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Agriculture for Nutrition in Latin America and the Caribbean: From Quantity to Quality



SecureNutrition
linking agriculture, food security, and nutrition



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June 10, 2013

This Document is a Guidance Note for Task Managers and Decision Makers working on the agriculture sector in the Latin American and the Caribbean region and serves as a Companion to the Global Guidance Note: “Improving Nutrition Through Multisectoral Approaches”, World Bank, 2013.



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Abbreviations and acronyms

CDD	Community Driven Development
CESCR	Committee on Economic, Social and Cultural Rights
CGIAR	Consultative Group on International Agricultural Research
DDI	Dietary Diversity Index
DES	Daily Energy Supply
FAO	Food and Agriculture Organization
FCS	Food Consumption Score
GFSP	Global Food Safety Program
GAFSP	Global Agriculture and Food Security Program
HDDS	Household Dietary Diversity Score
IDA	International Development Agency
IFPRI	International Food Policy Research Institute
MDG	Millennium Development Goals
NTAE	Non-Traditional Agricultural Exports
PDO	Project Development Objective
PPP	Public Private Partnership
TTLs	Task Team Leaders
WDI	World Development Indicators
WFP	World Food Program
WHO	World Health Organization



Foreword

Dear Colleagues:

In an era of high volatility of food prices, and in trying to achieve the twin goals of shared prosperity and poverty reduction, no other topic is more front and center than nutrition. Food security is the ability of all people at all times to have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs for an active and healthy life. Maintaining food security remains a huge challenge, despite increases in global food production in recent decades, in particular from the Latin America and Caribbean Region. Furthermore, in recent years, amid the food, fuel and financial crises, hunger and malnutrition have grown significantly in a large number of low-income countries.

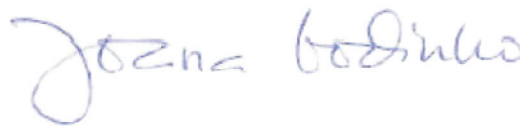
In Latin America and the Caribbean, not only millions of low income families, in particular in rural areas, suffer from deficiencies in micronutrients such as iron, zinc and vitamin A (which has serious implications for the health, survival and optimal cognitive development of vulnerable populations such as pregnant women and children in the first 1000 days of life), but also obesity has become a serious problem, where the rural poor in the region have comparable obesity rates as in high income countries. But agriculture and food production makes up an important percentage of the economy of the region, as well as the single most important source of income for the low income households in rural areas. The challenge is how to bridge the gap that exists in our region between being an agriculture powerhouse and yet having to tackle nutrition problems from the same households that produce the food.

The Latin America and Caribbean Region has been in many ways successful in increasing agriculture production and competitiveness, as well as tackling nutrition. The new challenge of integrating nutrition and agriculture should be achievable with political leadership and inter-institutional coordination. This Guidance Note seeks to bridge some of the important knowledge gaps on how best to identify, design, implement, monitor and evaluate agriculture and food security interventions. We need to think critically and to carefully plan sustainable solutions that address the challenges of linking agriculture with nutrition interventions.

Sincerely,



Laurent Msellati
Sector Manager
Agriculture and Rural Development



Joana Godinho
Sector Manager
Health, Nutrition and Population



I. Introduction

The right to adequate food is realized when every man, woman and child, alone or in community with others, has the physical and economic access at all times to adequate food or means for its procurement.

– General Comment 12 (CESCR)

A. Motivation

Mainstreaming nutrition considerations into agriculture operations could increase the availability of and access to nutritious food, which can improve the nutrition status of individuals (Hoddinott, J., 2012). The international community has increased its efforts to highlight the linkages between nutrition and agriculture. This Guidance Note aims to bridge the gap between the conceptual framework and tools that were proposed in the Global Guidance Note¹, presenting policy-makers and Project Managers (Task Team Leaders – TTLs) with a set of tools and examples of initiatives and

operations in LAC to mainstream nutrition outcomes into agriculture sector policies and investments. This Note describes first the current situation in LAC with respect to agriculture and nutrition, then offers practical guidance to TTLs regarding the available levers for positively impacting nutrition outcomes of agriculture projects, and presents a series of country notes and steps to be followed in designing nutrition sensitive interventions.

Nutrition-sensitive agriculture is central to ensuring food security. For over half a century, food security has been on the development agenda and the concept has evolved from focusing on production targets, often in combination with national food self-sufficiency objectives, to recognizing the importance of nutrition education, accessibility, affordability and availability of nutritious food. Per capita daily energy supply (DES) and caloric intake have been used to measure food security and it has long been assumed

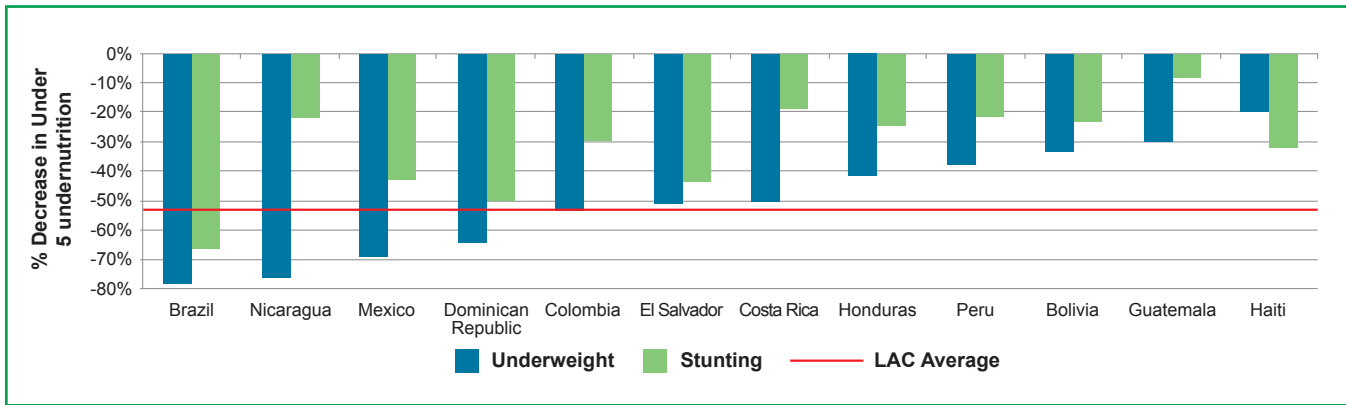
Figure 1. Share of Food Trade in LAC vs other Regions (only developing countries)



Source: WDI-COMTRADE

¹ <https://www.securenutritionplatform.org/Pages/DisplayResources.aspx?RID=151>

Figure 2.A. Reduction in Undernutrition in LAC Countries (1990-2005)

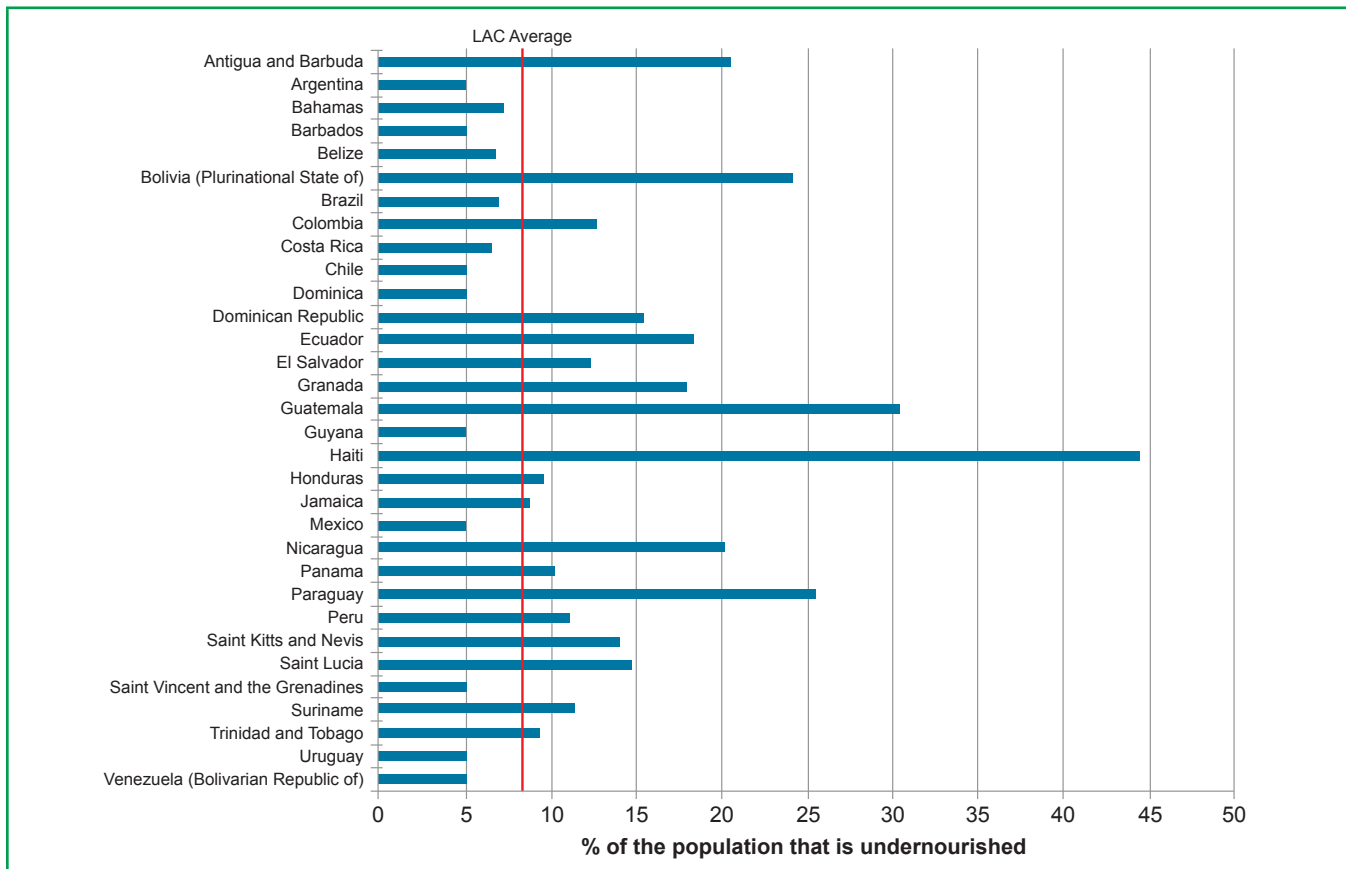


Source: World Bank, 2012c

that income increases and food security go hand-in-hand (see *The State of World Food Insecurity*² and *The State of Food and Agriculture*³). It is now increasingly recognized that this does not hold everywhere. Caloric

intake does not necessarily satisfy nutritional needs, and increased incomes, even in rural areas, do not automatically translate into better and more nutritious diets (FAO et al., 2012). Although health indicators

Figure 2.B. Percentage of Undernourishment (2010-2012)



Source: FAO

2 <http://www.fao.org/publications/sofi/en/>

3 <http://www.fao.org/docrep/018/i3301e/i3301e.pdf>

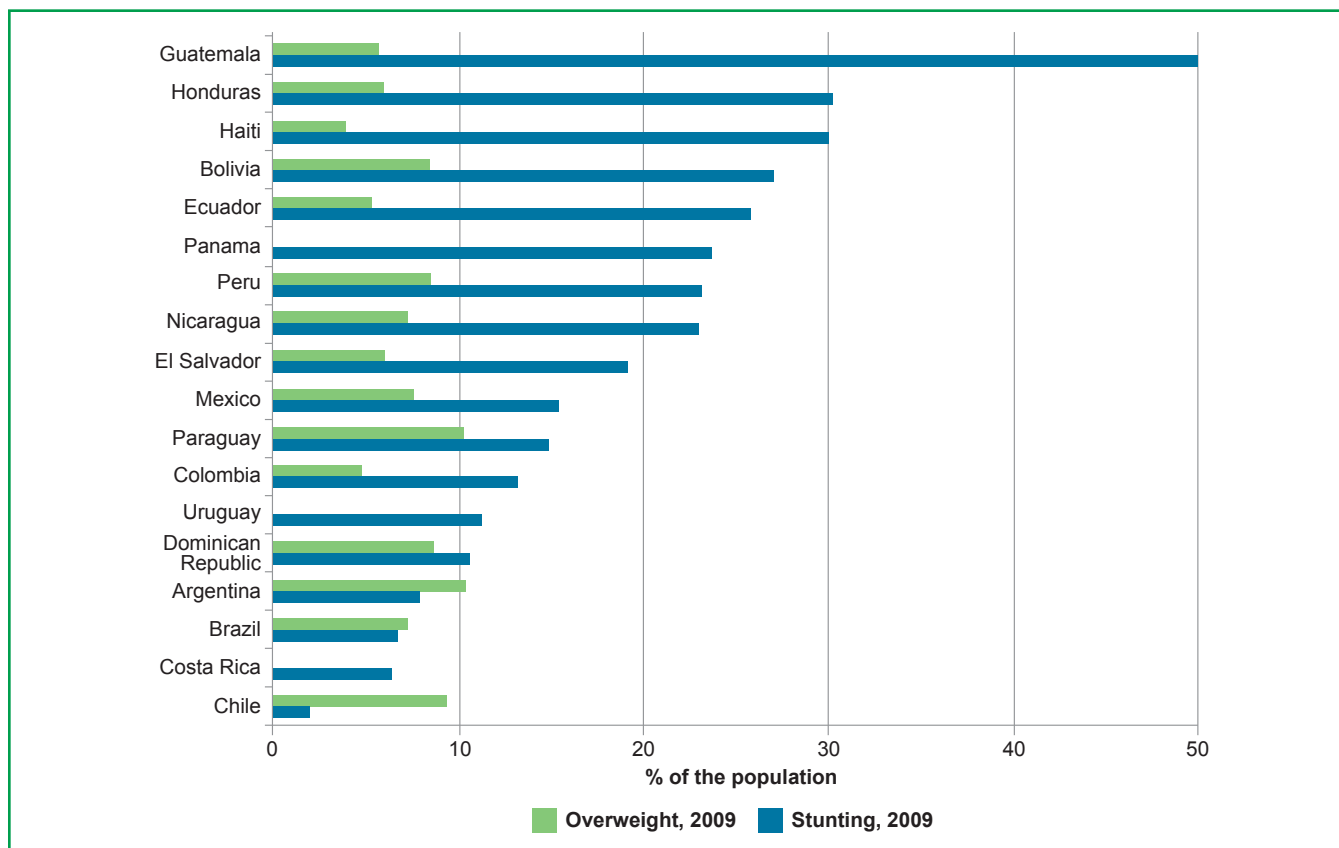
have improved in the past decades, overweight, obesity, and diet related diseases are now spreading rapidly (Popkin and Gordon-Larson, 2004; WHO, 2009a). Many opportunities exist in the agricultural sector and, particularly through multisectoral collaboration, to avail diverse and healthy diets across income segments.

With a population of 590 million and more than three quarters of it living in cities, food security is an important challenge for Latin America and the Caribbean (LAC). Favorable natural resources provide a comparative advantage to the region enabling it to meet domestic demand and expand its agricultural exports (Figure 1). However, despite a recent sustained period of regional economic and agricultural growth, the evolution of nutrition outcomes in the LAC region has been variable. Given the achievements of its agriculture sector, LAC should be a leader in designing

nutrition-sensitive policies, pushing the boundaries in rethinking agriculture and nutrition linkages.

Overall, the LAC region has seen a reduction in undernutrition and undernourishment indicators (Figures 2.A and 2.B). However, countries that have been the most successful in reducing undernutrition are now facing high overweight and obesity rates (Figure 3). The steady increase in overweight and obesity rates in the LAC region rivals today that of the U.S. and Canada and is positively correlated with income inequalities (Finucane et al., 2011). However, the prevalence of children with moderate or severe wasting and stunting are still high. Also, several countries in the region show alarming rates of undernourishment: higher than 30% in Haiti and Guatemala, and higher than 20% in Paraguay, Bolivia, Antigua and Barbuda, and Nicaragua (Figure 2.B).

Figure 3. Prevalence of Overweight and Stunting in LAC Countries (2009)



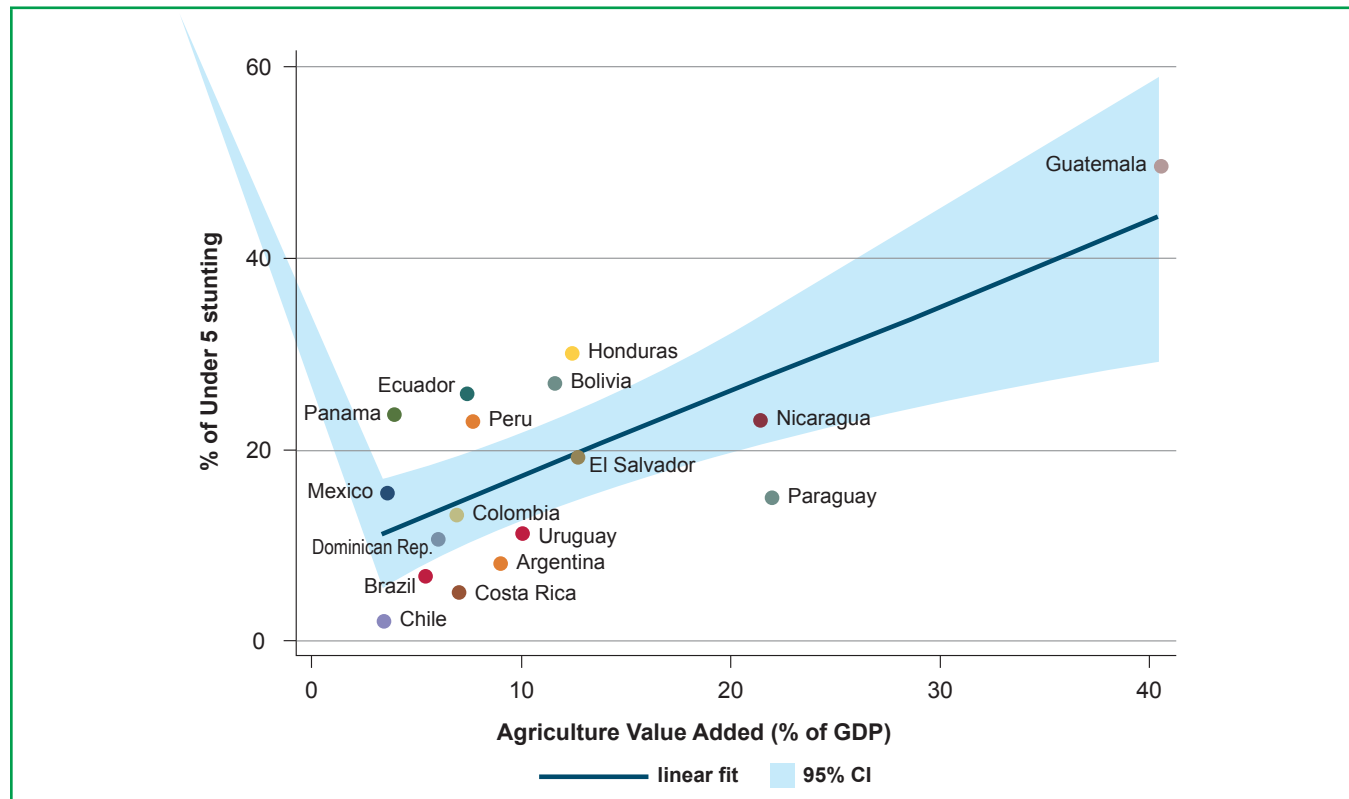
Source: Authors' calculations (see Annex 2 for details)

Countries in LAC where agriculture makes up a large part of the economy (agriculture GDP as % of total GDP), score poorly in the nutrition status of the most vulnerable groups. Figure 4 shows that there is a strong correlation between the importance of the agriculture sector (as % of GDP) and the prevalence of stunting. For example, Guatemala, Bolivia and Nicaragua have an agricultural sector that represents a relatively large share of their total GDP and yet households in these countries have the highest levels of both overweight mothers and under 5 stunting (Garret and Ruel, 2003). Furthermore, food insecurity and malnutrition are higher and highly seasonal in rural areas, compared to urban areas, which is a relevant fact when thinking about the role that agriculture can play in reducing malnutrition. The most recent data compiled by UNICEF in 2013 shows that in 82 out of 95 developing countries for which data is available, the prevalence of underweight children is higher in rural areas than in urban ones.

However, countries with more diversified rural economies and higher value added per agriculture worker have lower poverty and food insecurity rates. Although poverty and food insecurity are higher in areas highly dependent on agriculture, the relationship is more complex. Agriculture value added and income diversification can have positive implications for food security and rural development, as demonstrated in Figure 5.

