

Development Effectiveness Overview

Special Topic

Assessing the Effectiveness of Agricultural Interventions



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The volume *Assessing the Effectiveness of Agricultural Interventions* is the Special Topic for the *Development Effectiveness Overview 2008-2009*. The Special Topic provides an in-depth analysis of what we know about the effectiveness of projects in one of the Bank's specific areas of intervention and identifies what we can do to improve the development effectiveness in that area. This year, the Special Topic focuses on agricultural production and productivity, an area in which important changes have recently taken place and in which governments have taken on the dual challenges of promoting competitiveness while ensuring food security. This Special Topic identifies agricultural projects that the IDB and others have been funding in recent years to promote agricultural production and productivity, and reviews the available evidence on their effectiveness. It then identifies where gaps lie in the existing evidence, what needs to be evaluated in the future, and how this might be done.

The Special Topic was produced by the Strategy Development Division (SDV) of the Office of Strategic Planning and Development Effectiveness (SPD). The principal authors were Mario González, Alessandro Maffioli, Lina Salazar, and Paul Winters. Valuable inputs for this work were also provided by participants in the workshop "Evaluating the Impact of Agricultural Projects in Developing Countries", organized by SDV in Washington, D.C., in October 2009. The authors want to thank the many Bank staff who participated in internal discussions and collaborated to make this report possible. In particular, Sergio Ardila, Robert N. Kaplan, Carlos Eduardo Ludena, Héctor R. Malarin, Gabriel Montes Llamas, and Christian Volpe. Jorge Olave, Vania Salgado and Sarah Strickland edited the report.

Carola Alvarez

Chief of the Strategy Development Division
Washington, March 15, 2010



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ADTEN	National Technological Development Support Program. Brazil.
BNDES	National Development Bank. Brazil.
BSE	Banco de Seguro del Estado. Uruguay.
CAN	Country Department Andean Group
CCB	Country Department Caribbean Group
CID	Country Department Central America, Mexico, Panama and Dominican Republic
CSC	Country Department Southern Cone
DESER	Departamento de Estudos Sócio-Econômicos Rurais. Brazil.
ECLAC	Economic Commission for Latin America and the Caribbean
FAO	Food and Agriculture Organization of the United Nations
FNDCT	Fundo Nacional de Desenvolvimento Científico e Tecnológico. Brazil
FOGAPE	Fondo de Garantía para Pequeños Empresarios. Chile
FOMOTEC	Fondo de Modernización Tecnológica y Empresarial. Panama
FONDECYT	Chilean National Science and Technology Research Fund
FONTAGRO	Fondo Regional de Tecnología Agropecuaria
FONTAR-ANR	Argentinean Technological Fund (Non-Reimbursable Funds)
FONTAR-TMP I	Argentinean Technological Fund (Technology Modernization Program I)
FONTEC	Chilean National Fund for Technological and Productive Development
IEG	Independent Evaluation Group
IFAD	International Fund for Agricultural Development
IFFCO	Indian Farmers Fertiliser Cooperative Limited
IFOAM	International Federation of Organic Agriculture Movements
IFPRI	International Food Policy Research Institute
IICA	Instituto Interamericano de Cooperación para la Agricultura
IMT	Irrigation Management Transfer
IPCC	Intergovernmental Panel on Climate Change
IWMI	International Water Management Institute
MGAP	Ministry of Livestock Food, and Fisheries. Uruguay.
MIF	Multilateral Investment Fund
OVE	Office of Evaluation and Oversight. IDB
RND	Environment, Rural Development and Natural Disasters Division. IDB
SENASA	Servicio Nacional de Sanidad y Calidad Agroalimentaria. Argentina
TFP	Total Factor Productivity
WFP	World Food Programme. UN
WTO	World Trade Organization
WUA	Water Users Association



Motivation for Focusing on Agriculture

Prices for a range of food commodities began to rise in 2003, peaking in mid-2008. In real terms 2008 food price levels mirrored those seen during the inflationary period of the late 1970s and early 1980s (Headey and Fan, 2008). Although food prices have since declined with the global financial crisis and economic downturn, concerns remain that they will increase again once the global economy begins to recover. Evidence shows that the costs to poor consumers of dramatic food price increases substantially outweigh the benefits to poor producers and that a rise in food prices leads to an upsurge in the incidence and depth of poverty in developing countries (Ivanic and Martin, 2008).

Concerns over agricultural production, and specifically the future of food prices and food security, persuaded leaders from the G8 countries to agree to mobilize US\$20 billion over 2009-12 to fund agricultural projects through the Food Security Initiative.¹ At the same time, the Inter-American Development Bank (IDB) and the Food and Agriculture Organization of the United Nations signed an agreement to jointly collaborate on promoting investment projects in rural areas to enhance agricultural development in Latin America and the Caribbean.² Concerns over food security have come at a time when the agricultural sector has been forced to adapt in response to increases in agricultural trade, expanded processing of food commodities, and greater requirements for producers to meet grades and standards. These changes in the agricultural economy, brought about by globalization, have created a range of new challenges for the sector in general, and smallholders in particular.

This *DEO Special Topic* to the *Development Effectiveness Overview 2008-2009* has chosen to focus on agricultural production and productivity because of the changing dynamics of the sector as well as the dual challenges of improving farmer competitiveness while ensuring food security. The objective of the *DEO Special Topic* is to identify agricultural projects³ that the IDB and others have been funding to promote agricultural production and productivity in order to i) determine what evidence is available on the effectiveness of these projects and, ii) to determine where additional information on the effectiveness of these projects would be helpful. Prior to identifying and assessing funded agricultural projects,



The Development Effectiveness Overview has chosen to focus on agricultural production and productivity because of the changing dynamics of the sector as well as the dual challenges of improving farmer competitiveness while ensuring food security.

¹ This was an outcome of the July 2009 G8 summit. See <http://www.fao.org/news/story/en/item/24457/icode/>

² http://www.fao.org/tc/news_ES.asp?event_id=39092

³ In this document, following the impact evaluation literature the term project is used to refer to a public investment with a finite time horizon and specific, quantifiable objectives. In assessing IDB policy instruments, only investment loans and policy-based loans (only one was related to agriculture) are included. Technical cooperation and non-financial products are not considered.

The IDB has a long history of providing support to the agricultural sector and helping to improve competitiveness and foster food security, particularly among poor farmers.

the challenges of promoting the sector are examined in the first chapter. This provides the necessary background to understand the logic of projects being funded as well as the potential indicators of impact that should be used. Chapter II then considers the actions taken in general and by the IDB in particular to meet those challenges. The IDB has a long history of providing support to the agricultural sector and helping to improve competitiveness and foster food security, particularly among poor farmers. Some initial assessment of the success of meeting those challenges is noted in Chapter III, as well as the potential for improving the evaluation of interventions designed to assist the sectors. Chapter IV provides conclusions and recommendations.

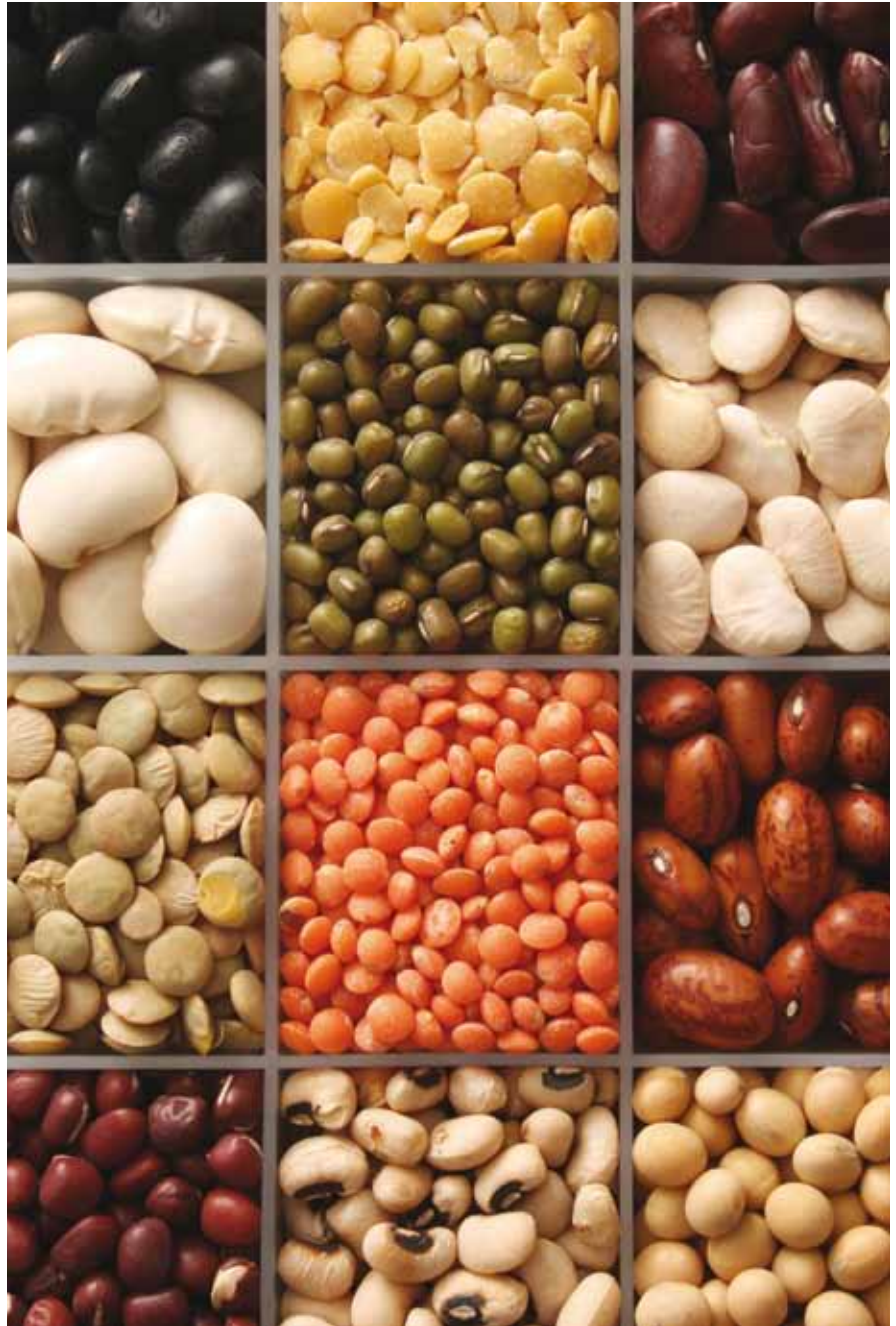






I

Chapter



Promoting Agricultural Production and Productivity to Foster Competitiveness and Ensure Food Security

I. AGRICULTURE IN LATIN AMERICA AND THE CARIBBEAN

Agriculture has always been of great importance to the economic development of Latin America and the Caribbean (LAC). Given LAC's rich natural-resource base, the agricultural sector has played a central role in the development of its modern societies (Echeverría, 1999). As one may expect, with the development of the region, the overall contribution of agriculture to GDP has declined, and currently agriculture contributes an average of 6 percent of GDP (World Bank [WB], 2008a). However, these numbers mask important differences across countries within the region. For instance, for the years 2003-05, the contribution of agriculture to GDP in Mexico was 3.9 percent compared to 17.9 percent in Nicaragua, 21.3 percent in Paraguay and 22.8 percent in Guatemala (World Bank, 2008a). Further, agriculture's contribution to employment in the region is greater than its contribution to GDP, with one in five workers in LAC employed in the sector. Again, there is significant heterogeneity across the region. In 2002-04, for example, in Argentina only 1.2 percent of the employed worked in agriculture, compared to 20.8 percent in Brazil, 32.3 percent in Paraguay, and 36.2 percent in Honduras. Even beyond its direct contribution to employment, the role of agriculture in the region's economy is much higher than it seems, when linkages with farm-input, food-processing and distribution industries are taken into account (Stads and Beintema, 2009).

In the last decades, agriculture has experienced a positive dynamic trend in LAC. Although the literature is not conclusive on the magnitude of the change, agricultural Total Factor Productivity (TFP) has significantly increased since the seventies and, particularly, during the last two decades.⁴ Most studies on this pattern show that productivity gains are mainly due to techno-

logical changes rather than an increase in efficiency, though efficiency has also grown since the early 1990s. This means that productivity has increased mainly due to the adoption of improved production technologies, including the adoption of modern varieties, rather than more efficient use of existing technologies. Once again, cross-country heterogeneity is an important part of the story. Increases in productivity have been considerable in the largest countries of the region, such as Argentina, Brazil, Chile, Colombia, Mexico and Venezuela (Dias Avila, Romano and Garagorry 2010). Smaller countries in Central America and the Caribbean, with the exception of Costa Rica, have instead experienced low productivity growth. As pointed out by Ludena (2010), the lower productivity growth of many land-constrained countries may have important consequences for food security and poverty reduction. General increases in agricultural productivity can potentially improve food security both through increased production, which can lower food prices for poor consumers, and through increased returns to poor farmers. In fact, land-constrained countries are usually net food importers and their limited agricultural productivity may worsen these food security problems.

