



# The Next Global Breadbasket

## How Latin America Can Feed the World

**A CALL TO ACTION FOR ADDRESSING  
CHALLENGES & DEVELOPING SOLUTIONS**

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# About this Report

**A**ddressing humanity's great challenge — finding sustainable ways to feed rapidly increasing numbers of people around the world — is Latin America's great opportunity.

Across Latin America and the Caribbean (LAC), a more productive and environmentally sustainable agriculture system holds great promise for achieving food security around the world — as well as for the region's development, for poverty alleviation and for social progress.

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***Global population growth combined with dramatic diet changes will, over the next several decades, place great stress on agriculture and food systems worldwide. The potential for skyrocketing food prices and widespread hunger is enormous. To meet the expected demand, governments and producers must work together to create environmentally sustainable, market-driven systems of agriculture and food production.***

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The LAC region has a third of the world's fresh water resources, the most of any developing region when measured on a per capita basis, and more than a quarter of the world's medium to high potential farmland. The region as a whole is already the largest net food exporting region in the world, and it still has achieved only a small fraction of its potential to expand agricultural production for regional consumption and global export.<sup>1</sup> In addition to its abundant natural resources, the region has a large number of farmers who have extensive experience and capacity to innovate, as well as relatively strong institutions and markets. The essential building blocks for massive and sustainable agricultural growth are already in place.

But in order for the entire LAC region to deliver on its enormous agricultural potential, many “moving parts” will have to be brought into harmony. How to do that is the subject of this report.

**The issue of food security has several key dimensions.**

This report focuses on the key elements of **food supply and food availability** — the sources of which are domestic food production (net of food exports) and food imports. Accordingly, policies and investments that promote the expansion of domestic food production, reducing loss at the farm and post-harvest stages, and facilitate international food trade are potentially pro-food security and are addressed herein.

Other elements of food security, which were not the focus of this report, include the **nutritional status** of household members, **purchasing power for food access** by households, and **food consumption and utilization**. For country level measurement and analysis that include these elements, visit the Global Food Security Index at [www.foodsecurityindex.eiu.com](http://www.foodsecurityindex.eiu.com).

The next 10 to 20 years offer a critical window of opportunity to advance new forms of productive and environmentally sustainable agriculture in the region. With that in mind, we have set out to illustrate the great potential that exists, the obstacles and challenges that stand in the way of realizing that potential, and how the private and public sectors can and must move forward together.

Drawing on the knowledge and experiences of public and private sector entities, and from people working in and for the region, we offer herein a set of issues, recommendations and action items for governments and policy makers, the donor community, farmers and agribusiness, and civil society.

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<sup>1</sup> Latin American and Caribbean Economic System - SELA, *Food Security and Food Prices in Latin America and the Caribbean: Current Situation and Prospects*, October 2010.

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 Mitsubishi Corporation (Americas)

 Mitsubishi Corporation do Brasil S.A.

The content and recommendations in this report were driven by a Steering Committee and supporting Technical Committee, both of which were comprised of companies and organizations noted herein. It is their input and direction that made this publication possible. ***For its part, the Inter-American Development Bank has developed a Sector Framework Document (SFD) on Agriculture and Natural Resources Management, reviewed by its Board of Directors in April 2013, which describes Latin America and the Caribbean's major sector challenges and provides concrete recommendations based on empirical evidence to address them, guiding in this way its financial and non-financial operations to its borrowing member countries in the sector. The SFD can be accessed at:***



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## Message from the IDB President

A vision of Latin America as the world's breadbasket is coming into focus. That is good news for the region's economic growth and for its own

efforts to reduce poverty and hunger. And it is great news for global food security.

Latin America has abundant natural resources, including a third of the world's fresh water. It has many farmers with experience and a flair for innovation, as well as institutions and markets that are becoming stronger and more resilient.

The region's export prowess is already being demonstrated in real terms, from the vast grain farms of Brazil to the meat packing plants of Argentina and Uruguay and on to the small coffee plantations of Central America, the asparagus fields of Peru, and the maize fields of Mexico. Despite all this, LAC has merely scratched the surface of its ability to produce food for its own people and for the world at large.

Soybeans to China. Rice to Africa. Coffee and meat to the United States. Specialty fruits and vegetables to supermarkets the world over. The markets are vast and ever expanding, and so is Latin America's potential to satisfy them.

But the challenge is much wider than simply producing more food. It is about resolving humanity's greatest challenge of the 21st Century — feeding a rapidly growing global population without expanding farming into environmentally sensitive areas, without diminishing the productive capacity of the land already under cultivation, and without compromising on quality.

It is also about inclusion, and particularly about enabling smaller, family farming operations and their rural neighbors to benefit and prosper from a reinvigorated agricultural

economy. With agricultural growth and prosperity comes a chance to address persistent hunger and poverty within the region itself — an opportunity the region cannot afford to squander.

At the heart of these challenges is investment — more and smarter investment by governments, by the organizations that support agricultural development, and by the private sector.

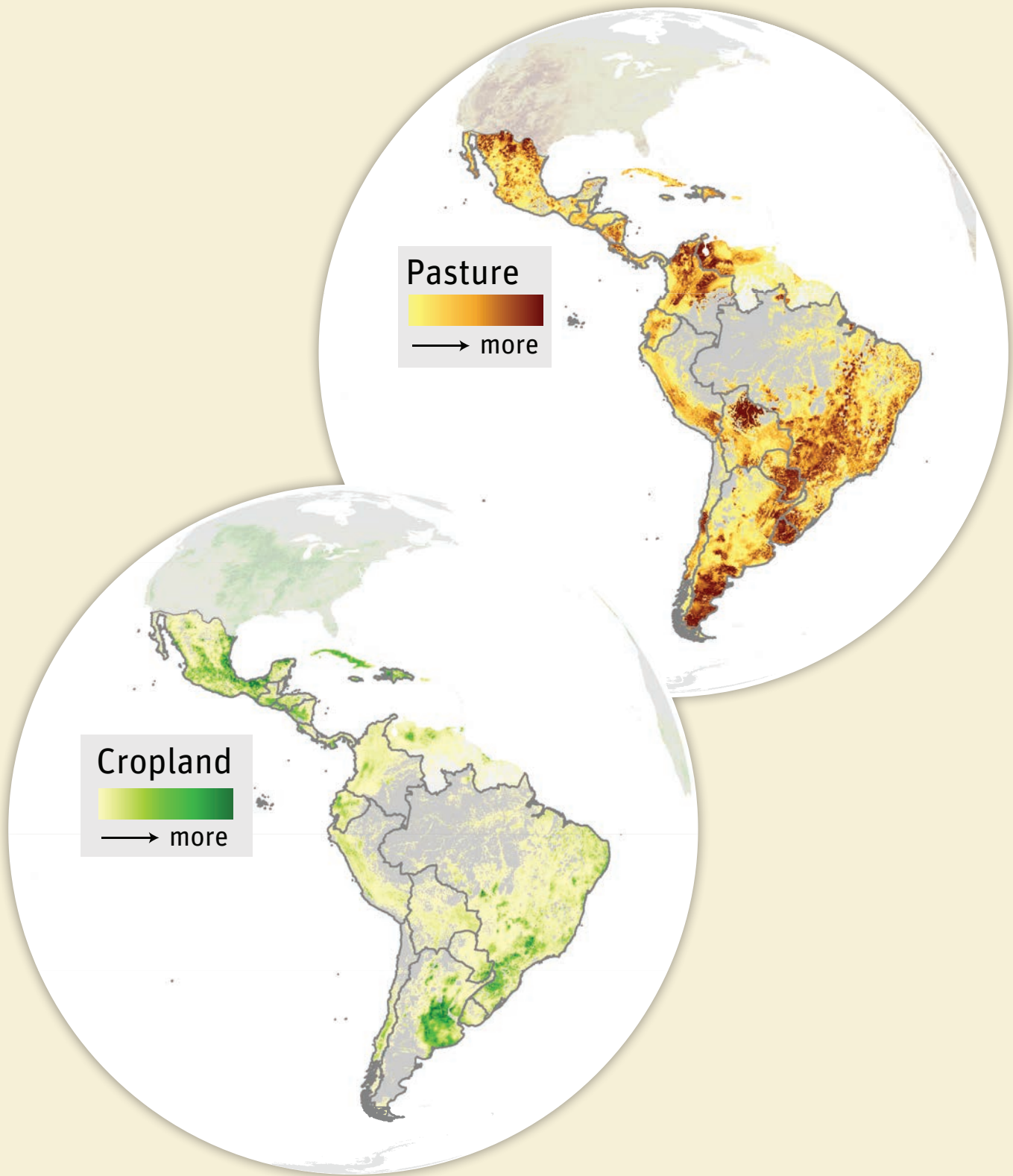
Together we need to greatly expand our commitments to agricultural research and focus on getting new skills and new technologies into the hands of farmers. We need to invest in improving rural infrastructure and in creating an enabling environment for a more profitable yet environmentally sustainable agriculture. These investments must be supported by new trade policies that increase farmers' productivity to meet local and global demand.

The companies, organizations, academics and other experts who contributed to this publication are fully aware of what needs to be done. This is their report, reflecting a single clarion call to scale up investments and policies to power the LAC region's future as a leading player in global agriculture.

We can do this. Together we can grow our region and feed our own while we satisfy the world's growing demand for food.

Luis Alberto Moreno





Source: Ramankutty, N., A.T. Evan, C. Monfreda, and J.A. Foley (2008), Farming the planet: 1. Geographic distribution of global agricultural lands in the year 2000. *Global Biogeochemical Cycles* 22, GB1003, doi:10.1029/2007GB002952.





Photo courtesy of Mitsubishi

## Introduction: Why Invest in LAC Agriculture?

Experts say that in order to feed the nine billion people who will inhabit the Earth by 2050, global food production will have to increase by 60 percent,<sup>2</sup> and on as little as 12 percent more arable land, much of which is likely to be marginal and/or environmentally sensitive. Overall agricultural output to meet food, fuel, fiber, and industrial needs will likely have to double from current production levels.<sup>3</sup> And this needs to be accomplished as farmers confront the effects of climate change – which scientists predict will make production even more challenging in many places – along with degradation of the natural resource base and growing competition for land and water.

Amid all this there is great opportunity for improving the productivity of farmers and producers throughout Latin America and the Caribbean – not only so that countries in the region can meet their own food and nutrition needs, but also to enable them to help satisfy growing food, fiber and fuel demand in other parts of the world.

### Latin America – the Time is Now

***The LAC region is rich in three of the most important ingredients for agricultural production: land, water, and natural habitat.*** The LAC region has a third of the world's

fresh water resources, the most of any developing region when measured on a per capita basis. It has about 28 percent of the world's land that has been identified as having medium to high potential for sustainable expansion of cultivated area,<sup>4</sup> and a 36 percent share of land that is within six hours travel time to a market.<sup>5</sup> In fact, the region has more potentially suitable land for rainfed cultivation than the combined land from all other regions of the world outside of sub-Saharan Africa.<sup>6</sup>

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***With nearly a third of both the world's arable land and fresh water, Latin America may well hold the key to a solution to the world's food security challenges.***

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Within LAC there is also enormous biodiversity, particularly in tropical areas, with the potential for producers in the region to make contributions to global advancements in medicine and agricultural science. Emerging practices that preserve, sustain, and carefully manage the region's unique biodiversity and habitat must be directed toward delivering benefits to producers who act to preserve these resources for the future. The intrinsic value of actions to preserve and

<sup>2</sup> Nikos Alexandratos and Jelle Bruinsma, *World agriculture towards 2030/2050: the 2012 revision*, (Food and Agricultural Organization of the United Nations), ESA Working paper No. 12-03, 2012.

<sup>3</sup> Global Harvest Initiative, *2010 GAP Report® (Global Agricultural Productivity Report)*, [www.globalharvestinitiative.org](http://www.globalharvestinitiative.org).

<sup>4</sup> Klaus Deininger, et al, *Rising Global Interest in Farmland. Can it Yield Sustainable and Equitable Benefits?*, (World Bank), 2011.

<sup>5</sup> Jelle Bruinsma, *The Resource Outlook to 2050: By How Much Do Land, Water, and Crop Yields Need to Increase by 2050?*, FAO Expert Meeting on How to Feed the World in 2050. (Food and Agricultural Organization of the United Nations, 2009).

<sup>6</sup> Deininger, et al, *Rising Global Interest in Farmland*, 79.



## THE FOCUS ON SUSTAINABLE AGRICULTURE

As developing countries begin to enter into more agricultural production, there are growing concerns that vastly expanding crop or livestock production on sensitive or marginal lands, in combination with misapplication of fertilizers, pesticides and insecticides will harm the natural resource base.

In recent years, the Food and Agricultural Organization of the United Nations (FAO) has outlined a “**conservation agriculture**” approach aimed at helping ensure that agricultural lands sustain their capability to produce over time. The approach is based on adopting farming practices (such as no-tillage) that create minimal soil disturbance, build up the organic content of the soil and thereby improve its productive capacity and resilience to erosion, and to rotate crops as a buffer against damage from diseases and pests.

**Sustainable agricultural intensification** is “producing more outputs with more efficient use of all inputs on a durable basis, while reducing environmental damage and building resilience, natural capital and the flow of environmental services.”<sup>\*</sup> The emerging sustainable intensification agenda, which can apply to farms of any size, calls for improved inputs and new technologies to achieve the twin goals of increased productivity and environmental protection. It is based on encouraging the adoption of farming techniques that preserve and restore the natural resource base — especially those that aim to improve the chemical, physical and biological properties of soils — in order to increase soil fertility and water availability.

\* The Montpellier Panel, *Sustainable Intensification: A New Paradigm for African Agriculture*, London, 2013.

enhance a region’s biodiversity — that is, the value that will be derived from biodiversity’s benefits for generations to come — through these and other means is incalculable.

*The LAC region is “well positioned to benefit from high prices and increase food production.”<sup>7</sup>*

In addition to these endowments, the LAC region as a whole offers increasing political, economic and civil stability and a more advanced infrastructure than many other developing regions. Financial, monetary and fiscal institutions are much sounder today than they were two decades ago, while new institutions and social policies have better enabled governments and civil society to make progress in promoting growth and reducing structural poverty. Included in these are food security and rural development along with decades of experience with agricultural research institutions generally not found in other developing regions of the world. Taken together, the environment for development in LAC is uniquely poised for agricultural growth across a broad range of food, fiber, fuel and other industrial products.

### Smallholders: An Important Part of the Equation

More than half of the food produced in LAC comes from the region’s 14 million smallholders, the majority of whom do not produce all the food that they themselves consume. Supporting the development of family agriculture through programs that encourage local food purchases can be an incentive for small farmers to invest in agriculture, developing local economies and improving their living standards and livelihoods.

## A Foundation to Build Upon

*Thanks largely, but not entirely, to the net agricultural trade surpluses of Brazil and Argentina (and strong output in Mexico), LAC is already growing in importance as a food exporter — having increased its share of global agricultural output over the last half century.<sup>8</sup>* In 2011, the region produced 60 percent of world’s soybean exports. From 2006 to 2009 it produced 45 percent of coffee and sugar, 44 percent of beef, 42 percent of poultry, 70 percent

<sup>7</sup> World Bank, “What are the facts about rising food prices and their effect on the region?”, September 13, 2012; available from [http://www.worldbank.org/en/news/feature/2012/09/13/america\\_latina\\_crisis\\_precio\\_alimentos](http://www.worldbank.org/en/news/feature/2012/09/13/america_latina_crisis_precio_alimentos).

<sup>8</sup> Eugenio Díaz-Bonilla, et al, *Better to Be Foresighted than Myopic: A Foresight Exercise Related to Agriculture, Food Security, and R&D in Latin America and the Caribbean*, paper prepared for the International Center for Tropical Agriculture (CIAT) and the Inter American Institute for Cooperation on Agriculture (IICA) in the context of the second Global Conference on Agricultural Research for Development, 2012.

of bananas, 12 percent of citrus, 13 percent of cocoa, and 33 percent of maize.<sup>9</sup>

**The Global Harvest Initiative estimates that if the LAC region maintains its current Total Factor Productivity (TFP)<sup>10</sup> growth rate of 2.67 percent per year, food demand within the region can be met and exceeded by 2030, enabling the region as a whole to vastly increase its contributions to global agricultural markets and thereby increase its share of food and agriculture exports.<sup>11</sup>**

According to the International Fund for Agricultural Development (IFAD), although extreme rural poverty has been on the decline in LAC, almost a quarter of the region's rural people still live on less than US\$2/day, with a strong concentration of extreme poverty (US\$1.25/day) in rural areas among landless farmers, indigenous peoples, women and children.<sup>12</sup>

There is enormous potential for increased productivity across Latin America. As noted above, Argentina, Brazil, Chile, Mexico, and Peru have increased agricultural output while maintaining the same amounts of inputs (land, labor, fertilizer, machinery, livestock) in the agricultural production process, thereby enhancing their TFP.