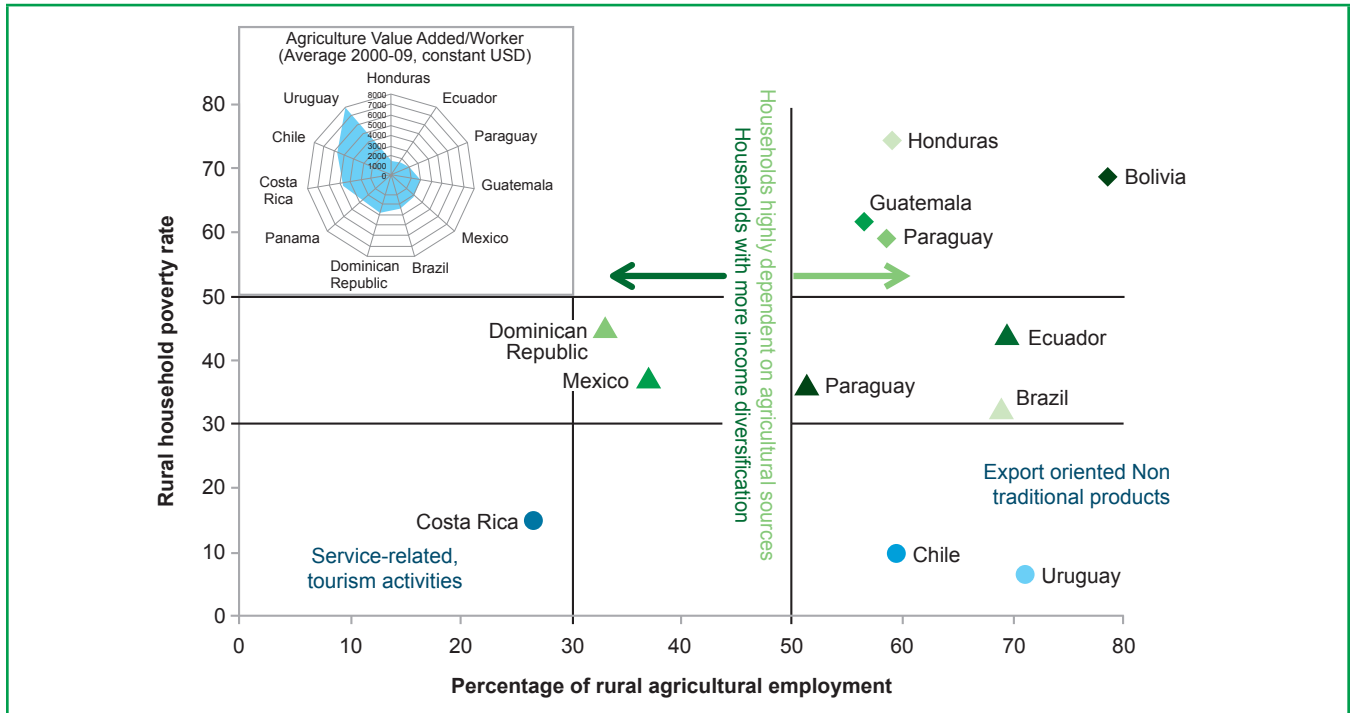
As expected, the prevalence of under 5 stunting across LAC is negatively correlated with GDP per capita (Figure 6). However, when seeking improved nutrition outcomes, it is not sufficient to focus only on increasing income. Other factors such as food access, affordability, quality and diversity play an important role. Economic growth has been shown to play a central role in reducing the prevalence of calorie deficiency in most countries during their early stages of development, but the

Figure 4. Agriculture Value Added 2011 (% of GDP) and Prevalence of Under 5 Stunting 2009 (%)



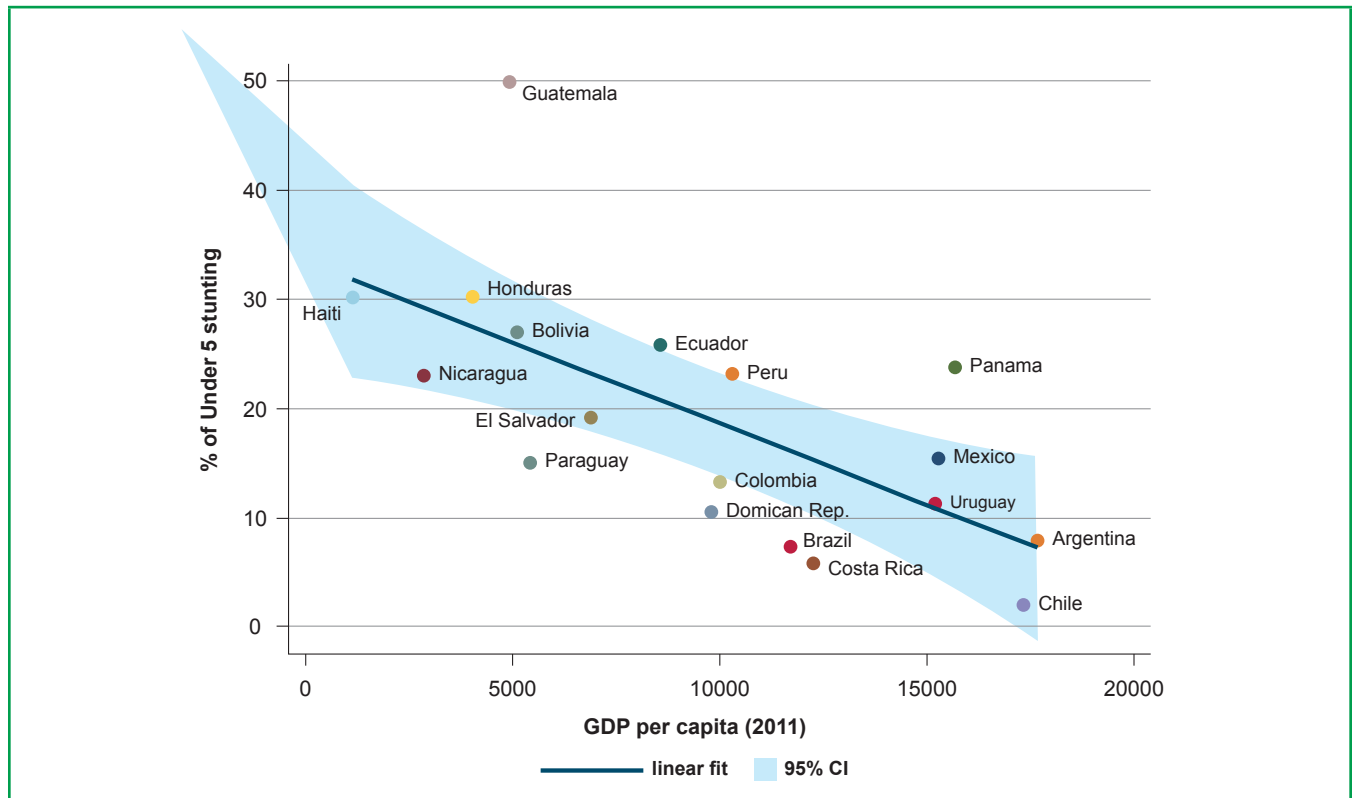
Source: Authors' calculations (see Annex 2 for methodology and data sources)

Figure 5. Production and Income Diversification in Rural Territories



Source: ECLAC/FAO/IICA (2013). *The Outlook for Agriculture and Rural Development in the Americas: A Perspective on Latin America and the Caribbean*

Figure 6. GDP per Capita PPP* 2011 (current international \$) and Prevalence of Under 5 Stunting 2009 (%)



* Purchasing Power Parity Source: Authors' calculations (see Annex 2 for methodology and data sources)

impact of increased income on nutrition declines as the development process evolves from the early stages (see Ecker O. et al., 2012 and Figure 7 for the case of India).

Agriculture is a key economic and social sector of most LAC countries, providing an important source of income for poor rural households and a source of growth for the region's economy.

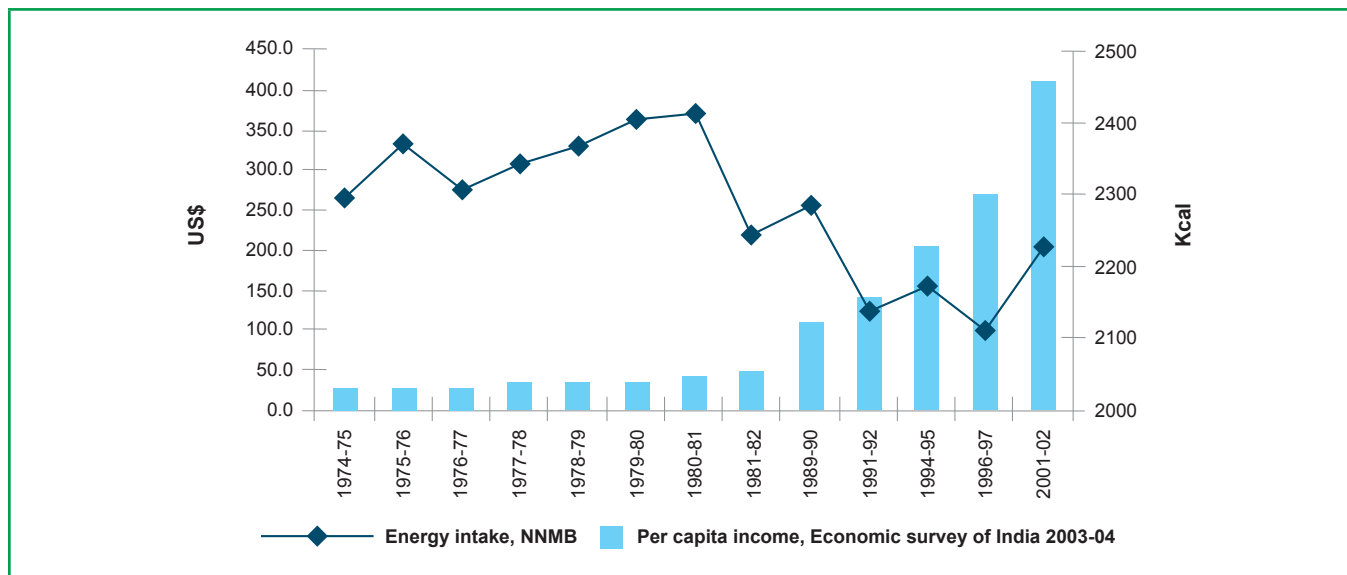
Recently, however, the rise in demand for non-food products, such as biofuels, combined with growing demand for meat and higher market potential for food products in developed countries have changed the dynamics of the sector. In order to improve the nutrition status of the most vulnerable populations in LAC, the agricultural and food systems need to be rethought to turn local agriculture and food production into a pathway to mitigate food insecurity in a sustainable manner. Expansion of income and food production has been shown to be a necessary, but insufficient condition to put an end to undernourishment and malnutrition⁴. It will require improving food quality on

the supply side in terms of variety, nutrient content and safety (FAO and UE, 2008; Fan, S. et al., 2012), as well as improving education and decision-making on the food consumption (demand) side.

Therefore, GDP growth and GDP per capita are not good indicators to measure nutrition improvements and, on the contrary, can be positively correlated with the prevalence of overweight. There is a positive correlation between the prevalence of overweight and GDP per capita across LAC countries (Figure 8). This is showing a transition of the nutrition problem of the population as countries move forward in their development processes.

The rural poor in LAC can have overweight rates comparable to those in richer countries. The correlation between living standards and overweight was found with different poverty indicators, such as poverty rates (incomes below US\$1.25 a day and below US\$2.5 a day), and rural poverty rates (below

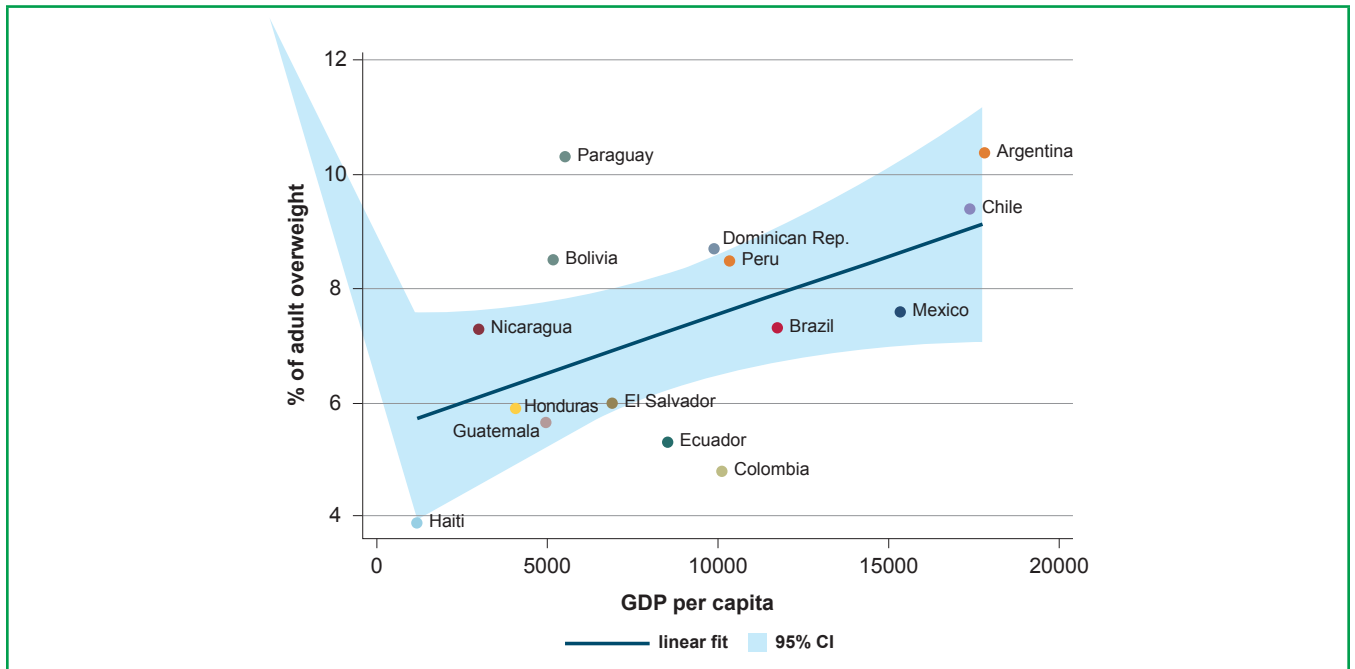
Figure 7. Trend in per Capita Income and Energy Intake in India from 1974 to 2002



Source: Ramachandran, P. 2006

⁴ Andrew MacMillan, former FAO Director of Field Operations and fellow member of the Global Forum on Food Security and Nutrition, declared “expanding food production, alone, will never put an end to hunger and malnutrition” in a lecture at Reading University on June 11, 2012.

Figure 8. GDP per Capita PPP* 2011 (current international \$) and Prevalence of Adult Overweight 2009 (%)

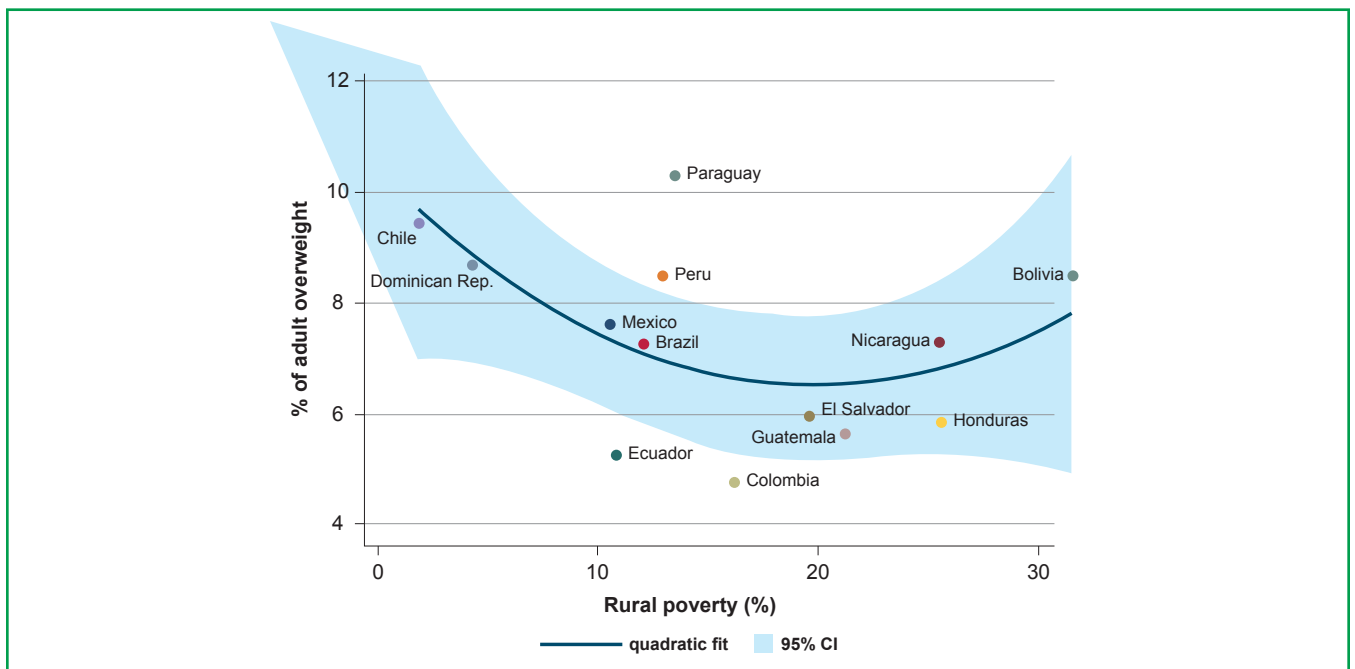


* Purchasing Power Parity Source: Authors' calculations (see Annex 2 for methodology and data sources)

US\$2.5 a day). The correlation between the most severe rural poverty (below US\$1.25 a day) and the prevalence of adult overweight is defined by a U-shape curve (Figure 9). In LAC countries with higher

per capita GDP, adult obesity is higher among women with low education levels, whereas the opposite holds for countries with lower per capita GDP (Rivera et. al., 2004).

Figure 9. Rural Poverty Level 2009 (below \$1.25 a day) and Prevalence of Adult Overweight 2009 (%)



Source: Authors' calculations (see Annex 2 for methodology and data sources)

B. Agriculture and nutrition in LAC

Stunting

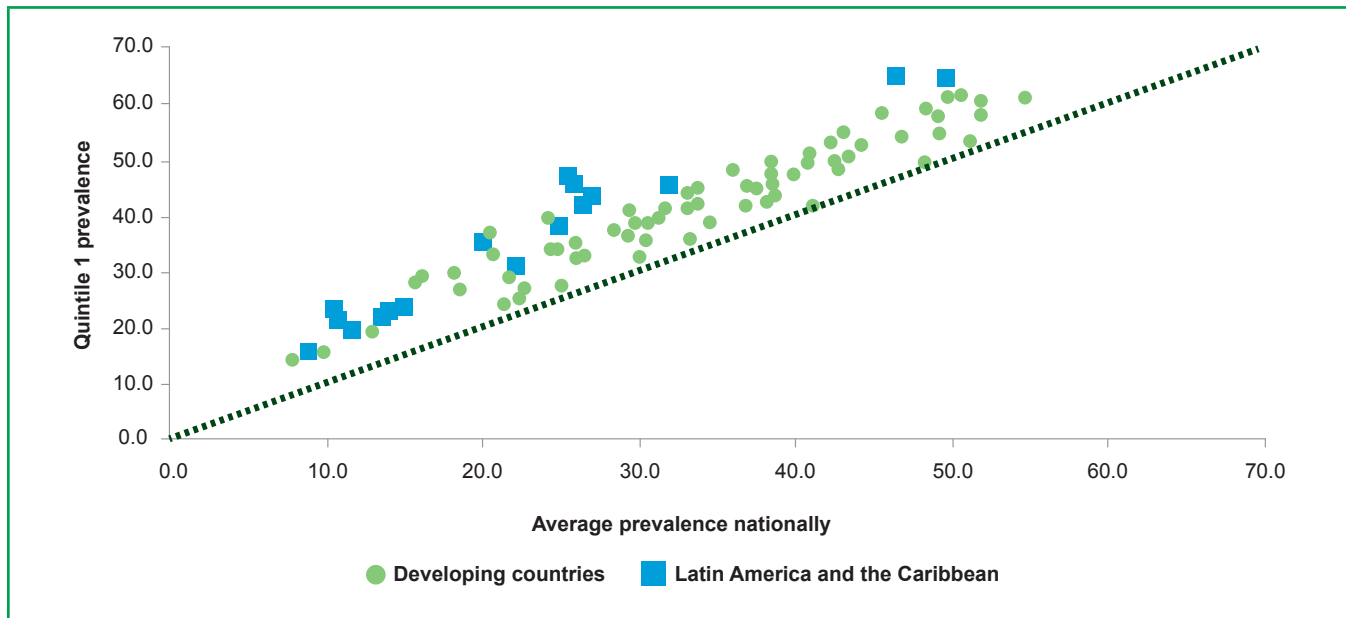
Rates of child stunting in the bottom quintile of LAC's population is among the highest in the world (Figure 10). Although the average prevalence of child stunting decreased during the last decade in the LAC region, the rate of reduction is unequally distributed across countries and across households. Child stunting has direct short-term private and social costs—such as mortality, morbidity, disability and monetary costs—and indirect long-term costs—such as reduced cognitive abilities, late entry into the education system, higher school drop-out rates, reduced economic productivity, reduced reproductive performance and increased chance of contracting metabolic and cardiovascular diseases—(Paraje, 2009; Victora et al., 2008; Strauss and Thomas, 2008; Behrman and Deolalikar, 1988). The disproportionate concentration of stunting in the lowest socioeconomic strata implies that stunting is a

consequence, as well as a cause of economic inequality, thus entering in a vicious circle.

Obesity

The burden of obesity affects the most vulnerable households in the poorest nations of the LAC region, with a particular concentration in urban areas⁵. In LAC some segments of the population continue to suffer from undernutrition, while others exhibit excess weight gain, contributing to the development of non-communicable diseases such as diabetes and cardiovascular diseases. In Latin America, the rate of diabetes was higher than the world average in 1995 and was expected to have an estimated 42% increase between 1995 and 2025 (Andrade, 2006). Such non-communicable diseases will have a dramatic effect on the population's future health, requiring a greater share of public expenditures to be directed towards overcoming this latent health problem. Annual costs associated with diabetes are

Figure 10. Prevalence of Child Stunting in the Poorest Quintile 1990-2005 (%) – 49 Developing Countries, 86 Observations



Source: Paraje, G. 2009

⁵ Overweight and obesity: (i) in the world: Eberwine, D., 2002; Popkin, B., 2009; Mendez, M.A., Monteiro, C.A., Popkin, B.M., 2005; Webb, P., Block, S., 2010; Bleich, S., Cutler, D., Murray, C., Adams, A., 2007; (ii) in LAC: Andrade, F., 2006; Fraser, B., 2005; Jaury, R., Albala, C., Kain, J., 2001.

estimated to be more than US\$65 billion for the region (Barceló et al., 2003).