Overall, agricultural growth has not equally benefited the rural population in LAC. In particular, it has not substantially reduced rural poverty, which remains high despite a 31 percent increase in agricultural production during 1995-2005 (Economic Commission for Latin America and the Caribbean [ECLAC], 2005). In fact, examining the three decades prior to 2000, an analysis by de Janvry and Sadoulet (2000) found that nearly all the reductions in rural poverty in Latin America were driven by rural out-migration and not by rural development. Again, this general tendency masks important differences among countries. In Chile, for instance, the expansion of agricultural production and export appears to have been labor intensive for

⁴ A wide literature has analyzed the evolution of agricultural TFP in developing countries, including LAC. Avila and Evenson (2004) find an average growth rate of TFP of 1.80 percent between 1961 and 2001 (2.24 percent for the 1981-2001 period). More recent estimates by von Cramon-Taubadel et al. (2009) find an average growth rate of 1.00 percent between 1975 and 2007, while Ludena (2010) estimates an average growth rate of 1.9 percent between 1961 and 2007.

a sustained period and has benefitted the rural poor through new employment opportunities in large-scale farms and agro-processors (Anríquez and López, 2007). In other cases, such in Brazil, the rapid growth of the agricultural sector has been much more capital intensive, providing few employment opportunities for the unskilled rural poor. Finally, subsistence agriculture, which has not experienced significant productivity changes, remains prevalent in the region's poorest countries (Stads and Beintema, 2009).

This raises questions about what, if anything, could be done to sustain agricultural productivity and simultaneously reduce rural poverty, given the dramatic changes that have occurred recently in the sector. Over the past decade a number of forces, including changing demand patterns, improved technologies, growing international trade, market pressures and competition, and an increasing interdependence of national economic processes, have been re-shaping the agricultural sector around the world. These new forces are creating new opportunities and challenges for those working in agriculture. Since world trade no longer implies completely separate buyers and sellers, there is an increasing tendency towards the coordination and financing of productive, commercial and consumption processes. In practice, this means that competition in the international and domestic markets nowadays takes place between economic chains and systems, rather than between factories, firms or farms. As noted in Chapter IV of Part II of the *Development Effectiveness Overview 2008-2009*, this reflects the fact that economic chains in agriculture often create agglomeration economies that have a productivity-enhancing effect. Indeed, competitiveness increasingly depends on partnerships based on the development and exploitation of technological know-how. Although this new agricultural economy presents potentially fruitful opportunities, developing

countries face major disadvantages in participating in the current global economic dynamic. This is partly due to their lower productive and financing capabilities, as well as major shortcomings in infrastructure, transportation, communications, services and institutional development (Food and Agriculture Organization [FAO], 2005).

Meeting the challenges of the new agricultural economy is complicated by the fact that agriculture in LAC is highly complex and dynamic, with traditional, often subsistence, production systems and sophisticated enterprises operating side-by-side (Stads and Beintema, 2009). For instance, even though around 27 percent of farmers own less than two hectares of land in LAC, the region has the second highest average farm size in the world at 67 hectares (Nagayets, 2005). This highlights the fact that land distribution in LAC is the world's most unequal. Indeed, LAC has the world's highest Gini coefficients for operational holdings of agricultural land, at 0.81 (de Ferranti et al., 2003). This unequal land distribution is especially prominent in certain countries. Smallholders in Ecuador, for example, constitute 43 percent of all farmers but cultivate only two percent of the land, and in Brazil 21 percent of all farmers are smallholders, but their total land share is less than 1 percent (Nagayets, 2005).⁵

Any strategy to increase productivity in the agricultural sector should consider what the structure and defining features of agriculture are likely to look like forty or fifty years from now, as LAC continues on a path to development. A potential predictor for the future of LAC agriculture can be found by looking at the historical experiences of most rich economies and the recent experiences of faster growing Asian economies. These experiences show that agriculture played a pivotal role in their early stages of development (Bezemer and Headey, 2008). However, they also show that, as

⁵ It is important to note that in relation to the percentages of small farmers and their farm size, as well as in regard to land inequality, there also exist differences between countries in the region. For instance, while only 11 percent of farmers in Uruguay are categorized as small farmers, in Panama, the percentage goes up to 63 percent. Similarly, while the average farm size for small farmers in Argentina is 0.1 hectares, it is twenty times as much for small farmers in Ecuador and in Colombia at 2.0 hectares (de Ferranti et al. 2003).



the relative profitability of agriculture decreased, and as non-agricultural activities accounted for a larger share of value-added in the economy, labor tended to be drawn out of the agricultural sector and relocated in more human-capital intensive sectors where workers attain higher wages. Although these higher wage activities are not exclusively urban, there is a tendency towards urban development as the proximity of industry creates agglomeration economies that provide increasing returns to investment (Lucas, 2009). Even though rural-urban migration leads to fewer people working in agriculture, there tends to be a consolidation of land holdings where the more productive and efficient farmers (often former smallholders) remain in agriculture, with a corresponding shift to more technology-based and mechanization-based agricultural production. Although there is no universal pathway or formula to economic development, this stylized picture of structural transformation seems to paint an accurate general picture (Lucas, 2004; WB, 2005a).

In sum, the real policy challenge for the next decades is to create the conditions for a structural transformation to occur “organically” by supporting those that rely on agriculture for food security in the short run while guiding the transformation of the sector in the long run. While the patterns of development noted above lead to a decline in the role of agriculture, previous experience (particularly in Latin America where policies often have had an urban bias) suggests that

forcing this transformation can lead to a neglect of the rural population and widespread rural poverty (Lipton, 1977; Grindle, 1986). On the other hand, it suggests being wary of policies that may unnecessarily keep farmers, particularly less efficient farmers, in agriculture. In discussing the challenges facing agriculture and policies for promoting the sector, the potential trade-off between supporting short-term food security and the long-term transformation of the sector needs to be kept in mind.

II. CHALLENGES TO EXPANDING AGRICULTURAL PRODUCTION AND IMPROVING PRODUCTIVITY

World population is expected to grow by over a third (2.3 billion people) between 2009 and 2050 with most of this growth taking place in developing countries (FAO, 2009a). Combined with continued economic growth, the demand for food will expand substantially over this period. In order to feed 9.1 billion people, it is estimated that overall food production will have to increase by 70 percent between 2005-2007 and 2050 (FAO, 2009a). Meeting this demand will require a major boost to agricultural production. Before the twentieth century, almost all increases in crop and animal production took place as a result of increases in cultivated land area; however, towards the end of the century, almost all production increases were from increases in productivity (Ruttan, 2002). With continued population growth and food demand and a declining supply of arable land

per capita, there is a growing need for food supply increases to come from growth in productivity, rather than from expansion in factors of production (Alauddin, Headey and Prasada Rao, 2005).

Productivity growth is also closely linked to the ability of farmers in LAC to compete in the new agricultural economy. While improved productivity is likely to allow greater participation in global markets, there is positive feedback from such participation on agricultural growth and productivity gains. Pingali (2006) notes that competing in global markets can induce agricultural transformation in three ways. Firstly, increased direct exposure of the domestic agricultural sector to international competition can result in access to international markets and specialization in areas of comparative advantage which potentially can yield high gains for the sector. Secondly, increased participation in international trade can improve the growth of non-agricultural sectors which could lead in turn to changes in the domestic demand for agricultural goods, both quantitatively and qualitatively (Pingali and Khwaja, 2004). Thirdly, globalization tends to be associated with changes in lifestyle including diet, especially among the urban middle class. The diet transition is generally characterized by diversity, convenience, and a break from tradition, with consumers in large, urban centers being more exposed to non-traditional foods as a result of their access to food retail or outlets (Reardon et al., 2009).

LAC has already experienced some of these changes. Although not all sectors have done equally well, LAC exports of fruits and vegetables, coffee, flowers, oil seeds, and organic food, for instance, have increased dramatically in recent years (WB, 2008a; International Fund for Agricultural Development [IFAD], 2003). On the other hand, improvements in per-capita income growth in many countries of the region in the 1990s and the rapid rise of the middle class have increased local demand for agricultural products and processed foods, which in turn has contributed to the rapid growth of supermarkets and retail stores (Reardon et al., 2009). This phenomenon has created new oppor-

tunities and challenges for domestic producers, since local demand for agricultural produce and foods has become quite substantial. For instance, in the case of sixteen Latin American countries that collectively account for more than 80 percent of the regional agricultural GDP, domestic markets consume 73 percent of agricultural output (Berdegúe et al., 2006).

While exports of high value-added produce have been mainly dominated by middle-income countries (due to substantial private and public investment as well as the well-developed institutions necessary to be successful in these markets) these opportunities have mainly benefited a relatively small number of early entrants and capitalized farmers (Berdegúe et al., 2006). On the other hand, family farmers, in some instances including poor households, have been able to benefit from significant participation in niche markets, such as organic coffee, where thirteen LAC countries provide almost half the global planted area (Henson, 2006). Indeed, LAC accounts for 20 percent of land dedicated to organic products in the world and in many instances small farmers play a significant role in these markets (Lernoud, 2008). Likewise, family farmers have also been able to achieve significant participation in Fair Trade markets for bananas and other fresh fruits and vegetables, coffee, honey, fruit juice and sugar, where LAC accounts for two thirds or more of the certified producers in the world (Farnworth and Goodman 2006).

Beyond providing the opportunity to compete in a global food markets, sustained growth in agricultural productivity is also critical to improving food security and mitigating poverty in LAC. Agricultural productivity, in fact, translates into increased food supplies and lower food prices for consumers. Further, for food-insecure people who earn their living through agricultural production, growth in agricultural productivity means higher incomes and thus greater ability to purchase food and meet other basic needs (Bezemer and Headey, 2006; Wik, Pingali and Broca, 2008; FAO, 2009b). Agricultural productivity growth can also act as an engine for overall economic growth and some

evidence suggests that growth of agricultural output and wages is the most effective means of reducing poverty in the poorest countries (Bezemer and Headey, 2006). In fact, rates of poverty reduction over the past 40 years have been closely related to differences in agricultural performance, particularly the rate of growth of agricultural productivity (Department for International Development [DFID], 2004).

Policies to induce gains in agricultural production and productivity in LAC must consider the increasing demand for food and the continuing changes in the food systems noted above as a competitive opportunity for the region. However, they also must remain cognizant of the need for agricultural production to play a role in maintaining food security for poorer farmers, at least in the short run. Moreover, policies must also consider the heterogeneity of agricultural sectors across the region and their recent experiences in an increasingly globalized world, which brings with it not only opportunities but also a diverse set of challenges.

Given these factors, it is also important to note that agricultural economies in most of LAC face significant and similar challenges. These challenges will be presented in more detail in the following sections. In general, they fall within three broad categories: (i) resource-related challenges; (ii) market limitations; and (iii) policy issues.

Natural Resource-related Challenges

Land

Land is a key asset for agricultural production, one that the rural poor depend upon for their livelihoods. It can provide a foundation for economic and social development and help the rural poor to cope with the challenges posed by recent globalization trends (Deininger, 2005). Yet many poor rural households are not able to gain sufficient access to land. In most developing countries, the problem of optimum access to farm land remains a serious unresolved issue. It is usually accompanied by high efficiency and welfare costs, as well as

environmental consequences and explosive political manifestations. Land is typically misallocated and land markets, if they exist, work under weak or incomplete property rights that lead to disincentives to efficient use (de Janvry, Sadoulet and Wolford, 2001).

As already noted, land distribution in LAC is the most unequal in the world. For instance, 26 percent of farms control 90 percent of total arable lands, while 50 percent of the smallest farmers control just 2 percent of the land (de Janvry, Sadoulet, and Wolford, 2001). Small farms coexist with very large commercial farms, and while the average-size farm is 64 hectares, around one quarter of LAC farmers own less than two hectares of land. Highly unequal land distribution and access to assets have made it difficult to establish economic growth patterns that are inclusive of the poor in Latin America (Deininger, 2005). Further, recent empirical evidence from Latin America suggests that the share of family farms (measured by having four workers, including family members, per farm) in total farms is positively related to economic growth, indicating that inequality in farm holdings is limiting development (Blanco, 2010).

One reason for the link between land inequality and growth is the evidence that suggests an inverse relationship between land size and productivity, which implies smaller farms tend to be more efficient than larger ones (even when controlling for differences in land quality and other factors). The argument in support of this relationship is based on the fact that while lumpy inputs, technology, other fixed costs, and the associated economies of scale favor larger farmers, the need to supervise hired workers and the advantages of family labor favor smallholders (Eastwood, Lipton and Newell, 2010). This potential inverse relationship between efficiency and land has been used as the basis for justifying land reform in LAC and elsewhere, since it suggests that potential gains in both efficiency and equity could be found in shifting land from larger landholders to smaller landholdings, thereby resulting in higher productivity (Otsuka, 2007).



While this may be an argument for shifting land holdings, de Janvry, Sadoulet and Wolford (2001) point out that land reforms in Latin America have failed to live up to their objectives and in many ways remain incomplete. Even after more than eighty years of reform, land still remains extremely unequally distributed and this skewed distribution has led to much misuse of the land from a social standpoint. Part of the problem, the authors note, is that even though beneficiaries were granted property rights as members of collective farms or as individuals, they were rarely offered the infrastructural and institutional support necessary to make them efficient producers. Thus, reform has tended not to live up to its promise of efficiency or equity gains.

