each country's poverty line.

**Figure 9. Food deficit intensity by country
(kcal/per capita/day)**



Source: FAOSTAT (2015).

C. Dimension 3: Food utilization

3.19 **The region is experiencing the “triple burden of malnutrition,” which refers to the three simultaneous dimensions of undernourishment, micronutrient deficiencies, and obesity.²⁸ This problem creates significant economic and social losses, while also imposing a financial burden on healthcare systems due to food-related illnesses.**

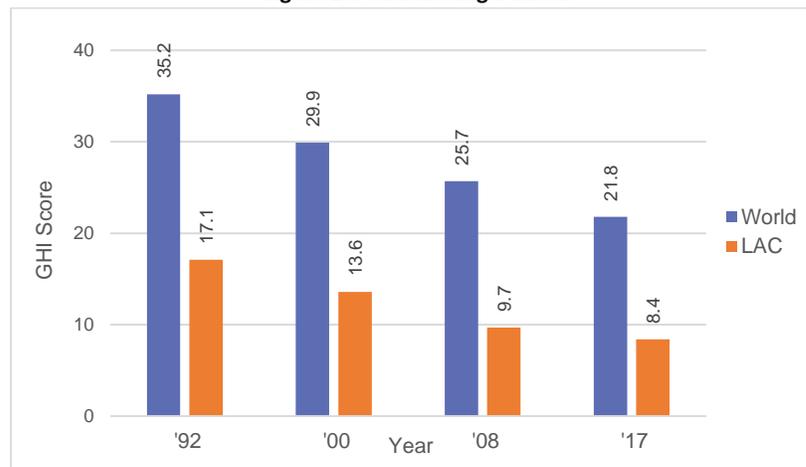
3.20 Undernourishment is highly correlated to mortality, wasting (weight-to-height ratio) and stunting (height-to-age ratio) in children under 5.²⁹ The Global Hunger Index³⁰ – consisting of the prevalence of: undernourishment in the population, mortality in children under 5, wasting in children under 5, and stunting in children under 5– shows that there have been significant improvements at the global level in all four indicators (von Grebmer et al., 2017). The region has also maintained this declining trend in terms of index scores and is characterized by a low hunger level, with a score of 8.4 that is significantly lower than the world average of 21.8 (see Figure 10).

²⁸ Undernourishment refers to a lack of macronutrients or the caloric requirements needed for a healthy life, while micronutrient deficit focuses solely on deficiencies of the vitamins and minerals required for appropriate development.

²⁹ Wasting refers to children who have low weight for their height, while stunting refers to children who have low height for their age.

³⁰ The Global Hunger Index consists of four equally weighted indicators: (i) percentage of the population that is undernourished; (ii) percentage of children who die before age 5; (iii) prevalence of wasting in children under 5; and (iv) prevalence of stunting in children under 5. Scores range from 0 to 100. The higher the index, the higher the level of food insecurity. Based on their score, countries are classified in one of five categories: low, moderate, serious, alarming, and extremely alarming level of hunger. One weakness in the index is that it does not provide an absolute number of persons suffering from food insecurity.

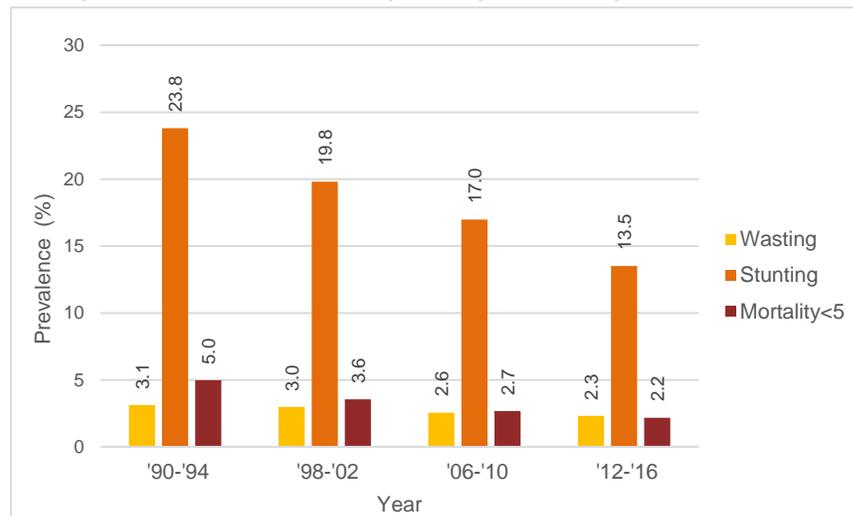
Figure 10. Global Hunger Index



Source: von Grebmer et al. (2017).

3.21 Figure 11 illustrates the prevalence of stunting, wasting, and mortality in children under 5 in LAC from 1990-1994 to 2012-2016. This diagram shows that these prevalence rates have generally decreased over time. With respect to wasting, prevalence in the region has been reduced from 3.1% in 1990-1994 to 2.3% in 2012-2016. The Caribbean subregion has the highest prevalence of wasting, with an average of 4.7%. Haiti and Guyana are the countries with the highest prevalence of wasting, 5.2% and 6.4%, respectively. With regard to stunting, which is the most common problem in children under 5 in the region, LAC has made significant improvements, from 24% in 1990-1994 to 13.5% in 2012-2016. The Mesoamerican subregion and the Andean countries have the highest stunting rate (17%), followed by the Caribbean (10%) and the Southern Cone (7.5%). In particular, Guatemala has the highest prevalence of stunting (46.5%), followed by Ecuador (25%), Honduras (22.7%), and Haiti (22%). Lastly, the region has managed to reduce the mortality rate from 5% in 1990-1994 to 2.2% in 2012-2016. Currently, the Caribbean subregion has the highest mortality rate, with an average of 3.3%. For countries, Haiti has the highest infant mortality rate, with an average of 6.9%, followed by Bolivia (3.8%).

Figure 11. Prevalence of mortality, wasting, and stunting in children under 5



Source: von Grebmer et al. (2017).

- 3.22 Food diversity is another important component of food utilization, since it is associated with healthier diets that result in nutritional improvements (FAO, 2013). However, maintaining a healthy food diversity requires that food systems supply a varied range of foods of different categories (FAO and PAHO, 2017). In LAC, the domestic supply of food does not provide the necessary diversity and quality (Arias Carballo and Coello, 2013). Consequently, it is important to create incentives to make food consumption more diverse and identify flaws in the food systems that hinder food diversity. In the region, children ages 6 to 24 months have low intake levels of animal source foods, which are a source of essential nutrients (IDB, 2014). The situation is worse for children in the lowest quintile. In Central American countries, 25% to 70% of 6-to-23-month-old children living in poverty consume diets of limited diversity (IHME, 2014). This situation is more pronounced in indigenous areas (Martorell, 2012).
- 3.23 Micronutrient deficiencies are another problem affecting the people of LAC. Micronutrient deficiencies (e.g. iron, zinc, vitamin A, vitamin D, vitamin B12, iodine, folic acid) can have an adverse impact on growth and development, particularly for children. In LAC, there are 13 countries that regard micronutrient deficiencies as a public health problem and 18 countries that have specific programs in place to provide micronutrients. However, even though the evidence shows that the prevalence of micronutrient deficiencies in the region has declined, the lack of representative data at local and national levels is a significant limiting factor that should be resolved so that programs can be deployed with greater effectiveness (de Romaña and Cediell, 2015). At the same time, a growing problem is the prevalence of overweight and obesity, which is rapidly increasing in the countries of the region. These problems arise as a consequence of the high consumption of foods high in caloric density but low in nutrients, as well as the high levels of sedentarism in the region. It is estimated that in LAC, close to 58% of the population is overweight (360 million people), and only in Haiti (38.5%), Paraguay (48.5%), and Nicaragua (49.4%) does overweight affect less than half of the population (FAO and PAHO,

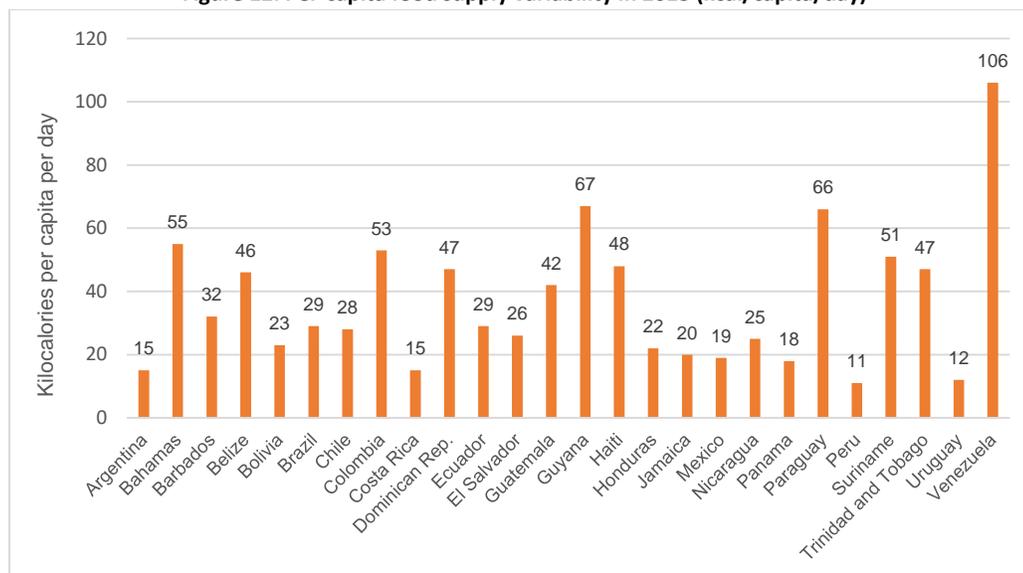
2017). The most heavily affected countries are Chile (63%), Mexico (64%), and Bahamas (69%). In addition, the prevalence of overweight in children under 5 is estimated at 7% in LAC (compared to 6% worldwide), while in adolescents (ages 12 to 19) the figure is 17% to 39% (WHO 2016b, Global Nutrition Report, 2017). Chile has the highest rate of childhood obesity in the region, which affects an estimated 23% of children (WHO, 2016b). Obesity affects 23% of the LAC population, and the highest percentages are in the Caribbean (FAO and PAHO, 2017). Lastly, it is estimated that the proportion of women with obesity exceeds that of men in all LAC subregions, the difference being 10 percentage points (FAO and PAHO, 2017). In the Caribbean, the rate of female obesity in most countries is approximately four times higher than that of men. For example, in Haiti, there are 16 obese women for every obese man and, in Jamaica, the ratio is 6 obese women for every obese man, while Barbados has the highest rate of female obesity (67.7%) (FAO, 2016c). In LAC, several countries have taken steps to reduce overweight and obesity. For example, Barbados and Mexico have approved specific taxes on sugary drinks, while Bolivia, Chile, Peru, and Ecuador have laws regulating food advertising and/or labeling (FAO and PAHO, 2017).

D. Dimension 4: Food stability

- 3.24 **Food stability in the region is threatened mainly by natural disasters and climate change, which have significant impacts on food availability, access, and utilization.** The stability of food security is quantified by means of indicators that measure the magnitude of various risks and the degree of exposure to them (FAO et al., 2013). This analysis focuses on two of these indicators: (i) dependence on grain imports; and (ii) per-capita food supply variability.
- 3.25 Over time, there is a reduction in the dependence on grain imports in the region as a whole. Subregionally, this indicator shows that South America is a net grain exporter, while the other subregions tend to be grain importers. However, this dependence has diminished in Central America in recent years, unlike in the Caribbean and Haiti. Furthermore, the highest dependence on grain imports is in Caribbean countries, where it reaches levels exceeding 97%.
- 3.26 Per-capita food supply variability measures the stability of the national food supply in terms of calories per person per day. When this indicator yields a low value, it means that the population faces less caloric variability per day and, therefore, the food supply is more stable. This indicator shows that in all LAC countries, food supply variability is higher than the world average, which is 7 kcal/capita/day (see Figure 12).³¹ However, the variability levels fluctuate across a broad range, from 11 kcal/capita/day (in Peru) to 106 kcal/capita/day (in Venezuela). In the region as a whole, variability declined in 2013 in comparison to 2000 (37 versus 41 kcal/capita/day, respectively), contrary to what occurred worldwide (7 versus 4 kcal/capita/day, respectively).

³¹ Per-capita food supply variability is an indicator of supply stability at the national level. It is measured as the sum of supply (production, imports, and changes in inventory) minus utilization (exports, food manufacturing, livestock feed, seeds, wastage, and other losses). FAO calculates the amount of energy in the edible portion of each type of food available for human consumption and then adds the total amount to compute the food supply. This total amount is then divided by the number of inhabitants and by 365 days to obtain the per-capita supply (kcal/capita/day). The reported variability is the standard deviation of per-capita supply over the previous five years.

Figure 12. Per-capita food supply variability in 2013 (kcal/capita/day)



Source: FAOSTAT (2017).

IV. LESSONS LEARNED FROM THE BANK’S EXPERIENCE IN FOOD SECURITY

A. Report of the Office of Evaluation and Oversight

- 4.1 The Bank’s Office of Evaluation and Oversight (OVE) has not undertaken any evaluations in the area of food security and has not updated the sector evaluations on agriculture, health and nutrition, and social protection, which affect food security. Consequently, the recommendations considered in the previous SFD, referring to the document “Review of the Bank’s Support to Agriculture 2002-2014,” remain in place. The aforementioned document presents an evaluation of the approach of the sector’s contribution to food security, primarily the food availability dimension, in the form of agricultural projects from 2002 to 2014. In this regard, Annex I of this document, “Food Security in LAC: Evaluation of the Focus of the IDB’s Agricultural Portfolio,” recommends that the Bank promote a comprehensive, coordinated multisectoral approach to food security. Given the crosscutting nature of food and nutrition security, some countries in the region have created interagency governance arrangements to develop policies in this area, although there is no rigorous empirical evidence of their effectiveness in comparison to sector approaches. Nonetheless, this shows that the countries recognize the multidimensional nature of the issue. The above-described recommendation is consistent with the approach in this SFD.
- 4.2 Regarding other sector evaluations performed by OVE, the previous SFD’s recommendations relating to health and social protection issues remain in place. With regard to health, the SFD examines the principal reform measures promoted by the Bank, which seek to improve efficiency, quality of care, and equity or to expand coverage, and offers recommendations that have been incorporated into the Bank’s analytic and operational work. With regard to social protection, the CCT program evaluations recommend, among other things, creating a system to

gather institutional knowledge regarding these programs. These recommendations have been incorporated into the Bank's analytic and operational work.

- 4.3 In addition, in some cases, the country strategy evaluations performed by OVE describe important issues related to the various dimensions of food security, primarily in Haiti, Nicaragua, Guyana, and Dominican Republic.