This is critically important given that other key regions are expected to fall short in meeting their growing food demand through productivity-led growth. For example, if East Asia stays on its current TFP growth rate, the region will be able to meet only 79 percent of its food demand, while Sub-Saharan Africa is on track to meet only 25 percent.<sup>13</sup>

Given the percentage of LAC's population that remains linked to the land, GDP growth generated by agriculture is up to four times more effective in reducing poverty than growth generated by other sectors.<sup>14</sup>

<sup>9</sup> World Bank, Latin America and Caribbean Region, *High Food Prices: Responses to a New Normal*, (Washington, DC, 2011), 9.

<sup>10</sup> Total factor productivity (TFP) is the ratio of the change in agricultural outputs (gross crop and livestock output measured in constant 2005 international dollars) per inputs (land, labor, livestock, fertilizer and machinery) used and is an indicator of higher productivity and efficiency in agricultural production. TFP measures the efficiency with which all the components of production are used, rather than relying on land expansion or increased use of irrigation, fertilizer, pesticides, and machinery.

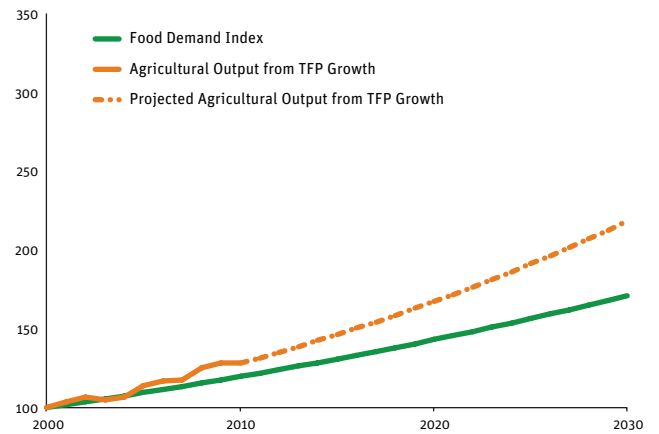
<sup>11</sup> Global Harvest Initiative, *2013 GAP Report® (Global Agricultural Productivity Report)*, [www.globalharvestinitiative.org](http://www.globalharvestinitiative.org).

<sup>12</sup> International Fund for Agricultural Development, *Rural Poverty Report 2011*, Rome, 2010.

<sup>13</sup> Global Harvest Initiative, *2013 GAP Report® (Global Agricultural Productivity Report)*, [www.globalharvestinitiative.org](http://www.globalharvestinitiative.org).

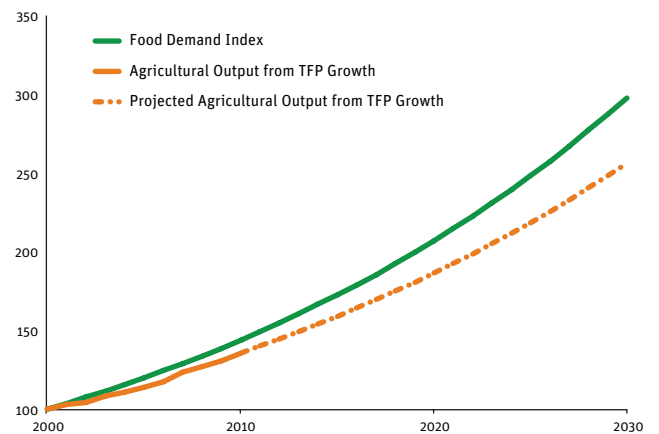
<sup>14</sup> The International Bank for Reconstruction and Development / The World Bank, *World Development Report 2008*, (Washington, DC, 2007).

## LATIN AMERICA AND CARIBBEAN



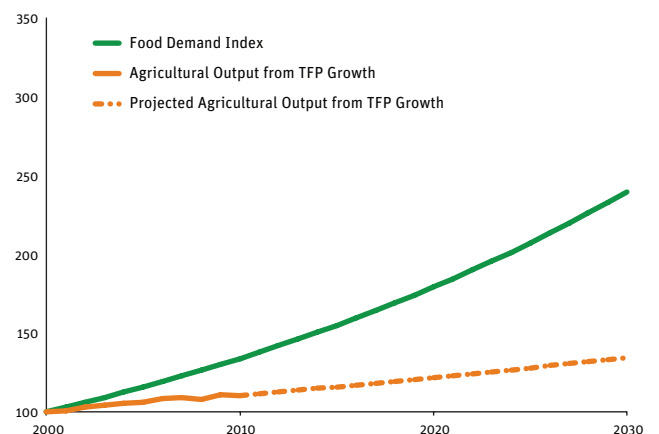
**166%** of total demand can be met by maintaining the current TFP growth rate.

## EAST ASIA



**79%** of total demand can be met by maintaining the current TFP growth rate.

## SUB-SAHARAN AFRICA



**25%** of total demand can be met by maintaining the current TFP growth rate.

Source: Global Harvest Initiative. For Brazil and China TFP and Food Demand Charts, visit [www.globalharvestinitiative.org](http://www.globalharvestinitiative.org).



## THE PROMISE (AND SUCCESS) OF NO-TILL FARMING

Latin America is the global leader in no-till farming, a form of cropping that does not require mechanical soil inversion. No-till management practices typically include crop residue retention and direct seeding. By avoiding the high energy costs required for full soil inversion with a plow, no-till systems limit soil erosion and soil organic matter losses, thereby increasing soil health, decreasing soil erosion, and increasing water-holding capacity and soil fertility. Of the 110 million hectares in no-tillage worldwide, approximately half are in Latin American countries, and of these 25 million hectares are in Brazil and nearly 20 million are in Argentina. Paraguay is also a global leader in the practice. No-till farming can also increase carbon sequestering in the soil, and farmers benefit by saving energy, labor, and capital costs in crop cultivation. Today, more than 50 percent of Brazilian farmers practice no-till farming, and it has been particularly effective for increasing productivity in the historically acidic and nutrient-deprived soils of Brazil's Cerrado region. Interestingly, the expansion of no-tillage in that country appears to have been aided by the Brazilian machine industry's development and production of specialized no-till seeding machines, which today are exported all over the world.\*

\* Rolf Derpsch et al, *Current status of adoption of no-till farming in the world and some of its main benefits*, (Beijing: International Journal of Agricultural and Biological Engineering, 2010).

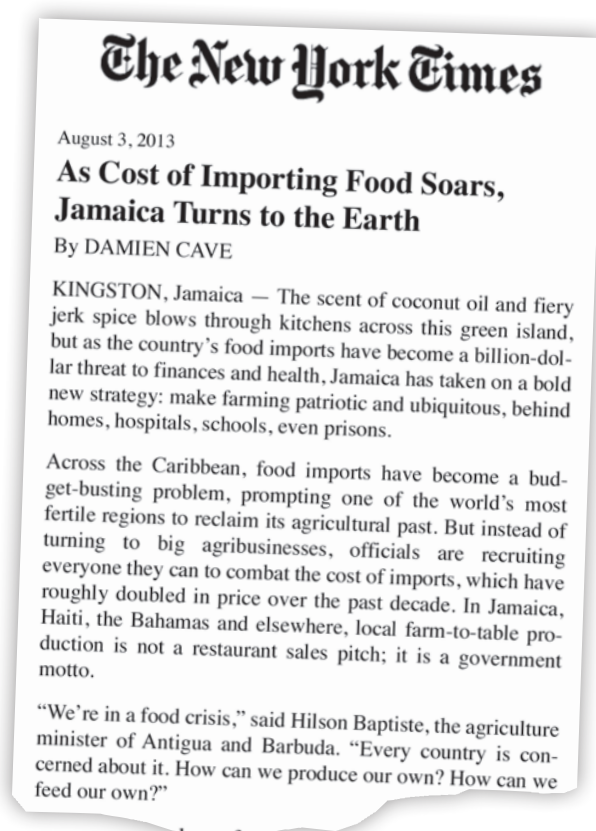
## An Opportunity to Address LAC's Own Food Security Challenges

***Given all of its potential as an increasingly important food exporting region, it is important to recognize that many areas within Latin America and the Caribbean are suffering from severe food insecurity, especially in agricultural regions.*** Just three countries — Brazil, Argentina and Mexico — represent 72 percent of the entire region's agricultural production.<sup>15</sup> (Despite its large output, Mexico is still one of the few net food importing countries in Latin America.<sup>16</sup>) And while Latin America has generally benefitted from increases in food prices, with efficient producers ramping up production and increasing their global market share, food price increases have been unwelcome events in many LAC countries — regardless of whether they are net food importers or exporters — as the higher cost of food can wreak havoc for people, especially those with extremely low incomes who have no access to productive land and who spend a high share of their incomes on food. This is particularly true in LAC's urban areas, where most of the region's poor live, and in Caribbean island nations, most of which have long depended on food imports.

A recent IDB study indicated that the potential impact of increases in international food prices could trigger an acceleration of inflation in several countries in LAC, particularly net food importing countries in the Central American and Caribbean sub-region, where food imports

<sup>15</sup> Source: FAOSTAT; available from <http://faostat.fao.org/>.

<sup>16</sup> Martin Piñeiro et al, *Food Security Policies in Latin America: New Trends with Uncertain Results*, (Winnipeg, Manitoba, Canada: International Institute for Sustainable Development, 2010), 17.



are in excess of 75 percent of caloric food supply and where food comprises a high share of household spending.<sup>17</sup>

<sup>17</sup> E. Lora, A. Powell, and P. Talavera, *How Will the Food Price Shock Affect Inflation in Latin America and the Caribbean?*, (Washington, DC: Inter-American Development Bank Policy Brief No. IDB-PB-120, 2011).

## AAPRESID: FROM NO-TILLAGE TO QUALITY MANAGEMENT

The *Asociación Argentina de Productores en Siembra Directa* (Aapresid) is a nongovernmental nonprofit organization with a network of farmers and a mission to disseminate and promote no-tillage systems that optimize productivity while conserving the soil. Founded more than two decades ago, Aapresid has 30 regional groups in eight Argentine provinces. Under this framework, the organization has developed a quality management system, “*Agricultura Certificada*,” which certifies the production processes of agribusinesses as compliant with a Good Agricultural Practices manual consisting of indicators such as the efficient use of water resources, crop rotation, balanced nutrition, integrated pest management, and the responsible and efficient use of agrochemicals. Underpinning the adoption of these practices are management goals for farming operations that include improving production processes, lowering hidden costs, and obtaining commitments from suppliers and improving speed and effectiveness of responses to market opportunities.

Global studies indicate that investment in agriculture holds enormous potential for alleviating poverty and hunger in the world’s food producing regions, but this has not yet been achieved in Latin America and the Caribbean. In spite of a 37 percent increase in agricultural production from 1999 to 2009, rural poverty in the region has remained at 53 percent, with about 53 million people in the region estimated to be undernourished, a figure which has not changed from 1995.<sup>18</sup>

***Family farming accounts for 80 percent of all farms in LAC and occupies 35 percent of the land under cultivation, contributes 40 percent of production, and generates 64 percent of agricultural employment.***<sup>19</sup>

Yet the experiences of China and India over the past several decades have shown that rapid agricultural growth – whether resulting from broad policy changes and R&D investment in China or from technical innovations in India – have brought forth major declines in rural poverty.<sup>20</sup> And analyses by the International Fund for Agricultural Development (IFAD), the World Bank and the International Food Policy Research Institute (IFPRI) show a clear correlation between agricultural growth and rural poverty reduction, with a one percent increase in farm growth leading to a 2.7 percent income rise among the poorest people.<sup>21</sup> Clearly, while investing in agricultural growth

<sup>18</sup> FAO, IFAD and WFP, *The State of Food Insecurity in the World 2013. The multiple dimensions of food security*, (Rome: FAO 2013).

<sup>19</sup> *The State of Food and Agriculture, Investing in Agriculture for a Better Future*, (Rome: Food and Agricultural Organization of the United Nations, 2012).

<sup>20</sup> The International Bank for Reconstruction and Development / The World Bank, *World Development Report 2008*, (Washington, DC, 2007).

<sup>21</sup> Kevin Cleaver, *Scaling Up in Agriculture, Rural Development, and Nutrition*, (Washington, DC: International Food Policy Research Institute, 2012).

holds great promise for poverty reduction and greater food security in LAC, seizing that opportunity will require policy makers to focus on ensuring these outcomes.

Further, while the specter of food price spikes and the potential for social unrest has prompted some countries

### According to the Intergovernmental Panel on Climate Change or IPCC (2007), the following climate scenarios can be forecast for Latin America:

- » Increase in temperature and the corresponding decrease in soil humidity would lead to tropical rainforests on the eastern side of the Amazon region being gradually replaced by savannahs.
- » Semiarid vegetation would gradually be replaced by arid land vegetation.
- » Significant losses of biological diversity could occur, with the extinction of species in many areas of tropical Latin America.
- » The productivity of some important crops would decrease, leading to a decrease in the productivity of cattle farming, with adverse consequences for food security. The yield of soy bean crops would improve in temperate areas. Together with this, the number of people threatened by hunger would generally increase.
- » Changes in rainfall patterns and the disappearance of glaciers would notably reduce the availability of water for human, agricultural and hydroelectric consumption.
- » An increase in sea level would cause more floods, storm surges, erosion and other dangerous coastal phenomena.
- » The deterioration of conditions on the coast, for example as a result of beach erosion or the de-coloration of corals, would affect local resources.<sup>22</sup>

<sup>22</sup> European Commission, *Climate Change in Latin America*, 2009, 13.





### IN BRAZIL: NEW TOOLS IN THE GOVERNMENT'S EFFORT TO REDUCE DEFORESTATION

As it seeks to balance food production aims with the protection of natural habitats in environmentally sensitive forest areas, a lack of monitoring tools and compliance mechanisms has frustrated Brazil's efforts to enforce its stringent Forest Code. In partnership with The Nature Conservancy (TNC) and other organizations, the government has created a Rural Environmental Registry (CAR — *Cadastro Ambiental Rural*), which has quickly become a cost-effective tool for integrating food production and conservation objectives — and is now federally mandated after several years of success in some regions of the country.

The CAR is an electronic registry of rural properties within a given landscape — such as a watershed, municipality, province or state — that is attached to key spatial information (land use and cover, hydrology, topography, roads, infrastructure, etc.) available for that landscape. Farmers are encouraged to register through tax and financing incentives and benefits, and through other requirements, and their compliance with efforts to reduce deforestation and land degradation are then monitored by satellite imaging.

Maps generated through the CAR also show topography, soil composition and other factors. Information from the registry is used to monitor property-owner compliance with the Forest Code, identify the location of production and biodiversity areas for planning purposes, help landowners optimize production on their lands while protecting and restoring key conservation areas, and support companies in managing their supply chains by ensuring the products they buy are produced in compliance with the Code.

As one example of how the CAR is used, Brazil's Ministry of the Environment annually releases a list of municipalities where deforestation rates are the highest, and those listed are subject to restrictions on access to credit and commercialization of agricultural goods originating there. One of the requirements to get off this "blacklist" is to have 80 percent of rural properties registered in the CAR.

A recent success story has been the municipality of Paragominas, where the main economic activity is cattle ranching and which was included in the list in 2008. With TNC's support to acquire updated high resolution imagery and help more than 650 landowners register their properties, the municipality went from 23 to 83 percent registration in a little under a year and became the first municipality to ever be removed from the list. Paragominas now benefits from preferential credit programs for low-carbon agriculture, and has become the model for the state of *Para's Green Municipalities* program. Since 2009, nine municipalities have come off the list.

The information from the CAR also supports enforcement action and advocacy. For example, in 2010, Brazil's *Ministerio Publico* launched a campaign to put pressure on companies purchasing beef cattle from ranchers in illegally deforested zones, requiring evidence that the ranchers were complying with the Forest Code and had registered in the CAR. This measure led to the registration of more than 250,000 properties in the Amazon frontier states of Pará and Mato Grosso, and continued commitment from meat packers and retailers to get deforestation out of their supply chains.

## IDENTIFYING AND CLOSING YIELD GAPS

To address the overall production issue in environmentally sustainable ways – and without significantly increasing the amount of cultivated land – agricultural policy experts suggest focusing on the “yield gap.” This is the difference between (1) the yield potential level, which represents the crop yield solely determined by weather conditions, genetics and planting date, and (2) the actual farm yield level, in which yields are also constrained by other factors, such as nutrients and incidence of pathogens, insect pests and weeds.\* There are significant opportunities to increase yields on underperforming lands across many parts of Latin America, particularly those on which nutrient and water limitations seem to be strongest. Better deployment of existing crop varieties with improved management, as well as continued improvements in crop genetics, have the potential to significantly increase yields across the region, narrow existing gaps, and enable LAC to vastly improve its agricultural output while preserving the natural resource base.\*\*

\* Global Harvest Initiative, *2013 GAP Report® (Global Agricultural Productivity Report)*, [www.globalharvestinitiative.org](http://www.globalharvestinitiative.org).