Along with problems in the implementation of land reforms, changes in the agricultural economy noted previously have also raised questions regarding the size of the most efficient farms. The new agricultural economy creates a need for grades and standards that requires significant market information and linkages, which creates substantial transaction costs in higher value markets (Reardon et al., 2001). Higher transactions costs, which are often fixed costs of production, are likely to favor those with larger landholdings who have the capacity to pay such costs and

the scale economies to efficiently provide high-value commodities. While this assertion is still to be tested, this potentially shifts the most efficient farms towards larger farmers and presents a challenge for smallholders in accessing such markets.

Another related issue is land titling. Insecure property rights are a major constraint in most countries, and they affect the poor disproportionately. In most of the region, fewer than 50 percent of farmers who cultivate small and medium-size holdings have legal title to the land, either because no title exists or because there is no official record of it. In the early 1990s, surveys showed that 63 percent of farmers in Chile, Colombia, Honduras, and Paraguay lacked legal title to their land (Birdsall, de la Torre and Menezes, 2007).

Titles provide clearly defined property rights and create a host of incentives that can potentially improve the efficiency of production. With clear titles, landholders have a greater incentive to invest in the land, thereby maintaining productivity levels. If financial markets function, land titles can also be used as collateral, thereby increasing access to credit. Further, with titles land can be more easily bought and sold, thereby allowing gains from trade between less and

more efficient producers (Besley, 1995). Each of these effects depends both on the type of titles available and the context in which the titles are provided.

Titles often differ in their degree of formality and how well they are supported within a legal framework. On the whole, the stronger the title, the greater the incentive effect. However, a strong title does not necessarily guarantee access to investment options. Even if titles can be used for credit, financial institutions may not be in a position to supply such credit. Further, without access to credit, land titles are unlikely to increase the number of land-market transactions and to facilitate a process by which more efficient smallholders buy out less efficient neighbors. In fact, evidence from Central America suggests that titling, even when combined with market-friendly land policies and credit-policy reforms, does not appear to induce consolidation among more efficient smallholders, since they remain unable to access credit (Boucher, Barham and Carter 2005).

The challenge then is to create land policies that facilitate shifting land to its most productive uses, both to improve the income of farmers and to help improve overall economic growth. This is likely to come through a combination of policies related to providing land access, titling and registering land, creating policies to facilitate land transfers, and promoting access to finance for land purchasing.

Water

The agricultural sector currently competes with households, industrial, and environmental users of scarce water supply. A global model of supply and demand for food and water developed by the International Food Policy Research Institute (IFPRI) shows that if current water policies continue, farmers will find it difficult to meet the world's food needs. The har-

dest hit in such a scenario will be the world's poorest people. Moreover, the report notes that continued neglect of water-related investments and policies will produce a severe water crisis, which will in turn lead to a food crisis (Rosegrant, Cai and Cline, 2002).

The LAC region is well endowed in terms of natural resources accounting for 21 percent of the world's agricultural land and around 31 percent of the world's renewable fresh water resources (Inter-American Institute for Cooperation on Agriculture [IICA] 2009; AQUASTAT, 2010). However, water resources are not evenly distributed across the region, which has areas of great abundance and some of the most arid zones of the world. For instance, 53 percent of the renewable water supply for the region as a whole comes from one river, the Amazon. In contrast, some desert zones have no surface runoff, except during rare and extreme rainfall events (Ringler, Rosegrant and Paisner, 2000). Similarly, even though the region's average rainfall as a whole is well above the world average, there are significant differences across countries within the region. For instance, during 2003-07, average yearly rainfall in LAC ranged from a low of 591 mm in Argentina and 752 mm in Mexico, to a mid-range of 1,130 mm in Paraguay and 1,265 mm in Uruguay, while Colombia averaged 2,612 mm and Costa Rica 2,926 mm (AQUASTAT, 2010).⁶

As in the rest of the world, agriculture is the leading sector in fresh water withdrawal, accounting for 71 percent of fresh water withdrawal in Latin America and 64 percent in the Caribbean. It is expected that by 2025, agriculture will account for 84.7 percent of water consumption in Latin America (AQUASTAT, 2010). Most of this water is not obtained through artificial irrigation since in LAC over 90 percent of agricultural land is rain fed (IICA, 2009). Yet, access to water and irrigation is a major determinant of land productivity and the stability of yields; indeed, irriga-

⁶ These percentages are reported from FAO-AQUASTAT, and correspond to the latest information available, although it is not for the same years for all countries.

ted land productivity is more than double that of rain-fed land productivity (WB, 2008a). Given the high levels of erosion and degradation in the region, coupled with recent depletion of the most fertile lands, which has considerably reduced the growth rates of crop yields, irrigation provides a promising alternative in the face of reduced water supply (IICA, 2009).

Globally, the amount of land under irrigation has grown at a rate of 2 percent per year for the last 30 years (IICA, 2007). In LAC, the percentage of cultivated land under irrigation has increased, although modestly, over the years. For instance, in Latin America, the percentage of cultivated land equipped for irrigation was 9.3 percent in 1980, 10.8 percent in 1990, 11.1 percent in 2000, and 10.8 percent in 2007. The Caribbean had 16.5 percent of cultivated land equipped for irrigation in 1980, 18.6 percent in 1990, 18.5 percent in 2000 and 18.7 percent in 2007 (AQUASTAT, 2010). However, there are significant differences within the region as well. For example, Nicaragua, Belize, Bolivia, and Honduras have between 2 percent and 4 percent of cultivated land equipped for irrigation, while Argentina, Brazil, Guatemala, Panama, and El Salvador fall within the higher range of 4 percent to 7 percent. On the high end of the distribution are Costa Rica with 21 percent, Colombia with 21 percent, Mexico with 23 percent, and Peru with 28 percent of cultivated land equipped for irrigation. Chile is in a category of its own with 83 percent of cultivated land equipped for irrigation (AQUASTAT, 2010).

This increase in irrigation is not without environmental costs. Some of the most serious results of irrigation are land salinization, soil waterlogging, water contamination, eutrophication and the unsustainable use of aquifers. Agricultural intensification that relies on irrigation as a key element must be wary of these potential dangers and take actions to avoid long-term environmental consequences that ultimately lead to reduced productivity.

Increasing use of irrigation, potential environmental dangers and the overall scarcity of water require that

it be used in the most efficient manner possible. To do this, incentives need to be created for users to manage water efficiently and put it to its best and most productive use. This is leading to some changes in the manner in which irrigation systems are managed. Yet, the number of irrigation projects has decreased in recent years and that to date, improvements in water supply and sanitation infrastructure, water resource management, and development of irrigation and drainage continue to be inadequate, while current irrigation systems are relatively inefficient (IICA, 2009).

There are limited opportunities to expand the agricultural frontier, and if yields are to be increased, it will be necessary to increase public and private investment in research and the building of irrigation infrastructure. Further, with climate change leading to rising uncertainties in rainfed agriculture and to reduced glacial runoff, investment in water storage will become increasingly critical (WB, 2008a). The efficient use of water for agriculture in LAC will depend on whether actions are taken: (i) to reduce friction among competing uses of water (domestic, agricultural, industrial and touristic); (ii) to reduce and/or reverse the degradation of watersheds; (iii) to institute policies on water use and regulatory frameworks; (iv) to decentralize water management to its most efficient level; and (v) to involve civil society in decision making (IICA, 2007). In this regard, and given the increasing scarcity of land and water in addition to the pressures of a globalizing world, the future of agriculture is intrinsically tied to better stewardship of this natural resource (WB, 2008a).

Climate Change

Agricultural activities are a major cause of greenhouse gas emissions worldwide, responsible for 25 percent of carbon dioxide (mainly from deforestation), 50 percent of methane (from rice and enteric fermentation), and over 75 percent of nitrogen dioxide (mainly from fertilizers), (Tubiello et al., 2008). The LAC region, however, accounts for less than 6 percent of direct global greenhouse gas emissions although it has



about 9 percent of the world's population and the rate of growth of greenhouse gas emissions there is much lower than all other regions of the developing world, apart from sub-Saharan Africa (Vergara, 2004). When deforestation and agriculture are taken into account, this becomes about 13 percent of global emissions (WB, 2009). Yet, despite making a small contribution to global warming, the region is very vulnerable to the impacts of climate change.⁷

Agriculture, in particular, is one of the sectors most vulnerable to climate change due to its seasonality and the restricted range of weather conditions in which crop and livestock production can take place (Padgham, 2009). If greenhouse gas emissions, including those from agriculture, are not controlled in the coming decades, continued growth of their atmospheric concentrations is projected to lead to severe climate changes throughout the twenty-first century (Tubiello et al., 2008). Agriculture and human well-being will potentially be negatively affected by climate change by declining crop yields, reduction in production, crop and meat prices increases, and reduced cereal consumption, which will lead to reduced calorie intake and increased child malnutrition.

Given the heterogeneity of the region, climate change is expected to have more damaging effects in certain places. Not all crops will see a decline in yields; in fact some regions may benefit from some of the expected rises in temperature (Nelson et al., 2009). For instance, climate changes are projected to have a negative effect on agricultural production in several sub-areas, such as the Amazon Basin and northeast Brazil, as well as parts of Central America and the Andes (Baettig, Wild, and Imboden, 2007; Christen-

sen et al., 2007). Meanwhile, an increase in the number of frost-free days would bring positive benefits to agriculture in the southern cone region of South America (Padgham, 2009). On the negative side, it is expected that northeastern Brazil, parts of the Amazon, and Central America will experience an intensification of moisture deficit; southern Central America and southeastern South America will face increased flood risks; and dry-land areas will see an increased risk of desertification and land degradation. Climate change impacts on the Amazon Basin area are of particular concern given the Basin's role in regulating regional precipitation and its influence on hydrology (Padgham, 2009).

Specific effects of climate change are also expected in certain vulnerable regions. As glaciers continue to retreat due to rises in temperature, the Andean highlands will be affected, where dry valleys are critically dependent on water from glaciers. Similarly, the lowland basins will also be affected since they also depend on water from the Andean tributary streams (Padgham, 2009). Undoubtedly, the retreat of glaciers in the coming years will have a profound impact on those that depend on them. After all, glaciers are known to play a critical role in regulating local climate and weather conditions, maintaining ecosystem integrity, and providing water for human consumption and agriculture, as well as hydropower generation (Padgham, 2009). Small island states such as those in the Caribbean are among the locations most vulnerable to the potential adverse effects of climate change due to sea-level rise (Walling and Creary-Chevannes, 2004). Furthermore, it is expected that agricultural production in the Caribbean region will face losses due to increased wind and flood dama-

⁷ According to the Intergovernmental Panel on Climate Change's Fourth Assessment Report (2007), there is ample evidence of increases in extreme climatic events and climate change in Latin America, such as the record hurricane season in 2005 in the Caribbean Basin, frequent drought and flood episodes, temperature increases, and rainfall increases and decreases. The report notes that by the end of the 21st century, the projected mean warming for Latin America will range from 1 to 4 degrees Celsius or from 2 to 6 degrees Celsius which would mean that the frequency of weather and climate extremes would be very likely to increase. Moreover, the report notes that the predicted changes are very likely to severely affect a number of ecosystems and sectors by decreasing plant and animal species diversity; by melting most tropical glaciers in the near future (2020-30); by reducing the availability of water; by increasing desertification and aridity; by increasing crop pests and diseases; by changing the distribution of some human diseases and introducing new ones; and severely affecting people, resources and economic activities in coastal areas (IPCC Fourth Assessment Report, Ch. 13, Latin America 2007).

ge from hurricanes. Temperature rises and drought are also expected to negatively affect food production (Padgham, 2009).

In sum, climate change could lead to shortfalls in food production and deteriorating food security in LAC. Higher temperatures may eventually reduce yields of desirable crops, encourage weed and pest proliferation and change precipitation patterns, increasing the likelihood of short-run crop failures and long-run production declines (Nelson et al. 2009). Local food shortages caused by unpredictable and abnormal weather may not only pose immediate challenges to meeting food security needs and preventing hunger, but also lead to significant economic and social instability for national governments (Pinstrup-Andersen and Babinard, 2001). Adapting to these changing conditions is a major challenge.

While LAC may face substantial challenges as a result of climate change, there is also an opportunity to play a role in mitigating the increases in greenhouse gases. Mitigation can include actions to avoid the emission of greenhouse gases as well as positive actions to sequester these gases. The Clean Development Mechanism (CDM), as defined in the Kyoto Protocol, allows an industrialized country with an emission-reduction/limitation commitment to implement an emission-reduction project in developing countries that can earn saleable certified emission reduction credits that can be counted towards meeting Kyoto targets. Potential afforestation and reforestation project activities eligible under the CDM could range from small-scale agro-forestry and native forest restoration to large-scale industrial plantations (Niesten et al. 2002). Although many CDM projects are likely to focus on forestry, since projects are directly linked to land use, they often influence agricultural production. Further, some projects may involve agricultural activities and changes in agricultural practices can play a role in mitigating the greenhouse effect which is causing climate change (IICA, 2007). The challenge for the countries in LAC is to come up with policies that create the right incentives to mitigate greenhouse ga-

ses while maintaining and potentially enhancing agricultural productivity.