B. Lessons learned from IDB operations

- 4.4 This section reviews the Bank's recent experience in addressing food security. While, as indicated, this SFD does not analyze a sector in itself, operations in both of the Bank's windows (sovereign-guaranteed and non-sovereign guaranteed) were analyzed. In the case of sovereign guaranteed operations, according to information provided by the Office of Strategic Planning and Development Effectiveness (SPD), only 3 of a total of 89 sovereign guaranteed projects indicated that they were contributing to the auxiliary indicator on food security. These were Environment, Rural Development and Risk Management Division (RND) operations.³²

- 4.5 In addition, we performed an analysis of indicators in the results matrix of active projects of the RND, Water and Sanitation Division (WSA), Transport Division (TSP), Social Protection and Health Division (SPH), Integration and Trade Sector (INT), and Gender and Diversity Division (GDI), identifying those projects whose indicators had any connection to the dimensions of food security. Of a total of 268 operations in the active portfolio, 125 (46%) had indicators associated with food security. The following table summarizes the analysis:

Table 1. Sovereign-guaranteed projects that contribute to one or more dimensions of food security

Sector	Division	Portfolio projects	Food security projects*	Food security dimensions			
				Availability	Access	Utilization	Stability
CSD	RND	30	26	22	21	6	8
SCL	SPH	50	24	0	5	24	0
	GDI	2	1	0	1	0	0
INE	WSA	78	47	0	1	46	1
	TSP	88	19	13	6	0	0
INT	INT	20	7	7	0	0	0
Total		268	125	42	34	76	9

Source: Own calculations using the Bank's systems (Convergence).

Note: The total number of projects does not coincide with the number of projects in each of the dimensions since there are operations that contribute to more than one dimension.

* Refers to projects that contribute to one or more dimensions of food security.

- 4.6 In addition, we identified the main lessons learned arising from a [sample of 38 operations](#), of which 15 have a project completion report, 8 have been recently approved, and the remaining 15 are in execution with an average of 68% disbursed. The project sample analyzed to identify lessons learned was defined jointly with focal points from the various divisions, considering impact and/or outcome indicators in the results matrix that were associated with one or more dimensions of food security. This exercise was carried out by means of interviews with project team leaders and

³² CO-L1166, HA-L1107, and PE-L1229.

- documentary analysis (review of project completion reports, project monitoring reports, loan proposals, Technical Notes, impact assessments, and other relevant documents).
- 4.7 Below are the main lessons learned for each of the dimensions of food security, followed by an analysis of crosscutting lessons for all dimensions. It should also be emphasized that the lessons learned by the Bank in sectors such as agriculture, social protection, health and nutrition, climate change, and integration and trade are spelled out in greater detail in the respective SFDs.
- 4.8 **Dimension 1: Food availability.** The Bank's work in this dimension has focused on three areas: (i) actions aimed at ensuring increases in agricultural productivity designed to boost food availability without putting additional pressure on natural resources; (ii) activities to reinforce domestic policies and the development of international trade agreements to facilitate trade flows; and (iii) investments in infrastructure works to increase market access and reduce transaction costs.
- 4.9 **Boost food availability through agricultural sector productive programs targeting small producers.** The Bank's experience shows that programs that seek to boost food availability have a greater impact on food security when they focus on addressing the needs of small producers. This requires: (i) properly targeting the interventions through eligibility criteria and monitoring mechanisms for the beneficiaries; and (ii) ensuring that the activities implemented through agricultural interventions integrate small farmers into global value chains not only for the marketing of products but also for the purchase of inputs and cutting-edge machinery. The Bank's experience also highlights the importance of including specific actions to promote gender equality and access to productive resources by women, indigenous groups, and vulnerable populations.
- 4.10 **The role of technical assistance.** The Bank's actions in productive support projects aimed at boosting food availability through increases in agricultural productivity demonstrate the importance of having the support of duly trained technicians during at least two agricultural cycles after the start of the project. Therefore, the type of technical assistance to be offered should be evaluated in the design phase of the operation, based on the cost and complexity of the implemented intervention. Furthermore, in some instances, the producer should be the one to select the type of specialized technical service he or she wishes to receive. On occasion, the high cost involved in the provision of individual technical assistance has posed a challenge in terms of introducing technological improvements. To overcome this barrier, it is advisable to promote modalities that enable the adoption of technologies in the most efficient and cost-effective manner. In addition, it is suggested that this technical assistance have a gender perspective that applies specific actions, based on gap analyses, to encourage the participation of women.
- 4.11 **Complementary trade and production approach.** The Bank's actions in the trade and integration sector have focused on offering assistance to stakeholders with mature products who require information systems and financing in order to gain access to the international markets. In addition, horizontal programs, international fairs such as Food Logistics, and investment promotion projects such as AgroNegocios have proven to be valid instruments for sponsoring international investment in agribusiness.

- 4.12 **Rural infrastructure works to expand connectivity between markets and producers.** Investment in rural infrastructure works, mainly rural roads, is essential for linking small producers with markets and reducing transaction costs. Local production needs include basic rural infrastructure works to allow small farmers to sell their production in markets of greater value. Evidence shows that these infrastructure works, such as rural roads, increase incentives for productive diversification and strengthen connectivity with markets. The Bank's operational experience has demonstrated that, once completed, these works are extensively appropriated by producers. However, technical assistance to local organizations is needed to ensure the sustainability of these works and their long-term maintenance.
- 4.13 **Dimension 2: Food access.** In this dimension, the Bank has worked principally along two lines of action. The first focuses on productive programs aimed at increasing the capacity to obtain food by boosting rural household income. The second focuses on social protection programs, mainly in CCT implementation, to ensure household financial capacity and, consequently, food consumption.
- 4.14 **Analyze the financial capacity of the beneficiaries of productive programs.** Ensuring profitability that translates into income improvements, through productive projects aimed at expanding the availability of food (i.e., adoption of technologies, tilling, irrigation, agrifood health, etc.), requires analyzing farmers' financial capacity. This type of analysis will make it possible to identify whether small producers are able to adopt the various actions promoted by the program and sustain them over time. For example, in the case of agroforestry projects, experience shows the need to identify whether small-scale farmers have the financial means to maintain fruit trees during the first years of investment. In the case of projects that promote technology (i.e., irrigation) adoption, it is crucial to identify the additional costs that the producer will need to incur in terms of inputs or complementary technologies to maximize the impacts on productivity and income. Similarly, in the case of land tenure projects, it is essential to analyze the costs of the titling process and verify whether these are in line with the financial capacity of the beneficiaries so as not to discourage participation. Based on these studies, actions should be identified to promote participation by small farmers, including cofinancing, credit access promotion, and others. To date, the Bank's operations have opted for various cofinancing formulas, including nonreimbursable support for family farming projects—for example, through vouchers—and/or the issuance of financial loans backed by guarantees issued by reciprocal guarantee companies. Selection of the most appropriate modality should take the socioeconomic context of the country into consideration. In addition, this type of analysis should be performed by population subgroup to identify potentially different financing requirements based on gender, ethnicity, etc.
- 4.15 **Conditional cash transfer (CCT) programs to boost food consumption.** The Bank has a solid track record in CCT programs, assisting countries in the region in the consolidation of their social protection policies with a view to improving the human capital of families living in poverty and the level of food security. The evidence indicates that the transfers constitute: (i) additional income for the family unit, which translates into better access to food, not only in quantitative but also in qualitative terms, due to the increase in dietary diversity; and (ii) a saving that is at times allocated to making improvements in the family farming businesses. Operational experience recommends: (i) combining different targeting methods (i.e.,

- geographic, means testing, etc.), to ensure that the program in fact supports the poorest households; (ii) investing in monitoring systems, including single registries, to ensure transparency in the distribution of transfers; (iii) appropriate selection of indicators to verify conditionalities; (iv) design and implementation of robust information systems; and (v) complementing the delivery of transfers with informative workshops on good eating habits, food safety, and nutrition.
- 4.16 **Dimension 3: Food utilization.** The Bank's actions in this dimension have been aimed at: (i) reinforcing the nutritional status of children, including strategies to reduce undernourishment and obesity, by means of cash transfer programs with health and nutrition conditionalities and nutritional supplements; (ii) strengthening agrifood safety, animal health, and plant health services to reduce the presence of foodborne diseases; and (iii) expanding the provision of adequate water and sanitation services to reduce the presence of acute diarrheal disease and improve the absorption of nutrients.
- 4.17 **Relevance of CCT programs for improving food utilization.** CCT programs show that the best utilization of food, through conditionalities associated with nutrition and health indicators, is directly related to: (i) the capacity of the executing units to verify compliance with conditionalities; (ii) the quantity and quality of supply of the public services that should be provided to the beneficiaries (in terms of qualified medical personnel, administrative support, and infrastructure, among others) so as to ensure proper compliance with conditionalities; and (iii) cultural characteristics of the population. Therefore, it is recommended that governments introduce adequate systems for verification of conditionalities, identify solutions to problems related to the supply of health services, and adjust their actions in keeping with the particular characteristics of the various population groups, such as indigenous and displaced communities. Based on this, a different approach should be adopted for the treatment of more vulnerable populations, such as indigenous communities.
- 4.18 **Institutional strengthening and multisectoral coordination to ensure agrifood safety and health.** The Bank's experience highlights institutional weakness as an important challenge in the implementation of food safety and health projects. The experience in the sector favors supporting the strengthening and empowerment of the institutions that are part of the food safety and health system, through: (i) implementation of international good practices; (ii) continuous commitment of regular Public Treasury resources given that interventions in this area are a public good; (iii) creation and implementation of cost recovery mechanisms to ensure the system's sustainability, particularly in actions that have significant private returns (e.g., vaccines and traceability systems); and (iv) creation and implementation of mechanisms that ensure interagency coordination—participation by the Ministries of Health, Agriculture, and Education is crucial and indispensable—and participation by relevant civil society and private sector stakeholders, in accordance with previously agreed roles.
- 4.19 **Promotion of actions to encourage supply of and demand for safe products.** The Bank has made multiple efforts to promote the supply of safe products through the introduction of good agricultural and husbandry practices. However, operational experience shows that ensuring the effectiveness of this type of intervention requires implementing a system of incentives to drive supply and demand. This implies a food system approach that can create the conditions for rewarding (penalizing) the

- production of safe (unsafe) food. For example, this can be achieved by implementing a “green seal” that allows consumers to identify quality foods. This also requires carrying out internal controls, with periodic food sampling, to identify the presence and level of chemical and biological contaminants in different (formal and informal) markets. Another recommendation is to include actions that inform, educate, and promote the consumption of safe food by the population through mass communication campaigns.
- 4.20 **Robust outcome attribution evaluations.** In general, the volume of empirical evidence on the availability and access dimensions of food security is larger and more robust than on the utilization dimension. Specifically, there is a knowledge gap regarding the impact of CCT interventions and agricultural projects on changes in diet and nutrition in the poorest households. Consequently, the recommendation is to identify and include in the results framework specific indicators that allow monitoring of nutrition issues and ensure measurement of the effects on the utilization dimension. The Bank’s experience has also shown that planning the impact evaluation activities during the project design stage is essential in order to increase the amount of rigorous evidence available on the effectiveness of the interventions. In addition, if the Bank has solid information on impacts and outcomes, actions can be adjusted in keeping with the specific characteristics of the communities, thus adapting the interventions to the context.
- 4.21 **Dimension 4: Stability.** The Bank’s actions in the stability dimension have focused on the implementation of climate-smart agricultural interventions that promote climate change adaptation activities by small producers. This includes access to irrigation systems to make production less vulnerable to variations in precipitation, as well as promotion of agroforestry systems to boost resilience to climate variability. In addition, to reduce the effects of price variability, the Bank has encouraged the use of CCTs to allow the most vulnerable communities to maintain their access to food.
- 4.22 **Climate-smart agriculture to make production less vulnerable to climate change.** The Bank’s experience shows that ensuring the effectiveness of agricultural interventions that include climate change adaptation requires encouraging the combined adoption of environmental and agricultural practices. To this end, training should be provided in good management of natural resources, crop diversification, and access to higher-value markets. Additionally, this training may include nutrition-related topics to encourage proper utilization of food. The evaluations also highlight the following recommendations: (i) adoption of a watershed approach for better management of water resources and land use; (ii) creation of water resource information systems that facilitate decision-making regarding the long-term management of these resources; and (iii) strengthening and empowerment of community social bodies (i.e., irrigation boards and producer associations) that promote the proper use of natural resources and create incentives to access markets.
- 4.23 **Price volatility: the role of CCTs.** Low-income households are particularly vulnerable to changes in food prices since they use a larger share of their income on food. In such cases, CCTs can be used as cushions to mitigate the adverse effects of these changes on the poorest population groups, which are the target of these interventions. For this reason, the countries of the region have on occasion

expanded the list of beneficiaries temporarily to include the population groups that are most sensitive to price volatility.

- 4.24 **Crosscutting lessons:** The lessons cutting across all dimensions of food security include (i) interagency and intersectoral coordination, and (ii) gender approach.
- 4.25 **Interagency and intersectoral coordination.** Operational experience has shown the importance of improving coordination among the different sectors of the Bank as well as among the ministries of health, agriculture, and education of the countries. At the interagency level, it is crucial to develop coordination mechanisms with legal, operational, and budgetary capacity to facilitate dialogue among the various relevant actors and make it possible to devise joint actions for the development of integrated strategies. Given the multisectoral nature of food security, the Bank needs to articulate mechanisms to help strengthen the design and implementation of multisectoral programs. This can ensure that the issue of food security is being addressed comprehensively, including all of its dimensions.
- 4.26 **Gender approach.** The empirical evidence shows that the empowerment of women bolsters food security. The experience indicates that, to increase women's empowerment, it is essential to adopt a gender approach that ensures equal access at the various stages of the project cycle. In addition, evaluations must be performed that measure impacts by gender and by ethnic group. This requires designing adequate indicators, having an ex ante monitoring and evaluation plan (prior to project execution), and establishing baselines to enable a comparison over time.

C. The Bank's comparative advantages in food security

- 4.27 The Bank's main comparative advantage in promoting the food security agenda is its extensive knowledge and experience in various sectors that influence food security. These sectors include agriculture, social protection, health and nutrition, water and sanitation, transportation, climate change, and integration and trade. As indicated in the respective sector frameworks, the Bank has strengthened its strategic positioning in recent years, consolidating the presence of these sectors in its portfolio of investments in the region and supporting the generation of relevant knowledge for clients. In this regard, the Bank's work can have a higher value-added by promoting and coordinating a multisectoral and multi-institutional vision, to tackle the challenges of food security in LAC.