High levels of obesity among women are related to poor diets that very often also correlate with anemia.

The mother's nutritional status at the time of conception and during pregnancy is transmitted across generations to the child, contributing to both under-nutrition in childhood and obesity and related diseases in adulthood (Fraser, 2005). Therefore, the double burden where underweight and micronutrient deficiency coexist is often present at the country, household and individual levels.

The obesity problem in LAC reflects a global trend in shifting diets towards foods high in sugar, salt and fat.

This trend is also driven in part by increases in income, relative prices and structural changes like urbanization, female labor force participation, infrastructure development, diversity of food markets and food environments (Cummins and Macintyre, 2005; Rayner and Lang, 2012). Further, in LAC and, particularly in Central America, this shift in diets seems to have been in part supply driven by international trade agreements and the increased availability of sugared beverages and highly processed snack products (Rivera et al., 2004; Hawkes, 2006).

The change in diets in the LAC region has been reinforced by changes in distribution channels and expansion of supermarkets.

In 1990, the retail market accounted for a maximum of 10 to 20 percent of national food retail sales. In 2000, supermarkets had risen to occupy 50 to 60 percent of national food retail, approaching the 70 to 80 percent share in the United States and France. Latin America has thus seen, in just a single decade, the same expansion of supermarkets that the United States experienced over five decades (Reardon and Berdegue, 2002). While supermarkets by themselves may be a good source of nutritious food compared with other forms of retailing⁶ and avail fresh

⁶ See for example the food deserts in the United States that have emerged in supermarket scarce areas (USDA Food Access Research Atlas, 2013).

produce across seasons, they often drive a broader shift in diets towards non-traditional and processed foods. This shift is often reflected also in local markets and small shops where similar products are often offered (Byerlee et al., 2013).

In the LAC region, caloric availability is in general not the main problem, as staple foods provide sufficient energy for the population. Rather, the problem is a diet composed mainly of carbohydrates that lacks essential nutrients such as proteins and micronutrients.

Livestock products, for instance, are an excellent source of protein and micronutrients (vitamin B-12, calcium, zinc and riboflavin) not found in crops that are especially important for women and children. The challenge is to increase the quality of food consumed, while at the same time making it affordable to the most vulnerable households in the LAC region.

Progress towards the Millennium Development Goal (MDG) of halving the proportion of people who suffer from hunger is uneven in Latin America and the Caribbean.

Approximately 70% of the countries for which data is available are off track in terms of achieving MDG 1 (eradication of extreme poverty and hunger). Efforts must be made if the region wants to achieve its nutrition target by 2015 (Global Monitoring Report, 2012). Given that most of the population growth in the next 30 years will occur in urban areas, the double burden of malnutrition (underweight-overweight) will probably continue to exacerbate if nothing is done to reverse this trend (Caballero B., 2005).

Micronutrient deficiency

Micronutrient deficiencies are also of public health significance in LAC.

According to the WHO (2009b), the prevalence of vitamin A deficiency among LAC preschool-age children is 15.6%, and 4.4% of pregnant women suffer night blindness, a consequence of preexisting maternal vitamin A deficiency. When looking at iron deficiency, anemia prevalence in the region is alarming: 40% of preschool-age children, 31% of pregnant women and 23.5% of non-pregnant women suffer anemia (WHO,

2008). This means that approximately one quarter of women in the LAC region is anemic (United Nations SCN, 2010). Anemia is the most widespread nutrition problem affecting girls and women in developing countries; it is a significant cause of maternal mortality and can cause premature birth and low birth weight. A child born with low birth weight is more likely to experience adverse health outcomes, including neonatal and infant mortality, poor growth and cognitive development, and morbidity due to chronic diseases later in life. As much as half of all children stunting occurs in utero, highlighting the critical importance of better nutrition for women and girls (Box 1 and Save the Children, 2012).

Low income, limited access to diverse diets, and food habits all contribute to micronutrient deficiencies. As seen in previous sections, micronutrient intake is highly correlated with income but increased income does not necessarily lead to improved nutrition. Factors such as knowledge about nutritious diets and access to diverse food across seasons are important for nutrition outcomes (FAO et al., 2012). Experience shows that micronutrient intake can be higher among groups with access to an adequate and diverse diet, regardless of income. Farmers in some countries have shown more

diversified dietary intake than their urban equivalents (World Bank and World Food Programme, 2012).

The agro-ecological endowment and high levels of agricultural productivity have better equipped the LAC region to scale up its agricultural output in the future (Figure 11 and World Bank, 2012b)⁷.

The region revealed a comparative advantage index in agricultural production of 2.2, where 1 represents the global average (Anderson and Valdes, 2008). This has transformed LAC into the most integrated region in the world markets, in terms of both export and import ratios (Figure 12 and von Braun and Diaz-Bonilla, 2008). Agricultural exports in LAC increased almost threefold in the period from 1995 to 2009 (World Bank, 2012b), and together with the recent rise in food prices, has led to a shift in the composition of the crops grown. In recent years biofuel production has taken a growing share of the region's agricultural production as it has become increasingly attractive due to soaring energy prices. As a result of all these factors, LAC has been specializing on international agricultural markets resulting in a concentration of its agricultural exports. A recent estimation of this concentration using the Gini coefficient shows an

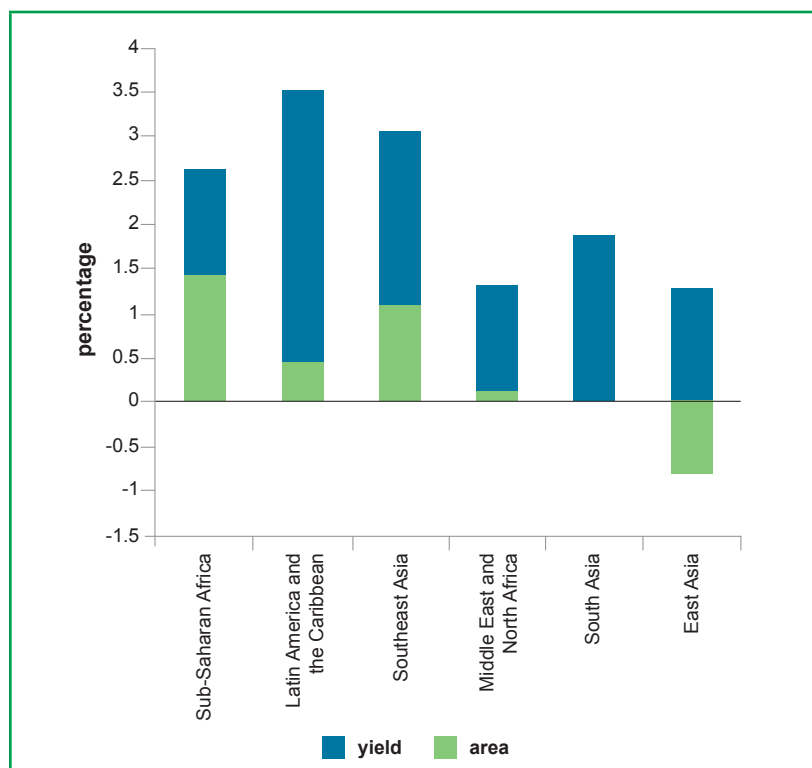
Box 1. The first 1000 days in the context of LAC

“Nutrition in the First 1,000 Days” is the title of the 2012 *State of the World's Mothers* report, published annually by Save the Children in commemoration of mothers' day. The report stresses the importance of the quality of nutrition in the first 1,000 days of a child's life in determining his future health and success. This is the period from the start of a mother's pregnancy through the child's second birthday. During these 1,000 days, a child's brain and body develop rapidly and hence need the right nutrients in the correct amounts in order to avoid often irreversible damage.

The report highlights that, although in LAC overall stunting prevalence is falling, stunting levels remain high in many countries (for example: Guatemala, Haiti and Honduras). It also stresses that success in fighting child undernutrition is very much dependent on political commitment, supportive policies and effective strategies. Latin American countries such as Brazil, Chile and Costa Rica are mentioned as examples of countries that are performing better on child nutrition than their national wealth might suggest. On the other hand, Guatemala, Mexico, Panama and Venezuela are included among the countries that are underperforming relative to their GDP.

⁷ The LAC region has the highest level of agricultural productivity within developing countries with an overall level 7 times higher than China (\$3,500 and \$500 in constant 2000 USD, respectively). Agricultural productivity is measured by the agriculture value added per worker (WDI).

Figure 11. World Area Expansion and Yield Growth (1990–2007)

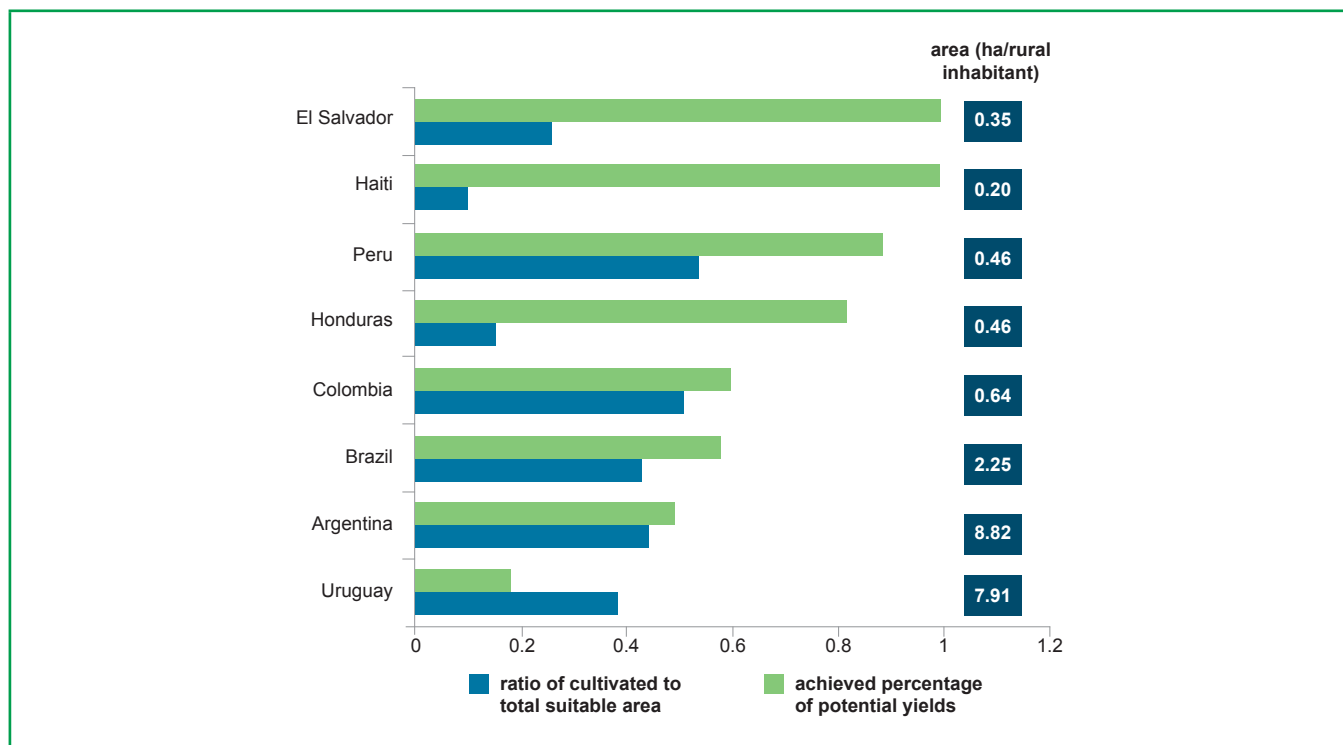


Source: Deining et al., 2011

increase from 0.69 in 2000 to 0.73 in 2008 (World Bank, 2012b).

The LAC region seems to be in a nutritional-agricultural paradox, reflected by the quantities of food supplied to the world market and the quality (nutritious value) of food accessible to the most vulnerable populations at home. LAC’s socioeconomic and demographic dynamics shows that the urbanization process has shifted from two-thirds of the population living in rural areas, in the middle of the past century, to more than three-quarters living in urban areas today. In more urbanized countries, the availability of cheap, energy-dense foods facilitates the consumption of more empty calories relative to expensive healthier food (Caballero, 2005). The problem is also present in rural areas that are not well integrated to local food markets and/or where agricultural specialization may have

Figure 12. Yield Gap, Availability of Uncultivated Area, and Area Cultivated per Rural Inhabitant



Source: Deining et al., 2011

increased incomes but reduced the availability and affordability of a diverse diet.

The increase in international food prices and food price volatility also has a direct impact on food insecurity and nutrition in LAC. Even if, in general, low-income food-deficit countries are the most vulnerable to international commodity price increases, poor households living in net agriculture exporting countries can also be net food-consumers (World Bank, 2011). For the poor net food-consumers, food costs take up a substantial part of the household's budget. So when prices rise or fluctuate, the portion taken up by essential staple foods increases at the expense of costly nutrient rich foods such as vegetables, fruits, and pulses (Bouis, 2011).

The increase of LAC's agricultural exports has improved the quality of production meant for export due to the need to conform to international standards and the food-quality demand from high-income food-importing countries in order to enter developed markets⁸. However, it seems that the quality spillovers to domestic markets and, particularly to the most vulnerable households, have been very limited. Very few initiatives or investments have been made in LAC to develop domestic food safety norms and regulations to promote healthier and more nutritious food at the local level. Domestic consumers are, in many cases, unable to identify the more nutritious and safer foods. When they can actually identify them, their certification—e.g. as organic or fair trade—transform them in an unaffordable good for the local population⁹.

Several opportunities exist in LAC's agricultural sector to create local spillovers from increasing the quantity and quality content of food production to improve the nutrition status of the most vulnerable. TTLs and policy makers have the opportunity to simultaneously tackle LAC's agriculture investment needs and nutrition challenges.

⁸ Developed countries' non-trade barriers are mainly based on sanitary and phytosanitary criteria.

⁹ See for example the recent case of the Quinoa in Bolivia: http://www.nytimes.com/2011/03/20/world/americas/20bolivia.html?_r=0

The lack of data to better understand potential linkages between agriculture and nutrition (Gillespie et al., 2012) has been a challenge and there is an immediate need to increase the number of surveys (including quantitative and qualitative data covering production, consumption and price patterns). Research in this area has identified, based on past experiences and on-going initiatives, several areas of opportunity to mainstream nutrition and agriculture.

C. Steps towards designing nutrition-sensitive agriculture interventions in LAC

When nutrition considerations are taken into account by policy makers and Project Managers in the design of agricultural policies and programs, these would be considered “nutrition-sensitive” interventions. During project design, and after the decision to include nutrition activities or components has been made, explicit nutrition objectives could be stipulated in relation to the traditional agriculture-sector project objectives such as increases in income, production volume, sales and/or productivity. Also, appropriate nutrition indicators should be identified in order to monitor the proposed activities and to evaluate the impact of the agricultural interventions on nutrition outcomes.

Projects with objectives and/or activities related to improving nutrition status or food security at the household level should reflect code 68 in the Bank's information system, the Nutrition and Food Security code that is part of the Bank's theme and sector coding. See Box A-3 from the Global Guidance Note¹⁰ for a list of activities that should be included under code 68. Graph 1 in the previous page shows the suggested steps to mainstream nutrition into agriculture programs.

Further in line with the World Bank's Global Guidance Note¹¹, the first suggested step is for the social assessment of projects to include the identification of

¹⁰ See footnote 1

¹¹ See footnote 1

nutrition problems and any opportunities for including nutrition sensitive activities in order to increase the project's nutrition impact. Depending on the proposed initial program's objective and target area, a nutritional profile of the most vulnerable groups (often women, landless households, indigenous communities, autarkic communities, etc.) should be done as part of the social assessment.

The social assessment should provide a diagnostic to understand the nutrition problem at hand (obesity, micronutrient deficiency, stunting, anemia, etc.) as well

as the context and the specific constraints related to the nutrition problem faced by the groups and communities to be targeted by the project (some key questions are included in Box 2). The social assessment would guide specific actions to better address the nutrition problem of the targeted vulnerable groups in terms of activities, roles and responsibilities. This is not to say that an agriculture project should become a health project, but that it should be nutrition-sensitive to address and complement ongoing or planned nutrition interventions, as well as adjust activities to maximize their nutrition impact. Finally, an M&E system should be designed

Graph 1. Steps for Mainstreaming Nutrition within the Cycle of Agriculture Programs

Step 1 - As part of the agriculture program's social assessment, evaluate the nutrition problem

- What is the food insecurity issue (i.e. the nutrition problem) in the country and/or intervention area?

Example: if the problem is low level of vitamin A intake, this could eventually lead to activities to promote biofortified crops rich in vitamin A; or stunting?, Zinc fertilizers can contribute to solving that problem; or anemia? Increase in crops with high levels of iron should be introduced.

- Is there any population in the area of intervention that is more at risk than others and that should be targeted?

Example: Have landless rural households a lower diverse diet? Or is it the indigenous population that is at risk?



Step 2 - How can the agricultural program address the nutrition problem?

Case of including nutrition objectives in the PDO

Can the problem be answered through an agricultural (or a multisectoral) intervention? What nutrition indicators are appropriate (see Section III)?

Case without nutrition objectives in the PDO

Will the policy/intervention have a positive or negative impact on the food security problem and/or on the particular group that is food insecure?



Step 3 - Design and implement nutrition activities and interventions

- Following the assessment and program's objectives, find opportunities (Section B) to mainstreaming nutrition into agriculture interventions.
- Design an M&E system to track and evaluate the impact of agriculture interventions in nutrition outcomes (if relevant).
- Ensure that counterpart agencies have qualified personnel available (internally or externally) to supervise program activities related to nutrition.

Box 2. Nutrition concerns to be addressed in the design of agricultural projects

Answers to these statements or questions can guide the diagnostic regarding nutrition status and food security issues that could be incorporated during project design (as part of the social assessment).

- Will the additional income be received or controlled by women?
- What is the food security situation in the country and/or intervention area? e.g. access to food, diet diversity.
- What's the nutrition problem of the targeted population? Anemia, micronutrient deficiency, obesity, stunting, contaminated food and water, etc.?
- Based on the nutrition problem at hand, potential interventions and activities should try to seek/promote: increased access all year long to safe, high-nutrient food; improve food diversity; improve affordability of the food basket; raise the micronutrient reserves of the soil; promote good agricultural practices and safe handling of food products.
- If a change in production and consumption patterns is expected, it is important to assess the level of acceptance of new food products by families and consumers, and if existing skills for handling and cooking can be applied.
- Have agricultural extension agents been trained to transmit knowledge on nutrition, food safety and good agricultural practices to farmers and, more generally, to families, or is this a possibility in the near future or during the project's implementation?
- What have been the nutrition education efforts in the project area and are local families aware of the nutrition benefits of food products and the health benefits of the safe production, processing, and handling of food?

and the skills of the counterpart agency in charge of the execution and the supervision should be assessed (see Section III).

As a result of the social assessment, the various activities (if any) to maximize the impact on nutrition of any given agriculture project could be grouped in the following two areas:

1. *Invest in women*

Women are most often the food and care providers of rural households and in particular for children.

(Cramer et al., 2010). There are already several initiatives and approaches to improve and invest in women as part of agriculture interventions (16 IDA-financed operations already require specific targeting to reach women), and

Box 3. Non-exhaustive list of proactive actions for female empowerment to achieve positive nutrition outcomes¹¹

- A sustainable increase in women's income (even if small) is more likely to be invested in food purchase and children's education, than other household expenditures.
- Improve women's access to project activities and benefits (such as extension services, credit, knowledge, common property, information, technology, inputs, productive assets and markets): Studies have shown that, once women have access to project activities (training, technical assistance, etc.), they show higher productivity and income increase more than other beneficiaries. Thus, there's a need to raise female awareness and advocate for their rights in project activities (particularly, in land, education, training, employment and information).
- Include interventions and investments in subsectors or activities where women are concentrated (for example, post-harvest activities, planting, weeding, grinding).
- Contribute to increased female leadership and visibility in the community (through projects' operational policies about decision-making processes such as quotas and participation incentives).
- Ensure that women are not explicitly or implicitly excluded from project activities (take into consideration security issues, type of crop, training and meeting at nighttime and/or far from their household, etc.).

focusing on women can have a direct effect on the food diversity intake and nutrition status of the family. However, given the diversity of agriculture programs in the LAC region, there is no model or set of recommended interventions for female empowerment. However, Box 3 lists some examples of actions that can improve families' nutrition status through female empowerment.

In certain regions in LAC, women are important contributors to livestock production activities, from feeding to selling products.

Investing in rural women can therefore be a way of increasing the production of livestock and animal source food (meat, milk, eggs), which are an important piece of a healthy diet. Furthermore, a recent FAO study argues that women livestock keepers must be recognized as the major actors in efforts to stop the decline of indigenous breeds, crucial for rural food security and animal genetics (FAO, 2012). Particular attention could be drawn towards promoting and advertising the production, marketing and consumption of nutritious foods grown by women groups.

Women can play a key role in efforts to undertake nutrition education.

Nutrition education for vulnerable families could have a great impact in solving the nutrition problem of the LAC region, as the primary problem is not quantity, but rather quality of the caloric intake. Given their direct link with the nutrition status of the family, women should be at the center of such nutrition education/extension programs. Starting early and including cooking and nutrition in elementary school curricula has also proven effective to improve knowledge and change approaches to new foods and dietary habits.

2. Increase access all year-round to high-nutrient content food for the most vulnerable

Quality food needs to be accessible all year-round in order to have an impact on the nutrition status of the vulnerable population. Social safety nets and other

¹² Adapted from Herforth, 2012

programs that aim to reach the poor and food insecure households are an important mechanism to sustain local investments in food quality. Many social programs in LAC that provide support in the form of cash and/or vouchers to vulnerable families could be an important incentive to invest in food quality. The same applies for linking agricultural beneficiaries to social safety nets or schools (i.e. school feeding, food aid programs, etc.)