Market limitations

Access to international and domestic agricultural markets

Far-reaching changes in domestic and global markets are creating substantial opportunities for farmers and agribusinesses. The demand for high-value primary and processed products is increasing at a fast pace, driven by rising incomes, increasing urbanization, liberalized trade, foreign investment, and advancing technology. These developments are expanding market opportunities, which is important for faster agricultural and non-farm growth and for greater employment and rural incomes. But the new markets demand quality, timely deliveries, and economies of scale, posing special challenges for smallholders (WB, 2008a).

In the 1990s, export strategies continued to dominate discussions on agricultural development in the region as liberalizing trade through WTO membership and regional trade agreements became increasingly important for LAC countries (Pinstrup-Andersen and Babinard, 2001). Especially for smaller developing countries in Latin America, agricultural and natural resource exports appeared likely to lead efforts to stimulate export growth. Extraordinarily rapid agro-export growth has already been achieved in many countries. From the middle to late 1980s, non-traditional agricultural exports grew at rates of 222 percent in Chile, 78 percent in Guatemala, and 348 percent in Costa Rica. In Paraguay, the most agrarian country in Latin America, agricultural exports nearly tripled during the otherwise difficult decade of the 1980s (Carter, Barham and Mesbah, 1996). This increase in trade liberalization expanded the exposure of the region's agricultural sectors to international markets and competition. The impact of this has varied across countries and across types of farmers, based on whether a country is a net exporter or importer, or

whether farmers are capable of accessing new markets and remaining competitive or not. Although the LAC region has been a net exporter in recent years, there are countries within it that are net importers such as El Salvador, Mexico, Venezuela and all the Caribbean countries (Daniel, 2008; Ng and Aksoy, 2008⁸). However, it is important to note that LAC mainly exports commodities, with soybean leading the way (8.5 percent of all agricultural exports), while the region mainly imports processed agricultural products; this trend has been accentuated in recent years (IICA, 2007).

For small countries that are net food importers more trade liberalization could lead to food price instability, which could hurt the poor by limiting their access to food supply at affordable prices (Pinstrup-Andersen and Babinard, 2001). Likewise, sectors that have been previously protected by trade may find themselves exposed to uneven competition against better equipped and more competitive farmers that may also be highly subsidized. It is also important to note that although some small farms have been able to participate in global markets (especially those supplying organic and fair trade produce), exports of high-value added produce have been dominated mainly by middle-income countries and these opportunities have mainly benefited a relatively small number of early entrants and capitalized farmers (Berdegúé et al., 2006).

Liberalization in LAC brought not only shifts in food consumption patterns in domestic markets as noted previously, but increased international and local investment in domestic food systems, including processing, and retailing through supermarkets. The broad modernization of agri-food systems represents a major opportunity to improve farm and off-farm income and benefit the poor in developing countries. Agri-food systems comprise the interdependent set of enterprises, institutions, activities, and relationships which collectively develop and deliver material inputs

to the farming sector, produce primary commodities, and handle, process, transport, market, and distribute food and other agro-based products to consumers. Much of this activity takes place in rural areas or in small or secondary cities (WB, 2003). Modernizing agri-food systems typically stimulates and accompanies broader economic development as noted in the discussion in Chapter IV of local development and cluster formation. Rising demand, especially for fruits and vegetables, livestock products, and other goods with relatively high income elasticity, stimulates product and process innovations and the development of stronger backward and forward linkages within the agri-food system and the local economy (WB, 2003).

In the case of 16 of the principal agricultural-producing countries in Latin America, 73 percent of agricultural output is now consumed in the domestic market (Berdegúé et al., 2006). As already seen in a number of countries, such as Chile, Brazil, and Mexico, agro-enterprise activity can be a powerful source of growth, diversification and poverty alleviation (WB, 2003). However, the competitive and technological forces underpinning the integration and globalization of agri-food markets do not intrinsically favor the poor who frequently lack the access and assets to compete (WB, 2003). Indeed, as Reardon et al. (2009) note, even though there has been a large body of literature over the past decade focusing on the agri-food industry's restructuring, organizational and institutional change, much less survey-based research has been done on the impacts of this transformation on farmers and farm workers. The authors add that much is still unknown about whether this transformation "includes" or "excludes" small farmers and farm workers, and whether inclusion in this market raises incomes and modernizes farmers' technologies. One of the key issues is whether or not the transformation will exclude small and asset-poor farmers, who do not have the capacity to respond to requirements of quality, consistency, volume, and transaction specifications

⁸ See their Annex Table 4: Raw Food, Cash Crops, and Agricultural Raw Materials (All Agriculture) Exports, Imports, and Net Imports in All Countries.



demanded by the modern food industry (Reardon et al., 2009).

In industrialized countries there is nothing new about the proliferation and evolution of food safety and quality standards, driven predominantly by the 'ratcheting-up' of regulatory requirements in response to consumer concerns about food safety and quality and scientific developments regarding the risks associated with food. Contemporary agri-food systems are also increasingly pervaded by a plethora of private food safety and quality standards that operate alongside regulatory systems and which, although not legally binding in a regulatory sense, can be de facto mandatory for suppliers. These private standards have evolved in response to regulatory developments and, more directly, consumer concerns, and as a means of competitive positioning in markets for high-value agricultural and food products. As a result, it is the private rather than the public standards that are becoming the predominant drivers of agri-food systems. While this phenomenon is well-established in industrialized countries, private standards are fast becoming a global phenomenon, not only in the context of international trade, but also within developing country agri-food markets (Reardon et al., 2001; Reardon, Berdegúe and Fa-

rrington, 2002; Henson and Reardon, 2005). Indeed, it is argued that the very ways in which agricultural food markets are structured and operate are defined by this quality-centered competition, and at the same time the associated institutional arrangements are crucial to the legitimacy of the quality attributes embedded in products (Busch and Bain, 2004). It is in this context that food safety and quality standards have emerged to take on a prominent role 'in global agricultural and food markets (Reardon et al., 2009).

The modernization of agri-food systems does not take place automatically and spontaneously and is fostered or constrained by a number of factors. However, deliberate and strategic interventions on the part of governments have frequently played important roles in the fostering of technological and institutional change in these systems. Some of the roles of government are related to the determination and enforcement of 'rules of the game' for market competition and cooperation, as well as compensating for market failures, and fostering investment in physical infrastructure and knowledge capital (WB, 2003). The challenge faced by LAC governments is to facilitate the operation of agricultural markets to foster competitiveness in the industry while simultaneously providing

sufficient support to the sector to facilitate market access for all producers, including smallholders, who can be competitive.

Volatile agricultural and food prices

While market liberalization and the new agricultural economy have provided a range of opportunities, removal of price controls has left countries vulnerable to fluctuations in global prices. Price fluctuations had previously been primarily a concern of cash crops, such as coffee which saw prices drop most recently in 2000-02. But now there is increasing concern over food-price instability as seen by the recent rise in food prices which peaked in July 2008. Although food prices appear to have stabilized due to the global financial crisis and recession, concerns remain over renewed price increases once the global economy has recovered. The recent food price instability and its social and political costs is arguably the Achilles' heel of agricultural market reform programs. Programs have progressed very slowly in many countries and in some cases, reforms have been reversed (WB, 2005b). According to Von Braun (2008), there were food-related protests in 61 countries in 2007-08.

The recent global food price rises had significant effects on food inflation in a number of countries in LAC. Particularly hard hit were a number of Central American (Nicaragua and Costa Rica), Caribbean (Trinidad, Jamaica, Haiti, and Guyana) and Andean (Venezuela and Bolivia) countries who saw food price indices increase by over 25 percent between 2006 and 2008 (Cuesta and Jaramillo, 2009). Given that the poor tend to spend a higher proportion of their income on food, they are more susceptible to food price increases. Estimates suggest that overall inflation was 3 percent higher for the poor compared to the general population as a result of the food price increases (WB, 2008b). The challenge for LAC is to address the issues raised by price fluctuations without returning to previous restrictive agricultural food-market policies which left the region materially worse off.

Lack of access to credit and insurance

Risk is an unavoidable element in agriculture. Producers face a host of different risks; some of the most common sources of risks are due to climatic, sanitary, geological, market, or man-made sources (Zorrilla, 2002). Some of these risks can have significant negative effects on production and yields. While risks cannot be completely eliminated, some can be reduced or managed. Producers often report that production and price risks are their two major concerns (Wenner, 2005). Among the numerous sources of production or yield variability, weather is universally recognized as the dominant one. Even though there are several sources that may affect yield variability, such as plant genetic potential, soil, pests and diseases, and planting date, among others, what distinguishes climate risk from other factors is the lack of human control. While non-weather factors can be significantly reduced or mitigated with on-farm strategies, weather cannot be controlled (Wenner, 2005).

In order to address the financial implications of risks associated with production or yields, farm operators use an array of risk management strategies, some of which have been used since ancient times and are geared to diversify risk (diversification of crops), prepare for 'lean' years (saving surplus), or prevent losses from climatic risks, such as hail, frost, drought, flood, fire, among others. However, even when a farmer applies the best and most efficient farming techniques to prevent losses and improve production, weather vagaries make agriculture a risky endeavor. As Wenner (2005) notes, this high degree of riskiness, especially in a sector dominated by producers with low incomes and scarce assets, has serious implications for economic growth, social equity and poverty alleviation. Moreover, the author notes that market-based and government-based solutions are needed. Yet, as Wenner and Arias (2003) observe, modern insurance instruments are not yet easily accessible to most farmers in the developing world. Indeed, the insurance market in Latin America and the Caribbean region is still in its infant stages. In comparison to the

U.S. where 75 percent of cultivated land is insured, only five LA countries have more than 1 percent of cropped land insured (Wenner, 2005).

By its very nature, agriculture requires upfront spending on production in anticipation of future returns. As with many economic activities, investment in capital, including land and livestock, can enhance the returns in agriculture. As mentioned above, agricultural production also involves significant risks including crop damage from fire, pest and disease outbreaks, floods or droughts, as well as risks related to health shocks, price volatility, policy changes, or failures of irrigation infrastructure, among others. Moreover, as noted previously, in liberalized markets the risk of fluctuating prices for inputs and outputs has shifted from governments to producers and consumers (WB, 2005a). Given the timing, seasonality and uncertainty of agriculture, the ability of agricultural ventures and farm households to make long-term investments and to decide on risky and time-patterned income flows, is shaped by the availability of financial services. However, financial access is often limited by the nature of agriculture since risks within the sector are often positively correlated—e.g. droughts, price changes, etc. often hit many farmers in the same way.

The lack of access to insurance instruments and credit makes agricultural producers quite vulnerable, particularly small farmers who are unable to adopt more productive capital-intensive techniques or higher-value products. Households facing production and price risk often choose low-risk activities or technology and a portfolio of varieties, crops and/or activities. Although these reduce risk exposure, they typically lead to lower average returns. When, in spite of risk management strategies, households face shocks, rural households will often respond by taking their children out of school or decreasing their attendance, selling assets (e.g. land, livestock or jewelry), or forgoing consumption or investments in activities that can yield higher than expected income. The inability to protect a household from income and asset shocks can result in long-term consequences across

generations in terms of lower health, nutrition, and schooling investment. Greater access to financial services would reduce vulnerability to such shocks and expand opportunities for more efficient technology adoption and resource allocation (WB, 2008a).

Although the benefits of the financial sector are widely known, structural adjustment programs in the 1980s dismantled the elaborate systems of public agencies that provided farmers with access to credit and insurance. With the state removed from the provision of these services, private entities were expected to take over these functions, reducing costs and improving the efficiency and quality of financial services. More often than not, this did not happen. In some countries the state's withdrawal was tentative at best, which limited the entry of private firms. In others, the private sector emerged slowly and partially, mainly serving commercial farmers and leaving small farmers exposed to extensive market failures, high transaction costs, high risks, and welfare losses, thereby threatening their competitiveness (WB, 2008a).

Since the late 1980s and early 1990s there has been a wave of financial liberalization in LAC, which has resulted in market-determined interest rates, greater investment efficiency, increasing banking competition, and a wider offering of financial products (Wenner and Proenza, 1999; IDB, 2004). However, most of these changes have taken place in urban markets while in rural markets, for the most part, financial services continue to be underdeveloped, shallow, and non-competitive (Wenner and Proenza, 1999). Even though a wide range of private and public projects have been implemented to improve the coverage and intensity of rural financial services, these have had modest results, while the sustainability and efficiency of the entities providing these services varies (Trivelli and Venero, 2007). Formal financial markets in rural areas remain stagnant and coverage has not increased sufficiently to meet the financial needs of farm households, especially the poorest ones (Trivelli and Venero, 2007). In recent years, microfinance has greatly expanded the outreach of the financial system



to millions of households in LAC and this has caught the attention of traditional providers of financial services, such as commercial banks, which are now entering this market (Navajas and Tejerina, 2006). In 2001 the total number of microfinance borrowers in LAC was estimated to be 1.8 million. By 2005 there were 336 microfinance institutions (MFIs) with a portfolio of US\$5,437 million, close to six million borrowers and an average loan of US\$913 (Navajas and Tejerina, 2006). However, despite this significant increase, coverage is still limited. For instance, Mendoza and Vick (2008), using data on total alternative financial institutions (AFI), report preliminary estimates of market coverage (percentage share of low-income target market) in LAC at 3.7 percent. Indeed, it seems that the financial markets are still quite segmented and, as Wenner and Proenza (1999) point out, the duality of financial market development in LAC limits growth and dynamism in the rural sector and raises policy concerns about income distribution and balanced economic growth.