V. TARGETS, PRINCIPLES, DIMENSIONS OF SUCCESS, AND LINES OF ACTION THAT WILL GUIDE THE BANK'S OPERATIONAL AND RESEARCH ACTIVITIES

A. Targets and principles of the Bank's work in food security

- 5.1 The Bank's target is to promote food security in LAC, contributing to its four dimensions. Any Bank interventions will be governed by three basic principles:
- a. **Social return on investment:** The Bank will seek to attain high rates of social return, supporting cost-effective interventions. This will be achieved by carrying out ex ante economic analyses for all interventions. Projects will be based on the most recent and relevant available evidence and will take into account accumulated experience at the global and regional levels. In the event of

significant gaps in knowledge, the projects will generate evidence and help to close these gaps by using rigorous impact evaluation methods.

- b. **Socioenvironmental principle:** Interventions will seek to preserve natural resources and environmental services. In addition, they will create incentives for the social and economic inclusion of vulnerable (mainly indigenous and Afro-descendant) communities. Lastly, the investments will promote gender equality and foster the participation of women.
- c. **Intersectoral coordination:** Given the multisectoral nature of food security, interventions will seek to promote coordination in the design of policies and sector strategies to address food security challenges in a comprehensive manner.

B. Dimensions of success, lines of action, and activities

- 5.2 To promote food security in LAC, four dimensions of success are proposed, each with its own priority lines of action. These dimensions of success and lines of action are based on empirical evidence and the challenges facing LAC; in addition, they are linked to each of the components of food security. The dimensions of success are designed to assist the Bank in developing a framework for addressing the different aspects of food security.
- 5.3 Furthermore, given the need for intersectoral coordination, this SFD includes activities that have been addressed previously in other sector framework documents (i.e., the Agriculture and Natural Resources Management; Social Protection and Poverty; Health and Nutrition; Climate Change; Integration and Trade; Gender and Diversity; Transportation; and Water and Sanitation SFDs) with a view to contributing to this issue in a comprehensive manner.
- 5.4 At the country level, it is important to design strategies that establish specific targets and the roles that primarily public institutions, but also private ones, need to perform to support food security, in a coordinated manner. This should be supplemented with a system for monitoring and evaluating interventions. In addition, the Bank's public-sector operations should be prompted by a market failure or by climate change impacts that justify an intervention by the State (paragraph 2.6).
- 5.5 As the evidence indicates, to improve food security, a combination of agricultural, social protection, nutrition, and water and sanitation strategies, among others, is needed. However, the relative importance of each sector will depend on the structure of each country's economy and on the characteristics of the vulnerable population. Specifically, in economies where agriculture carries a relatively significant weight (generally in countries that are small and have a high incidence of rural poverty) policies that promote agricultural development, with particular emphasis on small and medium-scale farmers, are important. In countries where agriculture has relatively lesser economic weight, but poverty, hunger, and malnutrition are predominantly rural, growth in the rural agricultural and nonfarm economy is important to reducing food insecurity. Lastly, in more urbanized economies, in which agriculture accounts for a relatively smaller share of the economy and urban poverty exceeds rural poverty, social protection and nutrition programs will have greater relative importance for reducing food insecurity. To do so, a multisector, interagency coordination strategy is needed, allowing for more

- effective work across sectors and institutions through joint efforts by communities, local government, academia, government agencies, and civil society.
- 5.6 What follows are the dimensions of success, lines of action, and activities associated with each dimension of food security. Given the multisectoral nature of food security, many of activities associated with the lines of action, in particular for dimensions of success 2, 3, 4, and 5, are found in other Bank SFDs.
- 1. Dimension of success 1. Encourage intersectoral and interagency coordination, to ensure the complementarity of food security-related interventions.**
- 5.7 The multidimensional nature of food security requires that coordination mechanisms be established to guarantee synergies and complementarities among the different sectors (e.g. agriculture, social protection, international trade, etc.). The following line of action is proposed to achieve the objective of this dimension of success:
- 5.8 **Line of action:** Promote intersectoral and interagency coordination mechanisms for designing and implementing food security-related policies and projects that also, ideally, include academia, civil society, and the private sector. The following activities are proposed to implement this line of action:
- 5.9 **Activities:**
- a. Support governments in designing and implementing mechanisms that facilitate intersectoral and interagency coordination of actions related to food security, also including the participation of academia, civil society, and the private sector (e.g. coordination units, councils, etc.).
 - b. Facilitate intersectoral coordination through the Bank's activities and projects, primarily in those countries facing greater food insecurity.
 - c. Promote the measurement of indicators of all dimensions of food security at the national and local levels.
 - d. Promote mechanisms for evaluating the different intersectoral and interagency coordination strategies in LAC, to identify the most efficient and effective ones.
- 2. Dimension of success 2. Ensure food availability by boosting productivity without putting pressure on natural resources, facilitating trade, and improving rural infrastructure.**
- 5.10 The evidence presented shows that an expansion in agricultural productivity, international trade, and infrastructure services are essential for the region to support a global increase in food availability. The following lines of action are proposed in order to achieve the objective of this dimension of success:
- 5.11 **Line of action 1.** Improve agricultural service delivery and infrastructure with public-good characteristics with a view to expanding food availability. The following activities are proposed to implement this line of action:
- 5.12 **Activities:**
- a. Modernize country agricultural innovation systems by strengthening technology generation and promotion to help small producers adapt to climate change,

employing a food systems approach (Agriculture and Natural Resources Management SFD).

- b. Investment to improve agricultural producers' access to rural infrastructure, based on a territorial approach (Agriculture and Natural Resources Management SFD).
- c. Modernize country agricultural health systems (Agriculture and Natural Resources Management SFD).
- d. Modernize statistical and producer information systems with respect to price as well as agroclimate and technical data (Agriculture and Natural Resources Management SFD).
- e. Improve small and medium-scale producer access to credit to make productive investments and empower associations of small producers (Agriculture and Natural Resources Management SFD).
- f. Regularization of land tenure and modernization of registration and cadaster systems, making them more accessible to the poorest people and to vulnerable groups such as women and indigenous communities (Agriculture and Natural Resources Management SFD).
- g. Agricultural interventions aimed at boosting food production should be designed to raise agricultural productivity without jeopardizing natural resources.
- h. Implement rigorous impact assessments that measure the causal effects of the Bank's interventions using specific food-security indicators.
- i. Implement independent monitoring and social auditing mechanisms and build the capacity of executing agencies to ensure that the benefits of the Bank's interventions reach the target population.

5.13 **Line of action 2.** Improve farmer participation in global markets and agricultural value chains not only to facilitate marketing and increase food availability but also to provide access to quality inputs and cutting-edge technology. The following activities are proposed to implement this line of action:

5.14 **Activities:**

- a. Promote actions to boost growth in agribusiness through risk management mechanisms such as hedging, options, and agricultural insurance, and through financial markets that facilitate the use of risk management instruments.
- b. Strengthen the capacity of the institutions that manage agribusiness support programs to manage conflicts of interest and verify the truthfulness of the information provided by those interested in the program, with a view to ensuring that the benefits reach the businesses that actually need support.
- c. Invest in road infrastructure and logistics that can help to reduce food transaction and transportation costs (Transportation SFD).
- d. Implement interventions that promote a consolidation of trade liberalization in the agricultural sector.

- e. Conduct and disseminate evaluations that measure the impact of agricultural and trade interventions on food availability.
- 5.15 **Line of action 3.** Increase access to productive resources and technical assistance by women and vulnerable groups. The following activities are proposed to implement this line of action:
- 5.16 **Activities:**
- a. Promote specific actions to encourage and foster participation by women and vulnerable groups in productive agricultural programs, including communication campaigns and targeted action.
 - b. Promote specific actions to encourage and foster participation by women and vulnerable groups in technical assistance activities, including technical assistance by women for women in their native languages and taking their roles in the household into account.
 - c. Implement evaluations that measure heterogenous impacts to identify specific effects by gender and by ethnic group.
- 5.17 **Line of action 4.** Generate interventions aimed at reducing food losses in all sections of the food system. The following activities are proposed to implement this line of action:
- 5.18 **Activities:**
- a. Encourage investments to adopt postharvest management technologies (e.g. storage of food and fish products) that reduce production losses and help producers manage price fluctuations.
 - b. Carry out interventions to generate changes in consumer behavior aimed at reducing food losses.
 - c. Increase empirical evidence on the causes and magnitude of food losses in LAC.
- 3. Dimension of success 3. Increase food access for the most vulnerable population of LAC through income generation that leads to higher consumption.**
- 5.19 Food availability is a necessary but insufficient condition to ensure food security. The evidence presented shows the effectiveness of actions aimed at boosting food consumption through interventions that generate higher income in rural and urban areas. The line of action in this dimension is:
- 5.20 **Line of action 1.** Promote productive activities in the agricultural sector and social protection programs that raise the income of the most vulnerable population and thereby increase food consumption. The following activities are proposed to implement this line of action:
- 5.21 **Activities:**
- a. Implement cost-effective mechanisms to stimulate the adoption of technological innovations that are profitable, environmentally appropriate, and contribute to climate change adaption among producers, with a particular focus

on vulnerable groups such as women and indigenous communities (Agriculture and Natural Resources Management SFD).

- b. Foster credit mechanisms and guarantees for financing the working and/or investment capital needs of key sections of value chains, or small and medium-scale producers directly, including technical assistance to intermediary financial institutions (Agriculture and Natural Resources Management SFD).
- c. Invest in agribusiness aimed at agroindustrial processing and innovation of sector products, as well as in companies that favor the development of business partnerships and access to credit, basic inputs, or capital for productive investment by small and medium-sized producers (Agriculture and Natural Resources Management SFD).
- d. Foster job placement programs, particularly for the most vulnerable population groups, with a view to increasing their income and thus their access to food. An additional recommendation is to strengthen income support programs for the unemployed and their connection to active policies (Labor SFD).
- e. Implement efficient redistributive social protection programs that target benefits to the neediest populations and do not create distortions in the product markets or disincentives in the labor market (Social Protection and Poverty SFD).
- f. Expand economic opportunities for women through an increase in the female participation rate, closing of the income and wage gaps between men and women, and access to more productive and better paid jobs and occupations (Gender and Diversity SFD).
- g. Support for formulating and/or updating food security strategies, plans, and/or policies under the principle of intersectoral coordination, as well as establishing and/or upgrading systems for monitoring and evaluating the respective intervention models.
- h. Preparing and disseminating impact evaluations that analyze the effect of agricultural, social protection, and labor interventions on food access (i.e., food consumption), including heterogeneous effects by gender and ethnicity.

4. Dimension of success 4. Reduce the triple burden of malnutrition and improve food safety through a food systems approach.

5.22 It has been amply documented that, even when households have food availability and access, the food's nutritional content may be insufficient for leading a healthy life. The evidence shows that agricultural interventions with nutrition-sensitive actions that promote crop diversification and empower women have positive effects on the utilization of food. In addition, these actions should be complemented by actions promoting food safety and investments in access to water and sanitation to reduce the presence of ADD and FBD, which limit nutrient absorption. The following lines of action are proposed for achieving this dimension of success:

5.23 **Line of action 1.** Continue to implement social protection programs with conditionalities related to nutrition and health indicators, as well as generate changes of behavior in the population with a view to introducing healthy diets that reduce overweight and obesity, mainly among children and adolescents. The following activities are proposed to implement this line of action:

5.24 **Activities:**

- a. Strengthen intersectoral education and communication approaches aimed at changing behavior and fostering the adoption of healthy lifestyles (Health and Nutrition SFD).
- b. Reduce financial, gender, ethnic, or cultural barriers to encourage the use of health services (Health and Nutrition SFD).
- c. Implement monitoring systems to ensure the transparency of CCT programs and the verification of conditionalities in a cost-effective and cost-efficient manner.
- d. Implement interventions combining various actions aimed at reducing obesity and overweight in children and adolescents. These actions may include physical activity, nutrition education, food supplements, etc.
- e. Increase the empirical evidence with impact evaluations that rigorously measure the effectiveness of CCT programs on household nutrition and food security.

5.25 **Line of action 2.** Expand the scope of agricultural interventions to include nutrition-sensitive actions, considering the needs of the food system in each country. The following activities are proposed to implement this line of action:

5.26 **Activities:**

- a. Include nutrition training activities as part of the technical assistance in agriculture projects.
- b. Coordinate productive programs with the social protection interventions.
- c. Include lines of action to develop and disseminate improved varieties with higher micronutrient content in agricultural research programs.
- d. Promote actions aimed at boosting the supply of and demand for foods with higher nutritional content.
- e. Implement impact evaluations that measure the effectiveness of nutrition-sensitive agricultural interventions on food security, with an emphasis on food utilization.

5.27 **Line of action 3.** Boost the supply of and demand for safe food and expand the population's access to water and sanitation services. The following activities are proposed to implement this line of action:

5.28 **Activities:**

- a. Foster the implementation of food safety systems providing for multisectoral coordination that encourage the production and consumption of quality foods (Agriculture and Natural Resources Management SFD).
- b. Encourage communication campaigns to educate the population on the importance of eating safe food.
- c. Implement actions that encourage producers' adoption of good agricultural practices through field schools, training, communication campaigns, etc.

- d. Increase the coverage and quality of water and sanitation services (Water and Sanitation SFD).
- e. Increase the volume of rigorous empirical evidence on the effectiveness of interventions aimed at boosting the demand for and supply of safe food, primarily with regard to the implementation of good agricultural practices, good husbandry practices, and food traceability systems.

5. Dimension of success 5. Make food systems less vulnerable to climate change and natural disasters.

5.29 Food availability, access, and utilization may be affected by climate and price fluctuations, making food systems more vulnerable and consequently increasing food insecurity. The evidence shows that agricultural interventions that boost resilience to climate change and diminish the effects of price fluctuations are effective in reducing food variability. The following line of action is proposed to achieve this dimension of success:

5.30 **Line of action 1.** Foster climate-smart agriculture and actions to make food systems less vulnerable to natural disasters. The following activities are proposed to implement this line of action:

5.31 **Activities:**

- a. Support climate-smart agriculture programs aimed at making production less vulnerable to changes in climate through access to irrigation, agroforestry systems, climate-change resistant varieties, adoption of improved seeds, postharvest technology, and others.
- b. Train farmers in better management and use of natural resources to boost agricultural production without degrading the environment.
- c. Improve the capacities of national agricultural research institutes and private firms to develop and promote improved crop varieties that are more resilient to climate change.
- d. Implement post-disaster interventions, such as direct food distribution, provision of food vouchers and/or cash transfers, and promotion of climate insurance, aimed at reducing consumption variability in vulnerable populations.
- e. Implement impact evaluations that measure the effectiveness of climate-smart agricultural interventions on food security-specific indicators and the long-term sustainability of such interventions.