\*\* Jonathan A. Foley et al, “Solutions for a cultivated planet”, *Nature*, October 2011, 337-342.

in the LAC region to equate food sovereignty with food security, this approach could have harmful consequences for people living in areas with scarce agricultural resources. A more promising way forward would combine improvements in the region’s productive capacity, particularly among small and medium-sized land holders, with expanded interregional trade and trade arrangements that eliminate barriers to market access for the region’s good exports, which in turn would contribute to stabilizing food supplies and prices within the region and sub-regions.

## Building the Capacity for Environmentally and Socially Sustainable Agricultural Production

***Sustainability is an essential part of the productivity challenge for policy makers, farmers and agribusiness entities.*** Carefully selecting new land for cultivation and conserving the land and water already being used must be a central component of agricultural policy and practice. In this area, LAC agriculture has many challenges before it.

The LAC region represented 32.6 percent of the global increase in land put to agricultural use during the decades between 1960s–2000s, while the share of the increase in world agricultural production during that same period was only 14.3 percent.<sup>23</sup> Latin America has already lost an estimated 40 percent of its original forests,<sup>24</sup> which are critical to preserving biodiversity and slowing the advance

of climate change.<sup>25</sup> About one-third of the total human-induced warming effect due to greenhouse gases (GHGs) comes from agriculture and land-use change.<sup>26</sup> How farmers use water resources has also taken center stage, as almost 70 percent of the planet’s extracted freshwater is used for agriculture.<sup>27</sup>

According to the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, the overwhelming direct cause of deforestation is agriculture. Subsistence farming is responsible for 48 percent of deforestation; commercial agriculture is responsible for 32 percent of deforestation; logging is responsible for 14 percent of deforestation and fuel wood removals make up five percent of deforestation.<sup>28</sup>

Consequently, it will be critical to enhance productivity of agriculture on existing land in order to minimize future expansion into forested areas. Productivity means producing more with less land, labor, fertilizer, livestock, and energy. Establishing policies to enhance productivity in existing production zones and carefully conserving fragile soils and biodiverse areas through conservation practices are integral parts of the solution to meet the growing global demand.

Accordingly, investments to increase agricultural productivity must include efforts to carefully manage and use inputs such as fertilizer, crop protection products, and

<sup>23</sup> SOURCE: FAOSTAT; available from <http://faostat.fao.org/>.

<sup>24</sup> *Global Deforestation*, University of Michigan, <http://www.globalchange.umich.edu/globalchange2/current/lectures/deforest/deforest.html>.

<sup>25</sup> H. Ricardo Grau and Mitchell Aide, *Globalization and land-use transitions in Latin America*, (Wolfville, Nova Scotia, Canada: Ecology and Society, 2008); available from <http://www.ecologyandsociety.org/vol13/iss2/art16/>.

<sup>26</sup> Keith Paustian, *Agriculture’s Role in Greenhouse Gas Mitigation*, (Arlington, VA: Pew Center on Global Climate Change, 2006).

<sup>27</sup> UN Water; available from [http://www.unwater.org/statistics\\_use.html](http://www.unwater.org/statistics_use.html).

<sup>28</sup> H.K. Gibbs et al, *Tropical forests were the primary sources of new agricultural land in the 1980s and 1990s*, Proceedings of the National Academy of Sciences, (Washington, DC: National Academy of Sciences, 2010) 107(38), 16732-16737.



water for irrigation. Better livestock management and care practices can maximize output while reducing livestock's contribution of greenhouse gases.<sup>29</sup> In all, highly productive agriculture systems applying the right inputs at the right time in the right amounts can greatly improve yields while reducing the harmful environmental impacts of farming.

Climate change is exacerbating this challenge, as it is contributing to more intense hurricanes and floods, and more persistent drought, all of which have the effect of making agriculture more risky for farmers.

Because of their location on a narrow strip of land surrounded by the Atlantic and Pacific oceans, Central American countries are considered to be the most vulnerable areas in the world, with four out of the 10 strongest hurricanes to hit the region having occurred in the past 10 years. This trend appears to be the result of a rise in nearby surface water temperatures (*El Niño* and *La Niña*), which increases storm intensity, and is compounded by the rising sea levels that expose more areas to flooding during intense weather events.<sup>30</sup>

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***Given the need for agricultural systems to sustain higher rates of production for the long term, a key goal will be to invest in farmers' capacity to increase production while preserving the land, water and other aspects of the natural environment. At the same time, these efforts should be supported by collaborative industry mechanisms that drive and accelerate sustainability goals, standards and metrics. One such example is the agreement established by the Consumer Goods Forum — an industry consortium of 400 companies with combined revenue of \$2.8 trillion — to reach a goal of zero net deforestation by 2020. The collaboration among these companies aligned with clear goals and metrics serves as important platform for the issue as well as a driver on impact.***<sup>31</sup>

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Meanwhile, temperature increases in the Central Andean sub-region has outpaced global rises by 70 percent, with subsistence agricultural systems already being affected by the increases and by anomalous rainfall patterns. Mountain ecosystems are considered to be among the most sensitive to climate change, with the receding of glaciers and alterations of other fresh water sources threatening serious repercussions for cities such as Lima and cities and irrigated valleys in the northern regions of Argentina and Chile, intensifying the effects of the desertification process in those areas. Scientists have also forecast significant impacts in the Southern Cone as a result of changes to rainfall patterns, and Argentina has already seen greater frequency and intensity of extreme climate events like floods, droughts, storms, tornadoes, and heavy rain.<sup>32</sup>

Hurricanes and sea level rises under the global warming scenarios, as forecast by the Intergovernmental Panel on Climate Change (IPCC), also threaten the island nations of the Caribbean, where there has already been a two-fold increase in the number of powerful hurricanes per decade over the last half century. Needed investments to address climate change adaptation options are currently well beyond the financial reach of Caribbean countries.<sup>33</sup>

In addition to the impacts that these weather events have on humans and economic activity in general, severe weather can cause contamination of water bodies, loss of harvest or livestock, and increased susceptibility to disease and destruction of irrigation systems and other agricultural and storage infrastructure. While estimates of the economic impact of climate change vary considerably, the potential effect could be significant — for instance, in Latin America it is projected that in the absence of climate smart agriculture<sup>34</sup> and appropriate risk management options, the region may suffer impact and mitigation costs of up to 137 percent of its current GDP by the end of the century,<sup>35</sup> and thereby reduce the region's potential for contributing to global food security.

<sup>29</sup> P.J. Gerber et al, *Tackling climate change through livestock — A global assessment of emissions and mitigation opportunities*. (Rome: Food and Agriculture Organization of the United Nations, 2013).

<sup>30</sup> European Commission, *Climate Change in Latin America*, 2009, 13.

<sup>31</sup> For more information see <http://www.theconsumergoodsforum.com>.

<sup>32</sup> European Commission, *Climate Change in Latin America*, 2009, 14.

<sup>33</sup> Emilio Sempris, "Climate Change and Freshwater in Latin America and the Caribbean," *UN Chronicle*, August 2009.

<sup>34</sup> According to FAO, climate smart agriculture is "agriculture that sustainably increases productivity, resilience (adaptation), reduces/removes GHGs (mitigation), and enhances achievement of national food security and development goals."

<sup>35</sup> United Nations Economic Commission for Latin America and the Caribbean (ECLAC), *Economics of climate change in Latin America and the Caribbean: Summary*, Santiago, 2009.





Photo courtesy of the Mosaic Villages Project

## The Way Forward: Accelerating LAC Agriculture

**W**hile higher global agricultural prices offer opportunities for farmers in Latin America to engage profitably in markets — and while LAC has an impressive record of agricultural productivity growth — there remains an urgent need across the region for better policy frameworks, more public and private funding, and more strategic investment approaches in key areas. In many countries in the region, the obstacles are centered on a broad lack of commitment to develop agriculture despite the opportunities that abound — leading to shortcomings in the policy framework and a lack of long-term planning.

In countries where such planning has occurred, investments made over a decade ago are now bearing fruit. But to scale up the productivity potential, governments and the private sector and producers of all sizes must focus now on getting a number of policy and investment actions right in order to support future decades of productivity growth. In particular, policies should promote the engagement of both public and private sector partners in strengthening agricultural value chains from the farmer to the consumer. Along the value chain, farmers and producers must have increased access to appropriate technology, tools, and training in order to allow the value chain participants to be more efficient, productive, and better stewards of land and natural resources. One recent study showed that exporters from LAC have been shifting their specializations toward post-farm processing more quickly than other regions, indicating that the region

is beginning to benefit from producing higher value-added agricultural products.<sup>36</sup>

### Harnessing the Opportunities from Value Chains<sup>37</sup> and Trade for Impact

With growing numbers of people worldwide demanding higher quality food, specialty food products, and packaged foods, the food retailing and processing industries are undergoing enormous restructuring. Latin America is in the forefront of these changes, as supermarkets have proliferated in the region and in many areas now account for 60 percent or more of retail food sales.<sup>38</sup>

The World Bank estimates that high-value markets for domestic consumption are the fastest-growing components of the overall agricultural markets in most developing countries, expanding up to 6–7 percent annually, with livestock and horticultural products leading the way.<sup>39</sup>

<sup>36</sup> Nabil Chaherli and John Nash, *Agricultural Exports from Latin America and the Caribbean: Harnessing Trade to Feed the World and Promote Development*, (Washington: World Bank, Agriculture and Rural Development Cluster of the Sustainable Development Department, Latin America and the Caribbean).

<sup>37</sup> The value chain approach analyzes the firms in a market chain—from input suppliers to final buyers—and the relationships among them. It analyzes the factors influencing industry performance, including access to and the requirements of end markets; the legal, regulatory and policy environment; coordination between firms in the industry; and the level and quality of support services.

<sup>38</sup> International Fund for Agricultural Development, *Rural Poverty Report 2011*, Rome, 2010.

<sup>39</sup> The International Bank for Reconstruction and Development / The World Bank, *World Development Report 2008*, (Washington, DC, 2007).



Notable among these is the escalating demand for meat (and the associated rise in demand for soy and corn for animal feed) around the world, including in many LAC countries and particularly among rapidly growing Chinese middle class.

The Brazilian beef industry offers one example of how this is playing out. Overall, the livestock sector in Brazil now accounts for almost 27 percent of the country's agricultural GDP, and for the last 10 years the country has been the largest exporter of beef in the world, thanks largely to investments in herd rebuilding through genetics and the changing of production systems to feedlot systems. There are estimates that by the end of this decade Brazil could supply between 45 and 60 percent of the world's market for beef, with growth in exports to Asian and Middle Eastern

### IN BRAZIL: THE RISE OF SOYBEANS

In 1990, Brazil exported 2.5 million tons of soybeans, compared to 15 million tons by the United States. For 2013, Brazil is expecting to produce 90 million tons of soybeans and become the world's leading exporter of this product.\* In recent years, it is clear that China has become the main driver of this trade, having increased its annual soybean imports from 1 million tons in 1990 to more than 60 million tons today. Thanks in large part to the robust and growing Chinese market, Brazilian soybeans have fueled the overall export growth of the country. Along with "second crop corn" that planting soybeans has made possible for many farmers in the country, soybeans have become an engine of growth for the meat industry in Brazil, which has recently become the world's largest exporter of chicken and red meat. This gain in productivity, fueled primarily by GMO-enhanced seed technology that improved yields and reduced the need for pesticide use, was the main driver of the expansion of Brazilian agricultural supply.\*\*

\* "Brazil expects a 90 million tons soybean crop, making it the world's top producer," Merco Press, December 12, 2013, available from <http://en.mercopress.com/2013/12/12/brazil-expects-a-90-million-ton-soybean-crop-making-it-the-world-s-top-producer>.

\*\* *Intacta Soybeans: An economic view of the benefits of adopting the new technology*, MB Agro June, 2013.

markets (Iran is now the second largest market for Brazilian beef).<sup>40</sup>

Although the U.S. and Europe account for 45 percent of LAC's agricultural exports, this proportion has dropped from 57 percent in the 1990s, while the rest of the world has risen to account for 30 percent of LAC export markets and 36 percent of the growth in those markets, rivaling Europe's growth and doubling that of the United States.<sup>41</sup>

While this restructuring offers many opportunities for LAC agriculture, there is a broad range of barriers to participation, both within the region and in terms of access to world markets, that small and medium-sized producers are not equipped to surmount. Wholly apart from the barriers presented by foreign tariffs, quotas and subsidies, particularly for smaller producers who lack scale, many of the region's producers do not have the technical know-how to implement best practices, nor the financial capacity to purchase high quality seeds, equipment and animal health, and crop protection products — and otherwise cope with the myriad risks they face, including the potential impact of climate change. Similarly, they cannot absorb the additional transaction costs that poor or outmoded transport, storage, and processing infrastructure impose or the cost of satisfying delivery requirements and sanitary/phytosanitary quality standards that are often required to access formal markets.

Poor infrastructure, particularly when it comes to roads, ports, and storage facilities, is often a major problem in LAC that prevents farmers from getting goods to market and aggravates product spoilage and loss. As a result, many farm communities in the region are simply too far removed from the business and market opportunities — in both agriculture and the non-farm economy — that could enable them to be more productive and prosperous.

### Thinking Strategically About “Public Goods”

Accelerating agricultural growth requires investment in key public goods like rural infrastructure, agricultural research and development (R&D) and extension, as well as standards and their enforcement. Policy makers must focus on these public sector investments to create an enabling environment that fosters private investment in agricultural productivity. For the same reason, development assistance in support of improved infrastructure can mobilize additional private sector resources for strengthening farmer skills and

<sup>40</sup> Lizzie Bonsall, "Brazilian beef: The China of Latin America?," *Global Meat News*, May 11, 2012; available from <http://www.globalmeatnews.com/Analysis/Brazilian-beef-The-China-of-Latin-America>.

<sup>41</sup> Nabil Chaherli and John Nash, *Agricultural Exports from Latin America and the Caribbean: Harnessing Trade to Feed the World and Promote Development*, (Washington: World Bank, Agriculture and Rural Development Cluster of the Sustainable Development Department, Latin America and the Caribbean), 3.

## THE WORLD FOOD PROGRAMME: ADDRESSING HUNGER WITH A FOCUS ON SMALLHOLDER AGRICULTURE

The vision of the World Food Programme's *Purchase for Progress (P4P)* pilot initiative is to use the agency's purchasing power to promote market opportunities for at least 500,000 low-income smallholder farmers around the world, half of whom are women. Linking its own demand for staple food commodities with the technical expertise of a wide range of its partners, WFP works to help smallholder farmers increase their production and sell their surplus to the agency at a fair price – a process that ultimately brings increased incomes to farm families. Beyond this, P4P offers opportunities for smallholder farmers to increase their capacities to become competitive players in the marketplace and access a wider range of market options. After four years of P4P implementation in Central America, changes are evident not just for almost 40,000 smallholder farmers in the sub-region who participate in the program – and whose market opportunities and incomes have increased – but also for governments in the sub-region, which now have a clearer vision of how to link farmers to markets.

Through P4P, since 2008, WFP has been able to contract more than 55,000 metric tons of food commodities from smallholder farmers in Central America, representing an investment of \$32 million in rural economies. This amount represents a savings of \$6.7 million for WFP when compared to the cost of the same amount of commodities purchased on international markets, while enabling participating farms in the sub-region to sell 31,000 metric tons worth \$13.7 million to the private sector and institutional markets.

capabilities and improving their access to financing, all of which lead to productivity improvements.

Unfortunately, across the LAC region there remains a bias toward providing direct subsidies to farmers. One study of 10 Latin American countries found that, on average, more than 54 percent of the total government expenditures in rural areas were spent in private goods such as direct subsidies and credit subsidies to producers, while only 45 percent was spent on public goods such as technology generation and transfers, soil conservation, plant and animal sanitary protection, communications and information services, rural roads, and social services.<sup>42</sup> With this in mind, opportunities to boost agricultural development in LAC would be enhanced by a shift away from private goods and toward the provision of public goods. Studies show that these public investments produce returns two to six times greater than spending devoted to input subsidies,<sup>43</sup> while another reported that a shift of 10 percent away from targeted subsidies and toward public goods may bring an increase of about 2.3 percent in per capita agricultural

income<sup>44</sup> and is more likely to spur natural resources conservation, as well.<sup>45</sup>

## Focusing on Small and Medium Sized Farmers<sup>46</sup>

It is important to recognize that operators of small and medium sized farms are the largest investors in developing country agriculture and therefore must be central to any strategy for increasing investment in the sector. In addition, they are important to addressing local and national food security issues, both in terms of producing for local markets and in improving rural standards of living through the success of their farming operations. Small-scale family farms continue to produce most of the staple foods in the region, including at least 70 percent in Brazil. Across LAC, smallholder farming accounts for 80 percent of the farms and occupies 35 percent of farmland, and is responsible for 64 percent of agricultural employment.