Linking local food production to social safety nets, food aid programs and school feeding initiatives can provide incentives to the market to sustain agricultural investment in food quality beyond project closing.

Creating demand for such high quality nutritional food products (even if it represents a small percentage of the overall food consumed), can transform the local food supply towards higher quality food, creating long-term spillovers on the rest of the society which would have already integrated and understood the benefits, in terms of income and health, of better food quality¹³. Furthermore, social programs would also increase their expected benefits in terms of nutrition outcomes, as they would guarantee that the provided support directly increases the nutrient content of households' diets and preserves those households from future nutrition problems.

Programs linking local food production to social safety nets have already been implemented with success in Brazil (see Box 4), resulting in a drop of 37.8% in hospital admissions due to undernutrition between 2002-2005 and achieving the first Millennium Development Goal in 2006¹⁴.

The positive impacts of such system have also been highlighted in a recent pilot program conducted by IFPRI in Ecuador (see Box 5). This mechanism could be amplified by direct information campaigns to prioritize the consumption of local and nutritionally better food

¹³ The idea is to use public purchases as a vector to overcome a market failure, which is not allowing the cost of investments on high quality food to be translated into higher prices, desincentivizing farmers to start and/or pursue such practices after the interventions.

¹⁴ Goal 1: Eradicate extreme poverty and hunger. See: <http://www.un.org/millenniumgoals/poverty.shtml>

Box 4. Brazil “Zero Hunger”

Zero Hunger (*Fome Zero*) is a Brazilian government program with the objective to eradicate hunger and extreme poverty in Brazil. The program is coordinated by the Ministry of Social Development and Hunger Combat and puts into action the government’s strategy to guarantee the right of access to basic food. The diagnostic in the country was that hunger was more related to inadequate access to food rather than availability. As a result, Zero Hunger’s strategy focuses on basic conditions for food security: food availability and food access. Its main goal is to guarantee access to food in the proper quantity, quality and regularity according to the needs of populations living in food and nutrition insecurity, as well as to promote social inclusion in rural areas by strengthening family agriculture.

The integrated action of the Ministries involved in Zero Hunger with the civil society allows a planned and articulated action with great possibilities of ensuring access to the production and consumption of healthy food. In order to achieve the human right of access to adequate food each, the State is obliged to ensure that all individuals under its jurisdiction have access to the minimum essential quantity of food. It should be noted that this quantity must be sufficient, so as to ensure that all citizens are, in fact, free from hunger. The Brazilian Congress has approved the Constitutional Amendment Project (PEC) 047/2003 to incorporate the Right to Food as a fundamental right in the national Constitution. The Right to Food has been included in article 6 of Brazil’s Supreme Law that already contemplates other social rights such as the right to work, health, education and social security.

The program takes a number of forms, ranging from direct financial aid to the poorest families (*Bolsa Familia*) to diverse strategies such as creating water cisterns in Brazil’s semi-arid areas, creating low-cost restaurants, educating people about healthy eating habits, distributing vitamins and iron supplements, supporting subsistence family farming and giving access to microcredit. Two components are particularly interesting:

1. Brazil’s Food Acquisition Program (*Programa de Aquisição de Alimentos, PAA*)

Created in 2003, the PAA allows the public purchase of food items for targeted family farmers, without a competitive bidding process, for distribution in the social assistance network and to build a strategic food reserve.

2. National School-Feeding Program (*Programa Nacional de Alimentação Escolar, PNAE*)

This program aims at fulfilling the nutritional needs of students during their stay at school, contributing to growth, development, learning and scholar goals, as well as to the constitution of healthy nourishment habits. 47 million students receive a free daily meal at pre-school, elementary and high school. In order to ensure the connection between school-feeding and family farming the regulations now require that 30% of the school-feeding budget be used for purchasing family farming production.

Box 5. Food vouchers in Ecuador

An innovative pilot program conducted by IFPRI and WFP in Ecuador tested the efficiency of food vouchers relative to the distribution of food or cash. The program conditioned the use of the voucher on a diversity of nutrient-rich foods that had a large impact on several food security indicators (HDDS, 5%, DDI, 16%, FCS, 16%). Food vouchers also had a higher impact than other modalities on the diversity of food groups consumed and on the social capital, notably increasing individuals’ confidence and participation in community groups.

products and certifications for visibility/identification¹⁵. In other terms, promoting a profitable production and an affordable consumption of high-quality food products will send a very strong signal to the market and ensure a behavioral change on both sides of the value chain. Finally, this type of mechanism could be used in time of emergency to ensure local food provision and distribution and avoid adverse market impacts¹⁶.

¹⁵ To maximize the impact, other measures such as those listed under section “Improving the safety and quality of food brought to markets” could be added.

¹⁶ Haiti has been a good example of the harm that food aid can cause to the agriculture sector when such systems are not in place to be scaled up. See: <http://www.gao.gov/products/GAO-11-636>

II. Opportunities for mainstreaming nutrition into agriculture in LAC

Following the steps and general areas for nutrition-sensitive agriculture activities outlined in the previous section, numerous opportunities exist to mainstream nutrition into agriculture policies and investments in the LAC region. These opportunities can be grouped into policy level opportunities (intersectoral collaboration; nutrition-sensitive agricultural policies), and program and investment level opportunities (agriculture R&D; programs linking farmers to markets and increasing agriculture productivity). Potential interventions include preventive actions and proactive actions such as promoting nutrition outcomes within agricultural projects and investments. The available levers to affect nutrition outcomes through agriculture interventions are numerous, including actions at the farm level all the way to the sector policy level. The following sections offer a practical guidance to TTLs in the LAC Region to mainstream nutrition into agriculture policies and programs, providing different types of levers and mechanisms that could be considered by TTLs and clients.

A. Policy level

The LAC Region has had extensive experience in mainstreaming different types of concepts within multisectoral policy dialogue and discussions with client countries, including Avian Flu, Climate Change, and various environmental and social issues that are cross-sectoral in nature, making interventions effective and sustainable. Below is a list of a few levers at the policy level that can be used as opportunities for introducing nutrition into the agriculture sector, building on past experiences of multisectoral work between the agriculture and health sectors.

1. **Strengthening intersectoral collaboration to achieve nutrition outcomes**

Although nutrition cuts across several sectors, the main responsibility often falls within the Ministry of Health.

However, nutrition and non-communicable diseases are often a low-level priority within the health agenda of the country. Furthermore, since agriculture sector specialists often see nutrition as a health issue, and not an agricultural one, the nutrition agenda within the agriculture sector and intersectoral collaboration are often non-existent. Nevertheless, recent initiatives (such as One Health) and crisis (such as the Swine and Avian Flu) have demonstrated the importance of the agriculture sector for the health of the local and global population (Box 6). Given the important role that the agriculture sector has by being at the source of the food supply, it can help prevent nutrition problems of the most vulnerable, while at the same time securing their agricultural incomes.

Box 6. One Health

One Health concept is a worldwide strategy for expanding interdisciplinary collaborations and communications in all aspects of health care for humans, animals and the environment. This initiative allows for synergies between different sectors to achieve advanced health care, enhanced public health efficacy, expeditiously expanding the scientific knowledge base, and improving medical education and clinical care. The One Health Initiative is a movement to forge co-equal, all inclusive collaborations between physicians, osteopaths, veterinarians, dentists, nurses and other scientific-health and environmentally related disciplines, including the American Medical Association, the American Veterinary Medical Association, the American Academy of Pediatrics, the American Nurses Association, the American Association of Public Health Physicians, the American Society of Tropical Medicine and Hygiene, the Centers for Disease Control and Prevention (CDC), the United States Department of Agriculture (USDA), and the U.S. National Environmental Health Association (NEHA). Additionally, more than 700 prominent scientists, physicians and veterinarians worldwide have endorsed the initiative: <https://www.onehealthcommission.org>

The health and agricultural sectors have well-established public institutions and Ministries, but they are often not well organized in ways that readily allow for cross-sectoral action.

Nutrition and related health problems are the result of several factors and require action across different sectors (social protection, health, education, water and sanitation, agriculture, etc.). Hence, in the absence of strong incentives to develop cross-ministerial policies and programs for food and nutrition security, sector-specific silos for nutrition will end up favoring one pillar of good nutrition at the expense of the others. There are however examples where such intersectoral coordination has worked (see Box 7), like in the outbreak of certain diseases, and in cases where agricultural extension agents have coordinated with health extension agents. This collaboration between extension programs has the potential to enlarge the area of coverage in terms of number of households but also in terms of household members, increasing the probability of achieving behavioral change in health and agriculture practices.

An overall public sector coordination body (interministerial committee) is key to ensure such multisectoral policy and interventions. The Zero Hunger initiative in Brazil (see Box 3) is one of the most known coordination initiatives in LAC. Although intersectoral collaboration can partly solve this problem of lack of capacity, Ministries of Agriculture can actively and unilaterally seek to increase knowledge and awareness of nutrition-sensitive agriculture policies and investments.

2. *Increasing knowledge and awareness of linkages between agriculture and nutrition*

A. Capacity at the Ministries of Agriculture

Increase nutrition knowledge at the policy level by incorporating nutrition experts and training into agriculture policy decision-making. Most Ministries of Agriculture in the region do not have nutrition experts or training on nutrition for Ministry staff. In order for agriculture policies and programs to maximize their impact on nutrition outcomes of the targeted rural (and urban) populations, Ministries of Agriculture should actively seek to include nutrition experts within their teams, and provide nutrition training to agriculture policy decision makers and extension agents. Mainstreaming nutrition considerations in agriculture policies and agriculture public services by having access to specialized nutrition experts, can ensure that the Ministry of Agriculture takes into account nutrition objectives across its various departments and investments at a relatively low cost. In most cases, as with other dimensions such as gender and environment, mainstreaming nutrition could just involve slight considerations in operational rules and policy incentives (see Section III).

B. Understanding the linkages between nutrition and agriculture

Given the need for more evidence in LAC on the impact of agriculture policies and investments on nutrition outcomes, data collection and impact analysis needs

Box 7. Multisectoral coordination to reduce chronic malnutrition in Peru

The recent national strategy to reduce malnutrition was set in a multisectoral and intergovernmental framework. The Social Inclusion Technical Assistance Project (P131029) is supporting the Ministry of Development and Social Inclusion in implementing such strategy. All the fiduciary responsibilities of the project will be carried out through the Ministry of Economy and Finance allowing for interinstitutional coordination toward the same objective of reducing chronic malnutrition. The creation of a National System of Monitoring and Evaluation will allow to condition additional resources allocation in the different local coordinations based on the performance of the results measured by malnutrition indicators.

to be prioritized. Monitoring and evaluation systems are crucial for tracking progress, for identifying good practice principles of program design that enhance impact, and for guiding unit costing for scale-up. Data are also essential to provide feedback to researchers and policy makers to continue improving and adapting solutions for the most vulnerable. Up until today, household surveys have major gaps regarding nutrition and agriculture as they rarely include data on feeding, nutrition and agriculture outcomes; and very few of them allow linking the different sets of indicators if available at all. Opportunities exist to improve data in order to relate the agro-ecological areas and nutritional and agricultural profiles of the population, such as, for example, net food buyer/net food seller and nutrition status. Also, food price surveys should include better spatial disaggregation and product quality differentiation.

A recent systematic review of agricultural interventions that aim to improve the nutrition status of children shows that, among the 23 studies that were considered methodologically valid, only one included cases in LAC (projects in Mexico and Nicaragua that involved biofortified maize seeds) (Masset et al., 2012). This shows that there is a need to increase the empirical analysis of nutrition-sensitive agriculture interventions in the region.

3. Improving the safety and quality of food brought to markets

Improving the food safety regulations is essential to safeguard the health and nutrition of the population.

Although other initiatives and efforts have been made in the area of food safety (see Box 8), it is important

Box 8. Global Food Safety Program (GFSP)

Globalization of the food supply means that food safety risks are shared across borders. Foodborne disease outbreaks are common in both the developed and developing world, and have serious implications for public health and agri-food trade. As such, food safety is a global public good, and addressing it requires global solutions.

Why a Global Partnership?

A globalized food supply chain means that food production is increasingly sourced from both developed and developing countries. In a globalized food supply chain, the concerned actors (including private sector producers, processors and retailers, regulatory agencies, consumer advocates, and technical service providers) find it difficult to combine forces to collaborate effectively to improve food safety. While several partnerships for food safety have combined private sector agribusinesses, or public sector organizations, the Global Food Safety Partnership (GFSP) aims at creating a forum where all concerned actors—private and public, consumer groups and academia, international organizations and financial institutions—would be able to participate. Therefore, the GFSP aims at bringing together global actors to collaborate on capacity building to improve the safety of the global food supply.

Global Food Safety Partnership

Building on the work initiated under the Asia Pacific Economic Cooperation (APEC) Food Safety Cooperation Forum (FSCF), the World Bank Group sees a unique opportunity to promote a new paradigm of capacity building for food safety as a global public good. The multi-stakeholder GFSP will support food safety capacity building around the world. The partnership will bring together stakeholders to collectively address critical capacity building gaps through the establishment of an innovative open-source knowledge-sharing community of practice.

What are the main objectives of GFSP?

The main GFSP program development objective is to support improved food safety systems as demonstrated by enhanced agri-food value chains and improved public health outcomes. These outcomes will be achieved through delivery of a 5-year program for training and capacity development, supported by a public-private-partnership and funded by a multi-donor trust fund. The GFSP would contribute to food security, accelerated economic growth, facilitated trade and reduced rural poverty.

to ensure that adequate food safety regulations and implementing institutions are in place as improvements in nutrition quality and consumer awareness can be undone if problems with unsafe food arise. Similarly, guidelines and regulations for good agricultural practices should be in place and promoted by extension services to ensure the safe production of food at the pre-harvest and pre-slaughter phase. This is important, not only to minimize contamination of foods, but also to sustain nutrient soils and clean waters, both of which are essential for sustainable, safe and nutritious food production. Thus, a comprehensive food safety framework with a “from farm to fork” approach to food safety is a necessary condition to ensure that investments in improving food quality and nutritional content are sustained over time, safeguarding against any individual case of unsafe food.

Provide policy incentives for the private sector to increase the nutritional quality of food and food safety. Opportunities exist for public policies to differentiate subsidy rates providing incentives for the production of nutritionally enhanced foods. For example, several countries in LAC have policies to subsidize agriculture inputs (such as fertilizers, seeds, etc.) and adoption of improved technologies (agroforestry, irrigation, soil preparation, etc.). By rewarding the adoption and/or use of nutrition-enhancing agriculture practices and technologies (i.e. zinc fertilizer, biofortified seeds, food fortification, etc.) (see Box 9), as well as Good Agricultural Practices, agriculture policy could induce agribusinesses and producers to improve the nutritional content of food and to adopt practices that improve food safety, creating positive externalities in consumer’s health. Although the market initially may not pay for the benefits of improved food quality

(such as increasing the zinc content of grains through zinc fertilizers), the benefits to the population (if zinc deficient) could be greater than the investment of the additional marginal cost derived from using zinc-rich fertilizers. Similarly, publicly funded investment support to the private sector could include selection criteria that benefit nutrition-sensitive agricultural and food-processing investments.

Another potential policy-level incentive is through certification and labeling of foods to reward safety and nutritional content. Beyond the food safety norms and standards that regulate the production, processing and marketing of foods, there is an opportunity to ensure that the labeling of food products inform consumers about nutritional values and, thus, facilitate social marketing. This can be in the form of nutrition fact labels that list the nutrient amount in the product, or as symbols reflecting the relative nutrition content and dietary value. It is important to develop unified standards and monitor the application of these labels so that they can be trusted by the consumers. Further, with the growth of natural and health food products, there is an opportunity to ensure that consumers are informed about the benefits and meanings of the different food labels (health, organic, natural, etc.). The identification of higher food quality products in the market place can allow to target (i.e. with vouchers) or condition the transfers (i.e. with cash) for nutritionally at risk population (see Box 10).

B. Agriculture program and investment level opportunities

Although this companion note is primarily discussing opportunities for investments and interventions in the

Box 9. Promoting zinc fertilizer

Recently, China has recognized the importance and current deficiency of zinc in its agricultural production. The Ministry of Agriculture (MoA) recommended zinc fertilizer in its official guide for fertilizer use. The International Zinc Association (IZA), working with the MoA and the Chinese Agricultural University (CAU), is currently carrying out crop trials involving zinc fertilizer with positive results (i.e. average yield increases between 7% and 10% across crops and provinces).

Box 10. Nutrition focused marketing in Kenya

Kenyan CSO (Farm Concern International) won a World Bank CGAP award for its approach of nutrition-focused marketing of African leafy vegetables, driving up the value of these horticultural products 213 percent in five years and substantially increasing incomes and awareness among farmers interested in growing them (see Ewbank et. al., 2007).

agricultural sector, food policy is cross-sectoral and comprises a multitude of diverse stakeholders in the public and private sector. Investment in nutrition-sensitive agriculture and food production, therefore, does not only fall under traditional agricultural investment projects, but also provides opportunities for Community Driven Development Programs (CDDs), Development Policy Operations (DPOs), and private sector development initiatives.

1. *Agriculture research and development*

Enhancing the capacity of regional and national agricultural research institutions to develop and promote new varieties of food products with improved nutritional content. Examples of recent agriculture research and development (R&D) investments in nutritional quality include biofortification (the process by which the nutritional quality of crops is improved, dovetailing on efforts to enhance agronomic traits through plant breeding). The 2008 Copenhagen consensus concluded that biofortification was the fifth most cost-effective intervention to address hunger and malnutrition. If micronutrient deficiencies are well identified, the development of such crops could improve the intake of iron, zinc and vitamin A. To create sustainability (i.e. availability from one year to another) and make initial investments in R&D cost-effective,

plant-breeding techniques should always be preferred to transgenic techniques. Relative to supplementation and fortification, biofortification offers several advantages. First, it targets food-at-risk households in rural areas. Second, it is cost-effective, as after the initial investment in R&D, crops are available all year round. Finally, it is sustainable because it relies on staple crops that people are already used to eating. In LAC, Agrosalud and Embrapa are good examples of research institutions that have been making large progress in the biofortification field (see Box 11 and Box 12).

Agriculture R&D investments also present ways to identify opportunities throughout the value chain, to increase food quality and/or to avoid nutritional losses and food safety risks. Traditionally, agricultural R&D has been focused on the agricultural production (i.e. pre-harvest) segment of the value chain, so today there are many areas of improvement on the remaining parts of the chain, which have shown to lead to potential high levels of private and social returns on investment. Understanding the entire value chain of the agricultural products (from the field to the plate) can help private and public sector investments in terms of achieving improved nutrition outcomes for the poorest. Often, such R&D can be conducted in partnership with the private sector (through PPPs). Applied research can focus on the area of post-harvest processes to address local

Box 11. Agrosalud, an applied research center based in Cali, Colombia

The objective of Agrosalud is the development and deployment of biofortified staple crops to reduce nutrient deficiencies and improve food security in Latin America and the Caribbean. The goal is to increase, through traditional plant-breeding, the levels of nutrients and the nutritional content of important staple crops: iron and zinc in beans, maize, rice and sweet potato; tryptophan and lysine in maize; and beta-carotene in orange-fleshed sweet potato and yellow maize. It must be noted that, in addition, these crops are bred to retain positive agronomic qualities such as high yields and disease resistance.

Box 12. Embrapa, agricultural R&D in Brazil

Embrapa, the Brazilian Agricultural Research Corporation, has generated and recommended more than nine thousand technologies for Brazilian agriculture, reduced production costs and helped Brazil to increase the supply of food while, at the same time, conserving natural resources and the environment and diminishing external dependence on technologies, basic products and genetic materials. One of its achievements is the creation of alternatives for soybean processes, the development of products for thermo-plastic extrusion, the identification of the grade and quality of essential oils of native plants, the development of small machinery for family agriculture and the optimization in the use of enzymes for the extraction of avocado and soy oil. One of its actual priorities is the loss reduction of fruits and vegetables in the post-harvest phase. Finally, a very interesting program was developed to incentivize school restaurants all over the country to source locally with the food promoted by the program.

Also, eleven regional Embrapa offices are working on a biofortification program that aims to develop and introduce eight biofortified crops, namely: pumpkin, rice, sweet potatoes, beans, cowpeas, cassava, maize and wheat.

nutrition problems and/or reduce nutrient deficiency and contamination risks in the value chain of the main food products consumed by the most vulnerable. For instance, milk is often consumed in school feeding programs and bought locally. Fortifying milk with needed micronutrients could be a cost effective solution to address some of the nutrition problems, also producing spillovers beyond the student population. Scope for R&D can also exist to improve marketability of local foods, in order to maintain a constant nutrient factor in the logistics of the product and to maximize shelf life.

2. *Agriculture Extension and Information Services*

Opportunities exist to increase nutrition knowledge at the local level by incorporating food security and nutrition modules into agriculture extension training curricula. Extension agents (both private and public) often provide great coverage throughout the territory and a direct link to farmers and rural households. They are readily available delivery channels to promote nutrition among small-scale farmers and their households, usually the most vulnerable to food insecurity. The skills taught by extension agents could be used to change behavioral habits of producers (and rural households) towards making their agricultural activities (e.g. choice of seeds, Good Agricultural Practices including harvesting and slaughtering, post-harvest handling, food preparation) more nutrition-sensitive.

Including nutrition in the agriculture extension curriculum and modules represents a marginal cost with potential great benefits to bring nutrition awareness to farmers and rural households (see Box 13 for an example on Haiti).

A parallel effort, in conjunction with the Ministries of Health, could be aimed at informing and raising awareness among local consumers about the benefits of nutritionally enhanced foods for the health of a family, and thus increase demand for such products. Social marketing and nutrition education could promote and advertise nutritional benefits as well as potential problems. This can be combined with marketing of local agricultural products to generate consumer demand for local production. Labeling and recommendations from the Ministry of Health and/or Agriculture can also be useful in promoting the benefits of sourcing local foods and nutrition-enhanced foods among consumers, restaurants, schools, etc.