BIBLIOGRAPHIC REFERENCES

- Abay, K. and Hirvonen, K. (2017). Does Market Access Mitigate the Impact of Seasonality on Child Growth? Panel Data Evidence from Northern Ethiopia. *The Journal of Development Studies*, 53(9), 1414-1429.
- Abbott, P. (2012), "Stabilisation policies in developing countries after the 2007-08 food crisis," in *Agricultural Policies for Poverty Reduction*, OECD Publishing, Paris.
- Adato, Michelle and John Hoddinott (eds.) (2010) *Conditional Cash Transfers in Latin America*. Baltimore: Johns Hopkins University Press for IFPRI.
- Adedayo, V., M. Fasona, and T. Kutu. 2014. Trend and Linkages between Climate Elements, Pest Activities and Pesticide Usage in Urban Farms Communities in Lagos. *Journal of Geography and Geology* 6(3): 178-186.
- Affognon, H., C. Mutungi, P. Sanginga, and C. Borgemeister. (2015). Unpacking postharvest losses in sub-Saharan Africa: a meta-analysis. *World Development*, 66, 49-68.
- Aggarwal, S. (2014). Three Essays in Development Economics. Chapter 1: Do Rural Roads Create Pathways out of Poverty? Evidence from India. Dissertation, University of California, Santa Cruz, 2014, pp. 1–26.
- Agrimonitor (2017). <https://agrimonitor.iadb.org/>.
- Ahammad, H., E. Heyhoe, G. Nelson, R. Sands, S. Fujimori, T. Hasegawa, D. van der Mensbrugge, E. Blanc, P. Halik, H. Valin, O. Kyle, D. Mason d'Croze, H. van Meijil, C. Schmitz, H. Lotze-Campen, M. von Lampe, and A. Tabeau. 2015. The Role of International Trade Under a Changing Climate: Insights from Global Economic Modelling. In *Climate Change and Food Systems Global Assessments and Implications for Food Security and Trade*. Editor: A. Elbehri. FAO.
- Ahmed, M. H., Geleta, K. M., Tazeze, A., and Andualem, E. (2017). [The Impact of improved maize varieties on farm productivity and wellbeing: evidence from the East Hararghe Zone of Ethiopia](#). *Development Studies Research*, 4(1), 9-21.
- Ahmed, A. U., A. R. Quisumbing, M. Nasreen, J.F. Hoddinott, and E. Bryan. (2009). Comparing food and cash transfers to the ultra-poor in Bangladesh (No. 163). International Food Policy Research Institute (IFPRI).
- Alaofè, H., Burney, J., Naylor, R., and Taren, D. (2016). Solar-powered drip irrigation impacts on crops production diversity and dietary diversity in Northern Benin. *Food and nutrition bulletin*, 37(2), 164-175.
- Ali, A. and O. Erenstein. 2017. Assessing Farmer Use of Climate Change Adaptation Practices and Impacts on Food Security and Poverty in Pakistan. *Climate Risk Management* 16: 183-194.
- Ali, R. (2011). Impact of Rural Road Improvement on High Yield Variety Technology Adoption: Evidence from Bangladesh. Working Paper, University of Maryland. Chicago.
- Alive and Thrive (2015). www.aliveandthrive.org.

- Allison, E.H., A.L. Perry, M Badjeck, W. Neil Adger, K. Brown, D. Conway, A.S. Halls, G.M. Pilling, J.D. Reynolds, N.L. Andrew, and N.K. Dulvy. 2009. Vulnerability of National Economies to the Impacts of Climate Change on Fisheries. *Fish and Fisheries* 10: 173-196.
- Alston, J., C. Chan-Kang, M. Marra, P. Pardey, and TJ Wyatt (2000). *A Meta-Analysis of Rates of Return to Agricultural R&D Ex Pede Herculem?* Research Report 113, IFPRI.
- Andean Community. 2009. Articulando la Gestión del Riesgo y la Adaptación al Cambio Climático en el Sector Agropecuario: Lineamientos Generales para la Planificación y la Gestión Sectorial. Project to Support Disaster Prevention in the Andean Community.
- Anderson K. and Nelgen S. (2012). Trade Barrier Volatility and Agricultural Price Stabilization, *World Development*, 40, 1.
- Anderson, K., M. Ivanic, and W.J. Martin. 2014. Food Price Spikes, Price Insulation, and Poverty. In *The Economics of Food Price Volatility*. Editors J. Chavas, D. Hummels, and B.D. Wright. University of Chicago Press. 311-339.
- Anríquez, G., W. Foster, J. Ortega, C. Falconi, and C. P. De Salvo. (2016). Gasto público y el desempeño de la agricultura en América Latina y el Caribe (No. IDB-WP-722). IDB Working Paper Series.
- Anríquez, G., Foster, W., and Valdés, A. 2017. The structural transformation of Latin American economies: a sectoral long-term review. Background paper prepared for *The State of Food and Agriculture 2017: Leveraging food systems for inclusive rural transformation*.
- AQUASTAT. (2014). <http://www.fao.org/nr/water/aquastat/main/index.stm>.
- Argent, J., Augsburg, B., and Rasul, I. (2014). Livestock asset transfers with and without training: Evidence from Rwanda. *Journal of Economic Behavior & Organization*, 108, 19-39.
- Arias Carballo, D. and Coello, B. 2013. Opportunities for Latin America and the Caribbean to mainstreaming nutrition into agriculture. FAO and WHO, Rome.
- Aristizábal, L. F., Lara, O., and Arthurs, S. P. (2012). Implementing an integrated pest management program for coffee berry borer in a specialty coffee plantation in Colombia. *Journal of Integrated Pest Management*, 3(1), G1-G5.
- Arriagada, R. A., E. O. Sills, P. J. Ferraro, S. K. Pattanayak. (2015). Do payments pay off? Evidence from participation in Costa Rica's PES program. *PLoS One*, 10(7), e0131544.
- Arroyave, G. and L. Mejia (2010). *Five decades of vitamin A studies in the region of Central America and Panama*. *Food Nutrition Bulletin* 3(11):118-129.
- Asher, S. and Novosad, P. (2016). Market access and structural transformation: Evidence from rural roads in India. Manuscript: Department of Economics, University of Oxford.
- Attanasio, O., V. di Maro, V. Lechene, D. Phillips (2013). *Welfare consequences of food prices increases: Evidence from rural Mexico*. *Journal of Development Economics*.104(4): 136-151.

- Azzarri, C., Zezza, A., Haile, B., and Cross, E. (2015). Does livestock ownership affect animal source foods consumption and child nutritional status? Evidence from rural Uganda. *The Journal of Development Studies*, 51(8), 1034-1059.
- Baez, J., A. de la Fuente, and I. Santos. 2010. Do Natural Disasters Affect Human Capital? An Assessment Based on Existing Empirical Evidence. IZA DP No. 5164.
- Bailey, S. and Harvey, P. (2015). State of evidence on humanitarian cash transfers. *Overseas Development Institute Background Note*.
- Banerjee, A., Duflo, E., Goldberg, N., Karlan, D., Osei, R., Parienté, W., ... and Udry, C. (2015). A multifaceted program causes lasting progress for the very poor: Evidence from six countries. *Science*, 348(6236), 1260799.
- Barber, S. L. and Gertler, P. J. (2008). The impact of Mexico's conditional cash transfer programme, Oportunidades, on birthweight. *Tropical Medicine & International Health*, 13(11), 1405-1414.
- Barreiro-Hurlé, J., A. Gracia, and T. de-Magistris (2010). *Does nutrition information on food products lead to healthier food choices? Food Policy*. 35(3):221-229.
- Behnassi, M., M. Boussaid, and R. Gopichandran. 2014. Achieving Food Security in a Changing Climate: The Potential of Climate-Smart Agriculture. In *Environmental Cost and Face of Agriculture in the Gulf Cooperation Council Countries: Fostering Agriculture in the Context of Climate Change*. Editors: Shahid S.A. and M. Ahmed.
- Berhane, G, Hoddinott, J., Kumar, N, and Margolies, A, 2017. *The Productive Safety Net Programme in Ethiopia: impacts on children's schooling, labour and nutritional status*, 3ie Impact Evaluation Report 55. New Delhi: International Initiative for Impact Evaluation (3ie).
- Bokusheva, R., Finger, R., Fischler, M., Berlin, R., Marín, Y., Pérez, F., and Paiz, F. (2012). Factors determining the adoption and impact of a postharvest storage technology. *Food Security*, 4(2), 279-293.
- Boucher, S. and C. Mullally (2010). *Case study: Evaluating the Impact of Index Insurance on Cotton Farmers in Peru in Designing Impact Evaluations for Agricultural Projects. Impact-Evaluation Guidelines*. P. Winters, L. Salazar, and A. Maffioli, editors. Inter-American Development Bank, Washington, D.C.
- Bouët, A. and D. Roy (2008). *Does Africa trade less than it should, and if so, why? The role of market access and domestic factors*. IFPRI Discussion Paper 00770. IFPRI.
- Bouis, H. E. and Saltzman, A. (2017). Improving nutrition through biofortification: A review of evidence from HarvestPlus, 2003 through 2016. *Global food security*, 12, 49-58.
- Bouroncle, C., P. Imbach, P. Läderach, B. Rodríguez, C. Medellín, E. Fung, M.R. Martínez-Rodríguez, C.I. Donatti. 2015. La Agricultura de Honduras y el Cambio Climático: ¿Dónde están las Prioridades para la Adaptación? CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), Copenhagen.
- Brauman, K., S. Siebert and J. Foley (2013). *Improvements in crop water productivity increase water sustainability and food security – a global analysis. Environmental Research letters* 8, 7pp.

- Brinkman, H. S. de Pee, I. Sanogo, L. Subran, and M.W. Bloem. 2009. High Food Prices and the Global Financial Crisis Have Reduced Access to Nutritious Food and Worsened Nutritional Status and Health. *The Journal of Nutrition* 140(1): 153S-161S.
- Brownrigg, L. 1985. *Home gardening in international development: What the literature shows*. League for International Food Education, Washington, D.C.
- Caldés, N., Coady, D., and Maluccio, J. A. (2006). The cost of poverty alleviation transfer programs: a comparative analysis of three programs in Latin America. *World development*, 34(5), 818-837.
- Campbell, B.M., S.J. Vermeulen, P.K. Aggarwal, C. Corner-Dolloff, E. Grivets, A.M. Luboguerrero, J. Ramírez-Villegas, T. Rosenstock, L. Sebastian, P.K. Thornton, and E. Wollenberg. 2016. Reducing Risks to Food Security from Climate Change. *Global Food Security* 11: 34-43.
- Carletto, G., Ruel, M., Winters, P., and Zezza, A. (2015). Farm-level pathways to improved nutritional status: introduction to the special issue. *The Journal of Development Studies*.
- Carter, M. R. and Janzen, S. A. (2017). Social protection in the face of climate change: Targeting principles and financing mechanisms. *Environment and Development Economics*, 1-21.
- Carter, M., P. Toledo, and E. Tjernström. 2012. *The impact of Rural Business Services on the Economic Well-Being of Small Farmers in Nicaragua*. USA MCC Report 102012.
- Carter, M.R., P.D. Little, T. Moguees, and W. Negatu. 2006. Shocks, Sensitivity and Resilience: Tracking the Economic Impacts of Environmental Disaster on Assets in Ethiopia and Honduras. IFPRI DSGD Discussion Paper No. 32.
- Casaburi, L., Glennerster, R., and Suri, T. (2013). Rural Roads and Intermediated Trade: Regression Discontinuity Evidence from Sierra Leone.
- Centers for Disease Control (CDC) (2014). *Estimates of Foodborne Illness in the United States*. Data retrieved 27 June 2014 from Centers for Disease Control (available at: <https://www.cdc.gov/foodborneburden/>).
- Central American Integration System. (2013). Potential impacts of climate change on basic grains in Central America.
- Chakraborty, S. and A.C. Newton. 2011. Climate Change, Plant Diseases and Food Security: An Overview. *Plant Pathology* 60:2-14.
- Chavas, J. P., Hummels, D., and Wright, B. D. (2014). Introduction to "The Economics of Food Price Volatility". In *The Economics of Food Price Volatility* (pp. 1-11). University of Chicago Press.
- Cheung, W. W. L., Lam, V. W. Y., Sarmiento, J. L., Kearney, K., Watson, R., Zeller, D., and Pauly, D. (2010). Large-scale redistribution of maximum fisheries catch potential in the global ocean under climate change. *Global Change Biology*, 16(1), 24-35.
- Cole S., G. Bastian, S. Vyas, C. Wendel, D. Stein (2012). *The effectiveness of index based micro-insurance in helping smallholders manage weather-related risks*. EPPI-Centre, Social Science Research Unit, Institute of Education, University of London, London.
- CRED. 2016. *Annual Disaster Statistical Review 2016*. Université Catholique de Louvain.

- Cueto, S. and Chinen, M. (2000). Educational Impact of a School Breakfast Programme in Rural Peru.
- Cunha, J. M. (2014). Testing Paternalism: Cash versus In-Kind Transfers. *American Economic Journal: Applied Economics*, 6(2), 195–230.
- Darrouzet-Nardi, A. F., Miller, L. C., Joshi, N., Mahato, S., Lohani, M., and Rogers, B. L. (2016). Child dietary quality in rural Nepal: Effectiveness of a community-level development intervention. *Food Policy*, 61, 185-197.
- De Brauw, A., D. O. Gilligan, J. Hoddinott, and S. Roy. 2013. “The Impact of Bolsa Familia on Women’s Decision-Making Power.” *World Development*, forthcoming.
- De Brauw, A., P. Eozenou, D. Gilligan, N. Kumar, and J. V. Meenakshi (2013). *Biofortification, crop adoption and health information: Impact pathways in Mozambique and Uganda*. IFPRI, Washington, D.C.
- De Groote, H., S. C. Kimenju, P. Likhayo, F. Kanampiu, T. Tefera, and J. Hellin. (2013). Effectiveness of hermetic systems in controlling maize storage pests in Kenya. *Journal of stored products research*, 53, 27-36.
- De Janvry, A. and E. Sadoulet (2010). *The global food crisis and Guatemala: what crisis and for whom?* *World Development*. 38(9): 1328-1339.
- De Janvry, A. and Sadoulet, E. (2006). [Chapter 9: Progress in the modeling of rural Households' Behavior under Market Failures](#). *Poverty, inequality and development* (pp. 155-181). Springer, Boston, MA.
- De Janvry, A., E. Sadoulet and W. Wolford (2001). “*The Changing Role of the State in Latin American Land Reforms*.” In: A. de Janvry, G. Gordillo, J.P. Platteau et al., editors. In *Access to Land, Rural Poverty and Public Action* 279–303. Oxford: Oxford University Press.
- De Janvry, A., E. Ramirez Ritchie, and E. Sadoulet. (2016). Weather index insurance and shock coping: evidence from Mexico’s CADENA Program.
- De los Santos-Montero, D., Luis, A., and Bravo-Ureta, B. E. (2017, November). Productivity effects and natural resource management: econometric evidence from POSAF-II in Nicaragua. In: *Natural Resources Forum* (Vol. 41, No. 4, pp. 220-233). Blackwell Publishing Ltd.
- De Romaña, D. L., and Cedieli, G (2015). Current Situation of Micronutrients in Latin America and the Caribbean. *Promoción de la fortificación del arroz en América Latina y el Caribe Scaling Up Rice Fortification in Latin America and the Caribbean*, 122.
- Deininger, K. and J. S. Chamorro. (2004). Investment and equity effects of land regularisation: the case of Nicaragua. *Agricultural Economics*, 30(2), 101-116.
- Deininger, K. and Y. Lui (2013). *Welfare and Poverty Impacts of India’s National Rural Employment Guarantee Scheme: Evidence from Andhra Pradesh*. Policy Research Working Paper (WPS-65343).
- Deininger, K., S. Jin, and H. K. Nagarajan. 2007. “Efficiency and equity impacts of rural land market restrictions: Evidence from India.” *European Economic Review*, forthcoming.