<sup>42</sup> Ramón López, *Why Governments Should Stop Non-Social Subsidies: Measuring Their Consequences for Rural Latin America*, World Bank Policy Research Working Paper 3609, (Washington, DC, 2005), 16.

<sup>43</sup> Steven Haggblade, "Returns to Investment in Agriculture," *Policy Synthesis Food Security Research Project*, January 2007, 19.

<sup>44</sup> López, 18.

<sup>45</sup> López, 24.

<sup>46</sup> Because definitions for what constitutes small and medium-size farms varies widely across LAC countries, for purposes of this report we are using the terms only in the general sense.



## A PROGRAM TO FACILITATE SAFER US-LAC AGRICULTURAL TRADE

As the world's largest agricultural trader and the most populous nation in the Americas, the United States has a great deal of potential as an export market for food products from Latin America and the Caribbean. However, the U.S. does take aggressive measures within its trade framework to prevent invasive alien species (IAS) – particularly with regard to crop/animal pests and diseases – from entering the country via the movement of people and commercial products and thereby threatening the profitability, competitiveness, and long-term sustainability of local agriculture. Using funds provided by the U.S. Department of Agriculture, the University of Florida has launched the Caribbean Pest Diagnostic Network (CPDN), which uses Internet-based systems to support regional safeguarding mechanisms that will help Caribbean countries meet international sanitary and phytosanitary reporting requirements. Initiatives like the CPDN could provide the basis for broader trade-liberalizing arrangements between the region and the United States that would expand market access and increase returns to the region's producers.



Photo courtesy of Neil Palmer/CIAT

Yet poverty continues to be primarily a rural problem in Latin America and the Caribbean. ECLAC's 2010 Social Panorama in Latin America indicates that 53 percent of the rural population in LAC is poor, and despite Brazil's growing reputation as an agricultural powerhouse, two thirds of the rural population remains in poverty and, according to a 2010 report from the International Institute for Sustainable Development, nearly a third of Brazil's 199 million people are not getting enough to eat.<sup>47</sup>

While the LAC region has favorable conditions for agricultural growth, from a smallholder perspective the sector is underinvested. In order for small and medium-sized farmers to become more profitable, they need better

access to working capital, advanced technologies, and other ways of improving their production and becoming better linked to markets. Public institutions and private sector enterprises must therefore work together to make sure that smaller producers in particular have access to agricultural inputs and technologies – improved seed, fertilizers, and pesticides, as well as farm equipment and technical assistance – and, importantly, that credit and financial services are available to facilitate this access.

At the same time, it is important to recognize that raising both small and medium-sized farmers' productivity and increasing their return on investment will likely involve diversification out of commodities in which they compete directly with larger scale producers. Accordingly, both public and private investment should focus on improving farmers' capacity to add value, rather than simply expanding their production of crops traditionally sold through commodity markets. It is also important that policy makers and stakeholders look at investing resources into researching the potential for farmers to build profitable businesses by growing and marketing crops that support traditional dietary preferences. These crops could have the added benefit of addressing challenges related to food insecurity and access to food in many LAC countries.

Given the evolution toward contract farming for most value added products, all of this implies a need to improve small and medium-sized farmers' ability to satisfy contractual arrangements with buyers – particularly in terms of quality and timely delivery, as well as to meet international standards that are key to accessing export markets.

### *Land Tenure and Ownership Rights*

Increasing the security of land ownership rights encourages farmers to undertake productive and sustainable use of the resource and to make long-term investments in both the

<sup>47</sup> Weber Antonio Neves do Amaral and Alessandro Peduto, *Food Security: The Brazilian Case*, (Winnipeg, Manitoba, Canada: International Institute for Sustainable Development, 2010).

land and their production capacity. Accordingly, investments in cost-effective systems of land management that seek to reduce the insecurity of ownership rights will have the effect of increasing overall investment, improving access to credit (by facilitating the use of the land as a guarantee) and leading to further increases in farm productivity and income.

In its studies of land titling programs in Peru and Nicaragua, the Inter-American Development Bank has found positive long-term effects on farms and in the value of the land, as well as significant positive impacts on agricultural income. In Nicaragua, producers with full ownership rights have accumulated more assets than producers with restricted property rights.

Any process of land tenure regularization, including the issuance of land titles, should involve granting full ownership of the land to the occupant. The issuance of land titles to occupants that do not provide clear and full ownership of their property end up subsequently creating irregular land tenure situations. In addition, transaction costs for the service of recording real estate property affect the sustainability of investments in clarification of ownership, particularly in impoverished rural areas. Lack of access and cumbersome and costly procedures for registration discourage the registration of future real estate transactions for properties with clear title, giving further rise to irregular land tenure.<sup>48</sup>

## Food Safety and Quality

What might be called the “software” of the agricultural world — standards, regulations and coordination with regional and global trading systems — is vitally important to ensuring that farming operations are able to deliver products that meet the quality and safety requirements that represent the gateway to global and regional markets. While the concept of good practices in food safety and quality control is not new, it has taken on a greater importance as a result of changes in global distribution and retailing that place a premium on satisfying the rising consumer demand for traceability and documenting linkages between food production and the consumer’s kitchen table. Increasingly, quality standards represent the single most important condition of market access. Ensuring that farmers can meet the quality standards demanded by formal markets requires the use of good agricultural practices as well as appropriate post-harvest management, storage, and warehousing practices. This issue has become a major factor in making farming operations more competitive and more reliable as a supplier, which consequently helps them attract investment capital and become more viable as a going concern.

<sup>48</sup> *Sector Framework Document on Agriculture and Natural Resources Management*, Document OP-1009-3, (Washington, DC: Inter-American Development Bank, 2013).

## TRACEABILITY: IMPLEMENTING INFORMATION TECHNOLOGY SOLUTIONS TO IMPROVE PRODUCT SAFETY FOR CONSUMERS AND BETTER INCOME TO PRODUCERS

Traceability in the world market is becoming increasingly important to many agricultural products and particularly to the meat processing industry as it seeks market access and works to build consumer confidence in products. Uruguay, which exports more than 75 percent of its beef production to 120 countries, is branding beef on a national level and is now recognized as a frontrunner in this field. The country was the first in the world to set up an individual ear-tag-based animal identification program for all livestock producers as well as a comprehensive and centrally organized traceability system installed at all approved slaughterhouses.

The Uruguayan traceability system, SEIC (Electronic Information System of the Meat Industry) was set up by INAC (The National Meat Institute) in cooperation with the meat processing equipment maker Marel, and has been in full operation since 2007. Its purpose is to gather, organize and present online information about cattle slaughter and deboning in order to ensure transparent management and consistency of data across all parties involved in the mandatory meat processing system — farmers, producers and the state. The system has proven especially valuable to the medium and small-sized slaughterhouses, helping them gain access to the European markets through SEIC’s compliance with the EU traceability regulations.





*Photo courtesy of the Mosaic Villages Project*

## FERTILIZER AS CAPITAL

A partnership of The Mosaic Company, a leading producer of crop nutrients, and the non-governmental organization HELPS International is enabling poor smallholder farmers in the highlands of Guatemala to break the cycle of poverty by increasing their yields three to five times over their traditional farming practices. Under *The Mosaic Villages Project*, the company's agronomists train local farmers to rejuvenate depleted soils and improve their knowledge of modern methods to farm more productively and sustainably. The agronomists have taught smallholders to plant seeds in

tighter rows, to avoid burning their crop residues and practice basic forms of conservation agriculture to increase organic matter in the soil, and when and how to apply fertilizer in the correct amount.

A formal evaluation of the program found that it helped farmers improve their farming practices — from the care of the soil to the sowing of seeds in the field, the planting format, and the vegetal nutrition — and that these practices enabled them to generate greater yields in corn harvests than those farmers who didn't participate. In one region, for example, the evaluators looked at 74 fields, half of which participated in the program, and found those that did experienced yields 1.71 times higher than those that did not. The evaluation also revealed that the improved agricultural practices have spread to surrounding villages by word of mouth and were quickly adopted without further program interventions.\*

\* *Report on the Verification of Yields and Evaluation of the Processes of the "Maíz para Todos" Program DISAGRO — HELPS International — THE MOSAIC Company, Deloitte, February, 2012.*

A photograph showing a person in a red cap and white shirt working in a field. In the foreground, a close-up shows hands planting a green seedling into dark soil. A teal banner with white text is overlaid on the right side of the image.

## Key Areas for Investment



# 1

## Boost Commitments to Agricultural Science, Research and Development by Public and Private Sectors

**A**gricultural research and development — and the strengthening of innovation processes and their transfer to farmers — are the most important predictors of a country’s ability to sustain long-term [TFP] growth.<sup>49</sup> Given the long lead time for research and development to deliver impact in the field, it is vital that institutional mechanisms and organizations that promote agricultural science and research be strengthened now.

*“The incorporation of technology in agriculture and in rural areas has helped to increase the productivity of agricultural labor in the [LAC] region from US\$ 2,618 per person in 2000 to US\$ 3,684 per person in 2009. On one hand, the increases are the result of significant participation of commercial agriculture, which is more capital-intensive than it is labor-intensive. On the other hand, this dynamic agricultural sector structured by modern technology coexists with rural areas where family farming, which is characterized by lower levels of productivity and a population without access to land, is most prevalent. Recent studies estimate that only 8 percent of family farmers are totally integrated into value chains and that only 25 percent have good potential for fully participating in the modern agricultural sector.”<sup>50</sup>*

<sup>49</sup> Keith Fuglie, “Productivity Growth and Technology Capital in the Global Agricultural Economy,” *Productivity Growth in Agriculture: An International Perspective*, ed. K. Fuglie, S. L. Wang, and V. Eldon Ball (Oxfordshire, England: CAB International, 2012).

<sup>50</sup> International Fund for Agricultural Development, Portfolio Performance Report, Latin American and Caribbean Division Annual Review 2011-2012.

While public investment in agricultural research and development in the LAC region has increased somewhat in the past decade, the region’s average investments are well below those of developed countries and most of the recent improvements can be attributed to spending by a few countries, most notably Brazil, which is investing 1.5 percent of agricultural GDP in agricultural research, about 40 percent above the region’s country average but still below the 2–3 percent invested by developed countries. In all, Argentina, Brazil, and Mexico accounted for 86 percent of the region’s R&D spending growth from 2000–2008.<sup>51</sup> However, there has been a growing trend of private sector investment in R&D, which, although typically directed at a company’s own product offerings and bottom line, has nevertheless had a significant impact on the region. Globally, private investment in R&D focusing on agriculture and food processing increased from \$12.9 billion in 1994 to \$18.2 billion in 2008, amounting to about 21 percent of total spending on R&D.<sup>52</sup>

A 2005 study of several LAC countries found that in many cases private R&D/innovation initiatives were an important part of networks and partnerships involving a broad range of public, private, and non-profit entities. In addition, it found that private initiatives were focused on importing knowledge and technology by bringing in international experts, often

<sup>51</sup> Nienke Beintema et al, *ASTI Global Assessment of Agricultural R&D Spending*, (Washington, DC: International Food Policy Research Institute, 2012), 5.

<sup>52</sup> Ibid, 13.





## → RECOMMENDATIONS

*Governments should increase their investments of public monies on agricultural research and development to a minimum of 1 percent, and ideally 2–3 percent, of agricultural GDP while focusing on benefitting farmers of all sizes and scales, especially with regard to innovations that address the unique needs of small and medium holders.*

*To encourage increased spending on R&D by the private sector, policy makers should work to strengthen intellectual property protection. The goals should be to provide an enabling environment for innovation by establishing predictable national and regional regulatory systems that include IP protection and that safeguard data generated in the regulatory process.*

as part of equipment purchases that included knowledge transfer from technicians in showing buyers how to use and maintain the new equipment.<sup>53</sup>

***In the LAC region, for every \$100 in goods produced by the agricultural sector there is only \$1.10 invested in agricultural research, which historically pays an enormous return on such investments over the medium and longer terms. In more developed economies this investment tends to be more than three times that amount.***

Encouraging these investments is among the most important actions governments in the region can take to boost agricultural productivity and sustainability over the long term. Studies indicate that for the LAC region, investments in agricultural research are highly correlated with increases in economic growth, agricultural development, and poverty reduction, with returns averaging 43 percent in the countries examined, with the adoption of new technologies

<sup>53</sup> Carlos Pomareda and Frank Hartwich, *Agricultural Innovation in Latin America: Understanding the Private Sector's Role*, (Washington, DC: International Food Policy Research Institute, 2006), 5.

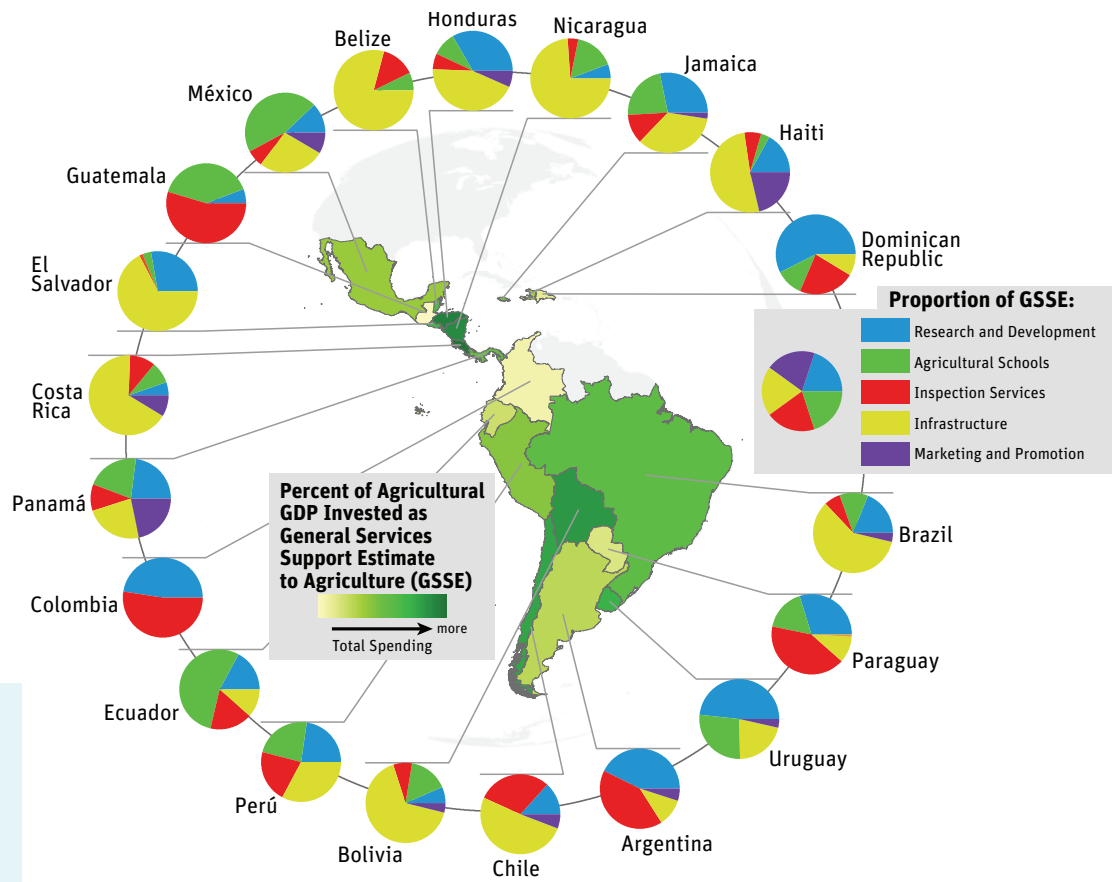
by farmers having a positive effect on farm income and on soil conservation.<sup>54</sup> The rate of return on public investment in agricultural research is actually higher than that for most other forms of public spending, and for private capital investment, as well.<sup>55</sup>

While regional agricultural research organizations have had success in LAC in promoting a common agenda and conducting cooperative projects and initiatives, many have lacked support and therefore have not been able to fulfill expectations. Given their importance in addressing food security and innovation challenges, building synergies, and avoiding duplications, support for these organizations should be included as part of an overall strategy to enhance capabilities at institutions of higher learning and research organizations across the region. In many cases, the best opportunities for investing efficiently in R&D — and in particular cutting down the period of time from the laboratory to the farmer — will come through international cooperation.