Financial constraints among rural households, particularly farmers, originate both from a lack of asset ownership that can be used as collateral (wealth rationing) and from unwillingness to use assets as collateral that are fundamental to their livelihoods (risk

rationing). Financial constraints are more pervasive in agriculture and related activities than in many other sectors, reflecting both the nature of agricultural activity and the average farm size; these constraints are costly and inequitably distributed, which severely limits small farmers' ability to compete. The demise of special credit lines to agriculture through public programs or state banks has left huge gaps in financial services, still largely unfilled despite numerous institutional innovations (WB, 2008a). The current challenge is to address the underlying constraints causing limitations to financial service access and to seek ways to improve the functioning of credit and insurance markets for agriculture.

Insufficient investment in agricultural innovation

Because it is often non-rival and non-excludable, certain forms of research and development (R&D) are considered public goods. As noted in Chapter IV of Part II of the Development Effectiveness Overview, this is a problem in a number of sectors but is particularly acute in the case of agriculture, where patenting of biological organisms is prohibited under most conditions and the large number of producers makes excluding certain users very difficult. Due to the public goods nature of R&D, insufficient access

to capital, and a misunderstanding or misperception of the opportunities arising from innovation, farmers and private-sector companies generally invest less in innovation than is optimal on both individual and social levels. As a result, governments and development agencies have supplemented private innovation efforts by providing funds and establishing research capacity in publicly-funded research organizations (Pomareda and Hartwich, 2006).

R&D innovations in the agriculture and food industry aim to develop new knowledge and technologies in production, marketing, and processing, with the desired goal of making farmers, processors, and traders more competitive, produce or sell better-quality products, and produce greater profits (Pomareda and Hartwich, 2006). Investments in agricultural R&D have been credited as being one of the main drivers of growth in agricultural productivity as well as a major contributor to the world's ability to produce more food from limited agricultural land over the past 40 years (Heisey, 2001). Substantial empirical evidence suggests that investment in agricultural R&D has contributed to economic growth, agricultural development, and poverty reduction in LAC over the past 50 years (International Assessment of Agricultural Knowledge, Science and Technology for Development [IAASTD], 2009).

Stads and Beintema (2009) note that investments in agricultural R&D in LAC grew by 1.1 percent per year during 1981–2006; however, this average masks important differences over time and across countries. For instance, from 1996–2006, agricultural research spending in countries like Argentina, Costa Rica, and Uruguay rose noticeably, while expenditure in countries like Chile, El Salvador, Guatemala, Honduras, and Paraguay decreased. In 2006, LAC as a whole invested US\$3 billion⁹ in agricultural R&D, the equivalent of 1.14 percent of the region's total agricultural output (Stads and Beintema, 2009). Nonetheless, 70 percent of this

total was spent by only three countries (Argentina, Brazil and Mexico), suggesting the current structure of agricultural research systems varies widely across LAC countries. While large and medium-sized countries usually have more advanced national systems, agricultural R&D in most smaller countries is carried out by a mere handful of agencies. Some countries do not have a national agricultural research institute at all (Honduras and Paraguay) and most of the R&D in the agricultural sector is carried out by higher education institutions and the non-profit sector.

Looking at trends in investments in agricultural R&D using a sample of 11 countries in LAC in 2001, Beintema and Pardey (2001) caution that perhaps the most worrying indication in their findings is an apparent bifurcation of research throughout the region. While richer countries seem to be making sufficient investments, poorer countries seem to be slipping behind in terms of their ability to generate new technologies and to continue doing so in the future. Using more recent data (up to 2006) from 15 countries in LAC, Stads and Beintema (2009) come to the same conclusion and confirm that the gap between the region's low- and middle-income countries has indeed widened. While some poorer countries like Guatemala, El Salvador and Paraguay experienced sharp cuts in their agricultural R&D expenditures and intensity ratios over the past 10 years, more economically-advanced countries like Argentina and Mexico experienced growth. Given the cross-country spillover of research, the incentive for smaller economies to invest in R&D may be lower and it might be a better strategy for them to focus on technology adoption, rather than innovation. Naturally they would need to maintain a certain level of absorption capacity.

Most agricultural R&D in LAC is funded by national governments, but sources differ across countries. For instance, in Colombia and Costa Rica, commodity

⁹ In 2005 purchasing power parity or PPP dollars; as presented in Stads and Beintema (2009).

taxes on the sale of production or exports have become popular to fund R&D. On the other hand, and even though donor dependency for R&D for the LAC region as a whole is quite low it remains very high in countries like Nicaragua and Honduras. Lastly, national and multinational private enterprises also carry out their own research in some countries but the exact share of private-sector involvement in agricultural R&D in LAC, however, is difficult to measure (Stads and Beintema, 2009).

Since most new agricultural technology consists of a physical input, such as an improved seed variety, a bag of fertilizer, etc., it can be effective in a farmer's field only if it is purchased or rented. In order for small farmers to gain from technical change, the input must be workable on small farms and farmers must be able to purchase it. This suggests that for small farmers to benefit fully from modern technology, they need access to formal rural-credit systems. Diffusion of new technology is also a matter of policy concern, given that not all farm households have equal access either to knowledge about new technology and its use, or to the agricultural and financial resources needed to make it productive on their farms. Given the location-specific nature of much new agricultural technology, large segments of a country might not benefit from the diffusion process unless government research and extension workers are actively engaged in testing, training and evaluating the new technologies at the farms (Timmer, 1988).

Sustainable financial support for agricultural innovation is crucial in all countries of the region, not only for revenue-generating export crops, but also for much-needed food crops and, more generally, for development initiatives to alleviate rural poverty. Production and marketing technologies for high-value products, such as fresh fruits and vegetables, have been introduced mostly by the private sector, indicating a need to consider the private sector role vis-a-vis the public sector in generating knowledge and technology for agricultural development (Pomareda and Hartwich, 2006). The challenge is to ensure a sufficient level of

public funding for research that does not crowd out private-sector initiative but instead helps to promote it.

Limited technology adoption

As previously noted, several studies show that technological shifts have been a major cause of productivity increases in LAC. This evidence is also confirmed by encouraging data on the rate of adoption of new crop varieties, particularly wheat, maize, rice and potatoes (Evenson, 2003). However, it is important to note that maintaining an adequate level of research and development (R&D) as a government policy does not guarantee that the majority of farmers will actually adopt the most adequate technology for their production.

Low appropriability problems may arise for several reasons. For instance, the decision to adopt new technologies can be affected by low levels of education. In the case of India, Foster and Rosenzweig (1996) found that in a sample of farm households, those with at least one adult who had completed primary schooling were significantly more likely to have adopted new high-yielding seed varieties than those with no adult who had completed primary school. In general, human capital plays a significant role in terms of productivity in agriculture. In fact, the returns in agriculture from schooling seem to increase substantially as a country goes from traditional to modern agricultural methods, since such methods create a dynamic technical and economic environment that requires information acquisition, technology evaluation, and adjustments to change (Schultz, 1964; Becker, 1993).

Technology adoption can also be affected by the amount of time needed to obtain information and learn about new technologies and to see returns from them, which mostly occur not immediately, but over time (Huffman, 1999). Another problem is that prices are relatively high for the first investors in new technology, while late adopters benefit from lower costs. This is particularly the case with technology that needs to be adjusted to the specific needs of farmers in certain localities through a process of trial



and error. Asymmetry of information between lenders or technology providers and farmers on the specific risks and benefits of the adoption process may also limit the availability of funding or reduce farmers' willingness to adopt. Coordination among farmers may reduce free-riding problems, by internalizing potential knowledge externalities in cooperatives.

Clearly, these challenges are most likely to affect small-scale and poor farmers. The existence of asymmetric information, for instance, can be made even more pronounced by remoteness. In this regard, remoteness provides another argument for public provision, since in order to profitably reach remote areas it is necessary to have economies of scope, and having a broad range of products to offer is more difficult for a private agent than for a public one.

One of the more commonly-used policies with the potential to increase technology adoption and diffusion and enhance productivity is agricultural extension services which range from occasional assistance from specialists when demanded by producers, formal training on specific topics for groups of producers, or specialists working directly with farmers. Indeed, in their study of research and education's contribution to Total Factor Productivity (TFP) in the United States, Huffman and Evenson (1993) found evidence that farmers' schooling and extension training were substitutes. The challenge for countries in LAC is to determine whether public intervention might be useful in facilitating technology adoption and, if public intervention is deemed necessary, the best and most fruitful way to implement it.

Policy Issues

Historical bias against agriculture

Although there has been substantial evidence that promotion of the agricultural sector can play a critical role in promoting economic growth, poverty reduction and structural transformation, evidence suggests that both domestic and international policies have been

biased against the agricultural sector in developing countries (Bezemer and Headey, 2008). In the domestic sphere, urban bias has been manifested in price distortion caused by price controls, export tariffs on agricultural exports, tariffs on imports of agricultural inputs, and overvalued exchange rates that keep food prices and consumer goods artificially low (Krueger, Schiff and Valdes, 1991; Anderson, 2008). While these policies benefit urban consumers, they come at the cost of lower returns to farmers. Along with price distortions, there is also evidence of lower investment in agriculture relative to industry and in the social sector in rural areas relative to the urban sector (WB, 2008a). In the international sphere, the bias against developing country agriculture relates largely to the bias in favor of agriculture in developed countries, where agriculture is heavily subsidized and subject to greater tariff protection than other sectors (Bezemer and Headey, 2008). This limits export opportunities for LAC agriculture to the world's wealthiest nations.

One potential reason for urban bias in developing countries relates to the way in which countries develop. While countries tend to start out predominantly rural with agriculturally-based economies, as countries develop agriculture tends to reduce in importance in GDP and employment. Yet, as noted, evidence suggests that agriculture is an important promoter of overall economic growth in its early stages of development. This creates a certain irony: agriculture must help promote development, yet will inevitably decline. Two key questions in development are therefore: on what terms will agriculture decline and what role will agriculture play (Varshney, 1993).

Although the inevitable decline of agriculture's importance to developing economies is cited when justifying urban bias, the ultimate sources of urban bias in developing countries have been carefully analyzed by Lipton (1977), who popularized the term "urban bias", and by Bates (1981). They, and subsequent authors, have argued that the development process is systematically biased against rural areas and this bias is embedded in a political process which is dominated

by urban elites. Those in urban areas have power to make decisions over policies and the use of funds to invest in development and they create those policies and choose investments that are in the interests of urban areas and come at the expense of their rural counterparts. This idea became widely recognized in development circles and contributed to the idea of “getting prices right” in the structural adjustment programs of the 1980s (Varshney, 1993). Getting prices right, among other things, meant reducing the bias due to domestic food prices that favored those living in urban areas over agricultural producers in rural areas.

Urban bias has not come without a cost. If, as the evidence suggests, agriculture has the potential to contribute to an effective economic development strategy, the earlier failure to recognize this in LAC meant lost potential growth. Agriculture and related industries have been found to have greater backward linkages and income and employment multipliers than other sectors. Further, as agricultural production and income rise in rural areas, demand for non-agricultural goods and services increases. Previous estimates suggest that US\$1 in agricultural output in LAC increases overall economic output by almost US\$4 (Pinstrup-Andersen, Lundberg and Garrett, 1995). Additionally, early policies that impoverished agriculture encouraged rural-urban migration, which exacerbated urban unemployment and associated urban social ills (Garcia Garcia, 1993). Rural areas in LAC continue to have higher poverty rates than their urban counterparts and food security issues are also a greater concern in these areas.

The challenge for policy makers is to find the right balance between investment in agricultural and non-agricultural sectors as well as urban and rural areas. Previous bias against agriculture does not suggest a need to excessively shift to agricultural investment, but to design policies and projects that recognize the potential of the sector to play a role in promoting development, even though the sector will almost certainly decline in overall importance in the economy.

Exclusion of small farmers

Many countries, donors and NGOs around the world have expressed renewed interest in and commitment to the role of small farmers in the agricultural development and poverty reduction of developing countries. However, as noted previously, the new agricultural economy appears to create greater opportunities for largeholders that are better equipped to participate in this new dynamic, while limiting opportunities for small farmers who are unable to compete in the ever-changing international and domestic markets. The rise of supermarkets provides a good example. Supermarkets’ share in retailing has quadrupled in Latin America since 1990 and they have penetrated all parts of the food economy, including those which were previously the domain of small farmers and traders, such as fresh fruit and vegetables and dairy products. They now occupy around 60 percent of the national retail sectors in Latin America, and around half this level of fresh fruit and vegetable products (Reardon et al., 2002).