- Descheemaeker, K., M. Zijlstra, P. Masikati, O. Crespo, and S.H. Tui. 2018. Effects of Climate Change and Adaptation on the Livestock Component of Mixed Farming Systems: A Modelling Study from Semi-arid Zimbabwe. *Agricultural Systems* 159: 282-295.
- Dey de Pryck, J. and P. Termine. 2014. Gender inequalities in rural labour markets. In A. Quisumbing, R. Meinzen-Dick, T. Raney, A. Croppenstedt, J. Behrman, and A. Peterman, eds. *Gender in agriculture. Closing the knowledge gap*, pp. 343–370. Dordrecht, the Netherlands, Springer.
- Dillon, A. (2011). The effect of irrigation on poverty reduction, asset accumulation, and informal insurance: Evidence from Northern Mali. *World Development*, 39(12), 2165-2175.
- Dillon, A., McGee, K., and Oseni, G. (2015). Agricultural production, dietary diversity and climate variability. *The Journal of Development Studies*, 51(8), 976-995.
- Ding, Q., X. Chen, R. Hilborn, and Y. Chen. 2017. Vulnerability to Impacts of Climate Change on Marine Fisheries and Food Security. *Marine Policy* 83: 55-61.
- Do, Q. T. and Iyer, L. (2007). Land Titling and Rural Transition in Vietnam.
- Dobermann, A., Nelson, R., Beever, D., Bergvinson, D., Crowley, E., Denning, G., ... and Lynam, J. (2013). Solutions for sustainable agriculture and food systems. Sustainable Development Solutions Network.
- Dorosh, P. A. (2001). Trade liberalization and national food security: Rice trade between Bangladesh and India. *World Development*, 29(4), 673-689.
- Dorosh, P., Wang, H. G., You, L., and Schmidt, E. (2012). Road connectivity, population, and crop production in Sub-Saharan Africa. *Agricultural Economics*, 43(1), 89-103.
- Dukpa, C. and B. Minten (2010). *An analysis of food demand in Bhutan*. IFPRI Policy Brief. IFPRI (International Food Policy Research Institute): Washington, D.C.
- Dupriez, Olivier (2007) *Building a household consumption database for the calculation of poverty PPPs*. Technical Note. World Bank, Washington, D.C.
- Duryea, S., and M. Robles. (2017). Pulso social en América Latina y el Caribe 2017: Legado familiar, ¿rompemos el molde o repetimos patrones?
- Ebata, A., Velasco Pacheco, P. A., and Cramon-Taubadel, S. (2017). The Influence of Proximity to Market on Bean Producer Prices in Nicaragua. *Agricultural Economics*, 48(4), 459-467.
- ECLAC (Economic Commission for Latin America and the Caribbean) (2018). Social Panorama of Latin America, 2017. Santiago.
- ECLAC. 2010. Achieving the Millennium Development Goals with Equality in Latin America and the Caribbean: Progress and Challenges. Santiago: ECLAC.
- ECLAC. 2012. *Social Panorama of Latin America*. Santiago: ECLAC.
- ECLAC. 2013. Impactos Potenciales del Cambio Climático sobre los Granos Básicos en Centroamérica. United Nations.
- ECLAC. 2014. Impactos Potenciales del Cambio Climático sobre el Café en Centroamérica. United Nations.

- ECLAC. 2018. *Social Panorama of Latin America 2017*. Santiago, Chile.
- EIU (Economist Intelligence Unit) (2013) *Global food security index 2013: An annual measure of the state of global food security*. The Economist Intelligence Unit, London.
- Ellis, K. and Keane, J. (2008). *A review of ethical standards and labels: Is there a gap in the market for a new 'Good for Development' label?* Working Paper 297, Overseas Development Institute, London, United Kingdom.
- Evans, S. E., and M. D. Wallenstein. (2014). Climate change alters ecological strategies of soil bacteria. *Ecology letters*, 17(2), 155-164.
- Fanzo, J., R. McLaren, C. Davis, and J. Choufani. 2017. Climate Change and Variability: What are the Risks for Nutrition, Diets, and Food Systems. IFPRI Discussion Paper 01645.
- FAO (1996). *Rome Declaration on World Food Security*, Rome, Italy.
- FAO (2002). *The State of Food and Agriculture 2002*. Rome, Italy.
- FAO (2006). *The State of Food Security in the World, 2006. Eradicating world hunger: taking stock ten years after the World Food Summit*.
- FAO (2008). *Climate Change and Food Security: A Framework Document*. Rome.
- FAO (2011). *Women in Agriculture: Closing the Gender Gap for Development. Feeding a Thirsty World*, 25.
- FAO (2011). *Global Food Losses and Waste. Extent, Causes and Prevention*.
- FAO (2012). *State of Food and Agriculture: Investing in Agriculture for a Better Future*. Rome, Italy.
- FAO (2013a). *State of food security in the world 2013: the multiple dimensions of food security*. Rome, Italy.
- FAO (2013b). *Synthesis of Guiding Principles on Agriculture Programming for Nutrition*. Rome, Italy.
- FAO (2013c). *State of Food and Agriculture: Food Systems for Better Nutrition*. Rome, Italy.
- FAO (2013d). *Seguridad y Soberanía Alimentarias (discussion document)*. Retrieved from: <http://www.fao.org/3/a-ax736s.pdf>.
- FAO (2014). *Appropriate food packaging solutions for developing countries*. Rome.
- FAO (2014a). *State of Food Insecurity in the World: Strengthening the Enabling Environment for Food Security*. Rome, Italy.
- FAO (2014b). *Panorama of Food and Nutrition Security in Latin America and the Caribbean 2014*.
- FAO (2014d). *Statistical Yearbook 2014 - Latin America and the Caribbean Food and Agriculture*. Rome. Retrieved from <http://www.fao.org/docrep/019/i3592e/i3592e.pdf>.
- FAO (2015). *The Impact of Disasters on Agriculture and Food Security*. Rome, Italy.
- FAO (2016a). *The State of World Fisheries and Aquaculture 2016. Contributing to food security and nutrition for all*. Rome. Retrieved from <http://www.fao.org/3/a-i5555e.pdf>.

- FAO (2016b). *Climate change and food security and nutrition Latin America and the Caribbean (policy guidelines)*. Santiago, Chile.
- FAO (2016c). *State of Food Security and Nutrition in Small Island Developing States (SIDS)*. Rome, Italy.
- FAO (2017a). *The future of food and agriculture – trends and challenges*. Rome.
- FAO (2017b). *The state of food and agriculture (Vol. 37)*. Food and Agriculture Organization of the UN (FAO), Rome, Italy.
- FAO (2018). *Food Loss and Waste Reduction*. <http://www.fao.org/food-loss-and-food-waste/en/>.
- FAO and PAHO (2017). *Panorama of Food and Nutrition Security in Latin America and the Caribbean*. Santiago, Chile.
- FAO, IFAD, and WFP (2013). *The State of Food Insecurity in the World 2013. The Multiple Dimensions of Food Security*. Rome, FAO.
- FAO, IFAD, IMF, OECD, UNSTAD, WFP, World Bank, WTZO, IFPRI, and UN HLTF (2011). *Price Volatility in Food and Agriculture Markets: Policy Responses*. Policy Paper for G20.
- FAO, IFAD, WFP (2015). *The State of Food Insecurity in the World 2015*. FAO, Rome. Finkelstein, J., Mehta, S., Udipi, S., et al., 2015. A randomized trial of iron-biofortified pearl millet in school children in India. *J. Nutr.* <http://dx.doi.org/10.3945/jn.114.208009>.
- FAO, IFAD, WHO, WFP, and UNICEF (2017). *The State of Food Security and Nutrition in the World 2017. Building Resilience for Peace and Food Security*. Rome, FAO.
- FAO. 2009. *Enfermedades transmitidas por alimentos y su impacto socio económico*. <http://www.fao.org/3/a-i0480s.pdf>.
- FAO. 2014a. *Developing sustainable food value chains—guiding principles*. Rome.
- FAOSTAT. (2017). *Food and Agriculture Organization of the United Nation Statistics*. <http://www.fao.org/faostat/en/?#data>.
- Fernandes, Erick C. M., Ayat Soliman, Roberto Confalonieri, Marcello Donatelli, and Francesco Tubiello (2012). *Climate Change and Agriculture in Latin America, 2020–2050: Projected Impacts and Response to Adaptation Strategies*. World Bank, Washington, D.C.
- Fernández-Stark, K. and Gereffi, G. (2012). *Inclusion of Small and Medium-Size Producers in High-Value Agro-food Value Chain*, MIF, December.
- Fiszbein, Ariel and Norbert Schady (2009) *Conditional cash transfers: reducing present and future poverty*. World Bank, Washington, D.C.
- Fleming, D. A. and D. G. Abler (2013) *Does agricultural trade affect productivity? Evidence from Chilean farms*. *Food Policy*. 41: 11-17.
- Foltz, J., B. A. Larson, and R. Lopez. (2000). *Land tenure, investment, and agricultural production in Nicaragua*.
- Freeman, M. C., Greene, L. E., Dreibelbis, R., Saboori, S., Muga, R., Brumback, B., and Rheingans, R. (2012). *Assessing the impact of a school-based water treatment, hygiene and sanitation programme on pupil absence in Nyanza Province, Kenya: a cluster-randomized trial*. *Tropical Medicine & International Health*, 17(3), 380-391.

- Gaarder, M. M., Glassman, A., and Todd, J. E. (2010). Conditional cash transfers and health: unpacking the causal chain. *Journal of development effectiveness*, 2(1), 6-50.
- Galiani, S., Gertler, P. J., and Orsola-Vidal, A. (2012). Promoting handwashing behavior in Peru: the effect of large-scale mass-media and community level interventions.
- Galiani, S., Gertler, P., and Schargrodsky, E. (2005). Water for life: The impact of the privatization of water services on child mortality. *Journal of political economy*, 113(1), 83-120.
- German Agency for Technical Cooperation (GTZ) (2010). *Regional Agricultural Trade for Economic Development and Food Security in Sub-Saharan Africa. Conceptual background and fields of action for development cooperation*. Eschborn: GTZ.
- Gertler, P. J., Gonzalez-Navarro, M., Gracner, T., and Rothenberg, A. D. (2016). Road Quality, Local Economic Activity, and Welfare: Evidence from Indonesia's Highways. CEGA Working Paper Series No. 058, Center for Effective Global Action, University of California, Berkeley.
- Gertler, P., Martinez, S., and Rubio-Codina, M., (2012) *Investing Cash Transfers to Raise Long-Term Living Standards*. *American Economic Journal: Applied Economics* 4(1): 164–192.
- Ghini, R., W. Bettiol, and E. Hamada. 2011. Diseases in Tropical and Plantation Crops as Affected by Climate Changes: Current Knowledge and Perspectives. *Plant Pathology* 60: 122-132.
- Gillson, I. and A. Fouad (2015). *Trade Policy and Food Security: Improving Access to Food in Developing Countries in the Wake of High World Prices*. World Bank, Washington, D.C.
- Gillson, I. and C. Busch (2015). *Trade Policy Responses to High and Volatile Food Prices in "Trade Policy and Food Security: Improving Access to Food in Developing Countries in the Wake of High World Prices,"* I. Gillson and A. Fouad, editors. World Bank, Washington, D.C.
- Gitter, S. R., and B. L. Barham. 2008. "Women's Power, Conditional Cash Transfers, and Schooling in Nicaragua." *World Bank Economic Review* 22 (2): 271–290.
- Glanz, K., J. Hersey, S. Cates, M. Muth, D. Creel, J. Nicholls, V. Fulgoni, S. Zaripeh (2012). *Effect of a nutrient rich foods consumer education program: results from the nutrition advice study*. *Journal of the Academy of Nutrition and Dietetics*. 112(1):56-63.
- Golan, E. H., Krissoff, B., Kuchler, F., Calvin, L., Nelson, K., and Price, G. (2004). *Traceability in the US food supply: economic theory and industry studies (No. 33939)*. United States Department of Agriculture, Economic Research Service.
- Gollin, D. and Rogerson, R. (2014). Productivity, Transport Costs and Subsistence Agriculture. *Journal of Development Economics*, 107, 38-48.
- Gomez, M. I., C. B. Barrett, T. Raney, P. Pinstrip-Andersen, J. Meerman, A. Croppenstedt, B. Carisma, B. Thompson (2013). *Post-green revolution food systems and the triple burden of malnutrition*. *Food Policy*. 42: 129-138.
- Gonzalez, J., Guasch, J. L., and T. Serebrisky (2008). *Improving Logistics Costs for Transportation and Trade Facilitation*. Policy Research Working Paper 4558, World Bank, Washington, D.C.