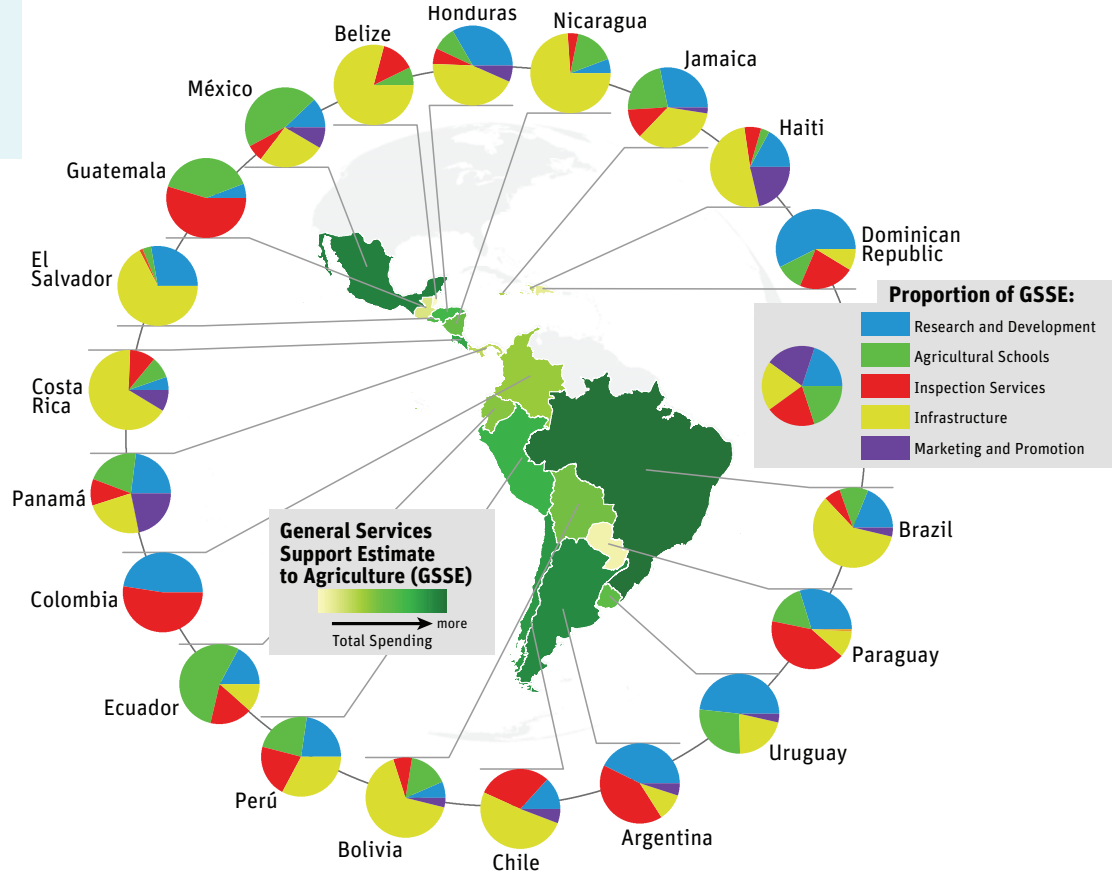
<sup>54</sup> Julian M. Alston et al, *A Meta-Analysis of Rates of Return to Agricultural R&D: Ex Pede Herculem?*, (Washington, DC: International Food Policy Research Institute, 2000).

<sup>55</sup> Julian M. Alston et al, "Research returns redux: a meta-analysis of the returns to agricultural R&D," *The Australian Journal of Agricultural and Resource Economics* 44:2, 185-215.





These two charts show government investment in agriculture both as a percentage of agricultural GDP (top) and by the amount of spending per country (bottom). The proportion of spending by category in each country, represented by the surrounding pie charts, remains constant in each case.



Graphs courtesy of Peder Engstrom and Paul West, Institute on the Environment, University of Minnesota.

Source: IDB.

## “INNOVATION SYSTEMS” IN PRACTICE

While efforts to improve agricultural innovation have typically focused primarily on training and organizational capacity development, there is an emerging practice that is centered on improving incentives for cooperation and strengthening linkages among relevant actors through what are known as “innovation intermediaries” or “innovation brokers.”

Examples of this new approach can be found in the Papa Andina Partnership Program, based at the International Potato Center (CIP), an international agricultural research center affiliated to the CGIAR and working in Bolivia, Ecuador, and Peru. The program functions as a second-level innovation broker in the Andean potato sector, backstopping national partners who facilitate local innovation processes in their respective countries, with the goal of developing more effective ways of bringing stakeholders together to promote within market chains innovation processes that benefit small-scale potato farmers in highland areas where native varieties of potatoes still predominate.

Until recently, these native varieties received almost no attention in potato research agendas. In Ecuador, for example, native potatoes have almost disappeared from the market. But the new innovation approaches have

focused on their untapped market potential, particularly given their diversity in color and shape, high cooking versatility, nutritional profile, and traditional, low input production practices. The program has focused on ways to exploit this potential through finding innovative ways to expand the market for native potatoes through product development – and working with researchers, farmers, private companies, and nutritional and gastronomic experts.

Early products have opened new market niches and brought higher prices for farmers. Among these were *T'ikapapa* (bagged native potatoes), which received the prestigious BBC World Challenge Award and the UN Seed Award, and *Jalca Chips* (multicolored native potato chips), which became highly popular in the duty-free shops at Lima airport. As a result, a supply chain has been created that gives more than 200 farmers access to a stable market and a negotiated price that provides them with a 20–40 percent profit margin.\*

\* André Devaux, Miguel Ordinola and Douglas Horton, eds., *Innovation for Development: The Papa Andina Experience*, (Lima: International Potato Center, 2011), 76.



## SUSTAINABLE FINANCING OF AGRICULTURAL RESEARCH AND INNOVATION: THE CASE OF FONTAGRO

As international support to agricultural research has declined over the past two decades, LAC's Regional Fund for Agricultural Technology (FONTAGRO) has emerged as an example of sustainable South-South cooperation aimed at promoting agricultural technology innovation in its member countries. Created in 1998 with the sponsorship of the IDB and the Inter-American Institute for Cooperation on Agriculture (IICA) — and now comprised of 14 LAC countries plus Spain — the fund has \$100 million in capital and functions as an endowment, with proceeds used to support agricultural research and development projects through a competitive process. The fund has mobilized substantial resources from various donors, including the IDB, World Bank, the Spanish Agency for International Cooperation (AECI), and the governments of Korea, Japan, and New Zealand.

Recent external evaluations have noted that FONTAGRO has thus far generated 35 technologies, 15 of them new to the region and four with global implications — many of which are used by smallholder farmers. FONTAGRO-funded projects work primarily toward improving crop varieties (maize, potatoes, sweet potatoes, rice, wheat, and tropical fruits), integrated pest management that results in reduction of pesticides, and integrated management of natural resources. Institutional arrangements have also been developed to strengthen value chains, promote access to markets and generate benefits to small farmers and other actors in value chains.

## Intellectual Property Protection

Spending by the private sector could add significantly to the overall commitment to research and development in LAC, as well as speed important gains in yield and drought tolerance, pest-resistance, and the potential for improving health by improving nutrient value of crops. Other forms of private sector agriculture investment include research for better irrigation systems, mechanization for crop production and post-harvest processing and storage, as well as innovation in animal health and nutrition.

Unfortunately, the system for establishing intellectual property (IP) protection for the companies that are developing these technologies is too slow or almost non-existent in the LAC region, leading to a withholding of these beneficial technologies from those countries that could benefit farming operations of all sizes.

This is a critical issue for many companies engaged in agricultural research and development. Assuring that their discoveries can be used by any farming operation requires many years of consultation, research, field trials, and testing. In particular, plant science innovation is research-intensive and costly, requiring a decade and an average \$250 million commitment to a single crop protection product. About a quarter of this cost goes to generate regulatory data for national governments, and half the time it takes is for regulatory review.<sup>56</sup>

Even when the laws and regulations are generally in order, implementation often becomes highly political and cumbersome. Diverse national regulatory systems across LAC hamper the potential to assure a consistent and predictable approach to innovation for the private sector.

Given the extraordinary commitments they must undertake, innovators and product developers need to have some assurance that their investments will pay off for them over the long term. Under these circumstances robust IP protection is essential for companies to have the ability to continually invest in developing new technologies that will help farmers protect and expand the food supply.

<sup>56</sup> CropLife, "Meeting Challenges in a Growing World: Protection of Regulatory Data"; available from [www.croplife.org](http://www.croplife.org).



### A GENDER-BASED APPROACH TO SUPPORTING PRODUCTION AND CONSUMPTION OF TRADITIONAL CROPS

In Andean communities, rural women, while pursuing food security for their families, have been contributing since ancestral times to the preservation of native roots and tubers, passing on to their children knowledge and skills regarding resource management and seed selection. This tradition has come under some pressure in recent years because of the growing consumption of commercially-produced products, and because of women's limited role in family and community decision making.

This is why PROINPA (Foundation for Promotion and Research of Andean Products) and the Bolivian Ministry of Agriculture, with the support of the CIP-Papa Andina Initiative, have targeted women in an initiative to restore the important role of Andean roots and tubers in the family diet, and to make it possible

to increase the family income with these products. The strategy to involve women farmers also aims to improve food security and prevent biodiversity loss by developing social and economic incentives for conservation. The project identified interest groups (producer associations) and local promoters to work in the rescue of available knowledge on the management and use of the roots.

Cariquina Grande, an Aymara community in the northern highlands of La Paz, has traditionally relied upon a large variety of native potatoes and other Andean tubers such as oca, papalisa, and isaño.

PROINPA has sponsored workshops with female community members to promote recovery of traditional uses, development of innovative new uses, and dissemination of recipes to increase consumption of these foods, particularly among younger people. And in the municipality of Coroico, 95 kilometers from La Paz, the program has worked with farming families, in which women play a leading role, to reinstate wide consumption of root vegetables such as the achira, ajipa, walusa, aricoma or yacon, and racacha. Under the program, these root crops are recovering and being reinstated in family diets, while generating additional income for the local farmers.\*

\* André Devaux, Miguel Ordinola and Douglas Horton, eds., *Innovation for Development: The Papa Andina Experience*, (Lima: International Potato Center, 2011), 354.





Photo courtesy of the Mosaic Company

# 2

## Improve Knowledge and Extension Services for Farmers

**A**gricultural machinery, farming techniques, and storage and communications platforms upon which to build more successful farming operations are growing more complex and are requiring increasing amounts of education of the end user. Examples include improved seed varieties, precision agriculture techniques that localize the application of fertilizer and pesticides, intercropping that can add nitrogen to the soil naturally, and creating more nutritious crops through breeding, and science, and improved irrigation techniques. Even the simplest technology solutions — such as critical market, weather, and technical information that can be easily accessed by farmers through their cell phones — are improving the overall environment for business success on farming operations of all sizes.

There is wide agreement that for new technologies to work, farmers have to be shown how to use them. Accordingly, it is fundamental that the agenda for improving agricultural productivity address the need for farmers — notably those

associated with small and medium-sized operations — to expand their understanding of farming systems and their capacity to innovate in their particular ecosystems. Additionally, farmers must increasingly have advanced business and marketing skills in order to take advantage of new opportunities presented by changes in agricultural value chains, particularly the rise of contract farming driven by large regional and global food retailers.

In Latin America and the Caribbean, the traditional public sector model of agricultural extension based on technology transfer and delivery has showed limited results. Some countries have re-engaged, especially Brazil, using new methods, while in other areas there is some evidence of increased investments in family farming. However, across the region as a whole, there is still a considerable need for further investment in extension services. As a result, small and medium-sized farmers in particular are not getting basic and critical information about new technologies and

“In some LAC countries there are often professional agronomists who are very well informed and who offer consulting services delivering technical information and knowledge. However, small sized farmers or producers might not be able to pay for the service, don’t deem it important or culturally distrust innovations and are reluctant to change.”

*Gary R. Burniske, Ph.D., Managing Director, Center for Global Food Security, Discovery Park / Purdue University*



## → RECOMMENDATIONS

*Governments and the private sector must work together to reinvigorate agricultural extension services and to ensure that policies, incentives, and innovation systems increase the level and scale of technical assistance to farmers. Stronger and more effective extension services should be part of integrated packages of support that combine flexible financing, risk management, and new technologies and mechanization for achieving productive, sustainable, and financially successful farming operations. NGOs and multilateral organizations can and should play a critical role in helping replicate effective extension models across the region.*

*In order to expand opportunities to deliver extension services to farmers, policy makers should prioritize the further build-out of mobile broadband networks into agricultural areas. At the same time, governments and the private sector should pursue policies and investments that encourage more open source access to information and data in order to facilitate farmers' access to accurate and timely information on market pricing.*

practices that can help raise their productivity levels and help them become better stewards of the natural resource base. Agribusiness companies have tried to fill this gap out of a concern that farmers will blame them when, for example, seeds fail because the farmer did not introduce the right nutrients into the soil at the right time, or did not buy seeds with the minimum quality standards. However, private extension services are still new and limited in scope and in the numbers of farmers they reach.

Some countries, especially but not exclusively in Latin America and the Caribbean, have gone far in privatizing and contracting out advisory services, and a variety of alternative advisory services have emerged, along with a vast assortment of NGO-supported efforts, services run by producer organizations, farmer-to-farmer exchanges, and mobile phone and Internet-based services. While these developments are encouraging, this patchwork approach also contributes to the overall problem of farmers not knowing whether the advice they are receiving is really useful or trustworthy. Private sector interest and public

policy makers should focus on building stronger, more consistent and more sustainable platforms for information that farmers can come to trust and rely upon over time.

To be highly successful, extension requires direct linkages in the field among education and training staff, researchers, extension agents, and farmers, as well as joint problem-solving. One possible approach to improving farmer knowledge and technical capacity along the food and agriculture value chain is the interactive Agriculture Innovation System (AIS). AIS involves mobilizing a wide range of actors who play various roles in enabling, funding, creating, and diffusing knowledge and applying this to extension for farmers that targets their specific contextual needs to make them more successful. An example of AIS in action is El Salvador's Family Agriculture Plan (PAF), currently being implemented by the Government of El Salvador's Ministry of Agriculture.



## THE SUCCESS OF THE ECUADORIAN PLATAFORMAS

A decade ago in the Ecuadorian Sierra, smallholder potato farmers were drawn into alliances with a range of government and non-government entities in an effort to increase the farmers' profits by linking them to high-value potato markets such as restaurants, supermarkets, and processors. Known as *Plataformas*, the alliances enabled the farmers to reap the benefits of the new agricultural economy in the country by circumventing wholesale markets, lowering their transaction costs, and improving the overall cost-effectiveness and quality of their production and their access to high value markets, which were facilitated by the program's training through Farmer Field Schools. The schools helped the farmers adopt integrated pest management, deploy new potato varieties to meet the demands of high value markets, and organize to meet the grades and standards of those markets.

An impact evaluation of the *Plataformas* found that the program had increased gross margins of beneficiary farmers, that prices received by potato farmers increased by 30 percent, and that overall more potatoes were being produced and marketed in the region — and that the newly established linkages between farmers and high value markets had been at least partly responsible for a growth in productivity among the small potato farmers.\*

\* Paul Winters, Lina Salazar and Alessandro Maffioli, *Designing Impact Evaluations for Agricultural Projects*, (Washington, DC: Inter-American Development Bank, 2010), 9.

## MAKING FINANCING AND TRAINING WORK FOR DISADVANTAGED FARMERS

About four-fifths of Peru's rural poor are employed in agriculture and fishing, and both women and indigenous peoples — whom together represent a large share of the rural poor — face significant barriers to developing agricultural enterprises. With this in mind, the Peru Agricultural Research and Extension Program (INCAGRO), founded in 2000 to help consolidate agricultural research and strengthen the rural innovation system to make it more pluralistic and demand driven, has undertaken efforts to reach these populations with special financing instruments, technical assistance, and capacity building.

INCAGRO worked to make its Competitive Fund, which provides co-financing to research and extension sub-projects as well as to training workshops, pre-professional internships, and local forums, more accessible to the indigenous peoples and women's organization by setting up specific financing terms, eligibility criteria and selection processes for them. Sliding scales were used for co-financing percentage requirements — where women and indigenous projects were only required to co-finance a minimum of 15 percent of the total amount of the sub-project in contrast to 25 to 35 percent for other producers.