Reardon et al. (2009) note that much is still unknown about whether this transformation “includes” or “excludes” small farmers and farm workers, but that it may well exclude small and asset-poor farmers who do not have the capacity to respond to requirements of quality, consistency, volume, and to transaction specifications demanded by the modern food industry (Reardon et al., 2002). Overall, there is a growing view that small farmers do not have a viable future in farming and that agricultural development should now focus on larger, commercially-oriented farms that can take advantage of the new types of international and local market chains (Hazell and Diao, 2005).

In general, the agricultural sectors of LAC have done fairly well in the past decade but small farms, on average, have not done as well. As Hazell and Diao (2005) point out, in Latin America the evidence over the last decade and a half in favor of small farms is not promising: they have experienced falling incomes, slow increases in productivity, slow improvement in pover-

ty and indigence levels, and little participation in value chains oriented to growing markets, whether for processed products, local supermarkets or exports. With increased trade liberalization, structural adjustments and a withdrawal of the state from providing an array of key services to small farmers, small farmers are currently facing tremendous challenges in this new agricultural economy, including limited access to vital inputs, credit or insurance instruments, market information and marketing tools.

Yet small farms offer important economic and social benefits in low-income countries. They can be more efficient producers in labor-surplus economies, since family workers are less costly and more motivated than hired workers and small farms are more likely to use labor instead of capital-intensive technologies; they can help contain poverty by providing an affordable home platform from which poor households can experiment with ways to improve their livelihoods; they help prevent premature urban migration and the explosive growth of urban areas; and they ensure a degree of food security in rural areas where high transport and marketing costs can drive up food prices (Hazell and Diao, 2005).

As small farms struggle to diversify into higher-value products, they must increasingly meet the requirements of demanding markets, both at home and overseas. The changes discussed above offer new opportunities to those small farmers who can successfully access and compete in the transformed markets, but they are a serious threat to those that cannot (Hazell and Diao, 2005). In this regard, there is a significant and urgent role for governments to play in providing assets to farmers to “make the grade”, allowing for the successful participation of small farmers in the transforming food economy (Reardon et al., 2009).

Insufficient investments in agricultural infrastructure

Structural adjustment in the 1980s and 1990s led to severe reductions in the budget for infrastructure investment, with some LAC countries reducing half or more

of their entire budget through reductions in infrastructure investment (Easterly and Servén, 2003). This occurred in spite of evidence suggesting high returns from such investments. Since the private sector has not responded by filling the gap in investment, Latin America now lags behind international norms in most areas of infrastructure investment, with the exception of telecommunications. The few cases where there has been private sector investment (Chile, Colombia and Bolivia), are where public sector investment has remained high (Calderón and Servén, 2004).

This failure to invest in infrastructure has not come without a price. For several LAC countries, the cost is estimated to be higher than 1 percent of growth per year and has been found to contribute to about one-third of the growing GDP gap between Latin America and successful East Asian economies (Calderón and Servén, 2003). LAC spends on average less than 2 percent of GDP on infrastructure compared with 4-6 percent in countries like China and Korea. This gap in infrastructure access is even more magnified in rural areas, where less than 50 percent of the rural population has access to water and sanitation compared to 95 and 80 percent respectively in urban areas (Brus-hett and John-Abraham, 2006).

While there appears to be a need for greater infrastructure investment in rural areas in LAC, identifying the optimal mix of types of infrastructure to invest in and the combination of public and private sector investment is complicated. Evidence from a series of studies of rural infrastructure in developing countries by IFPRI (2008) suggests that while returns to different forms of infrastructure tend to be positive, they vary widely across different types of investments and regions, even within the same country. This finding implies that while there is the potential to achieve more growth and poverty reduction through better targeting of investment, the choice of specific investments requires sufficient information on local conditions.

The need for institutional change/reform

Looking at the relationship between governance and agricultural performance using a cross-country panel sample, Lio and Liu (2008) tested the hypothesis that better governance fosters agricultural productivity. The authors found that their results were in line with Hayami and Ruttan's claim (1985) that governance is a basic factor in the poor economic performance of many developing countries. In order to improve the agricultural performance of many developing countries, apart from physical and education investments, more emphasis should be placed on improving the governance infra-structure of these countries. Similarly, in a study of the role of institutions and agricultural productivity from 1972-2002 in Mercosur member countries, Bharati and Fulginiti (2007) found that all the member countries experienced positive agricultural productivity growth for the same period, with Brazil being the fastest gainer. Institutions such as investment in public health and in agricultural R&D, as well as an economic environment conducive to trade with the rest of the world, are associated with differential performance across countries.

The new agricultural economy, with its global and domestic opportunities and challenges for different kinds of farmers, along with the heterogeneity of the LAC region, demands a differentiated regional agricultural agenda that takes these opportunities and challenges into consideration. Three fundamental issues to keep in mind are the restructuring of LAC with regards to improvements in per capita income and rising urbanization, which are increasingly shaping the increased domestic demand of agricultural products and foods. Secondly, and closely related to the first point, is the opportunity to insert small- and medium-sized farmers into the production and distribution chains of the supermarket revolution.

Lastly, and as Berdegue, et al. (2006) point out, all studies confirm that public policy to promote and support the productive transformation and institutional development of rural areas will play a critical role

here, whether one is looking at the poorest counties (Alwang and Jansen, 2006) or at the largest economies (da Silva, 1999; de Janvry and Sadoulet, 2000; Winters, Davis and Corral 2002); at commodity markets (Escobal, 2000) or at contract agriculture (Escobal, Agreda, and Reardon, 2000; Huacuja, 2001); or whether one is considering the region as a whole (Schejtman and Berdegue, 2004; de Janvry and Sadoulet, 2004; de Ferranti et al., 2005).

III. CONCLUSION

This chapter describes some of the main trends and characteristics of the agricultural sector in the LAC region, and highlights some of the current challenges to promoting agricultural production and productivity. In particular, these challenges are related to using and maintaining the natural resource base, and the presence of market failures and policy issues. The new agricultural economy is increasing the complexity of these challenges. In this regard, while the region is characterized by a significantly heterogeneous agricultural sector (and farmers), the challenges described here potentially affect all farmers in the region, and particularly, small-scale farmers.

However, while these challenges are ever-changing, the new agricultural economy has also provided new opportunities. Through its projects, the IDB and other development agencies provide support to the agricultural sector to meet many of these specific challenges and to enhance the competitiveness of the sector. In this regard, most of these projects are designed to address certain problems which limit agricultural development in LAC, while also helping position the agricultural sector to take advantage of the new possibilities presented by the new agricultural economy.

The purpose of this report is not to determine whether the overall set of projects supported by the IDB or development agencies, in general, is appropriate. Instead, this *DEO Special Topic* to the Development Effectiveness Overview examines projects being supported by the IDB and other development agencies



to see how they fit within the challenges noted above, and to identify the overall evidence available on their effectiveness. Towards this end, the next chapter identifies the key sets of projects that have been im-

plemented in the last decade noting how they address current challenges by examining the underlying logic of these interventions as well as some of their expected impacts.



II

Chapter



Projects Designed to Support Agriculture

I. INTRODUCTION

This chapter reviews the literature to identify the key projects that have been promoted in Latin America and the Caribbean (LAC)¹⁰ to support agricultural production and productivity and to deal with the challenges described in the previous chapter. In addition to describing these projects, the underlying logic of these instruments and the specific goals of the interventions are also considered. The general discussion, below, is organized to link the projects used to address the challenges noted, as well as a description on how IDB loan operations fit within this overall set of projects. In this regard, the Bank's approach in helping to address each of these challenges is also presented through the use of illustrative project examples that describe the logic of the Bank's interventions to address each of these challenges. However, prior to presenting this information, a brief general summary of the IDB's contribution to support the agricultural sectors in LAC over the past ten years is presented.

Over the past decade, the IDB has supported the agricultural sectors of the LAC region in some of the key noted areas in order to promote the development, growth, and competitiveness of the sector. In fact, from 2000-09¹¹ the IDB developed ninety-seven loan projects¹² and collaborated on 324 other agricultural projects, including a number of technical cooperation projects (146), multilateral investment-fund operations (81), programming products (42), non-financial products (26) and knowledge and capacity building products (1). Despite this significant contribution to

support the agricultural sectors through the various instruments, it is important to note that the focus of this report is only on projects that have been developed by the Bank, and thus, the focus is on the ninety-seven loan operations.

Currently, thirteen projects have been completed, fifty-three loan projects are in execution, eight have been approved but have not yet been implemented and twenty-three are in preparation.¹³ These ninety-seven projects amount to US\$5,030 million, of which 28 percent is allocated to Southern Cone Countries (CSC), 51 percent to Central America, Mexico and the Dominican Republic (CID), 5 percent to the Caribbean Region (CCB) and 15 percent to the Andean Countries (CAN). By country, these projects were for Argentina (11), Brazil (8), Peru (8), Panama (8), Bolivia (8), Mexico (6), Haiti (5), Honduras (5), Nicaragua (5), Paraguay (4), Guatemala (4), Belize (3), the Dominican Republic (3), Jamaica (3), Ecuador (3), Uruguay (3), Barbados (2), Colombia (2), El Salvador (2), Guyana (2), Venezuela (2), Bahamas (1) and Costa Rica (1).¹⁴ The trends overtime show that the amount of funding allocated to agriculture has increased sharply since 2007, which corroborates the importance that IDB is giving to the sector. The loan projects financed by the IDB in the past ten years are categorized under eleven sub-categories: agricultural development; agricultural markets and productivity; agricultural and animal health; agribusiness support; rural land management; irrigation and drainage; integrated rural development; rural community development and settlement; livestock; agricultural research; and agricultural credit.

¹⁰ In a few cases, relevant projects in the 2010 and 2011 pipeline were included in the analysis to better illustrate the Bank's approach in specific areas of intervention.

¹¹ Relevant information is provided on other countries and regions whenever appropriate.

¹² These numbers only include loans from the INE/RND, INE/WSA, INE/ECC Divisions and a few relevant loans from the SCF/CFI division. These projects have been chosen based on their impact on agricultural productivity and competitiveness only.

¹³ The status of the projects corresponds to the time of the analysis which is January 2010.

¹⁴ The number of projects by country adds up to 99 because the project *Sustainable Management of the Lempa River Basin* [CA0034] is implemented in El Salvador, Guatemala and Honduras.

FIG. 1
Agricultural Projects

(% of funds allocated by region)

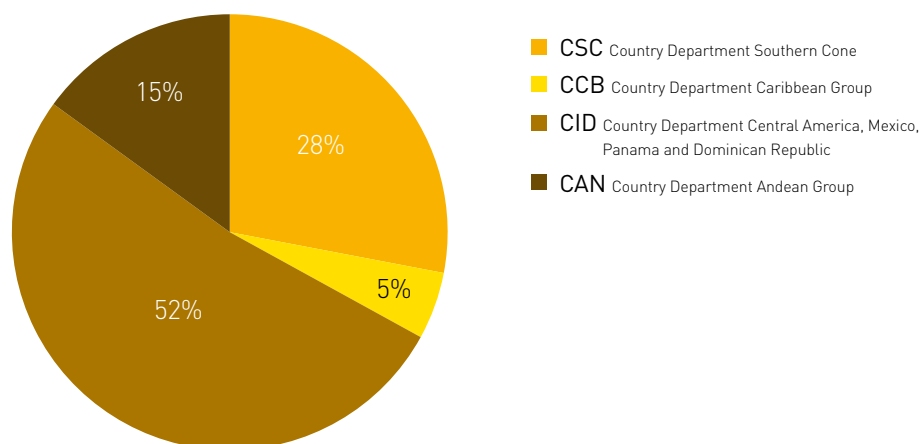
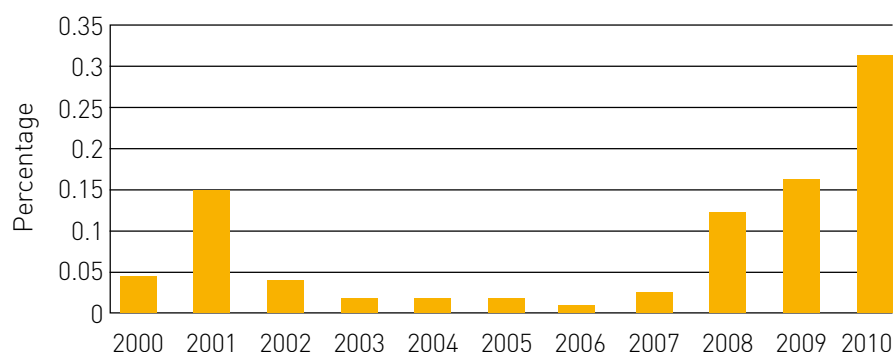


FIG. 2
Agricultural Projects (2000-2010)

(% of funds by year)



II. PROJECTS DESIGNED TO ADDRESS NATURAL RESOURCE-RELATED CHALLENGES

Land

Although the traditional approach for land reform in LAC used to be state-mandated redistributive land reform, this has been decidedly off the policy agenda in most Latin American countries since the 1990s (Carter and Salgado, 2001). The current land-reform agenda has become more diverse and the term “land reform” is increasingly used to refer to colonization programs on publicly-owned land, land registration, consolidation of fragmented holdings, tenancy improvement, and land taxation in addition to redistribu-

tion (El-Ghonemy, 2003; Lipton, 1993 as presented in Sikor and Müller, 2009). However, Carter and Salgado (2001) note that contemporary land policy in LAC is primarily comprised of two instruments: land titling and negotiated or market-assisted land reforms. The authors’ state that while it can be argued that both policy instruments can address rural inequality in theory, whether or not this is the case in practice depends on the way that liberalized land markets function in the real world of imperfect rural markets.