- Gonzalez, V., P. Ibarra, A. Maffioli, and S. Roza (2009). *The Impact of Technology Adoption on Agricultural Productivity: The Case of the Dominican Republic*. Office of Evaluation and Oversight, Inter-American Development Bank, Washington, D.C.
- Gore, R. and Patel, M. (2006). UNICEF East Asia and the Pacific Regional Office Bangkok, Thailand October 2006.
- Guedes Pinto, L. F., P. Stanley, P.C. Gomes, and D. Robinson. (2008). Experience with NTFP certification in Brazil. *Forests, Trees and Livelihoods*, 18(1), 37-54.
- Guha-Sapir D, Hoyois P., Below, R. (2013). *Annual Disaster Statistical Review 2012: The Numbers and Trends*. CRED, Brussels.
- Gustavsson, J., C. Cederberg, U. Sonesson, R. van Otterdijk, and A. Meybeck (2011). *Global Food Losses and Food Waste: Extent, Causes and Prevention. Study conducted for the International Congress Save Food! – Düsseldorf*. FAO: Rome, Italy.
- Haggblade, S., J. Govereh, H. Nielson, D. Tschirley, and P. Dorosh (2008). “Regional Trade in Food Staples: Prospects for Stimulating Agricultural Growth and Moderating Short-term Food Security Crises in Eastern and Southern Africa.” Paper 7144132. World Bank, Washington, D.C.
- Hagos, H. G. and Holden, S. (2013, October). *Links Between Tenure Security and Food Security: Evidence from Ethiopia*. ESSP Working Paper 59. International Food Policy Research Institute, Ethiopia Strategy Support Program II.
- Hallegatte, S., A. Vogt-Schilb, M. Bangalore, and J. Rozenberg. 2017. *Unbreakable: Building Resilience of the Poor in the Face of Natural Disasters*. World Bank Group.
- Hallegatte, S., M. Bangalore, L. Bonzanigo, M. Fay, T. Kane, U. Narloch, J. Rozenberg, D. Treguer, and A. Vogt-Schilb. 2016. *Shock Waves: Managing the Impacts of Climate Change on Poverty*. World Bank Group.
- Handa, S., A. Peterman, B. Davis, and M. Stampini. 2009. “Opening Up Pandora’s Box: The Effect of Gender Targeting and Conditionality on Household Spending Behavior in Mexico’s Progresa Program.” *World Development* 37 (6): 1129–1142.
- HarvestPlus, 2016. <http://www.harvestplus.org/knowledge-market/in-the-news/nutritious-crops-growing-popularity-latin-america>.
- Headey, D. (2011). *Turning economic growth into nutrition-sensitive growth*. Conference Paper No. 6. 2020 Conference on Leveraging 89 Agriculture for Improving Nutrition and Health, 10–12 February, New Delhi, India.
- Heady, D. (2011). Was the Global Food Crisis Really a Crisis? Simulations versus self-reporting.
- Hellmuth, M. E., Osgood, D. E., Hess, U., Moorhead, A., and Bhojwani, H. (2009). *Index insurance and climate risk: Prospects for development and disaster management*. International Research Institute for Climate and Society (IRI).
- Hellmuth, M., Osgood, D., Hess, U., Moorhead, A., and Bhojwani, H. (2010). “Index Insurance and Climate Risk: Prospects for Development and Risk Management.” *Climate and Society* (2).
- Hernández, R. and T. Reardon (2012). *Land Tenure and Vegetable Farming in Nicaragua*. Document prepared for the IDB and presented at the seminar.

- Hetherington, J. B., Wiethoelter, A. K., Negin, J., and Mor, S. M. (2017). Livestock ownership, animal source foods and child nutritional outcomes in seven rural village clusters in Sub-Saharan Africa. *Agriculture & Food Security*, 6(1), 9.
- Hidrobo, M., Hoddinott, J., Kumar, N., and Olivier, M. (2018). *Social Protection, Food Security, and Asset Formation*. World Development, 101, 88–103.
- Hidrobo, M., Hoddinott, J., Peterman, A., Margolies, A., and Moreira, V. (2014). Cash, food, or vouchers? Evidence from a randomized experiment in northern Ecuador. *Journal of Development Economics*, 107, 144-156.
- Higgins, D., T. Balint, H. Liversage, and P. Winters. (2018). Investigating the impacts of increased rural land tenure security: A systematic review of the evidence. *Journal of Rural Studies*, 61, 34-62.
- Hine, J., Abedin, M., Stevens, R., Airey, T., and Anderson, T. (2016). “*Does the Extension of the Rural Road Network have a Positive Impact on Poverty Reduction and Resilience for the Rural Areas Served? If so How, and if not Why Not? A Systemic Review*”. EPPI-Centre, Social Science Research Unit, UCL Institute of Education, University College London.
- Hirvonen, K., Hoddinott, J., Minten, B., and Stifel, D. (2017). [Children’s Diets, Nutrition Knowledge, and Access to Markets](#). *World Development*, 95, 303-315.
- HLPE. 2017. Nutrition and Food Systems. A Report by the High-Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome.
- Hoddinott, J., Headey, D., and Dereje, M. (2015). Cows, missing milk markets, and nutrition in rural Ethiopia. *The Journal of Development Studies*, 51(8), 958-975.
- Hoddinott, John (2010) “*Nutrition and Conditional Cash Transfer Programs*.” In Michelle Adato and John Hoddinott (eds.) *Conditional Cash Transfers in Latin America*. Baltimore: Johns Hopkins University Press for IFPRI.
- Hoddinott, John and Doris Weismann (2010) “*The Impact of Conditional Cash Transfer Programs on Food Consumption*.” In Michelle Adato and John Hoddinott (eds.) *Conditional Cash Transfers in Latin America*. Baltimore: Johns Hopkins University Press for IFPRI.
- Holden, S. T., K. Deininger, and H. Ghebru. (2009). Impacts of low-cost land certification on investment and productivity. *American Journal of Agricultural Economics*, 91(2), 359-373.
- Horrell, S. and Krishnan, P. 2009. Poverty and productivity in female-headed households in Zimbabwe. *Journal of Development Studies*, 43(8): 1351–1380.
- Horton, Sue and Richard Steckel (2011). “*Global Economic Losses Attributable to Malnutrition 1900-2000 and projections to 2050*,” Assessment Paper Copenhagen Consensus on Human Challenges.
- Hristov, A. N., A. T. Degaetano, CA. A. Rotz, E. Hoberg. R. H. Skinner, T. Felix, H. Li, P. H. Patterson, G. Roth, M. Hall, T. L. Ott, L. H. Baumgard, W. Staniar, R. M. Hulet, C. J. Dell, A. F. Britto, and D. Y. Hollinger (2018). Climate Change Effects on Livestock in the Northeast U.S. and Strategies for Adaptation. *Climatic Change*, 146(1-2), 33-45.
- Huang, J., Y. Jun, Z. Hu, S. Rozelle, and N. Li (2007). *Agricultural trade liberalization and poverty in China*. *China Economic Review* 18: 244-265.

- Huot, B., C.D.M. Castroverde, A.C. Velásquez, E. Hubbard, J.A. Pulman, J. Yao, K.L. Childs, K.T. Tsuda, B.L. Montgomery, and S. Yang He. 2017. Dual Impact of the Elevated Temperature on Plant Defense and Bacterial Virulence in Arabidopsis. *Nature Communications* 1808:1-12.
- Hurley, T. M., Rao, X., and Pardey, P. G. (2014). Re-examining the Reported Rates of Return to Food and Agricultural Research and Development. *American Journal of Agricultural Economics*, 96(5), 1492–1504.
- Ibarrarán, P., Medellín, N., Regalia, F., Stampini, M., Parodi, S., Tejerina, L., ... and Vásquez, M. (2017). How Conditional Cash Transfers Work: Good Practices after 20 years of Implementation. IDB Publications (Books).
- IFPRI (2012) Women's Empowerment in Agriculture Index.
- IFPRI (2014a). *Global Hunger Index: The Challenge of Hidden Hunger*. Washington, D.C.
- IFPRI (2014b). *Global Food Policy Report*. Washington, D.C.
- IFPRI (2015). *Global Hunger Index: Armed and the Challenge of Hunger*. Washington, D.C.
- Inter-American Institute for Cooperation on Agriculture (IICA) (2007). *State and Outlook for Agriculture and Rural Life in the Americas*. San José, Costa Rica.
- IFPRI (2017). *Global Food Policy Report*. Washington, D.C.
- IFPRI (2018). Quantifying the Cost and Benefits of Ending Hunger and Undernutrition. IFPRI Issue Brief. Washington, D.C.
- Imamura, F., Micha, R., Khatibzadeh, S., Fahimi, S., Shi, P., Powles, J., and Mozaffarian, D. 2015. Dietary quality among men and women in 187 countries in 1990 and 2010: a systematic assessment. *The Lancet Global Health*, 3(3): e132–e142.
- Institute for Health Metrics and Evaluation (IHME) (2014). Baseline Report for the Salud Mesoamérica Initiative 2015. Seattle, WA.
- Inter-American Development Bank (IDB) (2013). *Labor Sector Framework Document*. Washington, D.C.
- Inter-American Development Bank (IDB) (2014). *Internal Data Analysis from DHS Surveys*. 2014. Washington, D.C.
- Inter-American Development Bank (IDB) (2015). "La política de innovación en América Latina y el Caribe: nuevos caminos." Washington, D.C.
- Inter-American Development Bank (IDB) (2017). "Index of Governance and Public Policy in Disaster Risk Management: National Reports." Washington, D.C.
- International Rice Research Institute (IRRI) (2015). www.irri.org.
- Ivanic, M., and W. Martin (2008). *Implications of higher global food prices for poverty in low-income countries*. *Agricultural Economics*. 39(s1): 405-416.
- Ivanic, M., and W. Martin. 2014. Short- and Long-Run Impacts of Food Price Changes on Poverty. Policy Research Working Paper 7011. World Bank Group.
- Ivanic, M., W. Martin, H. Zaman (2011). *Estimating the Short-Run Poverty Impacts of the 2010–11 Surge in Food Prices*. Policy Research Working Paper 5633. World Bank, Washington, D.C.

- Jack, B. K. (2013). Constraints on the adoption of agricultural technologies in developing countries. Literature Review: Agricultural Technology Adoption Initiative, J-PAL (MIT) and CEGA (UC Berkeley).
- Jacoby, H. G. and Minten, B. (2007). Is land titling in Sub-Saharan Africa cost-effective? Evidence from Madagascar. *The World Bank Economic Review*, 21(3), 461-485.
- Jones, K. M. and de Brauw, A. (2015). Using agriculture to improve child health: promoting orange sweet potatoes reduces diarrhea. *World Development*, 74, 15-24.
- Jørs, Erik, et al. "Impact of training Bolivian farmers on integrated pest management and diffusion of knowledge to neighboring farmers." *Journal of agromedicine* 21.2 (2016): 200-208.
- Kabunga, N.S., S. Ghosh, and P. Webb. 2017. Does Ownership of Improved Dairy Cow Breeds Improve Child Nutrition? A Pathway Analysis for Uganda. *PloS ONE* 112(11): e0187816.
- Kangmennaang, J., Kerr, R. B., Lupafya, E., Dakishoni, L., Katundu, M., and Luginaah, I. (2017). Impact of a Participatory Agroecological Development Project on Household Wealth and Food Security in Malawi. *Food Security*, 9(3), 561–576.
- Karlan, D., R. Osei-Akoto, and C. I. Udry (2014). *Agricultural Decisions after relaxing Credit and Risk Constraints*. Bureau of Research and Economic Analysis of Development, Duke University.
- Kebede, B., and D. Korji. (2017). Pre-scaling up of improved faba bean technologies in the highland districts of Guji Zone, Oromia regional state, Ethiopia.
- Keswell, M. and Carter, M. R. (2014). Poverty and land redistribution. *Journal of Development Economics*, 110, 250-261.
- Khandker, S. R., Bakht, Z., and Koolwal, G. B. (2009). The poverty impact of rural roads: Evidence from Bangladesh. *Economic Development and Cultural Change*, 57(4), 685-722.
- Khonje, M., Mkandawire, P., Manda, J., and Alene, A. D. (2015). Analysis of adoption and impacts of improved cassava varieties in Zambia. In 29th Triennial Conference of the International Association of Agricultural Economists (IAAE) in Milan Italy from 8th–14th August.
- Kilic, T., Palacios-Lopez, A., and Goldstein, M. (2015). Caught in a productivity trap: a distributional perspective on gender differences in Malawian agriculture. *World Development*, 70, 416-463.
- Komatsu, H., Malapit, H. J., and Theis, S. (2015). How does women's time in reproductive work and agriculture affect maternal and child nutrition? Evidence from Bangladesh, Cambodia, Ghana, Mozambique, and Nepal.
- Krivonos, E. and R. da Paixao (2015). *Trade Policy and Food Security in Latin America in "Trade Policy and Food Security: Improving Access to Food in Developing Countries in the Wake of High World Prices,"* I. Gillson and A. Fouad, editors. Washington, D.C., World Bank.
- Kumar, D. and Kalita, P. (2017). Reducing postharvest losses during storage of grain crops to strengthen food security in developing countries. *Foods*, 6(1), 8.

- Kumar, N. and Quisumbing, A. (2013). *Gendered Impacts of the 2007–2008 Food Price Crisis: Evidence Using Panel Data*. *Food Policy* 38:11–22.
- Kumar, N. and Quisumbing, A. (2014). *Gender, shocks, and resilience* (Vol. 11). Intl Food Policy Res Inst.
- Kumar, N., Harris, J., and Rawat, R. (2015). If they grow it, will they eat and grow? Evidence from Zambia on agricultural diversity and child undernutrition. *The Journal of Development Studies*, 51(8), 1060-1077.
- Kumase, W.N., Bisseleua, H. and Klasen, S. (2008). *Opportunities and constraints in agriculture: a gendered analysis of cocoa production in Southern Cameroon*. Discussion paper No. 27. Göttingen, Germany, Courant Research Centre “Poverty, Equity and Growth,” University of Göttingen.
- Kuwornu, J. and Owusu, E. (2012). Irrigation access and per capita consumption in farm households: Evidence from Ghana. *Journal of Development and Agricultural Economics*, 4(3): 78-92.
- Laborde, D. (2018) Macroeconomic Benefits of Ending Hunger by 2030. Unpublished.
- Laderach, P., A. Jarvis, and J. Ramírez. 2009. The Impact of Climate Change in Coffee-Growing Regions: The Case of 10 Municipalities in Nicaragua. Adaptation for Smallholders to Climate Change (AdapCC).
- Lamontagne, J. F., P. L. Engle, and M. F. Zeitlin (1998). *Maternal employment, child care, and nutritional status of 12-18-month children in Managua, Nicaragua*. *Social Science and Medicine*. 46(3): 403-414.
- Lau, C., Jarvis, A., and Ramírez, J. 2010. Colombian Agriculture: Adapting to Climate Change, Policy Brief, CIAT.
- Lawry, S., Samii, C., Hall, R., Leopold, A., Hornby, D., and Mtero, F. (2017). The impact of land property rights interventions on investment and agricultural productivity in developing countries: a systematic review. *Journal of Development Effectiveness*, 9(1), 61-81.
- Le Cotty, T., Maitre D’Hotel, E., and Ndiaye, M. (2017). Transport Costs and Food Price Volatility in Africa. *Journal of African Economies*, 26(5), 625-654.
- Lipper, L., Thornton, P., Campbell, B. M., Baedeker, T., Braimoh, A., Bwalya, M., ... and Hottle, R. (2014). Climate-smart agriculture for food security. *Nature Climate Change*, 4(12), 1068.
- Loayza, N., E. Olaberria, J. Rigolini, and L. Christiansen (2009). “*Natural Disasters and Growth: Going Beyond the Averages*.” Policy Research Working Paper 4980, World Bank, Washington, D.C.
- López, R. and Galinato, G. I. (2007). Should governments stop subsidies to private goods? Evidence from rural Latin America. *Journal of Public Economics*, 91(5-6), 1071-1094.
- Lopez, R., G. I. Galinato, and A. Islam. (2011). Fiscal spending and the environment: Theory and empirics. *Journal of Environmental Economics and Management*, 62(2), 180-198.