The measures led to the creation of 155 business plans from these groups, of which 117 agricultural extension projects came from indigenous producers and 38 from women's organizations — the majority of whom had never before received a public sector grant or created a business plan. Said one woman, a coffee producer, "our commercial production is important because there is great demand from the market of coffee produced by women. With INCAGRO's financing we were trained and learned how to manage a business, leadership and accounting. We feel like business women because we manage our own farms."



## The Promise of Mobile Broadband

Farmers are enormously dependent on information to properly manage their businesses and to assure successful production. Information about when to plant, when to harvest, when and how to apply inputs, how to negotiate prices, and how to access the private sector can change from one day to the next. Having the tools to access this information can make the difference between success and failure in their operations.

### Where Information and Communications Technology can Enable Progress in Food Production

- » In developing and enhancing crop growth models that automatically make recommendations for maximizing yield and minimizing inputs for specific crops in specific locations — the outputs from these can then be rendered into simple recommendations for farmers.
- » To make available location-specific, precision weather forecasting as an input to planting and irrigation decisions.
- » As a platform for state-of-the-art supply chain management tools that speed the process of food through the supply chain.
- » To track and trace to allow the provenance and growing standards of crops, meat and fish to be validated (and — if needed — food recalls to be expedited).
- » To facilitate real-time market offer and discovery mechanisms that allow growers to find markets and buyers to find sources, thereby improving the stability and viability of supply chains for all actors in the market.
- » To monitor run-off and thereby indicate where reduced use of fertilizer may be possible for the purpose of protecting natural water resources.

Thanks to heavy private sector investment in mobile infrastructure, mobile broadband coverage and access is expanding rapidly across the LAC region, with mobile broadband penetration in the region having already surpassed fixed broadband.<sup>57</sup> While much of the build-out has been concentrated in cities and large towns, its anticipated spread into rural areas will offer a new and robust platform for farmers to receive timely and highly useful information that they can use to improve their operations, to select the optimum time and place to market their goods, to access low-cost diagnostic services through their smart-phones, and ultimately become more successful and profitable.

There are enormous opportunities to enhance access to mobile and fixed-line broadband through smart, simple solutions. Research from around the world has shown that access to a mobile telephone, and the connectivity to information that entails, can make an enormous difference

in the success of a farming operation in developing countries. For example, there are applications available where farmers can send a text message on their mobile phones with the readings from a pre-packaged soil test kit and instantly receive a tailored prescription for balanced crop nutrition in their fields — a powerful solution to the so-called “Goldilocks Problem” of too much or too little in the way of soil applications. Another program enables a farmer to take a photograph of a weed with his or her phone and send it to an online service to be digitally analyzed using local infestation maps. The service generates a call to the farmer with an electronic message on what action to take. Similar services generate SMS messages to help farmers

### THE MASAGRO MÓVIL PROJECT IN MEXICO

MasAgro Móvil, an agricultural information service for mobile devices launched in 2012 by the International Maize and Wheat Improvement Center (CIMMYT) with the support of the Mexican Ministry of Agriculture (SAGARPA), is a subscription service that delivers weather and price data specific to the regions of Mexico where the research and capacity building project MasAgro operates. The service relies on input provided by the Mexican Information System for Food, Agriculture and Fisheries. MasAgro Móvil will provide subscribers with advice from a network of nearly 2,500 extension workers to promote sustainable farming practices based on conservation agriculture techniques. At present, CIMMYT is preparing the technicians for the task in hand through a train-the-trainer approach, whereby 100 extension workers are training 2,500 agronomists. This workforce will give specific advice to some 80,000 farmers that are currently participating in MasAgro. The aim is to offer banking services and to use mobile devices as tools for precision agriculture that help enhance sowing, irrigation, fertilizing, and harvesting procedures.

<sup>57</sup> Inter-American Development Bank, *Bridging Gaps, Building Opportunity: Broadband as a Catalyst for Economic Growth and Social Progress in Latin America and the Caribbean*, 2012.





A Harvard Business School\* study in India found that a mobile phone service was able to significantly change farmers' sources of information for their sowing and input-related decisions. For a monthly cost of \$1.13 per farmer, the mobile service provided weather and pest control information that enabled farmers to reduce their reliance on agricultural input dealers (who tend to be motivated by sales commissions) for advice on applying dangerous pesticides and on changing to dramatically less toxic pesticides. The service also helped farmers improve their investment decision making and build their knowledge on the crops they grow and how to grow them. The monthly cost of the mobile service compared favorably to the "all-in" costs for physical extension of about \$8.50 per farmer.

\* Shawn A. Cole and A. Nilesh Fernando, *The Value of Advice: Evidence from Mobile Phone-Based Agricultural Extension*, (Cambridge, MA: Harvard Business School, Working Paper 13-047, 2012).

## EL SALVADOR'S FAMILY AGRICULTURE PLAN

The Salvadoran government's Family Agriculture Plan (PAF), launched in 2011, seeks to use innovations and knowledge transfer to strengthen the technical and business skills of rural people in agricultural areas in order to increase net household incomes and improve the competitiveness of family farms and other rural businesses. The initiative's approach is to empower producers and create rural farm schools to share experiences, knowledge, and technologies. Targeted at a number of agricultural and rural value chains, the program has been showing productivity increases of up to 80 percent in some areas, as well as reduced production costs, improvements in quality standards, and increased profitability per hectare of land.

The program, co-executed with the Inter-American Institute for Cooperation on Agriculture (IICA), focuses on eight prioritized agricultural production chains: staple grains, dairy, aquaculture, fruits, vegetables, honey, cocoa, and coffee. About 500 extension technicians were trained to enhance their technical knowledge in extension methodologies and the transfer of knowledge, as well as new production technologies, marketing, and the management of innovation and communication technologies (ICT). Thus far, the program has reached nearly 17,500 producers in El Salvador, including more than 4,000 women, who were trained in Farmer Field Schools (FFS) and who attended more than 13,000 learning group sessions on production link innovations. This was supplemented with 34,000 farm visits by extension technicians and the organization of 177 marketing events to enable producers to approach the formal market.

Thus far, across all participating farms, sales to the formal market have increased by 95 percent and tax revenues to the government from increased sales have more than doubled. As just a few examples, participating white corn producers saw an average productivity increase of 53 percent, with marginal revenue of producers increasing by approximately 860 dollars per hectare. Milk producers reported a 14 percent increase in productivity, while annual sales increased from \$17.5 million to \$25.2 million. Shrimp producers in the aquaculture chain increased their production by two-thirds and saw their sales volumes rise by more than 50 percent. And the fruit chain, where bananas are the main product, reported an increase of 110 percent in the yield and a net profit increase of 148 percent.\*

\* Inter-American Institute for Cooperation on Agriculture IICA, *Informes Finales de las 8 cadenas priorizadas por el Programa PAF Cadenas Productivas*, 2013. Inter-American Institute for Cooperation on Agriculture, *Informe de Resultados de los Principales Indicadores de Ejecución, Sistema de Seguimiento y Monitoreo del PAF Cadenas Productivas*, 2013. Inter-American Institute for Cooperation on Agriculture, *Informe de Resultados e Impactos de Corto Plazo de los Centros de Acopio y Servicios (CAS)*, 2013.

improve productivity or gain instant access to market prices and financing information. In some cases, the technology can enable a local seed representative or extension agent to partake in the exchange of information and offer tailored solutions to the farmer.

While the end-user access technology is generally available across the region and adoption rates are good, there is a need to boost the presence of relevant information services. What is missing is the backend infrastructure of services to collate data from various streams/apps and produce information on reliable, widely trusted platforms that farmers can use to make their decisions.





# 3

## Invest in Transport and Logistics Infrastructure

Latin America's transportation and rural infrastructure gaps, the result of decades of low and often inefficient public investment, are major factors in raising transaction costs and thereby a key challenge to improved agricultural productivity growth.<sup>58</sup>

Even with Brazil and Argentina's recent success in agriculture, the World Economic Forum ranks Brazil's quality of infrastructure 104th out of 142 countries surveyed, behind China (69), India (86), and Russia (100), while in Argentina only 30 percent of the country's roads are paved.<sup>59</sup> Meanwhile, the average proportion of paved roads across all Mercosur countries — Argentina, Brazil, Paraguay, Uruguay and Bolivia — is 11 percent.

In Brazil, for example, limitations in investment in railroad infrastructure has restricted the exportation of soybeans, as they have to be sent on long routes by truck and the present road infrastructure is not able to support this. In the southern Brazilian state of Mato Grosso, the cost of transporting a ton of soybeans to China via the Port of Santos is approximately \$170 compared \$71 for transporting

a ton of soybeans from Illinois in the U.S. to China via the Port of New Orleans. Once the soybeans leave the port, the cost is about the same for both countries, \$45 per ton from Brazil and \$46 per ton from the U.S.<sup>60</sup> Poor roads not only limit speed to market, they are also obstacles to bringing in fertilizers and other vital inputs for replenishing cropland. A study of the causal relationship between investment in rural roads and productivity gains found a multiplier effect of 1.57, leading to increased employment and income.<sup>61</sup>

Underdevelopment of infrastructure critical to agriculture extends to other areas, including storage and port logistics. In 2013, record harvests in Brazil resulted in lines of more than 20 kilometers on roads leading into port facilities and hundreds of ships waited to load, with delays in some ports of more than a month. Other improvements that are needed include better development of critical irrigation systems and electric utilities, which are both essential for scaling up farming operations.

A dearth of modern logistics services such as consolidation and freight forwarding also leads in many cases to higher costs and fewer opportunities to raise farm productivity.

<sup>58</sup> Mauricio Mesquita Moreira, Christian Volpe, and Juan Blyde, *Unclogging the Arteries: The Impact of Transport Costs on Latin American and Caribbean Trade*, (Washington, DC: Inter-American Development Bank, 2008). Mauricio Mesquita Moreira et al, *Too Far to Export: Domestic Transport Costs and Regional Export Disparities in Latin America and the Caribbean*, (Washington, DC: Inter-American Development Bank, 2013).

<sup>59</sup> "The Road Forsaken," *The Economist*, August 11, 2012; available from <http://www.economist.com/node/21560309>.

<sup>60</sup> "Domestic Soy Transport in Brazil Cost Five Times More than U.S.," *Soybean & Corn Advisor*, October 25, 2012; available from [http://www.soybeansandcorn.com/news/Oct25\\_12-Domestic-Soy-Transport-in-Brazil-Cost-Five-Times-More-Than-US](http://www.soybeansandcorn.com/news/Oct25_12-Domestic-Soy-Transport-in-Brazil-Cost-Five-Times-More-Than-US).

<sup>61</sup> Shenggen Fan and Connie Chang-Kang, *Road Development. Economic Growth and Poverty Reduction in China*, IFPRI Research Report 138, (Washington, DC: International Food Policy Research Institute, 2006).



## → RECOMMENDATIONS

*In order for Latin America and the Caribbean to realize its agricultural productivity and export trade potential, governments in the region must increase infrastructure investment to at least 4 percent of GDP. This commitment to modernizing rural roads, ports, and railroads — as well as customs processes, irrigation, energy, and commercialization infrastructure — will reduce transportation costs and increase the competitiveness of domestic agricultural producers and firms.*

### Where and How Logistics Problems Drive up Transaction Costs

Logistics and transport costs for food can run as high as 60 percent of total food costs and are among the highest costs along the value chain given the modest decreases in import tariffs across LAC. These cost include:

- » Reception of grains at the port of entry — sanitation costs, delays in processing times, increased storage costs due to the unpredictability of shipments.
- » Bottlenecks at land border crossings.
- » Poor quality of the road infrastructure and lack of close or convenient proximity between points in the value chain.
- » Amount of food wasted due to climate conditions, lack of safe storage and/or distance from farm to market.

Additionally, the need for more customs and border facilities and personnel, and improved port facilities in particular, adds to transaction costs through extended clearance times, losses related to spoilage of produce, and higher associated financial costs. Meanwhile, high transit costs associated with aging and inefficient port infrastructures are limiting farmers' opportunities to link with potentially lucrative global value chains. Overall, the LAC region needs a much more modern and diversified transportation matrix that is developed with the goal of greater efficiency in moving goods throughout the value chain.



*Photo courtesy of Neil Palmer/CIAT*





Photo courtesy of Dupont Pioneer

# 4

## Support Irrigation, Water Management and Mechanization Technology

**W**ater is a key issue for LAC agriculture. Irrigation is a major determinant of agricultural productivity and yield stability, and yet only about 15 percent of arable land in LAC is equipped for irrigation.

*An analysis of the portfolio of investments in irrigation operations financed by the World Bank shows that between 1998 and 2008, 92 percent of the projects reported increases in agricultural production and four-fifths of the projects reached their production goals.<sup>62</sup> The Bank also found that irrigation systems managed by user associations outperformed those under public administrations, encouraged water efficiency and may be increasing the demand for labor, the marketing of agricultural products and, in general, increased economic activity in the regions of influence.*

As an increasing number of countries around the world reach alarming levels of water scarcity, the LAC region has a surplus of renewable water resources that will aid in its agricultural production for years to come. But these should be used as efficiently and sustainably as possible, which

requires continuous research and adaptation, especially in view of the shifting climate patterns.

Accordingly, it is important that irrigation be viewed not just in terms of the conveyance and delivery of water to agricultural lands, but also the management of water resources so as to maximize the benefits of increased food production (“more crop per drop”) in farming communities, while ensuring that there is not overuse of these resources resulting in environmental damage and deprivation in nearby communities.

### Mechanization

**Farm mechanization** is an often overlooked factor in achieving global food security. As with irrigation and water management, mechanization is more than just labor replacement — it is about yields, timing, multiple crops, and quality of production. Forms of mechanization will vary widely by farm size, type, and location but require solutions viable for the smallholder farmer and the largest most advanced farms — and everything in between.

Mechanization can address one of the major limitations on farm productivity, which is the reliance on human labor with a hand hoe. Mechanization is a powerful tool in achieving sustainable agricultural production because it enhances human capacity of men and women farmers when gender issues are anticipated and addressed.

<sup>62</sup> Independent Evaluation Group (IEG), *Growth and Productivity in Agriculture and Agribusiness*, (Washington, DC: The World Bank, 2011).



## → RECOMMENDATIONS

*Public policy makers and agricultural enterprises must work to advance research and continual adaptation that will increase efficiency in irrigation and water management, and to promote the widespread adoption of techniques that will lead to a more sustainable use of water for agricultural purposes.*

*Public and private sector entities should seek to establish innovative partnerships that promote the research, development, and adoption of appropriate mechanized agriculture, particularly on smaller and medium-sized farms. Of critical importance is incorporating a gender lens to ensure women's access and avoid displacement, and to include approaches tied to servicing networks and expanded access to credit for the purchase and use of farm machinery.*

It is a fact of life that increasing appropriate forms of farm mechanization will be required to improve productivity as available farm labor shifts to urban areas and population growth slows in many agricultural regions. But mechanization has been hindered by its cost per unit and the need for scale to afford the cost of the investment, as well as the challenges associated with establishing local agro-dealerships for repairs and maintenance of farm equipment.

Farm equipment makers have typically found many parts of the LAC market to be a challenge for selling their products, with manufacturers citing the small size of farms in many areas, topography that is not conducive to mechanized farming, and an availability of affordable labor that prevents many small family farms from realizing a cost benefit from mechanizing their operations. Regulatory issues in particular pose many barriers for mechanization companies that wish to establish operations in developing countries. Issues surrounding worker and equipment safety, machinery maintenance and noise, and supply and management of fuel for machinery are additional considerations. The mechanization that the companies are seeing in areas comprised of small farms tends to consist of used equipment — some 40 percent of tractors and 50 percent

of combines used in the region are more than 20 years old. Mechanization companies have noted that gaining access to more modern machinery for agriculture and infrastructure will help LAC become competitive in the global market.

New partnerships between private sector and governments and producer associations and cooperatives are establishing creative models to overcome the challenges to develop, finance, and deploy mechanization across many parts of the developing world. Effective partnerships must be tested and brought to scale along with an enabling regulatory environment for mechanization companies to make the long-term investments needed. And to maximize the social and economic impact, there should be a focus on ensuring that women can access the benefits of mechanization and not experience displacement from cash-crop opportunities.