3. *Linking farmers to markets and strengthening the value chain*

Programs that invest in helping farmers link to markets, such as Rural Alliances and Community Driven Development (CDD) type of projects, have the opportunity to provide incentives to improve food quality and safety in value chains by not only

Box 13. Nutrition in agriculture investments in Haiti

After the 2010 earthquake, humanitarian agencies in Haiti wanted to procure food locally to distribute to distraught populations but neither the quality nor the quantities needed were available in the country to suit the organizations' needs. Most food aid was imported and distributed freely, harming national production. Therefore, the Ministry of Agriculture (MARNDR) of Haiti decided to implement policies and programs that would increase the volume and quality of the food produced to increase farmers' income and contribute to the overall food security of the country. The MARNDR and the Bank designed the RESEPAG II project to strengthen the MARNDR's capacity to define and implement the National Agriculture Extension Strategy, to increase access of small farmers to agriculture extension services and training on animal and plant health in priority regions (the US\$50 million project was declared effective in April 2012). Nutrition is integrated into project activities in the following ways:

- Nutrition status of rural households in the project area is a PDO level indicator
- Creation of a nutrition unit within the MARNDR to support the development of a nutrition strategy
- Training of agricultural extension agents just in the field of nutrition
- Under the “Market Support Facility”, matching grants will finance activities related to:
 - Improving the nutritional quality of foods in post-harvest processes
 - Facilitating the production of nutrient dense foods through the use of biofortified seeds already present in Haiti, and zinc-based fertilizers
 - Training women in post-harvest activities, knowledge about market demand for food quality norms, capacity to respond to such market demands through skill and leadership building
 - Supporting food processing techniques such as fortification and food quality control
- Development of a network of agribusinesses, mainly composed of informal female-owned microenterprises, to support the increase and improvement of agricultural production and value-added products needed to fulfill local buyers' demand (e.g. National School Feeding Program, Household Development Agent Initiative and the World Food Organization).
- Implementation of an impact evaluation to measure the appropriate impacts related to these specific interventions in nutrition.

linking to markets but to food purchasing programs, like food aid and school feeding¹⁷. These projects and “alliances” require a clear demand for the food product to be produced (often in the form of a letter of intent from the buyer). Therefore, to promote investments in food quality, projects that help link farmers to markets could: (i) actively help farmer groups to find potential markets that value increased nutritional content of food (having positive spillovers into other markets and consumers); (ii) increase the amount and/or scoring system for those initiatives that show a positive impact on nutrition outcomes; and

¹⁷ All traditional investments that aim to increase farmers' access to markets such as infrastructure investment or market promotion are also examples of ways of linking farmers to markets and strengthening the value chain.

(iii) provide (a) technical assistance related to complying with procurement rules and nutrition expertise for local farmer groups to (b) improve food quality and supply food assistance programs (such as food aid, school feeding, and other local purchases programs).

More traditional value chain approaches that benefit nutrition and food safety involve post-harvest handling and logistics. To improve food safety for marketed products, cold storage and transportation, together with good hygiene practices in handling and packaging, are essential. While some of these measures can be improved through knowledge and changes in routines, other require relatively large up-front investments, which are more

prone to market failures, especially when agricultural credit is scarce. Public investment project can therefore play a role, either by availing credit or by co-financing through conditional and competitive grants. Similar investments are required to maintain nutrition quality throughout the supply chain. The nutrition value of perishable products such as fruits and vegetable quickly declines after harvest, so appropriate storage, packaging, and preservation techniques are therefore crucial.

C. Mainstreaming nutrition into different agriculture sector settings in LAC

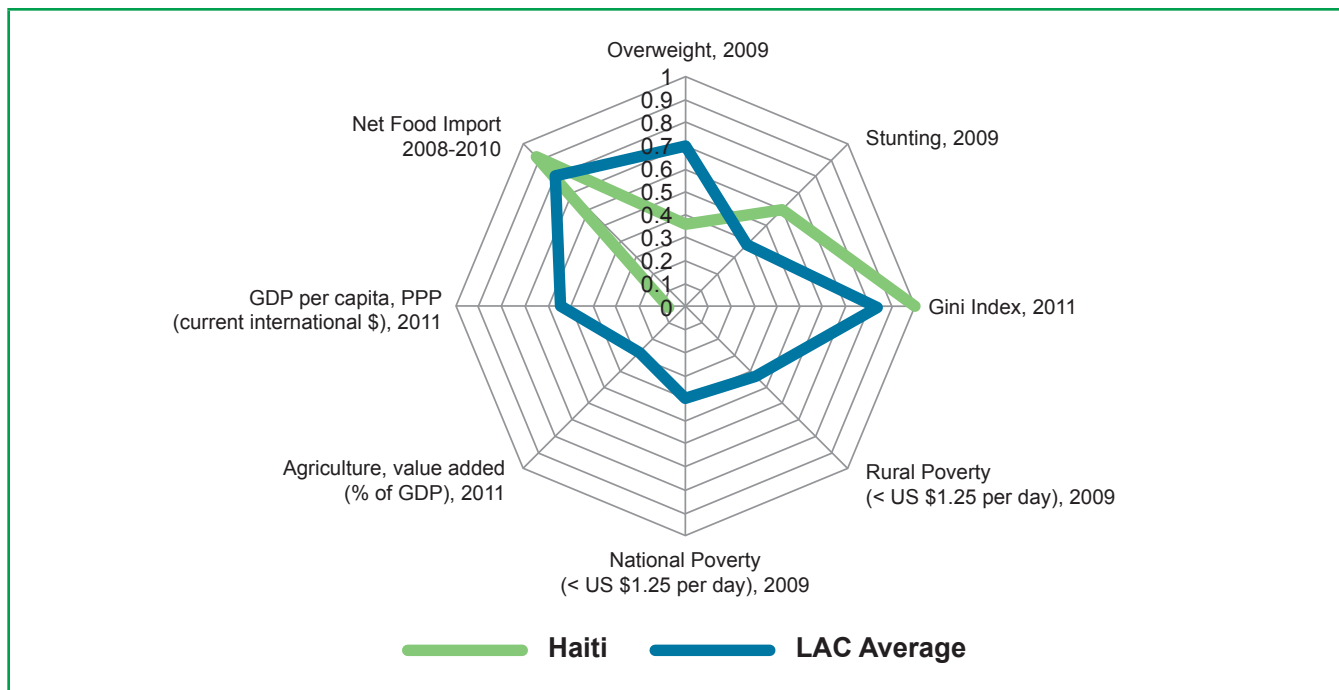
Given the difficulty of grouping countries, this section provides some country examples to

illustrate the different nutrition problems and agriculture sector country contexts, and how the potential interventions may vary. The agriculture sector in LAC is very heterogeneous in terms of overall economic importance (agricultural GDP as % of total GDP), social importance (agriculture income as % of total income of the rural poor), competitiveness (net food exporter vs. net food importer), structure (small vs. large-size farmers), etc. Also, nutrition indicators like obesity and stunting vary across countries, and the solutions and linkages between agriculture and nutrition are numerous depending on the situation. In the next pages, we have focused on 3 countries as a way to illustrate the different situations and different opportunities for mainstreaming nutrition into agriculture investments.

D. Country notes - Agriculture for nutrition

1. Haiti

Country Context



Note: All the LAC data were normalized to 1 to ensure comparability between variables and countries.

- HDI ranking: 161 out of 182 countries¹
- Life expectancy: 63 years²
- Under-five mortality rate: 76 per 1,000 live births²
- Global ranking of stunting prevalence: 75th out of 123 countries² (where 1 is the highest prevalence and 123 is the lowest)
- Ag. GDP per Total GDP: 25%³ (GDP per capita: US\$771)
- Ag. employment per total employment: 50%¹⁰ (24.15% of the agricultural labor force are women)³
- Rural population: 45% of total population³
- Rural poverty 88%²; total poverty 55%

Investing in nutrition yields high returns: 6-30 times its costs⁸.

GDP growth originating in agriculture is at least twice as effective in reducing poverty as GDP growth stemming from other sectors (WDR, 2008)¹¹.

Key Agricultural Actions to Address Nutrition Challenges in Haiti

- Support diversified, nutritious and safe food production, and raise farmers' as well as local consumers awareness of the nutrition side of food production to reduce chronic food insecurity.
- Support farmers' access to markets, including food aid and school feeding programs, and food preservation techniques to improve access to nutritious food.
- Support production of animal-sourced food for the local markets to reduce anemia.
- Support the laboratory infrastructure to increase food safety for local and international markets
- Develop food standards such as, for example, iodized salt to address iodine deficiency.

The Costs of Undernutrition

- Nearly half (45%) of all deaths in children under five are due to undernutrition¹³.
- The economic costs of undernutrition include direct costs such as the increased burden on the healthcare system, and indirect costs like the lost productivity.
- Childhood anemia alone is associated with a 2.5% drop in adult wages⁴.

Where Does Haiti Stand?

- 58% of all households in Haiti are food insecure⁵ and 49.8% are undernourished. The main strategies that households adopt in response to lack of food or money to obtain food are reducing food quantity or number of meals per day, reducing dietary diversity, and adults reducing consumption for the benefit of children.
- Overall food availability remains low with a total food supply of 1,979 caloric per capita and day in 2009^{6*}.
- 22% of children under the age of five are stunted, 11% are underweight, and 5% are wasted².

- 25% infants are born with a low birth weight².
- 68% of children aged 6–24 months are not fed according to the three recommended infant and young child feeding practices based on diet diversity, adequate feeding frequency and receiving breast feeding or milk products⁷.
- One third of pre-school aged children are deficient in vitamin A; two thirds of children under-five, three fourths of children under-two, and 60% of pregnant women suffer from anemia: 59% of children 6-12 are considered iodine deficient.
- Food insecurity is highest in rural areas: For every 100 person affirming to be unable to satisfy their alimentary needs in the country, 77 are located in rural areas, 9 in the capital's metropolitan area and 14 in other cities¹². Achieving food security means ensuring quantity, nutritional quality and continuity of food access for all household members.
- Food price declines at the international level after the food crisis were not fully reflected in local markets.
- Haiti has a high disease burden from food and waterborne diseases. Undernourished children who fall sick are much more likely to die from such illness than well-nourished children. 7% of deaths under 5 children children is due to diarrhea.

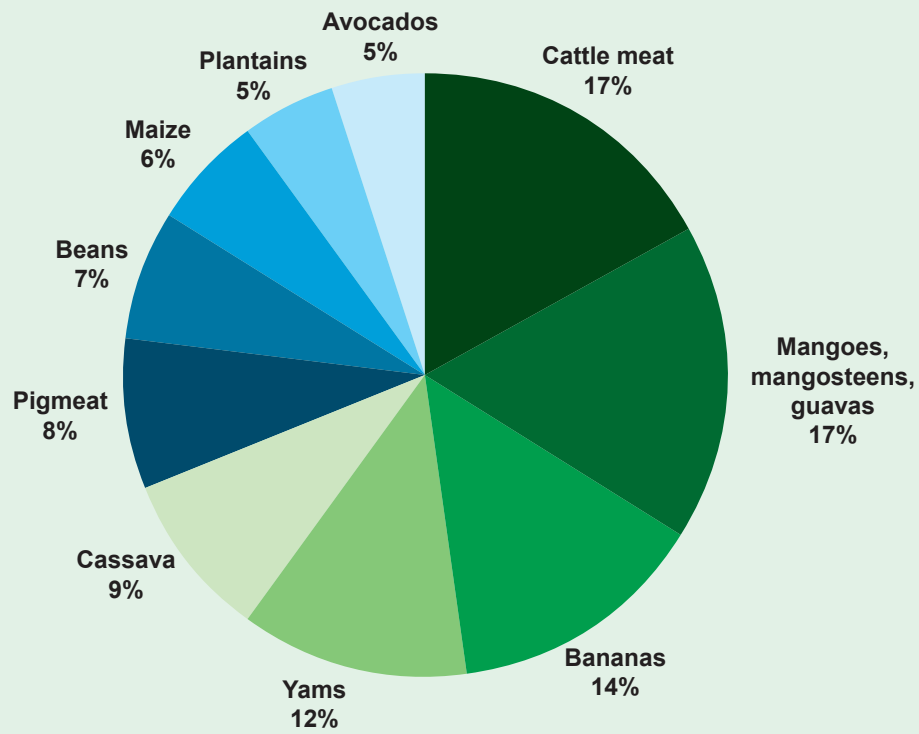
Box 1. Haiti's Agro-Food Sector

There are approximately one million farms in Haiti, averaging about 1.5 ha and divided between multiple parcels. The number of small farmers is rapidly growing and expanding on marginal land, which currently accounts for one third of the land used for farming. Haiti's agro-environment is diverse, with about 20% of country is occupied by plains and the rest being mountainous. Forests are a natural component in the environment but also rapidly decreasing due to expanded agricultural land and the demand for wood. As a result, less than 2% of total land area is currently covered by dense forest. Similarly, watersheds are deteriorated and cause frequent floods.

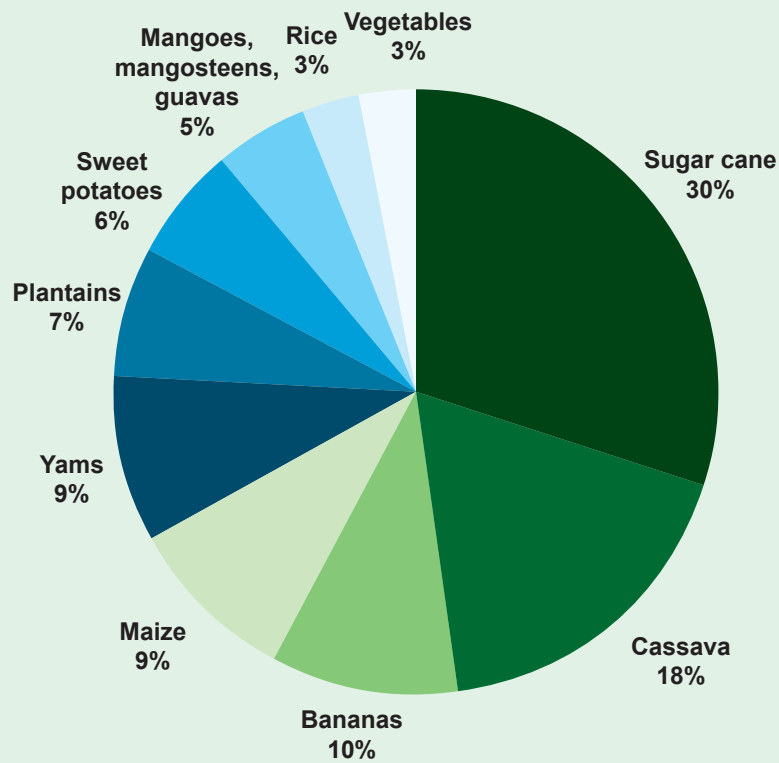
Agricultural production: Haiti's agricultural production is diverse, and the sector produces both for the domestic and export markets. Exports have remained fairly stable over the past two decades, whereas imports of agro-food products have seen a four-fold increase. Fishing is important for income and nutrition in the costal areas, and occupies 50,000 people part or full-time, with demand at both local and international markets.

* Anything below 2,200 kcal per capita and day in a country is considered low from a food availability perspective. 2,500 kcal per capita and day is considered a lower limit to ensure stable food access among the vast majority of a country's population.

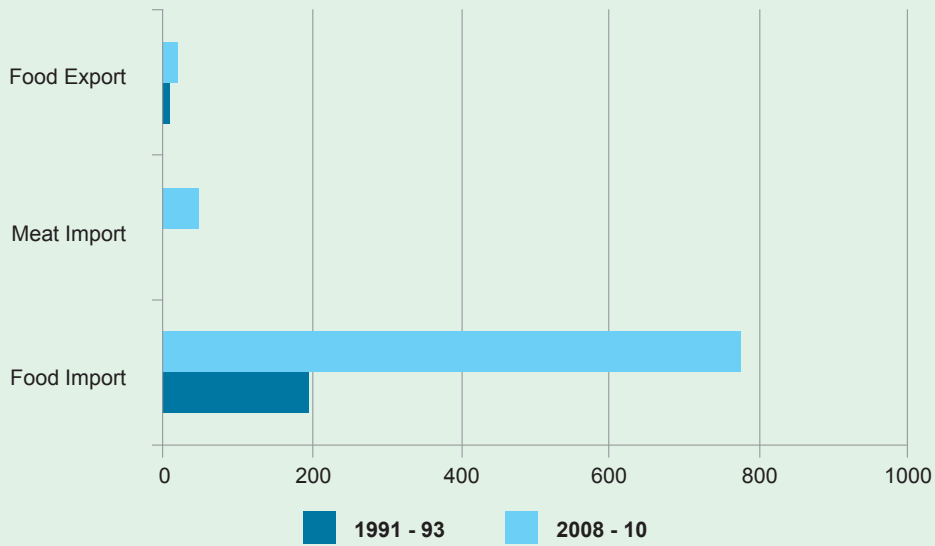
Top 10, Production Value



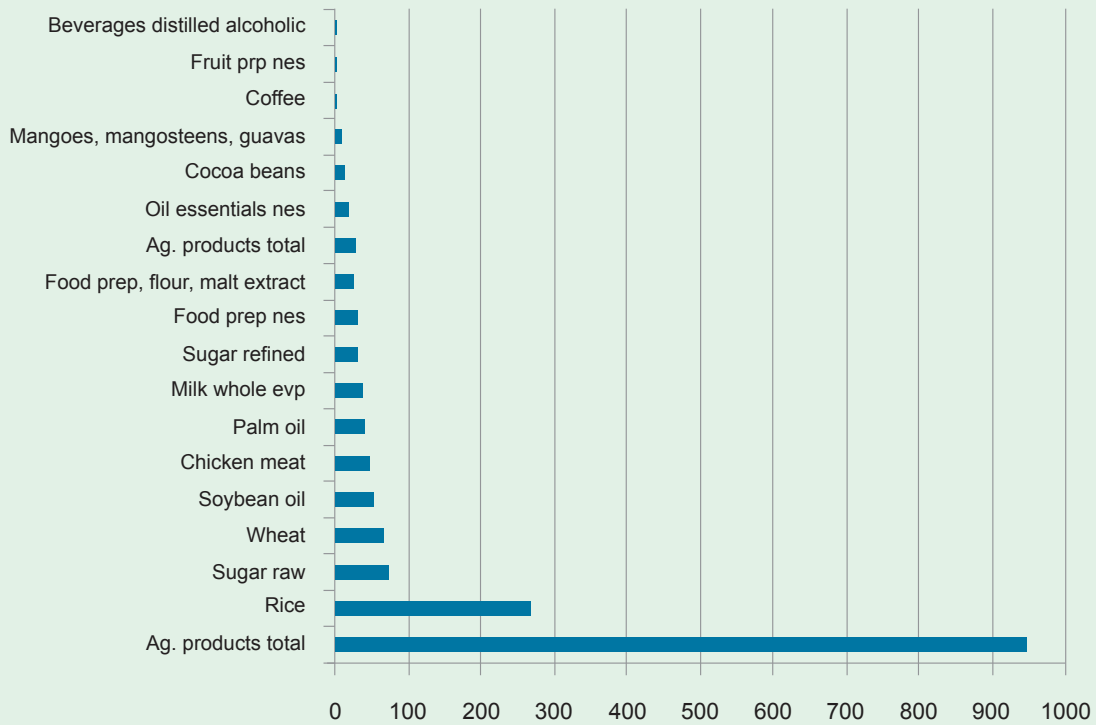
Top 10, Production Quantity



Import and Export Food Products, US\$ Million



Import and Export (2010), US\$ Million



Haiti's farmers face numerous challenges that impact food security for both producers and consumers. Agricultural practices are basic and access to inputs such as fertilizers, quality seeds, livestock feed and even tools and equipment is limited. As a result, fertilizer use in Haiti is among the lowest in the world. Limited availability to agricultural credit poses an additional challenge to accessing inputs. Post-harvest infrastructure, including storage and post-harvest handling are underdeveloped, which cause oversupply of agricultural products in harvest seasons and post-harvest losses. They also result in poor quality of meat products and fruits and vegetables at markets. Similarly, physical access to markets is challenged by poor roads, which causes perishable products to rot on the way, to the extent that farmers are discouraged from producing fruits and vegetables.

Limited agro-food processing shortens potential shelf-life of food products and limits access to food across seasons: Haiti's agro-food industry is under-developed with poor infrastructure, poor communication, and difficulties complying with food safety standards, especially for export. Similarly, inadequate equipment, organization, and post-harvest handling, pose challenges to development of the fishing sector.

Source: FAO STAT: Haiti National Agricultural Investment Plan, May 2010

Opportunities in Agro-Food Sector to Address Causes of Undernutrition in Haiti

Two main causes of undernutrition in Haiti are the limited access to nutritious and safe food faced by a large proportion of Haitians, and the high disease burden stemming from food and waterborne diseases.

It is necessary to promote farm-to-fork approaches to improve food quality and safety, as well as support safe production and handling of food products throughout the agro-food chain. At the same time that actions are taken to increase food quality, the diversification of production is also needed to improve diets diversity across seasons. Finally actions should aim to contribute to the affordability of a diverse, safe and nutritious food all year-round for the most vulnerable. The agricultural sector counts many opportunities to contribute to these solutions:

Food Production

- Support farmers in increasing productivity and quality of diverse food crops (to increase rural incomes and decrease prices through increased supply).
- Integrate activities strengthening backyard farming for household consumption and local markets, including chicken and small ruminants, into the regular work program of the extension services.
- Improve an all-year safe and diverse food supply by promoting good hygiene and storage practices in post-harvest handling. Also develop on and off-farm storing and processing techniques for horticulture and livestock products.
- Promote good agricultural practices for production of safe food. Such practices include livestock management, and fertilizer and

pesticide management, in particular related to water sources.