As Latin American countries enter this new phase of land reform, de Janvry, Sadoulet and Wolford (2001) note that two critically important issues need to be addressed: (i) access to land for the landless and

mini-fundistas; and (ii) competitiveness of titled beneficiaries in the reform sector. Resolving these two issues will determine the future social structure of Latin American agriculture; particularly, whether or not a viable middle class will emerge from these land reforms. In the words of de Janvry et al. (2001), the “ultimate achievement of land reform policy would be to enable these smallholders to become competitive in the context of liberalized markets and a sharply reduced role of the state.” The expectation is that with the introduction or improvement of land markets, it would allow ‘better’ farmers to replace less skilled farmers and this would lead to a gradual transfer of land to the most competitive farms and farmers.

a. Land Titling

One of the most common instruments used in Latin America to provide land-tenure security has been the provision of land titling. Under this framework, governments establish specialized agencies and administrative procedures to grant land titles (Sikor and Müller, 2009). Land-titling programs collect and register data about property rights; land registration defines the boundaries of a parcel of land and links a particular parcel with the name of a property holder or holders and thereby connects them with the state for future tax-levying (Jansen and Roquas, 1998). In general terms, the beneficiaries of these programs have been previous land-reform beneficiaries, owners of uncultivated land, and campesino communities. Although these programs initially focused on the registration of individual land claims and titling, more recently they have included steps to grant land titles to couples (Deere and León, 2001) and indigenous groups such as those in Bolivia, Colombia, Ecuador and Panama (Plant and Hvalkof, 2001).

The logic of land titling is to address market failures related to insecure property rights, which are directly linked to issues of minimal or no productive investments and difficulties in accessing credit. The expectation is that having a title will increase land security, which in turn will incentivize future investments in the land, potentially increasing production and efficiency while at the same time increasing the value of the pro-

perty. It is also hoped that farmers will be able to use land titles as collateral to access credit. Lastly, land security may also stimulate rental and sales markets as well as increase the value of land assets.

b. Negotiated or market-assisted land reform

Given the political difficulties associated with traditional state-led land reform that often expropriated land, new land-reform policy has sought to use the market and negotiate land transfers. This is a variation of redistributive land reform, where land transactions take place partly through land markets, which are facilitated by loan programs offered by the government (Sikor and Müller, 2009). Negotiated land reform relies on voluntary land transfers based on negotiation between buyers and sellers, with the government establishing the necessary framework and making available a land-purchase grant to eligible beneficiaries (Deininger, 1999). With this approach, the most important factor is the landlord. Only landlords who voluntarily want to sell do so; those who do not want to sell are not compelled to do so (Borras, 2003).

This market-assisted approach is demand driven and usually targets poor families who explicitly seek land, with only the lands demanded being up for negotiation (Borras, 2003). The model adopts a decentralized method of implementation for speedy transaction, transparency and accountability. Local government is assumed to be nearer to the people and so should be more responsive to the actual needs of local communities (Borras, 2003). Additionally, an integral part of these programs is the technical training that should be offered to participants so that they can invest in their land and make it productive.

The purpose of this type of intervention is to address issues of equity and efficiency through a market-based approach that will stimulate land, credit, and input and output markets, while respecting property rights. For instance, on equity grounds, land is being transferred from medium- or large-scale land holders to

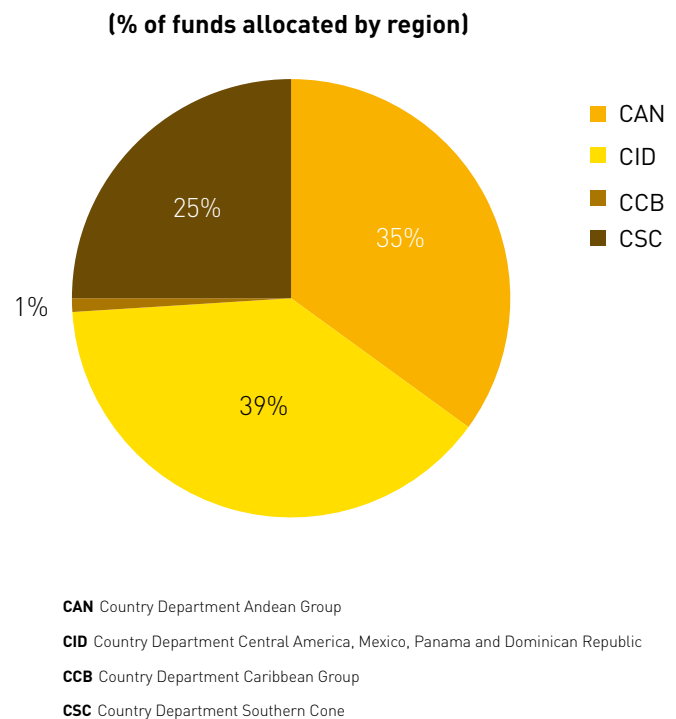
small-scale or landless farmers. Having a piece of land on which to reside and to cultivate can facilitate subsistence farming as well as farming oriented to markets. Similarly, the expectation is that with a piece of land and a title, it will make it easier for farmers to access credit and will encourage them to make productive investments in their new properties. On efficiency grounds, the land that is typically bought and sold under this approach is generally idle or in a low productivity use. In the long run, if the appropriate structures are in place, and if farmers can access credit and make productive investments in their land, this in turn should also stimulate input markets; the demand for basic services, such as electricity, water and sewage, roads, etc., also should increase.

c. Rural Land Management and the IDB's approach

Over the last ten years, the IDB has been supporting projects that address land-related challenges; however, it has not participated in market-assisted land projects. There have been sixteen major projects developed under Rural Land Management, two of which have been completed, twelve of which are still under implementation and one is yet to be implemented and one is in process of approval. These projects have been implemented in the Bahamas, Belize (2), Bolivia (2), Brazil (2), Dominican Republic, Ecuador, Guatemala,

la, Panama (3), Paraguay and Peru (2). The portfolio for these projects amounts to US\$288 million, which represents about 6 percent of the total amount of funds allocated to finance agricultural projects. Out of the total amount allocated to land-management projects, 35 percent has been allocated to the Andean Countries (CAN), 39 percent to Central America, Mexico and the Dominican Republic (CID), 25 percent to the Southern Cone Countries (CSC) and 1 percent to the Caribbean Region (CCB).

FIG. 3
Land Management Projects





The main approach followed by the IDB throughout these projects has been to strengthen the country's institutional capacity and legal framework at the national and local levels (ex. municipalities) in order to enhance land market efficiency, improve land security and prevent land disputes and conflicts. For this purpose the Bank's operations provided technical support, developed and modernized information systems, expanded national cadastral systems, improved titling and registration processes through digitalization and computerization, and granted support to national and local institutions in developing internal monitoring systems. For instance, in the *Land Regularization and Legal Cadastre* project in Bolivia, the IDB funded the titling and registration of 20.5 million hectares of land along with the public promotion of land registration processes to create incentives for farmers to participate. In the *Land Use Policy and Administration Project* in the Bahamas, the IDB financed the upgrade of computer equipment for the Bahamas National Geographic Information Systems Center and offered technical support to develop the GIS database in specific areas. Also, through the *Register and Land Title Stage II* program, the IDB financed the development of an electronic registry system to link the rural cadastre with the registry office in Peru.

Many of the land-management projects implemented by the IDB go hand in hand with environmental

components to define natural reserves, promote environmental conservation and identify cultural lands. For example, in the *Register and Land Title Stage II* project mentioned above, the IDB funded the demarcation of fifteen natural reserves and the registration of native community lands. Some of the land-management projects also funded infrastructure and rural projects in the affected areas in order to create incentives for settlers to register and legalize their properties as well as to spur rural development. In Panama, the *Supplementary Financing Program for Sustainable Development in Darien* has one component designed to fund productive activities and another to rehabilitate transportation systems in the Darien region. These projects then mix development objectives linked to land titling with other objectives since there are synergies created by jointly doing these activities.

Water Management

In the 1990s, irrigation policy underwent a dramatic shift in many developing countries, moving from investing heavily in expanding irrigated areas, towards a new emphasis on demand management and dealing with increasing scarcity of water resources and competition between water users (Meinzen-Dick, 1997). A growing number of countries have been turning over the management of irrigation systems from public agencies to farmers, or other local, non-governmental organizations, as well as the private sector (Meinzen-Dick, 1997; Vermillion, 2006). This new change

can be seen as the convergence of a number of policy trends: decentralization; privatization; participation and democratization; irrigation management transfer (IMT); and participatory irrigation management (PIM) (Meinzen-Dick, 1997). Yet, one of the elements common to either approach is the fact that they lead to some form of joint management of water resources, with the state responsible for more tasks at higher levels of the system, and stakeholders, including farmer organizations, responsible for more tasks at lower levels.¹⁵

In addition to this shift, two other important changes took place. First, there was a move to treat water as an economic commodity rather than a public good (Meinzen-Dick, 1997). And secondly, a general global consensus emerged on good practice that considered integrated water resources management, environmental water needs, and ecosystem approaches. In this regard, it was increasingly being recognized that agricultural water management needed to be more integrated, with the full range of water resources, water uses, and management-and-supply development options taken into consideration (Molden et al., 2007). With this in mind, common policies related to water and irrigation management have attempted to make water delivery and services more efficient (through decentralization, transfers, cost recovery, etc.) and sustainable (through an integrated management approach). To this end, the main policies that have been implemented under this dual approach come under the following two categories: irrigation management transfers (IMT); and watershed and river-basin management.

a. Irrigation Management Transfers (IMT) and Water Users' Associations (WUA)

The concept of IMT usually refers to the process that seeks relocation of responsibility and authority from

the controlling government agencies managing irrigation systems (under the public sector) into the hands of non-governmental organizations, such as WUAs or other private entities (Garcés-Restrepo, Vermillion and Muñoz, 2007). A WUA is a group of water users that are organized for the purpose of governing an irrigation system and overseeing its management and to some degree its financing (Vermillion, 2006). WUAs seek greater farmer participation in irrigation management, either as a complement to or replacement of the state (Meinzen-Dick, 1997).

In general, the transfer of management means that the WUA enters into a contract with the government for operating and maintaining the entire irrigation system or portions of it. The association has the authority and responsibility to operate its system as it desires and to hire its own management or technical staff (Groenfeldt and Sun, 1997). The logic of this approach is that broader and more direct farmer participation in WUAs will lead to stronger incentives to distribute water equitably. A greater sense of ownership by members also will improve monitoring and system maintenance (Turral, 1995). Additionally, this approach has the potential to internalize group externalities for good water management. Farmers that depend on irrigation for their livelihoods have a strong incentive to manage their resources more carefully, while no public agency could ever match the discipline that farmers impose on each other as members when they manage their own systems (Groenfeldt and Sun, 1997). Similarly, the expectation is that WUA membership will lead to improvements in income from the expansion of irrigated areas and increasing agricultural productivity (Turral, 1995).

b. Watershed and River Basin Management

Watersheds have been viewed as useful systems for planning and implementing natural resource and agri-

¹⁵ Meinzen-Dick, 1997, refers only to irrigation, but this concept is applicable to other forms of water management and not solely to irrigation. Likewise, the author refers to farmer associations but these can also include WUAs, civil society, NGOs, and other stakeholders as in the case of watersheds and river basins.

cultural development for many centuries (Brooks and Eckman, 2000). Watersheds are landscapes created by mountain ranges as they slope down to valleys, with creeks and torrents flowing downstream; they are also known as drainage areas or river basins. Watersheds are in zones where rain or melting snow drains downhill into a river, lake, dam, estuary, wetland, sea or ocean; they can be as small as a few hectares or as large as several thousand square kilometers. Smaller watersheds are almost always part of a larger watershed or river basin (Höfer and Warren, 2007). About 2.8 billion people, more than 40 percent of the world's population, live in river basins. Of these, 1.2 billion people live in river basins where water resource development has exceeded sustainable limits and water supply is now scarce (Molden et al., 2007).¹⁶

The concept of watershed management (WM) has evolved over the years. Reflecting general views the Food and Agriculture organization (FAO) defines it as a "participatory process of watershed inhabitants and users who formulate, manage and execute an integrated group of actions on the natural environment and on social, economic, institutional and legal watershed structure in order to attain the specific objectives of society"¹⁷ (FAO, 2004). Since 1990, most WM projects have focused on an integrated approach, which takes into consideration both the social and the natural environment with a view of achieving a balance between

productive development and environmental conservation, thus optimizing watershed use in the region (FAO, 2004). Additionally, the WM methodological framework has evolved from a regional approach based on centralized planning to a sustainable local-development approach that includes the participation of communities and the private sector (FAO, 2004).