- López, C. A., and L. Salazar. (2017). Unraveling the Threads of Decentralized Community-Based Irrigation Systems in Bolivia (No. IDB-WP-00886). Inter-American Development Bank.
- Los Santos-Montero, D., Luis, A., and Bravo-Ureta, B. E. (2017, November). Productivity effects and natural resource management: econometric evidence from POSAF-II in Nicaragua. In *Natural Resources Forum* (Vol. 41, No. 4, pp. 220-233). Blackwell Publishing Ltd.
- Magrini E., P. Montalbanob, S. Nenci, L. Salvatici, (2013). *Agricultural trade distortions during recent international price spikes: what implications for food security?* ETSG-2013, Birmingham, 15th Annual Conference, 12-14 September 2013 University of Birmingham.
- Malapit, H. J. L., Kadiyala, S., Quisumbing, A. R., Cunningham, K., and Tyagi, P. (2015). Women's empowerment mitigates the negative effects of low production diversity on maternal and child nutrition in Nepal. *The journal of development studies*, 51(8), 1097-1123.
- Mancipe Navarrete, J. A., Garcia Villamil, S. S., Correa Bautista, J. E., Meneses-Echávez, J. F., González-Jiménez, E., and Schmidt-RioValle, J. (2015). Efectividad de las intervenciones educativas realizadas en América Latina para la prevención del sobrepeso y obesidad infantil en niños escolares de 6 a 17 años: una revisión sistemática. *Nutrición hospitalaria*, 31(1).
- Manley, James, Seth Gitter, and Vanya Slavchevska (2012). *How Effective are Cash Transfer Programmes at Improving Nutritional Status? A Rapid Evidence Assessment of Programmes' Effects on Anthropometric Outcomes*. London: EPPI-Centre, University of London.
- Markussen, T. (2008). Property Rights, Productivity, and Common Property Resources: Insights from Rural Cambodia. *World Development*, 36(11), 2277-2296.
- Martin W., K. Anderson (2012). *Export restrictions and price insulation during commodity price booms*, *American Journal of Agricultural Economics*, 94, 1.
- Martinez, R. and Andres Fernandez (2008). "The cost of hunger: Social and economic impact of child undernutrition in Central America and the Dominican Republic," Chile: ECLAC and World Food Programme.
- Martorell, R. (2012). Intervention and Policy Options for Combating Malnutrition in Guatemala. IDB. Washington, D.C.
- Masset, E., L. Haddad, A. Cornelius, J. Isaza-Castro. (2011). *A systematic review of agricultural interventions that aim to improve nutritional status of children*. London: EPPI-Centre, Social Science Research Unit, Institute of Education, University of London.
- Maxwell, S. (1998). *Food Security: A Post-Modern Perspective*. *Food Policy*, 21(2).
- McDermott, J., Ait-Aïssa, M., Morel, J., and Rapando, N. (2013). Agriculture and household nutrition security—development practice and research needs. *Food security*, 5(5), 667-678.
- Medek, D.E., J. Schwartz, and S. S. Myers. 2017. Estimated Effects of Future Atmospheric CO₂ Concentrations on Protein Intake and the Risk of Protein Deficiency by Country and Region. *Environmental Health Perspectives* 125(8): 087002.

- Meinzen-Dick, R., Johnson, N., Quisumbing, A., Njuki, J., Behrman, J., Rubin, D., ... and Waithanji, E. M. (2011). Gender, assets, and agricultural development programs: A conceptual framework.
- Meng, T., W. J. Florkowski, D. Sarpong, A. V. A. Resurreccion, and M. Chinnan (2013). *The determinants of food expenditures in the urban households of Ghana: a quantile regression approach*. Selected Paper prepared for presentation at the Southern Agricultural Economics Association (SAEA) Annual Meeting, Orlando, Florida, 3-5 February, 2013.
- Met Office and WFP. 2012. Climate Impacts on Food Security and Nutrition: A Review of Existing Knowledge.
- Miller, L. C., N. Joshi, M. Lohani, B. Rogers, M. Loraditch, R. Houser, and S. Mahato. (2014). Community development and livestock promotion in rural Nepal: effects on child growth and health. *Food and nutrition bulletin*, 35(3), 312-326.
- Minot, N. (2013). *How volatile are African food prices?* IFPRI Research Brief 19. IFPRI: Washington, D.C. Mutambuki, K and M. Ngatia (2012). *Assessment of grain damage and weight loss on farm stored maize in highlands areas of Kenya*. *Journal of Agricultural Science and Technology* B2 349-366.
- Mishra, A. K., Khanal, A. R., and Pede, V. O. (2017). Is direct seeded rice a boon for economic performance? Empirical evidence from India. *Food Policy*, 73, 10-18.
- Moench-Pfanner, R., de Pee, S., Bloem, M. W., Foote, D., Kosen, S., and Webb, P. (2005). Food-for-work programs in Indonesia had a limited effect on anemia. *The Journal of Nutrition*, 135(6), 1423-1429.
- Morris, Saul S., et al. Hurricane Mitch and the livelihoods of the rural poor in Honduras. *World Development*, 30.1 (2002): 49-60.
- Mullally, C. and Chakravarty, S. (2017). *Are Matching Funds for Smallholder Irrigation Money Well Spent?* Working Paper (July).
- Myers, S.S., M.R. Smith, S. Guth, C.D. Golden. B. Vaitla, N.D. Mueller, A.D. Dangour, and P. Huybers. 2017. Climate Change and Global Food Systems: Potential Impacts on Food Security and Undernutrition. *Annu. Rev. Public Health* 38:259-277.
- Nelson, G. C., M. W. Rosegrant, R. Robertson, T. Sulser, T. Zhu, C. Ringler, S. Msangi, A. Palazzo, M. Batka, M. Magalhães, R. Valmonte-Santos, M. Ewing, D. Lee (2009). *Climate change: impact on agriculture and costs of adaptation*. *Food Policy Report*. IFPRI.
- Nelson, G.C., M.W. Rosegrant, A. Palazzo, I. Gray, C. Ingersoll, R. Robertson, S. Tokgoz, T. Zhu, T.N. Sulser, C. Ringler, S. Msangi, and L. You. 2010. *Food Security, Farming, and Climate Change to 2050: Scenarios, Results, Policy Options*. IFPRI.
- Nin-Pratt, A., C. Falconi, P. Martel, and C. Ludena (unpublished). *Productivity and the Performance of Agriculture in Latin America and the Caribbean: From the Lost Decade to the Commodity Boom*. Document presented at the Seminar on Agricultural Productivity in Latin America and the Caribbean, November 2014. Washington, D.C. IDB.
- Nkhata, R., Ch. Jumbe and M. Mwabumba (2014). *Does irrigation have an impact on food security and poverty?* Working Paper 04, IFPRI, Washington, D.C.

- OECD (2006). *Agricultural Policy and Trade Reform: Potential Effects at Global, National and Household Levels*, OECD Publishing, Paris.
- OECD (2013). *Global food security: challenges for the food and agricultural system*. Paris: OECD.
- Oliva Rodríguez, R., Tous Romero, M., Gil Barcenilla, B., Longo Abril, G., Pereira Cunill, J. L., and García Luna, P. P. (2013). *Impacto de una intervención educativa breve a escolares sobre nutrición y hábitos saludables impartida por un profesional sanitario*. *Nutrición Hospitalaria*, 28(5), 1567-1573.
- Olivari, J. and Navarro, J. C. (2016). La política de innovación en América Latina y el Caribe: nuevos caminos.
- Olney, D. K., Bliznashka, L., Pedehombga, A., Dillon, A., Ruel, M. T., and Heckert, J. (2016). A 2-Year Integrated Agriculture and Nutrition Program Targeted to Mothers of Young Children in Burkina Faso Reduces Underweight among Mothers and Increases Their Empowerment: A Cluster-Randomized Controlled Trial–3. *The Journal of Nutrition*, 146(5), 1109-1117.
- Olney, D. K., Pedehombga, A., Ruel, M. T., and Dillon, A. (2015). A 2-Year Integrated Agriculture and Nutrition and Health Behavior Change Communication Program Targeted to Women in Burkina Faso Reduces Anemia, Wasting, and Diarrhea in Children 3–12.9 Months of Age at Baseline: A Cluster-Randomized Controlled Trial–3. *The Journal of Nutrition*, 145(6), 1317-1324.
- Osei, A., Pandey, P., Nielsen, J., Pries, A., Spiro, D., Davis, D., and Haselow, N. (2017). Combining home garden, poultry, and nutrition education program targeted to families with young children improved anemia among children and anemia and underweight among nonpregnant women in Nepal. *Food and nutrition bulletin*, 38(1), 49-64.
- Ovalle-Rivera O., Läderach, P., Bunn, C., Obersteiner, M., and Schroth, G. 2015. Projected Shifts in *Coffea arabica* Suitability among Major Global Producing Regions Due to Climate Change. *PLoS ONE*, 10(4):1-13.
- Palacios-López, A. and Lopez, R. (2014). *Gender differences in agricultural productivity: the role of market imperfections* (No. 164061).
- Palmer, A. C., Siamusantu, W., Chileshe, J., Schulze, K. J., Barffour, M., Craft, N. E., ... and Caswell, B. (2016). Provitamin A–biofortified maize increases serum β -carotene, but not retinol, in marginally nourished children: a cluster-randomized trial in rural Zambia, 2. *The American Journal of Clinical Nutrition*, 104(1), 181-190.
- Pandey, V. L., Dev, S. M., and Jayachandran, U. (2016). Impact of agricultural interventions on the nutritional status in South Asia: A review. *Food Policy*, 62, 28-40.
- Peterman, A., J. A. Behrman, and A. R. Quisumbing. (2010). A review of empirical evidence on gender differences in nonland agricultural inputs, technology, and services in developing countries.
- Phalkey, R.K., C. Aranda-Jan, S. Marx, B. Höfle, and R. Sauerborn. 2015. Systematic Review of Current Efforts to Quantify the Impacts of Climate Change on Undernutrition. *PNAS-E4522-E4529*.

- Popkin, B. M., F. S. Solon, T. Fernandez, and M. C. Latham (1980). *Benefit-cost analysis in the nutrition area: a project in the Philippines. Social Science and Medicine*. 14C: 207-216.
- Popkin, B.M, L.S. Adair and Shu Wen Ng (2012). Now and Then: The Global Nutrition Transition: The Pandemic of Obesity in Developing Countries. *Nutrition Review* 2012 January 70(1): 3–21.
- Pradel, W., G. Hareau, L. Quintanilla, and V. Suarez. (2017). Adopción e impacto de variedades mejoradas de papa en el Peru: Resultado de una encuesta a nivel nacional (2013).
- Pretty, J. and Bharucha, Z. P. (2015). Integrated pest management for sustainable intensification of agriculture in Asia and Africa. *Insects*, 6(1), 152-182.
- Prüss-Ustün, A., Bartram, J., Clasen, T., Colford, J. M., Cumming, O., Curtis, V., ... and Freeman, M. C. (2014). Burden of disease from inadequate water, sanitation and hygiene in low-and middle-income settings: a retrospective analysis of data from 145 countries. *Tropical Medicine & International Health*, 19(8), 894-905.
- Pyakuryal, B., Roy, D., and Thapa, Y. B (2010). Trade liberalization and food security in Nepal. *Food Policy*, vol. 35, no 1, p. 20-31.
- Qin, Y. and Zhang, X. (2016). The road to specialization in agricultural production: Evidence from rural China. *World Development*, 77, 1-16.
- Quisumbing, A. R. (2003). Food aid and child nutrition in rural Ethiopia. *World Development*, 31(7), 1309-1324.
- Quisumbing, A. R. (2013). Generating evidence on individuals' experience of food insecurity and vulnerability. *Global Food Security*, 2(1), 50-55.
- Quisumbing, A.R., R. Meinzen-Dick, T. Raney, A. Croppenstedt, J. Behrman, and A. Peterman, eds. *Gender in agriculture. Closing the knowledge gap*, pp. 343–370. Dordrecht, The Netherlands, Springer (2014).
- Ramírez-López, E., Grijalva-Haro, M. I., Valencia, M. E., Ponce, J. A., and Artalejo, E. (2005). Impacto de un programa de desayunos escolares en la prevalencia de obesidad y factores de riesgo cardiovascular en niños sonorenses, *Salud Pública México* 47(2), 126-133.
- Rasella, D., Aquino, R., Santos, C. A., Paes-Sousa, R., and Barreto, M. L. (2013). Effect of a conditional cash transfer programme on childhood mortality: a nationwide analysis of Brazilian municipalities. *The Lancet*, 382(9886), 57-64.
- Rasul, G. (2016). Managing the food, water, and energy nexus for achieving the Sustainable Development Goals in South Asia. *Environmental Development*, 18, 14-25.
- Ratner, R., Durán, S., Balmaceda, S., and Atalah, E. (2013). Impacto de una intervención en alimentación y nutrición en escolares. *Revista chilena de pediatría*, 84(6), 634-640.
- Regattieri, A., Gamberi, M., and Manzini, R. (2007). Traceability of food products: General framework and experimental evidence. *Journal of Food Engineering*, 81(2), 347-356.
- Rivera, J.A., T. Gonzales de Cossio, S. Pedraza, C. Aburta, G. Sanchez, R. Martorell (2013). Childhood and Adolescent Overweight and Obesity in Latin America: a systematic review. *The Lancet*.