- Maximize the impacts of the natural environment, considering soil characteristics, nutritional content of crops and the diverse agro-ecological conditions. This can also support sustainability as it decreases the reliance on externally sourced inputs. Agroforestry** can be used as a method to improve soil quality and to maintain marginal land while availing it for food production. A recent multisectoral initiative has been launched by Aba Grangou (see below) to promote the adoption and the use of Benzolive (MORINGA) to reduce malnutrition. Similarly, integrated crop-livestock farming can be used to improve soil quality and maintain the natural nutrient cycle.
- All of the above is likely to require incentives for the adoption of new technologies and practices as well as financing due to the limited private resources among farmers. Such programs can give extra points to investments that will yield broader nutritional benefits.
- To maximize returns from public support in this regard, the focus should remain on identified food products produced for the domestic markets that have been shown to have the most impact in rural economic development, namely rice, plantain/bananas, beans, legumes, root, dairy products, and farm chickens¹².

Linking Farmers to Markets, Food Aid and School Feeding Programs

- Invest in rural and market infrastructure to improve connectivity to markets, decrease post-harvest losses, encourage production of perishable food

** Agroforestry means agricultural systems where trees are managed together with other crops and/or animals (FAO, 2013).

products, and improve marketability of local products in urban areas.

- Support the organization of farmers to increase volumes and quality of food produced, transformed and stored in order to offer continuous supply to markets.
- Help develop diverse food systems and investment in market infrastructure to locally procure for social programs including food aid, school feeding programs and vouchers distribution. This type of mechanism could be used in time of emergency to ensure local food provision of food distribution and avoid adverse market impacts***.
- Today, the legislation in Haiti makes it very difficult for social programs and public markets to procure the food locally. So action has to be taken to either change the legislation and/or support farmers to comply with the law and criteria to qualify as suppliers to such programs.
- Social marketing should be developed in parallel to promote diverse, safe and nutritious food to local demand.

Agriculture Research and Development

- Improve micronutrient content in food products by focusing R&D on developing fortified seeds of key staples and fertilizers rich in, for example, zinc.
- Partner with the private sector to initiate fortification of certain food products such as milk and maize flour further up the value chain. PPPs with salt producers and national food standards could enhance iodine fortification of salt in the country. These should be accompanied with awareness campaigns to increase demand for iodized salt.

Regulations and Standards

- Invest in food safety infrastructure such as laboratories to ensure and enforce food safety standards. The development of food safety standards needs be reinforced to build trust

*** Haiti has been a good example of the harm that food aid can cause to the agriculture sector when such a system is not in place to be scaled up. See: <http://www.gao.gov/products/GAO-11-636>.

among local and international consumers. To ensure affordability for local consumers, standards need to be developed in accordance with the Haitian context in addition to any international requirements.

- Develop national guidelines and standards for food product fortification and control mechanisms.
- Develop systems for labeling food products to highlight nutrition and safety content. Successful examples from other countries include systems of simple symbols reflecting the content. This can be done in collaboration with the private sector, laboratories and the Ministry of Health which already has an initiative on “*Agriculture de Santé Publique*” (Public Health Agriculture). Make sure that an independent verification system is in place to ensure the integrity of the system.

Ongoing Initiatives in Agriculture to Improve Nutrition in Haiti

There are numerous on-going nutrition-sensitive agricultural initiatives and activities in Haiti. Many of these can be built upon or serve as models in order to not duplicate work and institution building.

Aba Grangou is the Government cross-sectoral national strategic framework for reducing hunger and malnutrition. It is led by the President with the support of the First Lady and its objective is to halve the share of the food insecure population by 2016 and to eradicate hunger and malnutrition in Haiti by 2025. The program works across nine ministries, seven autonomous agencies, 21 government programs, and the Haiti Red Cross. The program addresses hunger and malnutrition by improving access through social safety net programs, increasing domestic food production through investing in agriculture, and availing basic services such as health, water and sanitation⁹.

The objective of the **Strengthening of Agricultural Public Services Project II** (RESEFAG II) is to strengthen agriculture innovation and extension services. While the

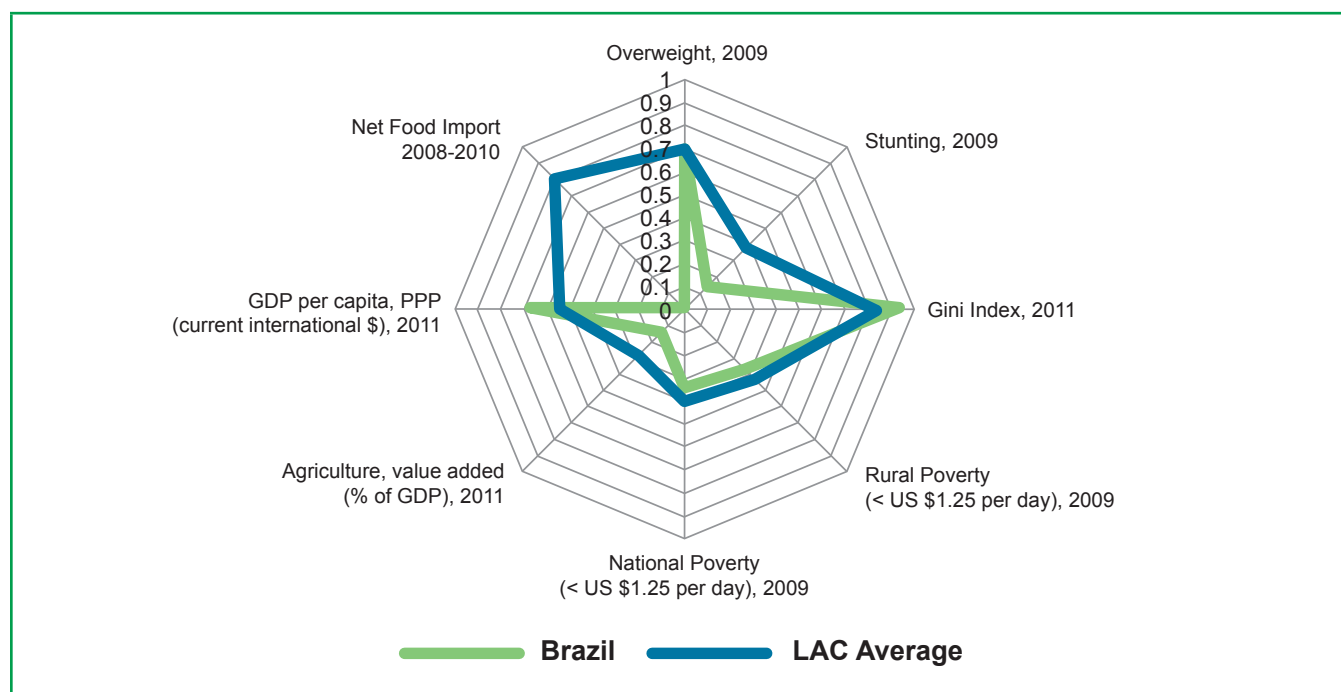
project works with the agricultural sector at large, it comprises several specific nutrition-sensitive activities. These include strengthening the institutional capacity of the Ministry of Agriculture in nutrition aspects, establishing nutrition modules in agriculture extension curriculum, and providing incentives for farmer groups (matching grants) to invest in nutrition improvements in food production.

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2. Brazil

Country Context



All the LAC data were normalized to 1 to ensure comparability between variables and countries.

- HDI ranking: 85th out of 182 countries¹
- Life expectancy: 73.8 years²
- Under-five mortality rate: 14 per 1,000 live births²
- Global ranking of stunting prevalence: 115th out of 123 countries³ (where 1 is the highest prevalence and 123 is the lowest)
- Ag. GDP per Total GDP: 5.5% (GDP per capita: US\$12,590)³
- Ag. employment per total employment: 10% (24.5% of the agricultural labor force are women)⁵
- Rural population: 12.7% of total population⁵ Rural poverty 12% (below US\$1.25 per day); total poverty 21% (6% below US\$1.25 per day)⁴.

Investing in nutrition yields high returns: 6–30 times its costs¹⁰.

GDP growth originating in agriculture is at least twice as effective in reducing poverty as GDP growth stemming from other sectors (WDR, 2008)¹¹.

Key Agricultural Actions to Address Nutrition Challenges in Brazil

- Support backyard and smallholder production of food in cash crop producing areas to improve nutrition outcomes in rural areas. When possible, include family agriculture in the supply chains of government safety net programs, to strengthen local food systems.
- Improve shelf-life of fresh products through support for the development of cold chains and small-scale food processing, to supply competitive, nutritious products to urban consumers despite distance and infrastructural challenges.
- Improve the food environment in urban areas to avail a more diverse diet, and develop a labeling system for healthy vs. unhealthy foods to address the growing burden of overweight and obesity.

The Costs of Undernutrition

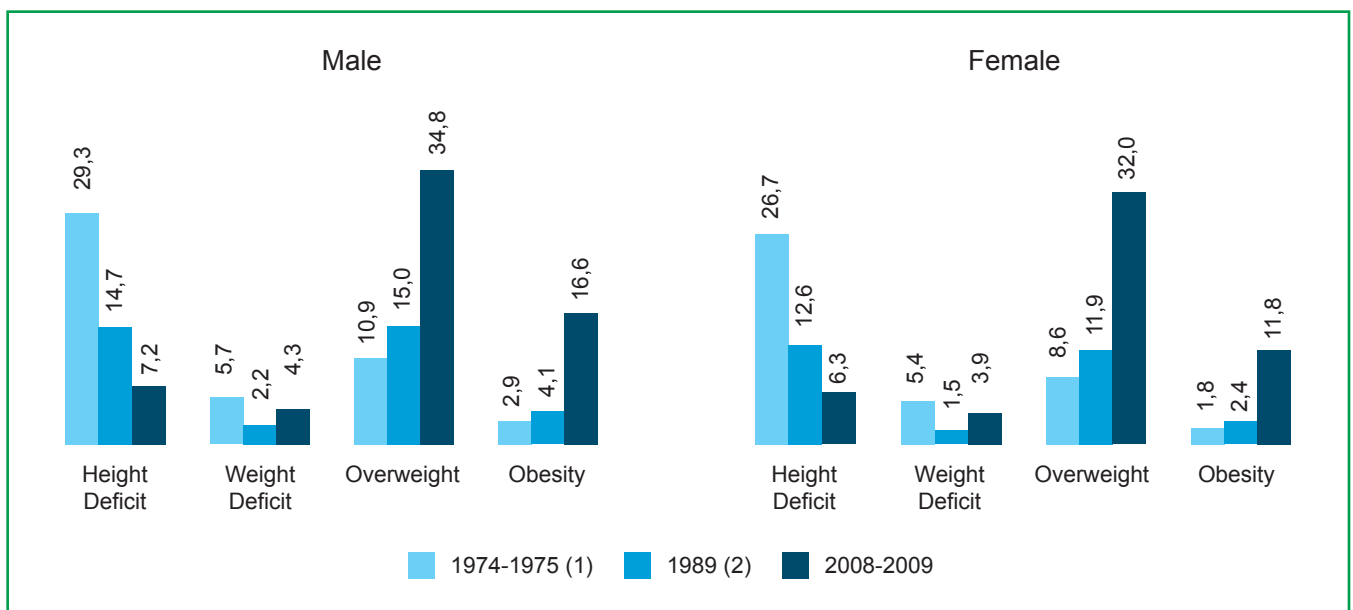
- Diabetes and cardiovascular diseases account for 38% of all deaths in Brazil⁸
- Children who are undernourished between conception and age two are at high risk for impaired cognitive development, which adversely affects the country’s productivity and growth.
- Childhood anemia alone is associated with a 2.5% drop in adult wages¹².
- The Latin America and Caribbean region is anticipated to lose a cumulative US\$8 billion to chronic disease by 2015⁹.

Where Does Brazil Stand?

- Poor nutrition affects rural and urban population differently in Brazil. Especially in the Northeast, the rural population is still struggling with undernutrition and limited access to food; in urban areas, malnourishment is a consequence of nutrient-poor, energy-dense diets, resulting in overweight and obesity, and diet-related non-communicable diseases.

- 6.7% of the population is estimated to consume below the minimum level of dietary energy (2011 figure)⁷.
- Stunting among children has decreased over the past years and prevalence is now about 7%⁶.
- 8% infants are born with a low birth weight².
- Malnutrition among children under five has been more than halved since the 1990s⁶; 88% of all households consume iodized salt².
- Although important gains have been achieved over the past decade in reducing undernutrition, obesity is now becoming a problem (see Figure below).
- 52% of Brazil’s population is overweight, 19% is obese⁸.
- 43% have raised cholesterol, 40% have raised blood pressure, and 10% raised blood glucose⁸.
- Daily food supply in Brazil is 3,173 Kcal per capita, at the level of high-income countries⁵.
- Race, gender, and birth location still determine access to adequate nutrition and clean water⁶.
- Clean water sources are problematic in rural and peri-urban areas⁶.

Brazil – Anthropometric Indicators for Population 5 to 9 Years of Age



Source: IBGE, *Diretoria de Pesquisas, Coordenação de Trabalho e Rendimento, Estudo Nacional de Despesa Familiar 1974-1975 e Pesquisa de Orçamentos Familiares 2008-2009*; Instituto Nacional de Alimentação e Nutrição, *Pesquisa Nacional sobre Saúde e Nutrição 1989*. (1) Exclusively rural areas of the North and Midwest Regions. (2) Exclusively rural areas of the North Region.

Box 1. Brazil's Agro-Food Sector

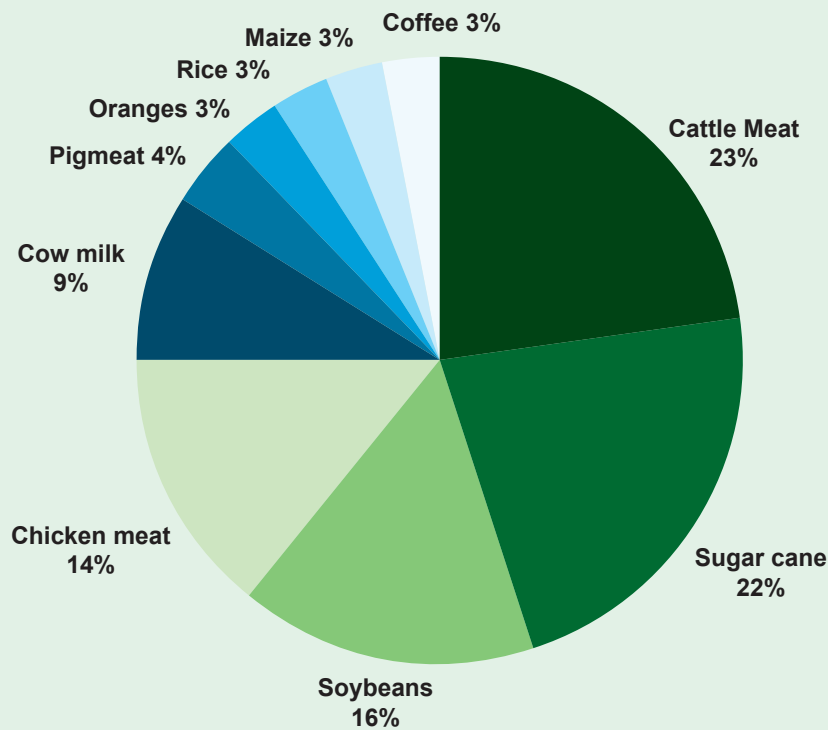
Brazil is one of the world's most important agricultural producers and the sector remains very important in the country's economy. Brazil is the world's third largest agri-food exporter after the European Union and the United States and agricultural products account for 30% of total exports. The sector still employs about 10% of the total labor force. However, the rural population is decreasing and has decreased from about 21% to 12.5% over the past 15 years.

Brazil's agro-environment is highly diverse but land degradation and deforestation is a challenge. Large parts of the country is covered with forests and about 31% of Brazil's land is used for agriculture (24% for pasture and 7% for cultivation). The climatic zones range from semi-arid land in the northeast, to tropical and subtropical climate in the center, and more temperate climate in the south. Brazil is well suited for agriculture but there is significant land-degradation and low soil-suitability across the country.

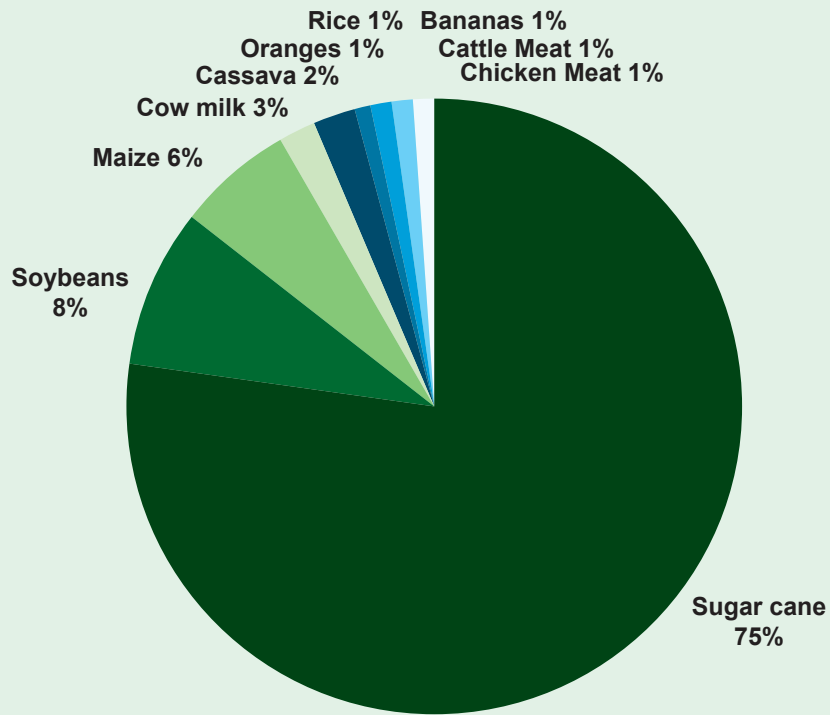
Smallholder farms are important contributors to the sector, though belong to Brazil's poorest. Brazil's agricultural sector is divided between large-scale export oriented farms in the south and center-east regions, and about 4 million smallholder, or family farms of which a share is classified as subsistence farms. Although these farms face a multitude of challenges, including limited access to inputs, credits, technical know-how, and markets, they account for 70% of domestic food production and also contribute to exports. Unequal land distribution contributes to rural poverty. In particular in the northeast and in central Brazil, landless farmers and smallholders are impoverished. At the same time, non-agricultural employment is increasingly important and provides the main source of income for 30% of the rural population

Brazil's agricultural production is strongly correlated with its main agricultural exports. Reflecting a significant shift towards meat exports over the past two decades, feed and meat products along with sugar and traditional export products like coffee and oranges (for juice) dominate agricultural production. As for trade, it is interesting to note that high-value and quite specialized products such as wine, olive oil, garlic and frozen potato are among the top ten import products in value terms.