## SUSTAINABLE IRRIGATION TECHNIQUES TO IMPROVE COFFEE PRODUCTIVITY

While coffee plants are traditionally not irrigated, experience shows that supplementary irrigation during periods of low soil humidity can increase productivity and plant growth, resulting in a higher quality crop. A three-year project aimed at more than a thousand small coffee producers in Central America sought to help farmers adopt low-cost, environmentally sustainable drip irrigation systems to accomplish these aims. The result of a public-private partnership between Nestec, ECOM Agroindustrial Corporation Ltd, and two U.S.-based NGOs, Rainforest Alliance and IDE, the project was first introduced in 2006 on 11 plantations in Nicaragua. The field results, later replicated as the project expanded, showed a significant increase in production of 40–60 percent, as well as rapid growth in young plants. Irrigated new plants produced crop in two years in comparison to three years for those plants not irrigated.\*

\* <http://www.nestle.com/csv/case-studies/AllCaseStudies/Drip-irrigation-project-Nicaragua>



Photo courtesy of Damiana Astudillo

## WHAT MECHANIZATION CAN MEAN FOR A FARMING COMMUNITY

In the Altiplano region of Southern Bolivia, where an arid landscape and harsh temperature extremes make farming difficult, farm families are finding opportunity in producing quinoa, a high-protein grain that is part of the traditional local diet but has given way in recent years to less nutritional, processed foods that have become easier to obtain. While the decreased consumption of quinoa can be attributed to a number of factors, one of the main obstacles is the amount of time and work required to process the grains,

which have to be scrubbed of a substance called *saponin*. Traditionally performed by women, this task is painstaking and debilitating to their health. The grains must be toasted, trampled in a stone bowl with bare feet, air-cleaned through pouring by hand, rinsed with water, and dried in the sun — a process that typically requires as much as six hours of labor to process 12kg of grain. Fortunately, there is a small machine that can process the same amount of grain in about seven minutes, while preserving more of the nutritional value of the quinoa. While the \$800 price of the machine is beyond the reach of most families in this impoverished region, the research-for-development CGIAR organization Bioversity International is working to distribute the machines to communities for quinoa farm families to use on a fee basis as they process their grains. In light of the local food security, health and nutritional gains, and new market and employment opportunities for women that this mechanization can bring, the mechanization of quinoa farming holds enormous promise for the future of these poor highland farm communities.





*Photo courtesy of John Deere*

## NEW MODELS OF MECHANIZATION FOR SMALLHOLDER FARMERS

In order to meet the needs of customers and the market, John Deere and other agricultural equipment companies are creating new business models to address the challenges that smallholder farmers face, such as lack of access to capital and financing. They are adapting new approaches on pricing, equipment size, technology level, after-sales service, customer financing (including non-traditional approaches), and training (machinery maintenance, agronomic practices and business management). For example, in Gujarat State in India, John Deere is working with the local government on an innovative public-private partnership to benefit marginalized tribal farmers. The program opened several small agricultural implement resource centers across Gujarat, making more than 500 tractors available for use by local farmers and providing access to 13 different implements for various operations. Each center has a trained operator and maintenance staff, and farmers are asked to pay a small fee to hire a tractor and operator. The program is expected to benefit 50,000 farm families who will learn skills to help mechanize their farms and increase crop yields.

Other models from the developing world include working through farmer cooperatives and agro-dealers to enable farmers to lease implements at lower costs so that they can deploy mechanization to increase their productivity. In each case, the strong leadership of local and national government is required to ensure that agricultural equipment companies can establish new mechanization business models that are successful. The potential in the LAC region for such partnerships is high and requires this public leadership in order to realize the long-term investments by the mechanization sector.





Photo courtesy of Neil Palmer/CIAT

# 5

## Promote, Enhance and Facilitate Regional and Global Trade

Policies that inhibit both intra-regional and international trade have long presented challenges in Latin America and the Caribbean, particularly for agricultural producers.<sup>63</sup> While taking many forms, these policies have combined to impede both food exports and imports across borders and raise the cost of capital equipment, such as farm machinery, thereby limiting access to the latest improvements in agricultural technology, both of which are key to raising agricultural productivity. In general, a common barrier to entry in the region is a high import tax on foreign products (including construction and agricultural machinery) that seeks to protect the local manufacturing base. As is true elsewhere in world trade, local sanitary and public health regulations can exceed what is needed to ensure food safety and instead create unwarranted barriers to market access. Similarly, customs regimes in some countries can include unnecessarily rigorous conformity assessment requirements and arduous documentation processes that offer little in the way of improved compliance with appropriate standards, but raise the cost of market access.

Trade liberalization through multilateral, regional, or bilateral trade agreements can be a major contributor to farm income and overall economic growth by expanding market access, improving efficiency, and increasing

investment in the food and agriculture sectors. For the countries of the region, these gains are most likely to materialize when agreements reducing tariffs, quotas, and market-distorting subsidies are combined with “aid for trade” assistance designed to facilitate market development.<sup>64</sup>

### Effective Trade Facilitation Contributes to Improved Productivity

“Trade facilitation is important to the food production cycle. It is imperative that farmers have access to tools and spare parts when farm equipment breaks down, during planting and harvest. Farm equipment and spare parts are often shipped across borders, but inefficient customs processes and corruption can cause delays that impede work during critical production windows. Clear and efficient procedures that facilitate trade are vital for farm productivity, allowing farmers to plant and harvest at optimal times.”<sup>65</sup>

From a trade policy perspective, the countries of the region should focus on a mix of unilateral action, bilateral and regional free trade arrangements, as well as multilateral negotiations that lower the trade costs along the entire agricultural value chain from inputs through to production,

<sup>63</sup> Paolo Giordano, Julio Nogués and Martín Piñeiro, eds., *Proteccionismo agrícola y pobreza en América Latina*, (Washington, DC: Inter-American Development Bank, 2011).

<sup>64</sup> Inter-American Development Bank, *Sector Strategy to Support Competitive Global and Regional Integration*, Washington, DC, 2011.

<sup>65</sup> Global Harvest Initiative, *2013 GAP Report® (Global Agricultural Productivity Report)*, [www.globalharvestinitiative.org](http://www.globalharvestinitiative.org).



## → RECOMMENDATIONS

*Policy makers in the region should ensure that trade policies support agricultural productivity, focusing especially on eliminating import and export barriers and integrating smaller farmers into value chains. Sanitary and phytosanitary standards should be harmonized across the region in order to facilitate cross-border trade in agricultural products.*

*Policy makers should press for broad liberalization of trade barriers along the entire agricultural value chain, whether in the context of multilateral, regional or bilateral trade agreements or, where possible, through unilateral action.*

*Private sector enterprises should work more closely together to encourage a reduction in practical barriers to trade, both within the region and globally. Where trade associations or other producer organizations do exist, they should intensify their focus on policy changes that will improve access to inputs, capital equipment, technology, and related services, as well as expanding market access for their members' exports.*

*Multilateral organizations should push for the development of trade integration corridors, while encouraging governments to promote private sector access to markets and to facilitate the development of regional and global value chains in the agriculture/food sector.*

### HELPING BOLIVIAN SEED FARMERS ACCESS HIGH-VALUE MARKETS

The Inter-American Development Bank's Multilateral Investment Fund (MIF) is working with small farmers in Bolivia to capture more value from the sesame supply chain through improved production quality and by facilitating access to high-value export markets. The project, which is run in partnership with the CABEXSE (Bolivian Chamber of Sesame Exporters), is introducing farmers to new production technologies (such as traceability) with help from an important market: Korea. At least five large food and agricultural companies in Korea are currently buying Bolivian sesame for the manufacturing of sesame oil. Working with the Korean government's Rural Development Administration (RDA) and the Korean Project of International Agriculture (KOPIA), the MIF project has provided key assistance in transferring production and processing technologies and knowledge to producers in Bolivia. The project has already benefited some 6,000 families by increasing sesame farmers' productivity, export volume, and income. So far, two experts from the RDA have provided advisory services in Bolivia, helping to spur the development of new, more pest and disease resistant seed varieties.





Photo courtesy of Fair Trade USA

## A PUBLIC-PRIVATE PARTNERSHIP FOR RESPONSIBLE SOURCING

A three-year Responsible Sourcing Partnership brought together the U.S. Agency for International Development, the Walmart Foundation, Wal-Mart Stores, Inc., SEBRAE — Minas Gerais, and Fair Trade USA to link 12 cooperatives representing more than 30,000 Brazilian coffee farmers with mass market coffee consumers in the U.S. through Fair Trade Certified products. With contributions from all partners totaling over \$2 million, the project provided thousands of farmers with training in cooperative governance, harvest, and processing best practices, quality evaluation, and organic conversion, as well as grants for infrastructure upgrades. The goal was to integrate micro and small enterprise coffee producers in Brazil into global markets through expanding and improving the quality of supply, increasing producer capacity, and raising the marketing capacity of Brazilian coffee growers from Minas Gerais, São Paulo, and Bahia States. By the end of the project term, farmers and cooperatives had the advanced skills necessary to meet market demand for high volumes of Fair Trade Certified coffee, enabling significant advances in the Brazilian specialty coffee market.

storage, shipping, and market access. Furthermore, trade policymakers must look beyond their traditional focus on conventional barriers to trade, such as tariffs, quotas, and subsidies, to address the recent proliferation of non-tariff measures (NTMs) as a means of protection and the increasing importance of private standards imposed by buyers that often exceed those otherwise required by governments. Addressing these new issues will require approaches that lie beyond the negotiation of trade agreements — they will require a focus on many of the issues highlighted above in terms of lowering transaction costs, improving quality and on-time delivery, and expanding the capacity of the region’s farmers to add value to what they produce.

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***Average contribution from agriculture production to GDP is approximately 10 percent, but increases up to 20–30 percent or more if the outputs of the entire value chain are included.<sup>66</sup>***

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Some countries in the region, most notably Chile and Mexico, have taken significant steps toward opening and facilitating trade in agricultural products — with Peru, Colombia and countries in the Central American sub-region also making progress. Some LAC countries are also working to improve trade efficiency through a “single window approach” that seeks to consolidate and streamline trade-related regulations and requirements into a less onerous system for importers and exporters — ensuring necessary regulation, taxation, and oversight while concurrently facilitating trade.

<sup>66</sup> FORAGRO, “Agriculture and rural prosperity from the perspective of research and technological innovation in Latin America and the Caribbean,” presentation, 2010; available from [www.egfar.org/egfar/digitalAssets/3378\\_FORAGRO\\_presentation\\_english.pdf](http://www.egfar.org/egfar/digitalAssets/3378_FORAGRO_presentation_english.pdf).

## PUBLIC-PRIVATE PARTNERSHIPS: IMPROVING THE FRUIT PRODUCTION VALUE CHAIN IN CHILE

Chile exports more than 75 different varieties of fresh fruit, an increasingly diverse industry that comprises more than 1.3 percent of GDP and employs 450,000 workers, or approximately 7 percent of the labor force. Exporting firms number more than 550, and more than 90 percent of them are small enterprises that either produce fruit themselves or purchase it from some of the 16,000 producers in the country. While on a volume basis this is largely concentrated on multinational, the trend has helped increase opportunities for many companies to find growth in these markets.

A series of government actions and initiatives have helped boost the fresh fruit industry in recent years. First, the Ministry of Agriculture has taken strong measures to protect Chile's naturally sound phytosanitary conditions such as disseminating information on best agronomic practices with producers and their associations, ensuring that sanitary and phytosanitary norms of importing countries are met by producers through agreements with those countries, and issuance of certificates for export to major markets. Following this lead, the country's Exporters' Association (ASOEX) has developed a norm of good agricultural practices, ChileGAP, based on the European Union's (EUREPGAP), and has obtained recognition for these norms from European supermarkets. Along the same lines, ASOEX negotiated with the United States to have Chilean fruit inspected by the U.S. Department of Agriculture before it leaves Chilean ports. For this service, it charges its members a fee to defray costs. Beyond these efforts, the government has also taken the lead on aggressive export promotion worldwide, backed by a commitment to agricultural research and development, with ASOEX joining with government in the development of new varieties of fruit through the application of vegetable genomics and other biotechnological advances.

With Chile increasingly relying on export markets for agricultural growth, the country is also focusing on the problem of extensive paperwork and lengthy administrative wait times — and the associated costs — for conducting international transactions. An IDB-financed project, SICEX, is building and implementing an electronic single window to serve as a one-stop-shop for all foreign trade transactions. The project is expected to cut wait times by 50 percent and bring Chile into alignment with international best practices.

## HOPE FOR HAITI THROUGH AGRICULTURE

With a goal of doubling the income from mango of 25,000 Haitian Farmers over five years, the Haiti Hope Project was launched shortly after the devastating 2010 earthquake as a public-private partnership comprised of The Coca-Cola Company, the IDB's Multilateral Investment Fund (MIF), the U.S. Agency for International Development (USAID), and the U.S. non-profit TechnoServe. The project seeks to accomplish this goal through increased production, improved production practices, and reduced losses through better supply chain organization.



Photo courtesy of Fair Trade USA

Thus far, more than 25,000 mango farmers — almost half of whom are women — have joined the project for detailed technical and business training. Forty percent of farmers actively participate in producer organizations, and from 2012 to 2013 sales from those organizations tripled to \$250,000, with Haitian mangoes now distributed as far as Seattle, Washington through the U.S. supermarket chain Whole Foods. More than 60 percent of farmers are applying new techniques to tree management to improve quality. And at one exporter, losses due to quality issues are down 30 percent. Additionally, the project connects farmers to financial services through financial literacy training and by working with local microfinance bank Sogesol to develop a custom credit product. To date more than \$1 million has been disbursed to 6,000 farmers, who earn an average 15 percent net profit from the investments made with the loans.





Photo courtesy of Neil Palmer/CIAT

# 6

## Improve Farmers' Access to Financial Services: Managing Risk and Availability of Credit

Small farmers, particularly the poorest ones, already face high and diverse risks, with exposure to shocks that threaten their livelihoods as well as food and nutritional security. These risks run the gamut from injury and ill-health to overall natural resource degradation, growing insecurity of access to land, changing climate, devastating crop diseases, and increasing volatility of food prices.

Additionally, producers bearing these risks often cannot afford to use whatever risk-mitigation tools may be available, despite evidence showing that overall investments in reducing risk are usually highly cost effective. Studies show that one dollar invested today in disaster risk reduction could save four dollars or more in relief and rehabilitation costs in the future.<sup>67</sup> Even the smallest farming operations have the potential to participate in programs that help them manage productivity risks from weather and diseases.

As technology and investment have enabled many farmers in LAC to increase their yields and incomes, it is clear that many others do not have access to affordable credit that their counterparts in industrialized countries routinely depend on to help them manage planting and harvest cycles and make their businesses run smoothly from year to year. This lack of access to credit also prevents them from scaling

up their operations, boosting their production in sustainable ways, and thereby making their operations more profitable. Across the region, real interest rates on loans charged to farmers can be 15 percent or more and therefore are not broadly affordable for most small farmers.

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***Only 17 percent of cultivated land in LAC is covered by some type of insurance.***<sup>68</sup>

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Greater access to financing, through affordable innovative private sector partnerships such as mutual guarantee funds, factoring and other receivables securitization facilities, would help to ease the credit constraints faced by small farmers in LAC, thereby enabling them to increase their investments and market participation, while introducing new products and technologies to improve their productivity. All of these outcomes would result in increased capacity to better manage all their financial risks through prevention and mitigation investments, as well as the use of diverse risk financing or transfer instruments.

<sup>67</sup> World Food Programme, "Disaster Risk Reduction;" available from <http://www.wfp.org/disaster-risk-reduction>.

<sup>68</sup> Ramiro Iturrioz and Diego Arias, *Agricultural Insurance in Latin America: Developing the Market*, (Washington, DC: World Bank, 2010), 56.



## → RECOMMENDATIONS

*Policy makers and private financial entities should raise their level of understanding of agricultural financing and investment for smallholder farmers, particularly in the area of finance for commercialization, agricultural inputs purchases, and agricultural insurance. Financial instruments must be developed with a specific focus on the credit constraints of smallholders.*

“ Farmers can only absorb so much risk from one season to the next, and transferring the risk to the insurance sector gives banks the comfort that they’ll be paid back and farmers the faith to invest in themselves.”

*Bridget Carle, Client Manager & Assistant Vice President, Global Partnerships, Swiss Re America Holding Corporation*



*Photo courtesy of Fair Trade USA*

A severe coffee rust outbreak is currently affecting Central America, particularly El Salvador, Guatemala, Honduras, and Nicaragua. The International Coffee Organization (ICO) estimates that harvests are likely to decline by up to 15–25 percent in 2012/13 and 30–40 percent in 2013/14 compared to 2011/12 levels, with losses of \$550 million for the 2012/13 season. The countries of the region and producers must address this disease and support the smallholders and their communities that will be devastated by the outbreak.





Photo courtesy of Dupont Pioneer

## FARM REVENUE INSURANCE SPURRING A BEHAVIORAL REVOLUTION AMONG BRAZILIAN FARMERS

In recent years, when negotiating their production loans for the upcoming season, farmers in Brazil have been offered a new way to protect themselves against financial loss: Farm revenue insurance offered by *Credicoamo*, the credit arm of Latin America's largest agricultural cooperative, *Coamo*. Unlike traditional agricultural insurance, under which farmers often found only a portion of their losses covered in the event of weather-related crop destruction, this new product covers farmers' revenue based on their actual outputs instead of an unrelated average.