- Robles, M. and M. Torero (2010). Understanding the impact of high food prices in Latin America. *Economía*, 10(2): 117-164.
- Rocourt, J. R., Moy, G. G., Vierk, K., Schlundt, J., and World Health Organization (2003). The present state of foodborne disease in OECD countries.
- Rodriguez-Takeuchi, L. and K. S. Imai (2013). Food price surges and poverty in urban Colombia: New evidence from household survey data. *Food Policy*, 43: 227-236.
- Rosegrant, M. W., E. Magalhaes, R. A. Valmonte-Santos, and D. M. D'Croz. (2015). Returns to investment in reducing postharvest food losses and increasing agricultural productivity growth. *Food Security and Nutrition Assessment Paper. Copenhagen Consensus Center*.
- Rubalcava, L., G. Teruel, and D. Thomas. 2009. "Investments, Time Preferences and Public Transfers Paid to Women." *Economic Development and Cultural Change* 57 (3): 507-538.
- Ruel (2001). Can Food-Based Strategies Help Reduce Vitamin A and Iron Deficiencies? IFPRI, Washington, D.C.
- Ruel, M. R., H. Alderman, and the Maternal and Child Nutrition Study Group (2013). Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? *The Lancet*. 382(9891): 536-551.
- Ruel, M. T., Quisumbing, A. R., and Balagamwala, M. (2017). *Nutrition-sensitive agriculture: What have we learned and where do we go from here?* (Vol. 1681). Intl Food Policy Res Inst.
- Ruiz-Arranz, M., Davis, B., Handa, S., Stampini, M., Winters, P. (2006). Program Conditionality and Food Security: The Impact of PROGRESA and PROCAMPO Transfers in Rural Mexico. *Revista Economía*.
- Rutten M., Shutes L. and Meijerink G. (2011). Sit down at the ball game: How trade barriers make the world less food secure, *Food Policy*, 38.
- Salazar, L., J. Aramburu, M. González-Flores, and P. Winters (2015). Food Security and Productivity: Impacts of Technology Adoption in Small Subsistence Farmers in Bolivia, IDB Working Paper Series, IDB-WP-567, Washington, D.C.
- Salazar, L., J. Aramburu, M. González-Flores, and P. Winters. (2016). Sowing for food security: A case study of smallholder farmers in Bolivia. *Food Policy*, 65, 32-52.
- Salazar, L., J. Fahsbender, and N. Kim. (2017). Livestock Transfers, Food Security and Women's Empowerment: Evidence from a Randomized Phased-in Program in Nicaragua.
- Salazar, L. and Quisumbing, A. (2009, March). Assessing the impact of gendered labor markets in the rural Philippines. In Paper for the FAO, IFAD, and ILO Workshop on Gaps, Trends and Current Research in Gender Dimensions of Agricultural and Rural Employment: Differentiated Pathways out of Poverty. Rome (Vol. 31).
- Salazar, L., P. Winters, L. Maldonado, G. Hareau, and G. Thiele. (2009). Assessing the impact of late blight resistant varieties on smallholders' potato production in the Peruvian Andes. International Potato Center.

- Sanghvi, T., R. Haque, S. Roy, K. Afsana, R. Seidel, S. Islam, and J. Baker. (2016). Achieving behaviour change at scale: Alive & Thrive's infant and young child feeding programme in Bangladesh. *Maternal & child nutrition*, 12(S1), 141-154.
- Sarig, Y. (2003). Traceability of food products.
- Schady, N. and J. Rosero (2008). Are cash transfers made to women spent like other sources of income? *Economic Letters*. 101(3): 246-248.
- Schmeer, K. K. (2005). Married women's resource positions and household food expenditure in Cebu, Philippines. *Journal of Marriage and Family*, 67(2): 339-409.
- Schmidhuber, J. and F.N. Tubiello. 2007. Global Food Security Under Climate Change. *PNAS*-104(50): 19703-19708.
- Schreinemachers, P., Patalagsa, M. A., and Uddin, N. (2016). Impact and cost-effectiveness of women's training in home gardening and nutrition in Bangladesh. *Journal of Development Effectiveness*, 8(4), 473-488.
- Seymour, G. (2017). Women's empowerment in agriculture: Implications for technical efficiency in rural Bangladesh. *Agricultural Economics*, 48(4), 513-522.
- Shamdasani, Y. (2016). Rural Road Infrastructure and Agricultural Production: Evidence from India. Working Paper (23 December 2016), Department of Economics, Columbia University, USA.
- Shephard, G.S. (2008). Risk assessment of aflatoxins in food in Africa. *Food Additives and Contaminants: Part A: Chemistry, Analysis, Control, Exposure and Risk Assessment*.
- Shiferaw, B., Kassie, M., Jaleta, M., and Yirga, C. (2014). Adoption of improved wheat varieties and impacts on household food security in Ethiopia. *Food Policy*, 44, 272-284.
- Shively, G. and Thapa, G. (2017). Markets, transportation infrastructure, and food prices in Nepal. *American Journal of Agricultural Economics*, 99(3), 660-682.
- Shrestha, S. A. (2017). Roads, Participation in Markets, and Benefits to Agricultural Households: Evidence from the Topography-based Highway Network in Nepal. Working Paper (20 February 2017), Department of Economics, National University of Singapore.
- Sibhatu, K. T. and Qaim, M. (2017). Rural Food Security, Subsistence Agriculture, and Seasonality. *PLoS One*, 12(10), e0186406.
- Slavchevska, V. (2015). Agricultural production and the nutritional status of family members in Tanzania. *The Journal of Development Studies*, 51(8), 1016-1033.
- Smith, M.R., C.D. Golden, and S.S. Myers. 2017. Potential Rise in Iron Deficiency Due to Future Anthropogenic Carbon Dioxide Emissions. *GeoHealth* 1: 248-527.
- Spears D. and L. Haddad (2015). *Why Sanitation Matters for Nutrition in Global Food Policy Report 2014-2015*, IFRPI, Washington, D.C.
- Stads G. and N. Beintema (2009). *Public Agricultural Research in Latin America and the Caribbean*, IFPRI-BID.
- Stamoulis, K. G. and Zezza, A. (2003). *A conceptual framework for national agricultural, rural development, and food security strategies and policies*. Food and Agriculture Organization of the United Nations. Agricultural and Development Economics Division.

- Stampini, M. and Tornarolli, L. (2012). *The growth of conditional cash transfers in Latin America and the Caribbean: did they go too far?* (No. 49). IZA Policy Paper.
- Stifel, D. and Minten, B. (2008). Isolation and agricultural productivity. *Agricultural Economics*, 39(1), 1-15.
- Stifel, D. and Minten, B. (2017). Market Access, Well-Being, and Nutrition: Evidence from Ethiopia. *World Development*, 90, 229-241.
- Strosnider H., Azziz-Baumgartner E., Banziger M., Bhat R.V., Breiman R., Brune M., DeCock K., Dilley A., Groopman J., Hell K., Henry S.H., Jeffers D., Jolly C., Jolly P., Kibata G.N., Lewis L., Liu X., Luber G., McCoy L., Mensah P., Miraglia M., Misore A., Njapau H., Ong C., Onsongo M.T.K., Page S.W., Park D., Patel M., Phillips T., Pineiro M., Pronczuk J., Schurz Rogers H., Rubin C., Sabino M., Schaafsma A., Shephard G., Stroka J., Wild C., Williams J.T., Wilson D. (2006). *Workgroup Report: Public Health Strategies for Reducing Aflatoxin Exposure in Developing Countries. Environmental Health Perspectives*. 114:1989-1903.
- Sturzenegger, G., Martinez, S., and Gertner, G. (2016). *Expandiendo acceso a agua potable y saneamiento en pequeñas comunidades rurales: Resultados de la encuesta de línea de base de una evaluación de impacto experimental*. Inter-American Development Bank.
- Swiss Re. (2016). Agricultural insurance in Latin America: taking root.
- Tamru, S. (2013). *Spatial integration of cereal markets in Ethiopia*. ESSP Working Paper 56. Addis Ababa, Ethiopia: Ethiopian Development Research Institute, Ethiopia Strategy Support Program (ESSP).
- Tefera, T., Kanampiu, F., De Groote, H., Hellin, J., Mugo, S., Kimenju, S., ... and Banziger, M. (2011). The metal silo: An effective grain storage technology for reducing post-harvest insect and pathogen losses in maize while improving smallholder farmers' food security in developing countries. *Crop protection*, 30(3), 240-245.
- Tesfamariam, B. Y., Owusu-Sekyere, E., Emmanuel, D., and Elizabeth, T. B. The impact of the homestead food garden programme on food security in South Africa. *Food Security*, 1-16.
- The Global Nutrition Report (2017). www.globalnutritionreport.org.
- Timmer, P. (2015). *Food Security and Scarcity: Why Ending Hunger Is So Hard*. University of Pennsylvania Press, Philadelphia.
- Tirado, M. C., Crahay, P., Mahy, L., Zanev, C., Neira, M., Msangi, S., and Müller, A. (2013). Climate change and nutrition: creating a climate for nutrition security. *Food and Nutrition Bulletin*, 34(4), 533-547.
- Todd, J., Winters, P. and Hertz, T. (2010) *Conditional Cash Transfers and Agricultural Production: Lessons from the Oportunidades Experience in Mexico*. *Journal of Development Studies* 46(1), 39-67.
- Tong, T., Yu, T. H. E., Cho, S. H., Jensen, K., and Ugarte, D. D. L. T. (2013). Evaluating the spatial spillover effects of transportation infrastructure on agricultural output across the United States. *Journal of Transport Geography*, 30, 47-55.
- Torero, M. and Field, E. (2005). Impact of land titles over rural households. Washington: Inter-American Development Bank, Working Paper OVE/WP-07.

- UNSCN (2016). *Investments for Healthy Food Systems*. United Nations System Standing Committee on Nutrition. Rome.
- USDA (United States Department of Agriculture) (2013) *International Food Security Assessment, 2012-22*. United States Department of Agriculture, Washington, D.C.
- Valdés, A. (2013). *Documento para la Oficina de Evaluación y Supervisión del BID. Desafíos del Sector Agropecuario en América Latina y el Caribe: Panorama y Sugerencias*. Washington, D.C.
- Van den Bold, M., Quisumbing, A. R., and Gillespie, S. (2013). *Women's Empowerment and Nutrition: An Evidence Review* (Vol. 1294). Intl Food Policy Res Inst.
- Van den Bossche, P., and J.A.W. Coetzer. 2008. Climate Change and Animal Health in Africa. *Rev. Sci. Tech.* 27(2): 551-562.
- Van den Broeck, K., C. Newman, and F. Tarp. (2007). Land titles and rice production in Vietnam (No. 07-32).
- Veras Soares, F., Perez Ribas, R., and Issamu Hirata, G. (2010) *Impact evaluation of a rural conditional cash transfer programme on outcomes beyond health and education. Journal of Development Effectiveness* 2(1), 138-157.
- Vergara, Walter, Ana R. Rios, Luis M. Galindo, Pablo Gutman, Paul Isbell, Paul H. Suding, and Jose Luis Samaniego (2013). *The Climate and Development Challenge for Latin America and the Caribbean: Options for Climate-Resilient Low-Carbon Development*. Inter-American Development Bank, Washington, D.C.
- Verkaart, S., Munyua, B. G., Mausch, K., and Michler, J. D. (2017). Welfare impacts of improved chickpea adoption: A pathway for rural development in Ethiopia? *Food policy*, 66, 50-61.
- Villena, M. (2013). Evaluación de Impacto de los Programas de Alimentación de la JUNAE, Ministry of Education.
- Von Grebmer, Klaus; Bernstein, Jill; Hossain, Naomi; Brown, Tracy; Prasai, Nilam; Yohannes, Yisehac; Patterson, Fraser; Sonntag, Andrea; Zimmerman, Sophia-Maria; Towey, Olive; and Foley, Connell. 2017. 2017 Global Hunger Index: The inequalities of hunger. Washington, D.C.; Bonn; and Dublin: International Food Policy Research Institute, Welthungerhilfe, and Concern Worldwide.
- Waters, E., de Silva-Sanigorski, A., Burford, B. J., Brown, T., Campbell, K. J., Gao, Y., ... and Summerbell, C. D. (2011). Interventions for preventing obesity in children. *The Cochrane Library*.
- Web, Patrick. (2012). "Impact Pathways from Agricultural Research to Improved Nutrition and Health: Literature Analysis and Research Priorities." ICN2 Second International Conference on Nutrition—better nutrition better lives. FAO, WHO.
- WFP. 2014. Loss and Damage Repairing Shattered Lives. Black & White Paper Series Paper No. 1. WFP Regional Bureau for Asia.
- WHO (2013). Diarrheal disease – Fact sheet No 330. Data retrieved 13 December 2013 from WHO website; available at <http://www.who.int/mediacentre/factsheets/fs330/en/index.html>.

- WHO (2013b). Obesity and overweight. Factsheet No. 311. 2012. Retrieved 3 May 2013; available at: <http://www.who.int/mediacentre/factsheets/fs311/en/>.
- WHO (2016) <http://www.who.int/mediacentre/factsheets/fs311/en/>.
- WHO (2016b). Consideration of the evidence on childhood obesity for the Commission on Ending Childhood Obesity: Report of the ad hoc working group on science and evidence for ending childhood obesity, Geneva, Switzerland.
- WHO (World Health Organization) (2014). World Health Statistics (2014). WHO Press, Geneva.
- Willaarts, B., A. Garrido, and M. R. Llamas (2014). *Water for Food and Wellbeing in Latin America and the Caribbean. Social and Environmental Implications for a Globalized Economy*. Routledge, Oxon, and New York.
- Winters, P., C. Falconi., P. Martel., J. Miranda, and M. Paiva (2015) Background Paper for the Food Security Sector Framework Document.
- Winters, P. C.; L. Salazar, and A. Maffioli (2010). *Designing Impact Evaluations for Agricultural Projects*. Technical Note IDB-TN-198, Inter-American Development Bank.
- Winters, P., B. Davis, G. Carletto, K. Covarrubias, E. J. Quiñones, A. Zezza, C. Azzarri, K. Stamoulis (2009). *Assets, activities and rural income generation: evidence from a multicountry analysis*. *World Development*. 37(9): 1435-1452.
- World Bank (2008). World Development Report 2008: *Agriculture for Development*. World Bank, Washington, D.C.
- World Bank (2009). "Eastern Africa: A Study of the Regional Maize Market and Marketing Costs." Agriculture and Rural Development Unit, Africa Region, World Bank, Washington, D.C.
- World Bank (2011a). *High food prices: Latin America and the Caribbean responses to a new normal*. World Bank, Washington, D.C.
- World Bank (2011b). *Russia and Central Asia: Win-win approaches in trade integration*. Washington, D.C.
- World Bank (2011c). *Missing Food: The Case of Postharvest Grain Losses in Sub-Saharan Africa*. Washington, D.C.
- World Bank (2012). Africa can help feed Africa: Removing barriers to regional trade in food staples, African Regional Report No. 6650-AFR. Washington, D.C.
- World Bank (2013). Poverty Action Lab. Washington, D.C.
- World Bank (2014). Logistic Performance Index, <http://www.lpi.worldbank.org>.
- World Bank (2018). World Bank Open Data. Washington, D.C. Retrieved from <https://data.worldbank.org/>.
- World Economic Forum (2017) <https://www.weforum.org/agenda/2016/12/this-map-shows-how-much-each-country-spends-on-food/> (date retrieved: July 2, 2018).
- Wu, F., C. Narrod, M. Tiangco, and Y. Liu (2011). *The health economics of aflatoxin: global burden of disease*. Working Paper 4. International Food Policy Research Institute, Washington, D.C.

Yoong, J., Rabinovich, L., and Diepeveen, S. (2012). The Impact of Economics Transfers to Women vs. Men: A Systematic Review. EPPI-Centre, Social Science Research Unit, Institute of Education, University of London. Available at: <http://eppi.ioe.ac.uk/cms/LinkClick.aspx>.

Zeza, A., G. Federighi, A. A. Kalilou, and P. Hiernaux. (2016). Milking the data: Measuring milk off-take in extensive livestock systems. Experimental evidence from Niger. *Food policy*, 59, 174-186.