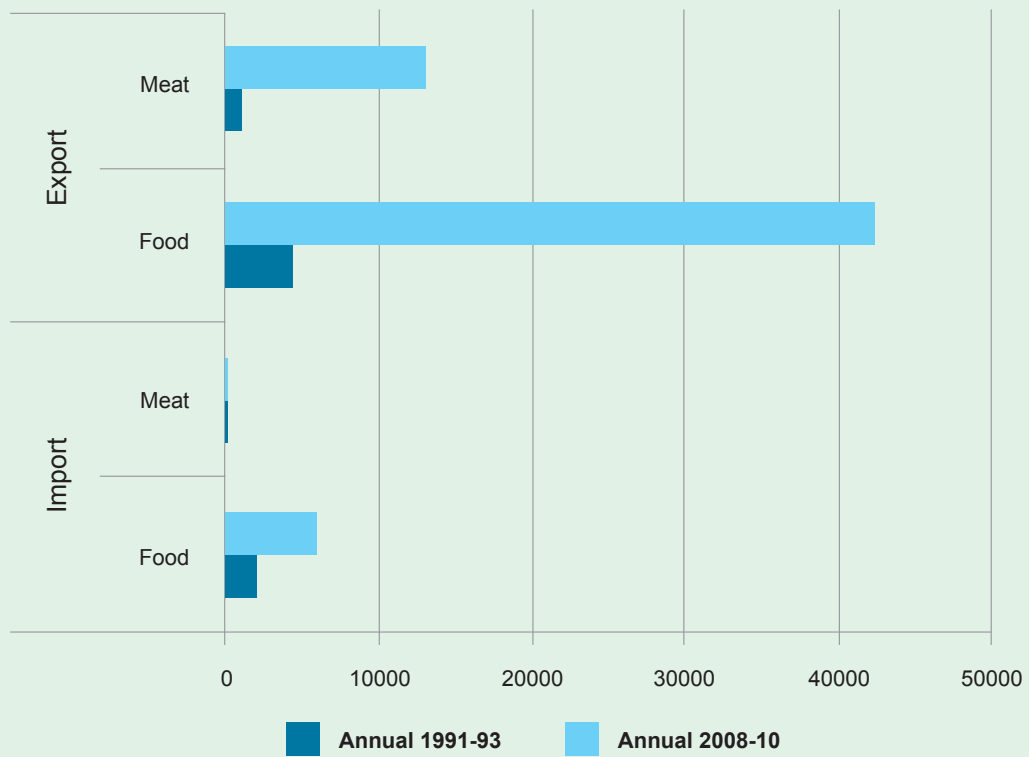
Top 10, Production Value (2011)



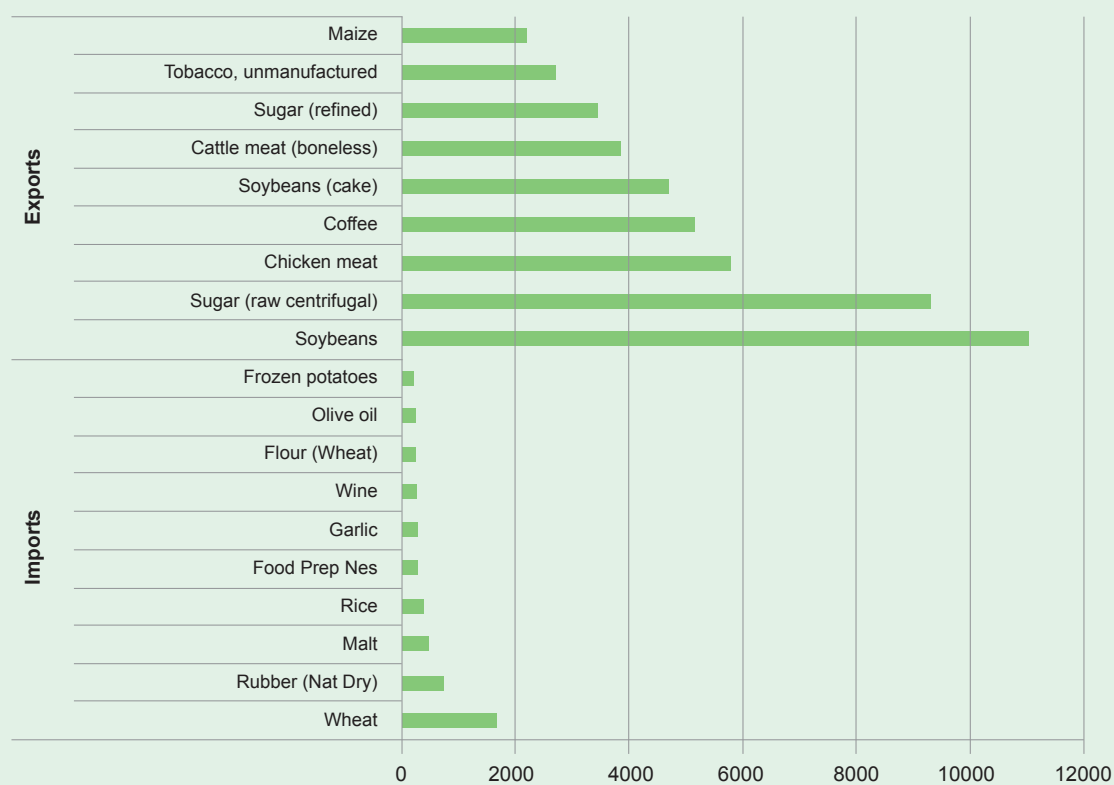
Top 10, Production Quantity (2011)



Change in Imports and Exports, US\$ Million



Top Imports and Exports (2010), US\$ Million



Productivity has increased significantly over the past decades but yield gaps remain and increase in production is also a result of expansion in land. Brazil's grain production increased 245% since the late 1970s, while cultivated land increased only 35%. At the same time, yield gaps remain.

Future competitiveness of the sector will depend on the ability to tackle environmental degradation and ensure sustainable use of natural resources. Deforestation, soil nutrient depletion, and soil erosion are of major concern in Brazil. A vicious cycle of deforestation in marginal areas for agricultural production (e.g. coffee, sugar, and cattle) by farmers who are unable to afford fertilizers causes nutrient depletion of soils and the need to incorporate new areas into production and thus further deforestation.

Brazil production is highly at risk of being affected by climate change over the next century and it will have significant impact on food production under the current agricultural system. Temperatures are projected to increase and precipitation is expected to decrease. Not all parts of the country will be equally affected, however. Although decreased crop yields are projected for southeastern Brazil, intense rains will occur more frequently and floods will increase, as opposed to northeastern Brazil where precipitation is expected to be reduced by 15-20%. Further, rising sea levels will affect the mangrove ecosystems of Brazil. Climate change models projects that, with time, southern Brazil will no longer be suitable for grain crops such as rice, beans, maize, and soy, and that this production would instead move towards the central and western parts of the country.

The rural poor are already affected by changes in weather patterns. Droughts over the past years in northeastern Brazil have resulted in up to a 25% decrease in agricultural GDP, which in turn has led to out-migration and displacement of millions of low-income rural people. Especially vulnerable have been those supporting themselves through subsistence agriculture.

Source: FAO STAT Country Profile: Brazil, World Bank Climate Change Country Note; IFAD Rural Poverty Country Profile; OECD Policy Brief (2005)

Opportunities in Agro-Food Sector to Address Causes of Undernutrition and Obesity in Brazil

Due to the size and the diversity of the country, agricultural interventions to tackle Brazil's nutrition problems will be complex and multifaceted. Although undernutrition and stunting still exist, particularly in certain rural areas, the adequate amount of calories is not the primary challenge to improve diets in Brazil, especially given the rise in obesity. Better understanding the local nutrition status and challenges to access nutritious and diverse diets is required to develop targeted interventions. Many initiatives of this kind are already ongoing throughout the country and have proven effective in improving nutrition indicators as well as developing and strengthening local food systems. Yet, with the past decades' rapid urbanization and continued rising incomes, the challenge of overweight and non-communicable, diet-related diseases are bound to grow, emphasizing the need for innovative approaches to integrate rural and urban markets.

Limited Access to Safe and Nutritious Food in Rural and Urban Areas

Some of the opportunities include: (i) improve food production in rural areas; (ii) improve supply opportunities to urban markets through improved storage and processing; (iii) improve food environments in urban areas and avail space for safe and diverse markets; (iv) link poor producers and consumers through existing government safety net programs; (v) promote farm-to-fork approaches to food safety; and (vi) help small farmers comply with food safety standards to be able to supply school feeding programs. This can be done through the following:

Food Production

Brazil has achieved great increases in food production in recent decades, however some opportunities to contribute to the nutrition agenda exist:

- Assess nutrition impacts on the rural population from state interventions and projects; ensure that such interventions do not compromise the

local populations' all-year access to diverse diets either through local food production or markets. Similarly, broader policies should be evaluated from a public health aspect at the macro level.

- Support access to improved fertilizers to avoid further soil nutrient depletion and to improve nutritional content in food production.
- Ensure access to competitive seed varieties for food producers to improve the quantity and quality of outputs and to ensure that they can compete on urban markets.
- Support integrated pasture management to halt land degradation and to ensure continued livestock production, also among smaller-scale farmers, without further deforestation.
- Support climate change adaptation among food producers through climate resilient seeds and breeds, knowledge about alternative production, and through improved water management. This can be done within the ongoing Climate Risk Zoning Program.
- In rural areas with limited access to diverse, year-round markets, promote diversity of subsistence food production, such as backyard farming, through extension services and improved access to inputs, specially for small-scale cash-crop producers and subsistence farmers.
- Promote good agricultural practices and hygienic handling of food products to reduce food and waterborne diseases. Such practices would include livestock management and fertilizer and pesticide management, in particular related to water sources. Promote good hygiene and storage practices in post-harvest handling of food products.

Develop more Diverse Food Markets

- Support increased profitability for local food production by developing market infrastructure and supporting on and off-farm storage and processing of food products. This is not only important in distant areas with poor roads but crucial for reaching the urban inhabitants that now account for almost 90% of Brazil's population.

Given the importance of small-scale farmers in the domestic food supply, developing market-channels and value chains could have significant impacts on both farm incomes and consumers' access to diverse diets.

- Although traditional cash crops may in many cases be most profitable for farmers to produce, opportunities exist for farmers to scale up food production by participating in Brazil's school feeding and safety net programs, under, or copying the model of, Brazil's Food Acquisition Program (*Programa de Aquisição de Alimentos*, PAA) and the National School Feeding Program (PNAE). Provide technical assistance to farmers to comply with food safety standards and other procurement requirements to participate in these programs.
- Improve the urban food environment so that diverse and nutritious foods are available at urban markets, also in areas with lower-income consumers. This can be done by developing market-space connected to clean water, electricity, and refrigerated storage areas for the cleaning of space and products, and for cold storage. These markets should have systems for accepting food stamps from program such as Zero Hunger.

Agriculture Research and Development

- Continue initiatives like BioFORT to develop fortified seeds in order to improve micronutrient content in food products. Scope also exists for developing mineral and nutrient-rich fertilizers for the same purpose.
- Focus R&D on developing climate resilient seeds and breeds for food production.
- Continue initiatives such as Harvest Plus to fortify processed food products in stores. Partner with the private sector to initiate fortification of certain food products such as milk and maize flour further up the value chain.

Food Regulations and Standards

- Invest in food safety infrastructure such as laboratories or purchase services from private

laboratories that currently support the export sector. Enforce stricter food safety standards on the domestic markets for larger producers.

- Develop national guidelines and standards for food product fortification and control mechanisms.
- Develop systems for labeling food products to highlight nutrition content and to alert consumers when products are high in sugars, salt, and saturated fats as a mean to tackle the growing obesity burden. Successful examples from other countries include systems of symbols reflecting the content. This can be done in collaboration with the private sector and can gradually be enforced among processors above a certain size. Make sure that an independent verification system is in place to ensure the integrity of the system.

Ongoing Initiatives Linking Agriculture to Nutrition in Brazil

The **Zero Hunger Program** (*Fome Zero*), adopted in 2003, is an umbrella program with the objective of eradicating hunger and extreme poverty in Brazil. The program supports both production and consumption of healthy food through measures such as food stamps, school feeding programs, and integrating family agriculture into viable food systems. Nutrition education is also part of the program⁹.

Food Acquisition Program (*Programa de Aquisição de Alimentos*, PAA): Through a public sector purchasing entity, the Government buys food products from small farmers and gives (donates) food to NGOs and public sector programs for food aid.

National School Feeding Program (PNAE): Through municipal-level quotas, the public resources allocated to buying food for school feeding require that a mandated minimum level of 30% of the food is sourced locally. In practice, many municipalities buy approximately 50% of their food from local small farmers.

Agriculture R&D: Embrapa, the public sector Agriculture Research organization, invests resources in

biofortification and best practices that improve nutrition content of food products.

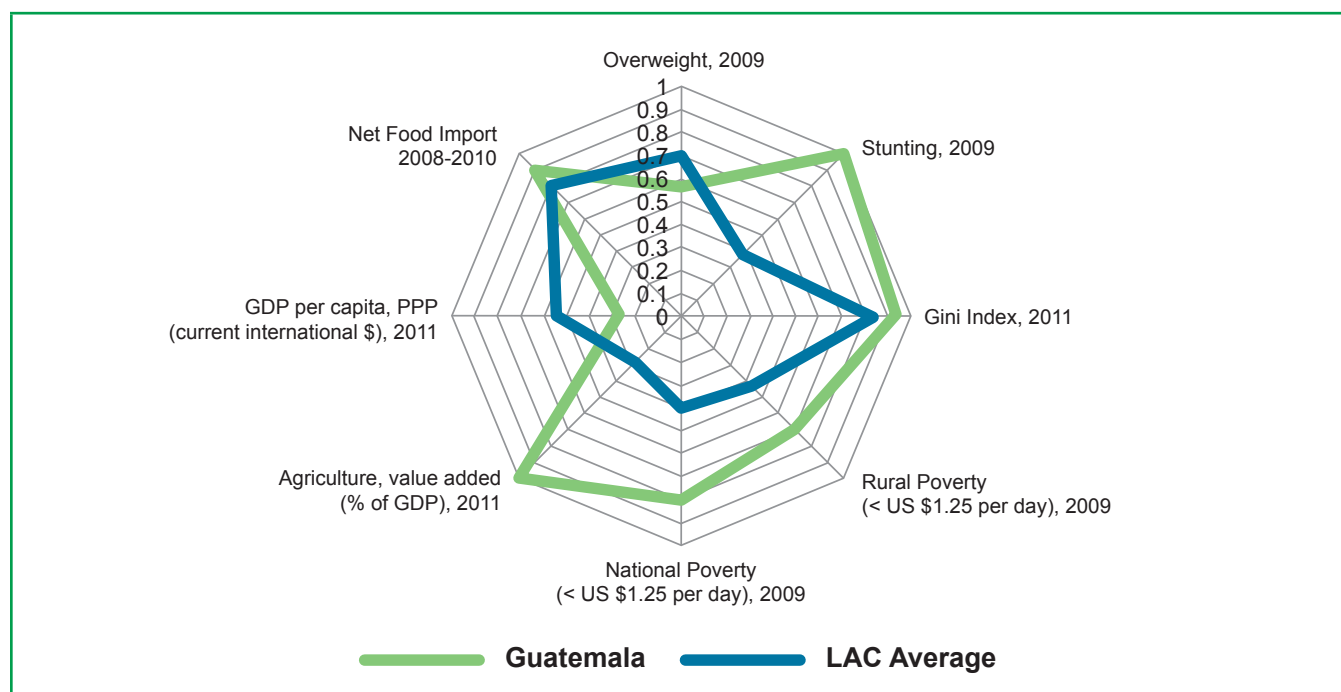
The World Bank supports rural poverty reduction and improved natural resource management through increased family agriculture productivity and market access in the North (Acre), Northeast (Ceará, Pernambuco, Rio Grande do Norte) and South (Paraná, Santa Catarina)⁶.

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3. Guatemala

Country Context



Note: All the LAC data were normalized to 1 to ensure comparability between variables and countries.

- HDI ranking: 133 out of 182 countries (2011, down from 122 in 2008)^{1,2}
- Life expectancy: 72 years²
- Under-five mortality rate: 32 per 1,000 live births²
- Global ranking of stunting prevalence: 6th highest out of 123 countries²
- Ag. GDP per Total GDP: about 20%¹ (11.3%⁶)
GDP per capita: US\$2,873⁶
- Ag. employment per total employment: 40%⁹
- Rural population: 51% of total population¹
- Rural poverty 71%⁶; total poverty 54%⁷ (7 out of 10 people of indigenous decent lives in poverty)⁹.

Investing in nutrition yields high returns: 6–30 times its costs⁴.

GDP growth originating in agriculture is at least twice as effective in reducing poverty as GDP growth stemming from other sectors (WDR, 2008)⁵.

Key Agricultural Actions to Address Nutrition Challenges in Guatemala

- Improve support to competitive supply chains of foods like meat and horticulture to link to local markets and food aid/school feeding programs to address problems such as anemia among young children and pregnant women.
- Improve diversity and production based on household food consumption and nutrition decisions.
- Improve the agriculture inputs used by farmers, promoting those with nutrition impact, such as biofortified seeds and fertilizers with zinc.
- Improve nutrition along the supply chain by promoting investments in food fortification and labeling systems for healthy foods to address the growing burden of overweight and obesity.
- Work together with the private sector to improve the food safety system and implement food standards for iodized salt and to address iodine deficiency.

The Costs of Undernutrition

- Underweight in Guatemala (at 18%) cost the country US\$3.1 million, or 11.4% of GDP, in lost productivity in 2004. This is over half the combined cost of undernutrition for all of Central America³.
- Nearly half (45%) of all deaths in children under five are due to undernutrition¹⁰.
- Children who are undernourished between conception and age two are at high risk for impaired cognitive development, which adversely affects the country's productivity and growth.
- Childhood anemia alone is associated with a 2.5% drop in adult wages⁴.
- The Latin America and Caribbean region is anticipated to lose a cumulative US\$8 billion to chronic disease by 2015⁵.

Where Does Guatemala Stand?

- Guatemala has the third highest rate of chronic malnutrition (stunting) in the world (54.5%)².
- Indigenous children suffer disproportionately, with rates of stunting and underweight almost

twice that of non-indigenous children³. Nearly 8 out of 10 indigenous children are stunted compared to 4 out of 10 non-indigenous children. Large differentials in chronic malnutrition by ethnicity may reflect social exclusion or other forms of differential access to services⁷. Indeed, supply side barriers have been shown to be particularly important for the indigenous population⁸.

- 1 in 8 infants are born with a low-birth weight².
- 67% of Guatemalans aged 15 and above are overweight, of which 29% are obese⁶. This is a problem in urban areas in particular. Poverty levels in urban areas are 35% compared with 71% in rural areas⁶.
- Micronutrient deficiency is wide spread, with 38% of children under-five and 22% of pregnant women being iron deficient, 16% of pre-school children being vitamin A deficient, and less than half the households in Guatemala use iodized salt, causing an estimated 67,000 children being born mentally impaired every year.
- Food insecurity is related to inadequate intake of nutritious food rather than insufficient intake of calories.

Box 1. Guatemala's Agro-Food Sector

Guatemala's agricultural sector accounts for a significant share of the economy, employing over 40% of the workforce and contributing 10.2% of GDP and about half the country's exports. About 70% of agricultural land is under cultivation. Agro-environmental conditions are not ideal as parts of the country are covered by mountains, and dense forests cover certain regions. Farming is largely done on steep slopes and soil erosion is a problem.

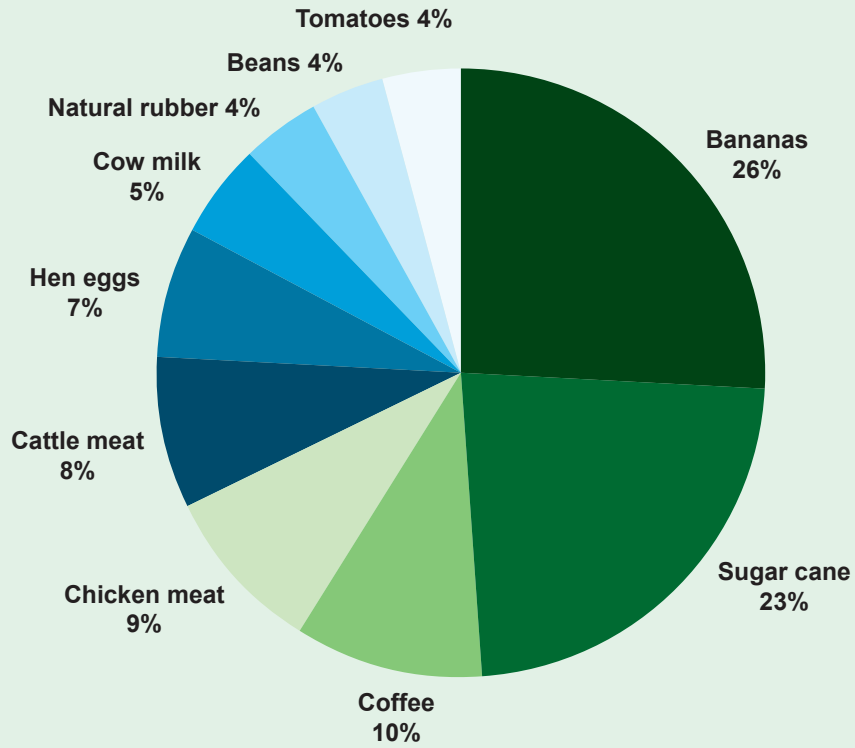
Roads are not well developed, especially in the northeastern region, and parts of the countries are relatively inaccessible. This is reflected in the limited development of irrigation in many places, and farmers often rely solely on rainfall, which makes them vulnerable to unpredictable weather. Changing weather patterns with increased temperatures, decreased precipitation, and more frequent droughts and hurricanes are projected in the future as a result of climate change. Forest-covered areas are cleared for subsistence farming and natural resources, such as land and water are heavily exploited for agriculture, which has resulted in lower productivity in basic crops. This has allegedly led to more food-insecurity among poor small-hold farmers.

Infrastructure is better developed and agro-climatic condition are favorable in the southeastern part of the country and has allowed farmers to diversify and to access markets.

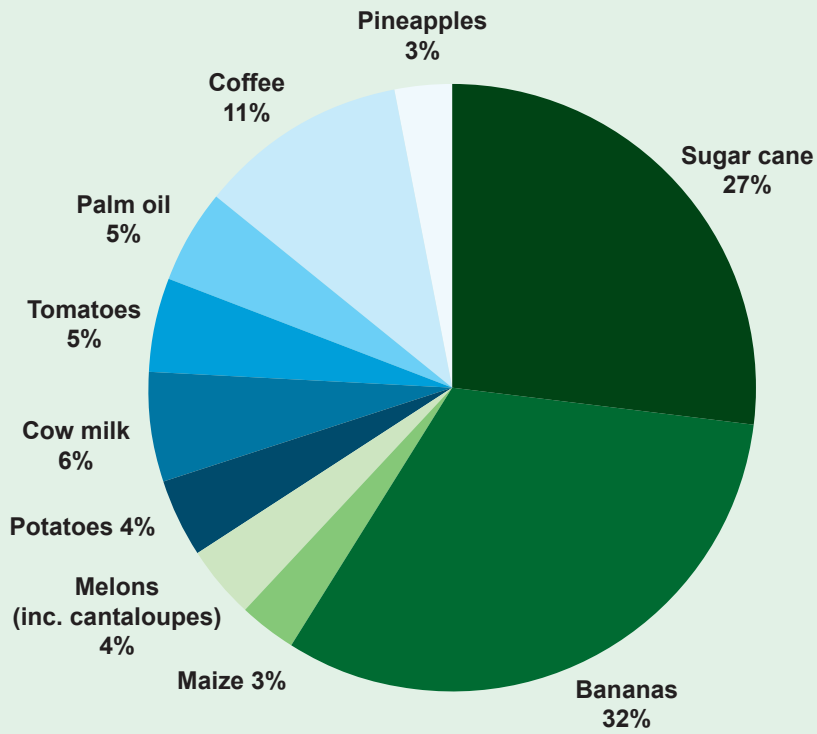
Agricultural production:

Guatemala's agricultural sector is highly export oriented. The top 10 products in terms of value are also Guatemala's main export products, including bananas, sugar, and coffee. Horticulture is limited but meat and animal sources food makes up a significant share of production.