With higher premiums than traditional insurance, the co-op aggressively marketed the new product as a better hedge against weather disasters, and those who purchased it found that it came in handy two years ago when a prolonged drought triggered the failure of the soy harvest in the Paraná region of Brazil. Valdeci Honiak, who farms land in Peabiru in northeastern Paraná, had taken out a drought insurance policy and believes that he would still be in debt without it. "I was worried because it had not rained for 30 days. But I was also more relaxed that I took out the insurance," he says today. He recalls how quickly his losses were calculated and the payment was made. The biggest surprise was the amount he received was enough to cover his losses. In previous years he had observed neighboring farmers having to sell their farms because their traditional insurance had not paid enough to cover their losses.

The product, developed jointly by *Credicoamo* and Swiss Re Corporate Solutions' Agriculture division, marked the first time revenue insurance had ever been sold in Brazil. Besides considering the average individual output of each member of the cooperative, the insured amount is benchmarked against the price of products on the Chicago Mercantile Exchange, the main global market for agricultural produce and the outlet for more than half of the 5.63 million tons *Coamo* sells.

More than 3,000 members of the co-op bought insurance for the 2012–2013 harvest, bringing the insured value to R\$ 420 million and the annual premium to R\$ 27 million, and the coverage is improving the liquidity of its members. If a harvest is lost to drought, they still have the money to pay back their loans.



## GETTING TO THE ROOT OF FINANCE CHALLENGES

In Nicaragua and other LAC countries, new forms of flexible finance are helping improve the ability of coffee cooperatives to help their farmer members become more successful. A leader in these efforts is Root Capital, a non-profit agricultural lender that seeks to improve rural prosperity through capital lending, financial training and strengthened market connections. Since 2010, the organization has provided loans to COOMPROCOM (*Cooperativa Multisectoral Productores de Café Organico de Matagalpa*), originally launched in 1997 as a project of the Inter-American Development Bank, which today is a Nicaraguan coffee cooperative that aggregates fair trade and organic coffee from 250 producers and exports their product to the United State and Europe.

COOMPROCOM farmers typically begin harvesting their coffee in October and the harvest winds down in February. By April, farmers must purchase inputs such as fertilizer for the upcoming growing season, which boosts demand for pre-harvest credit during this time of year. This has led to liquidity constraints and limits on the amount of credit farmers could obtain, with some farmers not being able to get pre-harvest credit at all. Today, loans from Root Capital enable COOMPROCOM to offer double the average amount of pre-harvest credit that was previously available, and farmers now have the opportunity to request additional funds as needed throughout the year. Root Capital also offers financial advisory services to farmers to help them improve their business operations, as well as microloans for social purposes such as school fees, health expenses, food security, and home improvements.\*

\* *Case Study COOMPROCOM—Nicaragua*, Root Capital, 2013; available from <http://blog.rootcapital.org/back-roads-to-boardrooms/nicaraguan-coffee-cooperative-coomprocom-paves-path-out-of-poverty>.



Photo courtesy of Fair Trade USA





Photo courtesy of Neil Palmer/CIAT

# 7

## Strengthen Cooperatives and Producer Associations

“Working with cooperatives and associations may be the most effective way to disseminate and adopt at scale sustainable intensification. Private sector companies can more readily collaborate with smallholders and help share costs with them if they are organized into cooperatives.”

*Dr. Thomas J. Herlehy, Land O'Lakes, Inc.*

Organizational strengthening among farmers, achieved by associating into cooperatives and producer organizations, helps them overcome market constraints, high transaction costs and quality issues, as well as enable them to be seen as reliable players for private sector and financial institutions. Small, family farmers can also gain important business capacity and marketing capabilities through their association with these organizations and their participatory structures of self-governance.

Within the context of restructuring of markets and the emergence of global value chains, grassroots agricultural producer associations and cooperatives can enhance the farmer's ability to negotiate better terms of trade and provide opportunities to scale up by improving their connections to markets. What is more, they increase trust among the various participants in the value chain, which contributes significantly to lowering risk and transaction

costs. Additionally, when it comes to getting loans, research has shown that farmers in cooperatives enjoy more bargaining power and lower transaction costs than those who are not members of co-ops.<sup>69</sup> Moreover, cooperatives have been shown to increase farmer incomes at significantly higher rates, primarily due to the farmer-to-farmer learning and marketing partnerships that take place among their members.<sup>70</sup>

Larger agribusiness companies find it easier and more beneficial to sell to smaller farming operations that have organized into a cooperative. Food and commodity businesses often find significant benefits in working with cooperatives to single source their purchasing. The farmers, for their part, find that membership in the cooperative

<sup>69</sup> Sripad Motiram and Vamsicharan Vakulabharanam, "Corporate and Cooperative Solutions for the Agrarian Crisis in Developing Countries," *Review of Radical Political Economics*, 39(3), 2007.

<sup>70</sup> K.M. Singh, "Public-private Partnership in Extension: The ATMA Experience," paper presented at the Agricultural Summit, New Delhi, October 18, 2006.



## → RECOMMENDATION

*Policy makers should seek to strengthen producer associations and cooperatives, most notably in the areas of technical training in agricultural production as well as in postharvest handling and storage, business management, marketing, and negotiation.*

or producer association gives them additional market knowledge, capabilities, and collective strength to identify and do business with companies that sell them inputs and equipment and purchase their produce.

***The World Bank has noted the value of cooperatives in disseminating agricultural extension messages, referencing a study in Kenya showing that four out of every 10 farmers attributed their awareness of better practices to other farmers, while fewer than three in 10 credited their knowledge gains to extension workers.<sup>71</sup>***


Cooperatives and producer associations often enable food safety and quality issues to be addressed at a central location rather than at the farm level. And, overall, they enable various stakeholders — including farmers, research centers, private sector firms, service suppliers, government agencies, producers’ associations, or processors of agricultural produce — to work together to identify bottlenecks in the value chains that hinder the development or adoption of new technologies, as well as market-based incentives for their development.

### ACDI/VOCA’S COOPERATIVE DEVELOPMENT PROGRAM IN PARAGUAY

The non-governmental organization ACDI/VOCA works in Paraguay to connect farmers and their cooperatives with expert assistance and larger markets, identifying small to medium-sized cooperatives and associations that have promising business models but that lack the technical, operational, or organizational knowledge to best serve their members. The program, which reaches 10,000 farmers, provides training in management, strategic planning, and sound business practices, focusing on high-value crops for export such as sugar, bananas, and pineapple. As one example, the program worked with the Manduvira cooperative in northern Paraguay, helping it lift its membership from 300 to 1,750 farmers and vastly increasing local production of organic sugar, which the cooperative now exports to 19 countries.

<sup>71</sup> The International Bank for Reconstruction and Development / The World Bank, *World Development Report 1998-99*, Washington, DC, 1998, Part II, Chapter 8.



A man in a blue shirt and light-colored pants is kneeling in a barn, milking a black and white cow. He is using a metal bucket to catch the milk. A red hose is visible in the background. The barn has a wooden ceiling and concrete floor.

In a poor agricultural area of Colombia, dairy farmers have long tried to make cheese using curd-forming rennet from the cow, which often results in poor quality production, extensive waste of milk and loss of potential income. Through distribution of its easy-to-use rennet enzyme tablet, DuPont has been working with farmers in the region to reduce milk waste and make quality cheese more consistently and hygienically. The company's efforts include holding workshops for farmers to teach them how to use the rennet tablets so they can ensure the highest quality product while reducing waste — and thereby improve their standard of living.

## ACCESS TO CAPITAL – FAIR TRADE USA

In its efforts to promote information and access to the U.S. market for coffee producers, Fair Trade USA hosts an annual producer forum that attracts hundreds of coffee farmers and cooperatives from 22 countries, the vast majority of them in Latin America and the Caribbean. The event serves as a much needed platform where farmers can access real-time industry information and collaborate with agronomists, financiers, technical assistance providers, and farmers from all over the world. Recently, Fair Trade USA's *Peru Intercambio* event in Lima brought together 45 coffee producer organizations, seven importers, three NGOs, and multiple social lenders and traders to exchange ideas and bring buyers and sellers into a productive collaboration. The event not only resulted in coffee contracts and access to much needed capital for local farmer cooperatives, but also helped reduce transactions costs for buyers and lenders alike. Social lenders Root Capital, Rabobank, and responsAbility were also present, signing contracts with numerous Peruvian coffee producer groups to provide access to affordable credit.



Photo courtesy of Neil Palmer/CIAT

## FEDERACIÓN NACIONAL DE CAFETEROS

The *Federación Nacional de Cafeteros* (National Federation of Coffee Growers or FEDECAFE) is a non-profit association, representing 500,000 coffee producers in Colombia (most of them small family farms), that is widely known for its “Juan Valdez” marketing campaign. In recent years the association has sponsored sustainable development projects to help coffee growers along four strategic lines of approach: Improving coffee farms, emphasizing community, preserving the environment, and rural telecommunications connectivity. FEDECAFE'S efforts in resource implementation have earned the group wide recognition as one of the world's top organizations for mobilizing development resources, as it focuses on ensuring greater competitiveness and innovation of rural communities as well as on the development of these communities in areas of education, welfare, women's participation, climate change mitigation, and biodiversity protection. The Inter-American Development Bank has tapped FEDECAFE's experience and expertise, along with that of Nestlé and the Colombian Government, to provide assistance to coffee growers in Haiti in order to improve their productivity, food security, institutions, associations, and marketing.





Photo courtesy of Ginya Truitt Nakata/IDB

# 8

## Reduce Post-Harvest Losses

**A**ccording to a 2010 United Nations Food and Agriculture Organization report, more than one third of the food produced worldwide is lost.

In developing countries — including many in the LAC region, where annual losses average nearly 200 kilograms per capita<sup>72</sup> — these losses occur predominantly after harvest, mainly due to poor post-harvest handling and storage as well as limited or lack of value addition activities and markets. In LAC, a major factor in generating food loss is a lack of infrastructure and inadequate harvesting techniques, namely the lack of post-harvest equipment, warehousing, silos, and other storage facilities. These are the types of things that enable farmers to reduce spoilage while giving them greater flexibility to sell when market conditions are favorable and ensuring product quality in order to get the best prices for what they grow.

Food losses also occur during processing, largely due to inadequate technology and investment for the efficient processing of food and because of the under-utilization of by-products. Examples of this include the cashew crop, where the nut is harvested and the rest of the fruit is discarded, and cases where pulp from coffee fruits is washed into streams.

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***Post-harvest losses account for up to 30 percent of the grain harvest and 15 to 20 percent of the maize and bean harvest in Nicaragua, and from 10 to 40 percent of the grain and cereal harvest in Guatemala, while in Ecuador fruits and vegetables are lost at rates of about 25 percent. In the Andean region, the losses of root crops such as potatoes — an essential component of the local diet — are as high as 40 percent in some areas. The problem is also serious in the Caribbean, where one-third to one-half of the tomato and pepper crops are lost in Trinidad and Tobago, and losses of pumpkins during marine shipments to North America are reported to exceed those levels. Meanwhile, in Haiti losses of basic food crops such as bananas, pumpkins, and vegetables are reported to be as high as 35 percent.***<sup>73</sup>

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Clearly, developing solutions in this area alone can provide almost immediate gains in food security before we even begin to address environmental and other issues associated with growing additional food. Visibility in the supply chain is critical in reducing post-harvest loss, as is monitoring

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<sup>72</sup> J. Gustavsson et al, *Global Food Losses and Food Waste: Extent, Causes and Prevention*, (Rome: Food and Agriculture Organization of the United Nations, 2011).

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<sup>73</sup> Source: Inter-American Institute for Cooperation on Agriculture (IICA).



## RECOMMENDATIONS

*Policy makers should work with the private sector to increase data collection and the use of information technology to better understand the extent and nature of farm level and post-harvest losses, and to invest in tools to acquire precision information and data analysis that can help address these challenges. They should also encourage public-private partnerships to innovate, test, and deploy post-harvest technologies for smallholders.*

the drying of grain and avoidance of spoilage once stored. Post-harvest losses can be reduced through improved threshing and drying processes (including both mechanical and solar driers), as well as better storage facilities (such as hermetic and cold storage), and improved infrastructure for transport to markets. The equipment and technology must be accompanied by hands-on education and training incorporating local language and customs and engaging community leaders and farmers in other practical ways.



Photo courtesy of Margaret Zeigler

In countries like Haiti, there is potential to produce high value crops such as peanuts. What is lacking are the availability of technology solutions for drying their crop after harvest — which would help them to scale up their operations.





### AFTER THE SOYBEAN HARVEST, A TRAIL OF LOSS

During transportation of soybeans in Argentina, more than 90 percent of produce is carried on trucks, which due to equipment deficiencies are responsible for post-harvest crop loss of between two and three percent. Further losses to the crop occur during silo storage, with losses being generated through biotic or abiotic stresses (insects, fungi, humidity, etc.). While technology exists to vastly reduce these losses, there is a lack of available financing for maintaining and improving equipment, incorporating new technologies, and upgrading the conditions under which the crop is transported. There is also a lack of knowledge in the technical area of product quality. A practical and cost-effective new storage technology for grain, called a silo-bag, is now being used widely in Argentina and Uruguay. This inexpensive and highly cost-effective solution consists of a polyethylene bag that stores grains for long periods, more than a year, without significant decrease in quality. Meanwhile, the use of metal silos among small-scale maize and bean producers has reduced post-harvest losses in Nicaragua, while Argentina's National Institute of Agricultural Technology (INTA) has successfully worked with private industry in the design of harvesting machines that reduce grain losses at the time of harvest for several crops such as rice and wheat.

Another solution, the Purdue Improved Cowpeas Storage (PICS) — which is being deployed in Africa — is a simple, low-cost and effective technology that enables low-resource farmers to preserve their cowpea grain after harvest with minimal losses to storage insects. PICS technology, which involves triple bagging of the grain in plastic bags, is (1) low cost, (2) eliminates insecticide use, (3) enables farmers to store their grain after harvest instead of selling it at harvest when the price is at the low point of the year, and (4) ensures a supply of clean grain for consumption or sale for many months after harvest. This low tech innovation, which has potential for wider adoption in Latin America, is now being investigated for other crops such as maize and beans.





*Photo courtesy of GrainPro*

### **A SOLUTION FOR REDUCING CROP LOSS FOR LARGE AND SMALL OPERATIONS**

GrainPro is US-based company that focuses on reducing post-harvest losses by improving drying and storage options for poor, smallholder farmers around the globe. The company makes “hermetic” storage (airtight) for farmers, which allows both small and commercial farmers to not only keep their commodities for long periods of time, but does not require the use of insecticides or fumigants. Farmers are now able to store their grains for months after harvest, providing the family not only improved access to food during the “lean” period, but also permitting them to sell their crops long after harvest, when market prices are generally higher. In Nicaragua, farmer coops are using 50 ton “Cocoons™” (large hermetic storage units made of food-grade, flexible PVC) to store maize, while in Colombia the Neumann Kaffee Gruppe uses the Cocoons to store green coffee beans before they are exported to North American, Asian, and European markets. In Guatemala, small farmers use a 1-ton storage unit, called a GrainSafe™ to protect their maize against insects and rodents. Man-portable, Ultra-Hermetic™ storage systems called SuperGrainbags™ stores grains from 25kg to 69kg and is used in over 10 Latin American countries to store all major grains plus seeds, cocoa, coffee, without refrigeration or pesticides.



## A Final Recommendation...

In order to realize the potential of a more productive and environmentally sustainable agriculture system for the LAC region and for global food security, the region's governments and their multilateral partners **must** put agriculture at the very center of the development agenda — with a full appreciation of the linkages that exist across a broad range of agricultural issues.

Policy makers should focus on shifting priorities away from targeted spending on direct subsidies to producers and direct them toward public goods — especially agricultural research and development, extension services, critical infrastructure, trade and integration policies, and supporting technical innovation that is applicable to farming. Investments in these areas are proven to advance overall agricultural productivity.

For their part, private sector companies and organizations should seek to align at the industry level to leverage an enabling policy environment toward greater access for farmers to appropriate technology, inputs, mechanization, and education and training. In addition to this, they should make a special effort to partner with governments and farmers to help farming operations of all sizes participate in regional and global markets.

“By putting in place a comprehensive agenda of pro-agriculture policies, Latin America can attract the investments and innovations to become the 21st century global breadbasket.”

*Margaret M. Zeigler, Executive Director, Global Harvest Initiative*



“ If you want to invest in global food security, if you want to invest in preventing hunger in all corners of the world, then invest in Latin American agriculture.”

*Luis Alberto Moreno, President, Inter-American Development Bank*



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