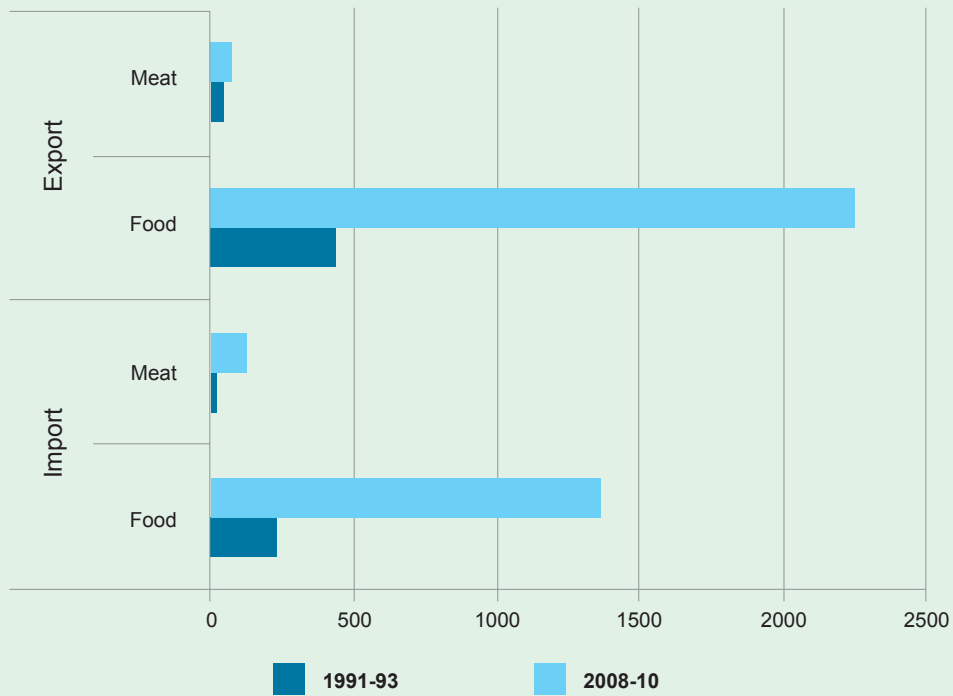
Top 10, Production Value



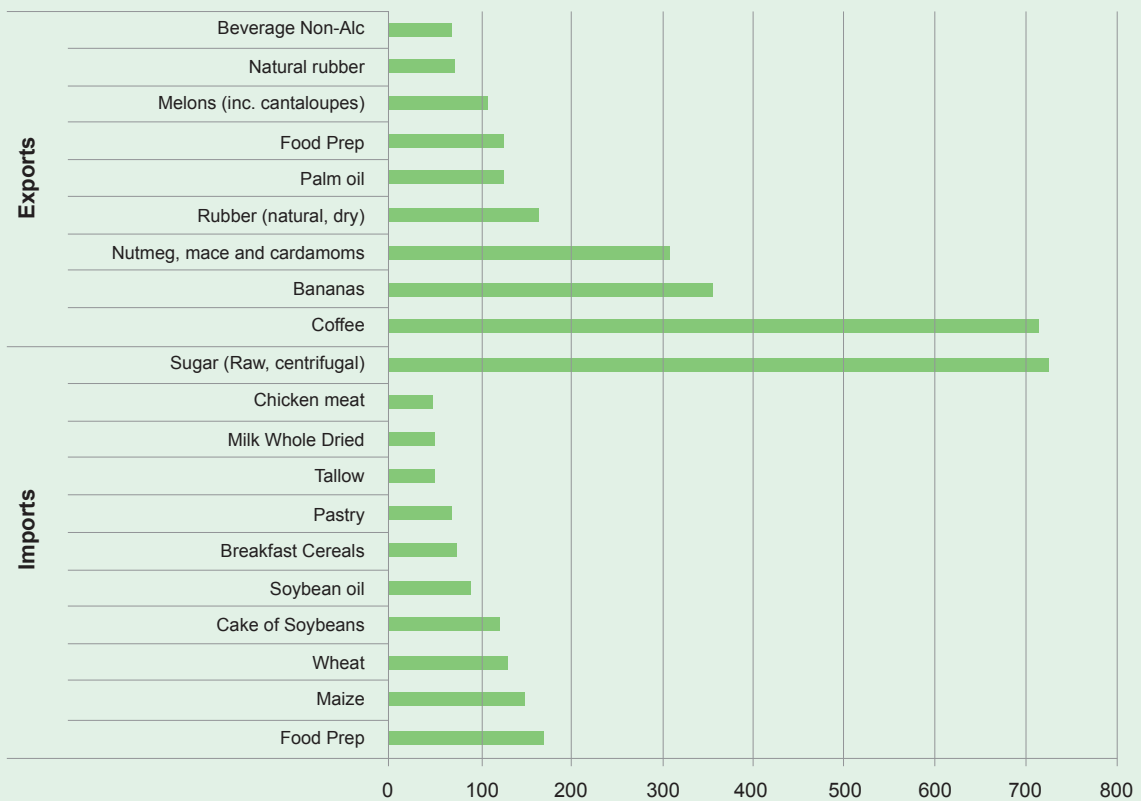
Top 10, Production Quantity



Change in Imports and Exports, US\$ Million



Top Import and Export (2010), US\$ Million



It can be noted that several products are both imported and exported. The preceding figure only covers the top 10 imports and exports products, but while Guatemala for example imports significant amount of pastry in value terms, pastry is also the country's 11th food export item. It might thus be that a number of products are for value adding industries.

Guatemala's agricultural sector has changed over the past decade. People have in part moved from on-farm labor to agricultural self-employment and to non-agricultural employment. Interestingly, farm workers in general earn more than the agricultural self-employed. Labor productivity in the sector has increased over the past years but mainly in large-scale, export oriented production. Nevertheless, access to resources is limited for the landless rural population and for households headed by women.

Guatemala produces food staples, including maize, sorghum, and beans for domestic consumption, and coffee, bananas, rubber, sugar cane, and livestock for export. High-value agriculture for export has also taken off, with vegetables, fruit, and flowers. Supply-chains include contract farming with small-scale farmers.

Source: FAO STAT; World Bank Poverty Assessment (2009); World Bank Climate Change Aspects in Agriculture, Guatemala Country Note (2009); Ifad, <http://www.ruralpovertyportal.org/country/home/tags/guatemala>

Opportunities in Agro-Food Sector to Address Causes of Undernutrition in Guatemala

Guatemala struggles with the double burden of undernutrition and obesity. Although the country has a competitive agro-food sector, high poverty rates prevail in rural areas and among the indigenous populations, and are the primary cause of undernutrition. Although income levels increased among the poor segments of the population in the 2000s, increases in domestic food prices exceeded that of incomes and thus extreme poverty grew as did the share of household income available to food. Any changes in extreme poverty were also uneven, as it declined among the non-indigenous population but not in the indigenous, and in certain regions but not in others⁸. In addition, rural infrastructure, including roads, does not cover much of the areas, limiting access to markets and market diversity for both producers and consumers, in particular in the northeastern part of the country⁸. Obesity, on the other hand, is common in urban areas and caused by a more complex set of factors from food environments and market offer, to affordability of diverse diets compared with energy-dense processed food. In both these cases, the agricultural sector has a role in improving diets in Guatemala.

Limited Access to Nutritious Food

Opportunities: Improve and diversify food production for local markets, diversify markets throughout seasons,

and improve affordability of diverse diets. Improve food environments in urban areas and avail space for safe and diverse markets by linking farmers to health and education programs (schools, food voucher programs, etc.). Promote a farm-to-fork approach to food safety. Support safe production and handling of food products throughout the agro-food chain. This can be done through the following:

Food Production

- Support farmers in increasing productivity and quality of diverse food crops by leveling the playing field of producer supports across food products (to increase rural incomes and decrease prices through increased supply).
- Given the inadequate access to markets, especially for rural on-farm laborers, strengthening backyard farming for household consumption and local markets, including chicken and small ruminants.
- Review agriculture support policies and programs to support all-year round diverse markets. With Guatemala's well-developed export supply chains (bananas, coffee, etc.), high-value horticulture could also reach local markets. Often the best quality products go directly for export, and the rest (often those with visible flaws) end up on the local market. Stronger linkages between high-quality foods and horticulture, and local

markets could be achieved by linking agriculture production policies and programs with social safety net, education and health programs with nutrition objectives. Support to farmers could include access to school feeding or food aid programs, as well as investing in off-farm storing and processing techniques for horticulture and livestock products, especially in areas where roads are poor and products more likely to spoil during transportation to markets.

- Promote food safety at the farm level, through good agricultural practices and hygienic handling of food products to reduce food and waterborne diseases. Such practices would include livestock management as well as fertilizer and pesticide management, in particular related to water sources. Promote good hygiene and storage practices in post-harvest handling of food products.

Develop Diverse Food Markets

- Invest in agriculture public goods and services (particularly in infrastructure in the northeastern region) to improve connectivity to markets, to decrease post-harvest losses, to encourage production of perishable food products, and to improve marketability of local products in urban areas.
- Help farmers link to school feeding programs by complying with quality and procurement standards and other criteria to qualify as suppliers to such programs.
- Help farmers link to food aid and food voucher systems, to promote urban farmers markets and link health campaigns with local food sourcing. This could help improve the urban food environment so that diverse and nutritious foods are available at urban markets, in particular in areas with lower-income consumers.

Research and Development

- Promote R&D in biofortification and improvements of agriculture inputs. Potential areas include the improvement of micronutrient content in food

products by focusing R&D on developing fortified seeds of key staples and fertilizers rich in, for example, zinc.

- Partner with the private sector to initiate fortification of certain food products such as milk and maize flour further up the value chain. PPPs with salt producers and national food standards could enhance iodine fortification of salt in the country. These should be accompanied with awareness campaigns to increase demand for iodized salt.

Regulations and Standards

- Invest in food safety management and infrastructure such as laboratories or purchase services from private laboratories that currently support the export sector. Enforce food safety standards on the domestic markets for larger producers.
- Ensure full implementation of the General Law for the Fortification of Food Products.
- Develop systems for labeling food products to highlight nutrition content and to alert consumers when products are high in sugars, salt, and saturated fats as a mean to tackle the growing obesity burden. Successful examples from other countries include systems of symbols reflecting the content. This can be done in collaboration with the private sector and can gradually be enforced among processors above a certain size. Make sure that an independent verification system is in place to ensure the integrity of the system.

Ongoing Initiatives in Agriculture to Improve Nutrition in Guatemala

To address the persistent malnutrition rates in Guatemala, several initiatives have been launched by the Government over the past years. Central is the Zero Hunger Pact, which pulls together Government, the civil society and the private sector in a movement to combat hunger in the country. Importantly, the Zero Hunger Pact is cross sectoral and an Action Plan at the

core of the Pact guides the Government's initiatives. The Zero Hunger Pact is committed to: (i) reduce chronic malnutrition among children by 10% over the next 4 years, and by 24% over the next 10 years; (ii) reduce the number of deaths due to acute malnutrition, and to provide maternity care and healthcare to young children; and (iii) fight poverty and exclusion as a mean to combat malnutrition, with a particular focus on rural indigenous women. The Zero Hunger Pact is coordinated by the Food and Nutrition Secretariat (SESAN), which has also developed the Zero Hunger Plan for 2012-16. The Action Plan focuses mainly on child feeding practices, including through the provision of nutrition supplements and fortified food products, and on providing vaccination to small children. However, to sustainably combat seasonal hunger and malnutrition, the Action Plan includes support to family agriculture to increase production through improved inputs and practices. The Pact has taken a step-wise approach, focusing on those municipalities where chronic and acute malnutrition is most prevalent but will, over time, scale up to cover the whole country. The Ministry of Agriculture, Livestock and Food (MAGA) has been assigned a central role in meeting the Pact's objectives.

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III. Measuring nutrition outcomes in agriculture programs in LAC

The list below summarizes some of the possible interventions to mainstream nutrition into agriculture programs in LAC, with possible respective indicators that could be used to measure progress in terms of nutrition outcomes. They have to be taken as a complement of those developed in the Global Guidance Note¹⁸. While each of these interventions could have a significant impact on nutrition outcomes, it is important to

recognize that a comprehensive approach is necessary to improve overall diet and nutrition indicators in a sustainable manner. As mentioned in previous sections, there's a need to better understand the potential impact of agriculture investments and policies in nutrition outcomes, and the measurement of such activities will be very useful to inform future project design and policy making in LAC.

Table 1. Possible nutrition sensitive interventions and example of indicators for agriculture programs (non-exhaustive list):

Nutrition related goals	Identified interventions	Examples of indicators and mechanisms for measuring impact on nutrition outcomes ¹⁹
1. Agriculture R&D Programs		
Increase year round access to and availability of high nutrient content food	<ul style="list-style-type: none"> Enhancing capacity of national agricultural research institutions to develop and promote nutrition-sensitive food production. Establish a regulatory framework that allows for the development of seeds, fertilizers, and breeds and that does not limit farmers' access to these. 	<ul style="list-style-type: none"> Availability of biofortified varieties relative to non-biofortified varieties Number of hectares harvested by farmers using biofortified varieties Availability of enhanced fertilizers relative to non-enhanced fertilizers Number of hectares cultivated with appropriate amounts of enhanced fertilizers compared with non-enhanced fertilizers. Availability of/number of animals/herds replaced with for the context improved breeds
	<ul style="list-style-type: none"> Establish a regulatory framework for fortification of food products. PPP in R&D to develop food products throughout the supply chains in a manner that would have significant nutrition outcomes, for example fortified products, improved packaging, extended shelf-life, etc. Develop models for marketing of local crops through improved packaging, shelf-life, etc. 	<ul style="list-style-type: none"> Nutrition-related indicators to measure the improvement in products focused on under the R&D project, such as improved nutrition content, decrease in contamination, or extended shelf-life Volume/Sales/Share of total market of fortified food produced and/or other products developed under the project
2. Linking Farmers to Markets and Food Purchasing Programs		
Increase year round access to and availability of high nutrient content food	<ul style="list-style-type: none"> Linking smallholders to the value chain of nutritious foods (e.g. livestock, dairy, fish, fruits & vegetables or any production with higher nutritional value/content) and food purchasing programs. 	<ul style="list-style-type: none"> Net sales from [livestock, milk, fish, fruits and vegetables or any production with higher nutritional value/content] Number of certification/labels created to identify safe and nutritious foods in the market Volume and % of food from social protection programs sourced from local production Number of farmers/volume of products included in cold-chains
	<ul style="list-style-type: none"> Development of local markets with better linked farmers and improved market infrastructure and food safety. Campaigns to promote locally produced agro-food products. 	<ul style="list-style-type: none"> % of food from food aid/school feeding programs being sourced locally using nutrition sensitive techniques and inputs Change in diversity of products procured under such programs.

18 See footnote 1

19 Except if it is mentioned, all indicators will be disentangle by gender

3. Agriculture Extension and Information Services		
Increase year round access to and availability of high nutrient content food	<ul style="list-style-type: none"> • Develop/adapt agriculture-nutrition related curriculum for extension/economics agents. • Develop extension activities to promote Good Agricultural Practices for the production of safe food and for protection of agricultural soil and waters. • Development of education curriculum to improve consumer's knowledge of nutrition. • Inclusion of home economics specialists in the agriculture extension force, favoring particularly the recruitment of women. 	<ul style="list-style-type: none"> • Training hours received by agriculture extension workers on practices that will impact the nutrition problem in line with the context • Training hours received by beneficiaries in order to improve the safety and nutritional content of the agricultural production/processing. • Training hours received by beneficiaries in order to improve the nutritional content of their meals • Number of hours of home economics extension services received by beneficiaries • Dietary diversity score of beneficiary households (for women and children)
	<ul style="list-style-type: none"> • Increase productivity of small scale nutritious food production (e.g. livestock, dairy, fish, fruits and vegetables). • Promote improved post-harvest handling and preservation techniques on the farms. 	<ul style="list-style-type: none"> • Number of times in the last week where any amount of [animal meat, fish, milk, fruits and vegetables] was consumed by household members (disaggregated by gender and children) • Grams/day of [animal meat, fish, milk, fruits and vegetables] consumed by household • Level and seasonal fluctuation of the dietary diversity score (for women and children) through the entire year and seasons • Number of times in the past 12 months the household was not able to procure nutrient rich foods [livestock, milk, fish, fruits and vegetables], specifying the reason: availability, price, etc. • Share of products with some form of value added for food safety and/or preservation/extended shelf-life before leaving farm
4. Women and Nutrition		
Invest in women	<ul style="list-style-type: none"> • Improve productivity and income for women. • Increase income stability of women revenue. • Increase women participation in decision making of agriculture production and commercialization. • Increase women empowerment in the corresponding programs and agencies. 	<ul style="list-style-type: none"> • Income and income coefficient of variation of revenues of women • Investments allocated to women and/or gender-sensitive activities • Value added of activities managed by women and/or women groups

Annex 1. Nutrition glossary

ANEMIA: It is a condition in which the number of red blood cells or their oxygen-carrying capacity is insufficient to meet physiologic needs, which vary by age, sex, altitude, smoking and pregnancy status. Iron deficiency is thought to be the most common cause of anaemia globally. It is caused by poor diet and can be exacerbated by infectious diseases, particularly malaria and intestinal parasites.

MALNUTRITION: It is defined as all forms of poor nutrition, including both undernutrition and overnutrition.

OVERWEIGHT and OBESITY – ADULTS: Overweight and obesity are defined as excessive fat accumulation that may impair health. The body mass index (BMI) is an index of weight-for-height that is commonly used to classify overweight and obesity in adults. The BMI is defined as the ratio of weight in kilograms over height in meters squared (kg/m^2). A person whose BMI is greater than 25 is overweight, and greater than 30 is obese.

OVERWEIGHT and OBESITY – CHILDREN: Children above 2 years of age can be classified as being normal weight, overweight or obese using their BMI measures, and the international cut-off points recommended by the Childhood Obesity Working Group of the International Obesity Taskforce: between the 85th and 95th percentiles children are considered overweight, and above the 95th percentile, obese.

STUNTING: Stunted growth reflects a process of failure to reach linear growth potential as a result of suboptimal health and/or nutrition conditions. Stunting is traditionally used as an indicator of nutrition status in children. It means being too short for one's age and it is calculated by comparing the height-for-age of a child with a reference population of well-nourished and healthy children. Stunting is a cumulative indicator of nutritional deprivation since birth or conception. It is relatively independent of immediate circumstances, since height does not change much in the short term. The worldwide variation of the prevalence of low height-for-age is considerable, ranging from 5% to 65% among the less developed countries.

UNDERNOURISHED: To provide insufficient quantity or quality of nourishment to sustain proper health and growth.

UNDERNUTRITION: It is the consequence of insufficient food intake and repeated infectious diseases. It includes being underweight, stunted, wasted or deficient in vitamins and minerals (micronutrient malnutrition).

UNDERWEIGHT: It means having too low weight for one's age and it is calculated by comparing the weight-for-age of a child with a reference population of well-nourished and healthy children. It can be seen as a more comprehensive indicator, as both stunted and wasted children are likely to be underweight. The worldwide variation of low weight-for-age is similar to that of stunting.

WASTING: It means being too thin for one's height and it is calculated by comparing the weight-for-height of a child with a reference population of well-nourished and healthy children. Wasting is usually taken to be an indicator of short-term nutrition status, as it reflects a recent and severe process that led to substantial weight loss, usually associated with starvation or disease. Provided there is no severe food shortage, the prevalence of wasting is usually below 5%, even in poor countries.

Z-SCORES: Weight-for-height, height-for-age and weight-for-age are usually interpreted by using the Z-score classification system. The Z-scores are constructed standardizing the measure as its deviation from the median of the reference healthy population for that age in months and sex, and dividing it by the standard deviation from the same reference population. The Z-score cut-off points are <-2 SD (standard deviations) to classify low weight-for-age, low height-for-age and low weight-for-height as moderate and severe undernutrition, and <-3 SD to define severe undernutrition. For example, a child whose height-for-age Z-score is less than minus two but greater than minus 3 ($-2 > Z > -3$) is considered moderately stunted.

An alternative classification uses the weight-for-height Z-scores: a child is overweight if he is more than 2 standard deviations above the corresponding child growth standards median, and he is obese if he is more than 3 standard deviations above it.

Annex 2. Data construction and sources

The nutrition data are nationally representative prevalence of stunting and overweight/obesity in Latin America and the Caribbean. Source: PAHO's Health in the Americas report, 2012 edition.

The food trade data comprises commodities in SITC sections 0 (food and live animals), 1 (beverages and tobacco), and 4 (animal and vegetable oils and fats), and SITC division 22 (oil seeds, oil nuts, and oil kernels). Source: UN Comtrade.

GDP per capita PPP: Gross Domestic Product per capita, based on Purchasing Power Parity (current international \$). Source: IMF, World Development Indicators (WDI).

Agriculture Value Added (% GDP). Source: World Development Indicators (WDI).

Rural Poverty (below US\$1.25 a day). Source: World Development Indicators (WDI).

Construction of the nutrition variables

When data was not available for the needed year, the two available nearest data points were averaged to obtain the prevalence rate for the year needed. The nearest data points were selected in the following ranges for each needed year:

1990: 1989-1991: Exceptions for stunting: 1986-1995 (Colombia), 1982-1996 (Costa Rica)

1995: 1994-1996

2000: 1998-2002

2005: 2002-2006

2009: 2007-2010: Exception for stunting: 2006-2010 (Ecuador)

The **"last available year"** for the nutrition indicators:

- Overweight: 2005-2010. Except for Guatemala (2002) and Dominican Republic (2002)
- Stunting: 2006-2010. Except for Haiti (2005) and Panama (2003)

The **"first available year"** for the nutrition indicators:

- Overweight: 1989-1996. Except for Haiti (2000) and Honduras (2001)
- Stunting: 1989-1996. Except for Ecuador (2005)

Growth from the 1990 to the last available data for the nutrition indicators: It is the percentage change between the first available and the last available year.

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