c. Water Management and the IDB's approach

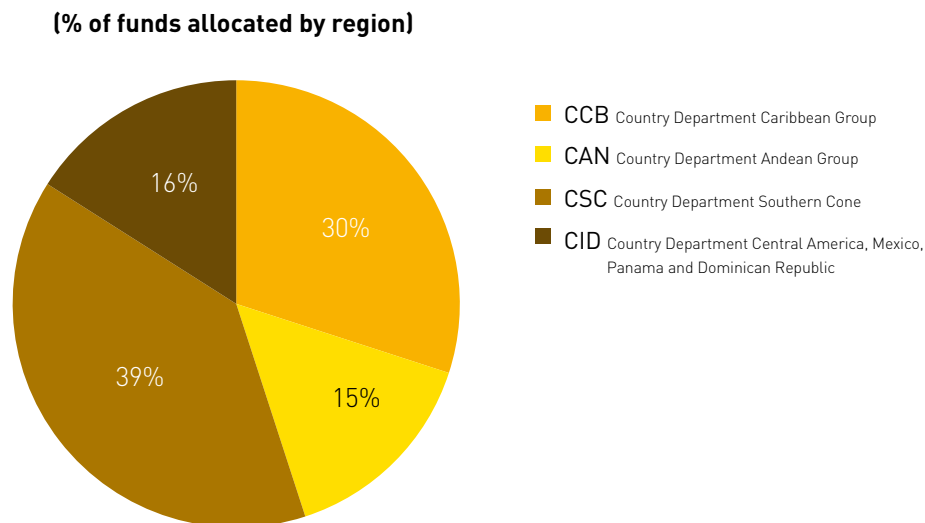
With respect to irrigation, drainage and water management, the IDB has financed sixteen projects over the last ten years, two of which have been completed, nine of which are under execution and five of which are in the process of being approved. The countries receiving these projects are Argentina, Bolivia (2), Brazil (3), Guyana, Honduras, Haiti (4), Jamaica, Nicaragua, Peru, Venezuela and a multi-country project in Guatemala, Honduras and El Salvador.¹⁸ Their portfolio amounts to about US\$509 million, which represents about 10 percent of the amount allocated to agricultural projects. Out of the total amount allocated to these projects, 39% of the funds are assigned to finance water management in the Southern Cone Countries (CSC), 30% to finance projects in the Caribbean Region (CCB), 16% in Central American countries (CID) and 15% to finance projects in the Andean Countries (CAN).

¹⁶ The authors present this information but note, in brackets, that there are "competing explanations" about it.

¹⁷ Source: Second Latin American Congress for Watershed Management (REDLACH), Merida, Venezuela, November 1994, as presented in FAO 2004.

¹⁸ An additional project to be implemented in Venezuela was cancelled.

FIG. 4
Water Mangement Projects



Throughout these projects, the IDB has prioritized the construction and rehabilitation of drainage and irrigation infrastructure; the promotion of training for farmers in irrigation and water-use management techniques; the expansion and improvement of water capacity at the local level; and institutional strengthening focused on moving from government reliance to farmer ownership. Additionally, most of these projects actively support the organization and sustainability of WUAs at the local level. For instance, the *Agriculture Support Services Program* implemented in Guyana aims to rehabilitate 1,200 kilometers of primary and secondary channels, and to provide water-management training and extension services to about six hundred farmers who belong to WUAs. In Jamaica, the *National Irrigation Development Program* seeks to increase irrigated land from 500 hectares to 1,700 ha, benefiting more than one thousand farmers. The project also supports the creation of WUAs. The main objectives of IDB-funded irrigation projects are to increase the efficiency and competitiveness of rural production; enhance agricultural productivity; improve rural households' income; and achieve efficiency

and equity in the allocation and usage of water resources. While reflecting the general view that management should shift to WUAs, the IDB projects also include expansion of the irrigation areas and training of farmers in water use and management.

In 1998, the IDB approved a Strategy for Integrated Water Resources Management, which calls for a watershed or river-basin approach to water management. According to Garcia (2001), this introduced institutional capacity building as a new line of action, alone or in parallel with other water-related projects. Projects financed by IDB and related to watershed management include the *National Irrigation Program with a Watershed Approach* in Bolivia, the *Integral Management of the Caroni River Watershed* in Venezuela, the *Environmental Management Itaqui/Ressaca Watersheds* in Brazil and the *Natural Resources Management of Priority Basin* in Honduras.

As with the land-titling projects, some irrigation-related projects also finance complementary infrastructure in rural areas such as road construction and the

provision of basic services. For example, in Brazil, the *South West Tocantins Region Development Program* finances road construction and improvements to facilitate the transportation of agricultural production and to reduce transaction costs. This project also funds electrification and sanitation services in the affected areas. The importance of complementing irrigation projects with institutional strengthening components is also clearly defined in most of the projects mentioned above. In Bolivia, for example, the *National Irrigation Program with a Watershed Approach* funds the implementation of a National Irrigation Information System to monitor the project's execution, manage the registration of water users' ownership and to ensure their rights. This project also finances the implementation of a watershed geographic-information system in order to integrate climatic and hydrologic information.

Climate Change

As noted in Chapter V of Part II of the Development Effectiveness Overview, responding to climate change must be viewed from two angles: adaptation and mitigation. For agriculture, the manifestations of climate change, especially changes in temperature, rainfall and water level, as well as the increase in extreme weather events, will lead to declines in agricultural production and productivity and will demand adaptation on the part of agricultural producers. Adaptation to maintain or increase productivity is likely to take the form of both changes in production practices as well as shifts in crops planted. In fact, a study of farmers in South America suggests that when faced with climate change, farmers are likely to shift production from the "cool-loving" crops they currently produce to the more "warm-loving" ones being produced elsewhere in South America (Seo and Mendhelson, 2008). This is unlikely to be instantaneous however and will depend largely on farmers' ability to adapt to changing conditions. Their ability to maintain productivity in a changing environment is of course linked to government policies and programs. Along with general policies to promote agricultural development, policies that speci-

fically focus on improving agricultural productivity and promoting relevant research and technology adoption are most likely to be effective (Nelson et al., 2009).

The mitigation potential of agriculture rests largely on the management of soil and land. Certain tillage practices can reduce carbon dioxide emissions from the soil and sequester additional carbon. Overall management of pastures and forests can have similar effects (Smith, 2009). The challenge is to find measures that not only help farmers adapt and maintain agricultural productivity and profitability, but also reduce the emissions associated with production. Even if drastic actions were taken today to reduce Greenhouse gas (GHG) emissions dramatically, little could be done to address some of the anticipated effects. The consequences of climate change are long-lasting, increasing the importance of taking forceful action to reduce emissions (mitigation) that incorporates adaptation measures (Vergara, 2004).

Many of the policies that address the relationship between climate change and agriculture involve more environmentally friendly techniques, technologies and conservation practices, as well as actions to develop the sector. The policies discussed in a number of the sections of this chapter can help address climate change. Recent approaches to supporting environmental conservation, as well as climate change mitigation, are the payment to farmers of environmental services for environmental protection.

a. Paying for Environmental Services

Ecosystems provide valuable "services" for those that benefit from them directly or indirectly. Yet many important functions of ecosystems have no markets, and hence, no apparent economic value, which could lead to their overuse and eventual deterioration. Adding economic value to such functions has the potential to change significantly the way one looks at all ecosystems. In recent years, market mechanisms for environmental services have become increasingly important in the international develop-

ment agenda (Landell-Mills and Porras, 2002; Pagio-la et al., 2004; Porras, Grieg-Gran and Neves, 2008). Payments for environmental services (PES) represent a new, more direct way to promote conservation and climate change mitigation. These agreements point to the role played by land-use activities in regulating the global carbon cycle, particularly the potential of forest management to store carbon dioxide and ameliorate climate change. Three of the more common instruments under this approach are: payments for watershed management, reforestation and aforestation (closely related to carbon markets); and conservation services in agricultural landscapes. One way of receiving payments for these environmental services is through the Clean Development Mechanism (CDM).

Since PES projects are directly linked to land use, they often influence agricultural production. Those in favor of such schemes argue that since the benefits offered by ecosystem services are not captured in conventional markets, there is no economic incentive for their conservation (Costanza et al., 1997). They argue that by putting a price on nature's services and assigning property rights to them, incentives will be created for resource users and ecosystem managers to conserve those services (Swingland, 2002). Farmers will then see a financial benefit to potentially foregoing agricultural production and providing an environmental service instead. Alternatively, through projects such as watershed management, training is provided for farmers in the use of more environmentally friendly techniques and in biodiversity conservation. The hope is that such projects will contribute to the conservation of the environment, while enhancing the productivity of participating farmers.

b. Climate Change, Environmental Projects and the IDB's approach

Chapter V of Part II of the *Development Effectiveness Overview 2008-2009* has already highlighted some



of the environmental and climate change projects implemented by the IDB in the last ten years. These projects range from disaster prevention programs to ecotourism. However, the particular focus in this section will be on environmental projects related to agricultural productivity.

The IDB has implemented thirteen projects that have been categorized as directly affecting agricultural productivity since 2000.¹⁹ These projects amount to about US\$1,146 million. Some have been mentioned and accounted for in previous sections in this chapter such as in the land management section, the *Supplementary Financing Program for Sustainable Development in Darien*, Panama; *Establishing Cadastral Registry & Strengthening Legal Certainty in Protected Areas* in Guatemala; and the *Environmental and Social Protection Project for the Santa Cruz–Puerto Suarez Corridor* in Bolivia. Other projects such as the *Sustainable Development Program for the Central Provinces*

¹⁹ Only loan operations are included as projects.



in Panama have been accounted for in the access to markets sections (section III. i. of this chapter). Yet other projects such as *Sustainable Development of the Huetar Atlantic Basin Region* in Costa Rica; *Sustainable Development of the Province of Bocas del Toro* in Panama; and *Priority Basin Natural Resources* in Guatemala aim to increase productivity and spur rural development in an environmentally sustainable manner by supporting investments to manage natural resources more efficiently, reduce the impact of natural disasters and improve institutional capacity. Additionally, other projects, such as the *Coastal Risk Management Program* (CCLIP) in Barbados, aim to improve coastal risk management and climate-change adaptation strategies through risk assessments, improved coastal infrastructure, institutional strengthening and by monitoring strategy implementation.

With respect to projects specifically related to climate change, the IDB has funded programs that combine both adaptation and mitigation strategies such as the *Climate Change Programmatic Loan* in Colombia, which has allocated US\$250 million to reducing the impact of climate change on various economic sectors including agriculture. *The Program in Support of Mexico's Climate Change Agenda* and the *Second*

Support Program for the Climate Change Agenda in Mexico (US\$200 million and US\$400 million respectively) also include mitigation and adaptation strategies. Overall, these projects provide financial support to fund Greenhouse Gas (GHG) emission reduction plans; to undertake research projects to identify vulnerabilities and challenges; to create stronger regulatory frameworks; and to strengthen institutional capacity. The main objectives of these climate change projects are to reduce vulnerability to future risks associated with climate change (adaptation) and to implement actions to reduce current GHG emissions and increase participation in international carbon markets (mitigation).

III. PROJECTS DESIGNED TO ADDRESS MARKET LIMITATIONS

Access to Markets

To improve access to higher-value agricultural markets, policies have tended to focus on improving the competitiveness of agribusiness, on increasing overall access to global markets for all farmers, and on helping link smallholders to both domestic and international high-value markets. Projects to support agribusiness

and to promote agricultural exports are often closely linked since both tend to seek to improve competitiveness in both domestic and international markets.

a. Agribusiness Support

Modernizing agro-food systems typically stimulates and accompanies broader economic development, particularly through the development of stronger backward and forward linkages within the agro-food system and the local economy (WB, 2003). Many experiences in Latin America, Asia and Africa have shown the potential of agro-based small and medium enterprises (SMEs) for value-adding, employment generation and improvement of farm and rural non-farm income (IFAD, 2008). As economies become more sophisticated, economic structures are transformed and capital and labor are transferred from agriculture to the expanding agro-industrial and related services (IFAD, 2008).

However, as noted, the modernization of agro-food systems does not take place automatically or spontaneously, and while several factors can influence its evolution (such as changes in demographics, overall economic environment, etc.), deliberate and strategic interventions on the part of governments have frequently played important roles in fostering technological and institutional change in agro-food systems (WB, 2003). Indeed, a growing body of literature highlights the importance of government policy in supporting the development of agribusiness. For instance, Reardon et al. (2009) observe that government policy affects the pace and nature of agri-food industry transformation and influences the inclusion of small farmers.²⁰

In an open and deregulated economy, the most important role of government concerning agribusiness

systems is the provision of public goods and institutions that improve competitiveness (Farina and Zylbersztajn, 1997). In particular, the role of government in agro-food system and agro-enterprise development falls within three general categories: (i) to set and ensure enforcement of laws and regulations; (ii) to compensate for market failures and asymmetric power relations; and (iii) to build physical and knowledge capital (WB, 2003).

Regarding the first point, the government's role concerns establishing and enforcing rules, such as cooperative rules (Vorley and Proctor, 2008); property rights (WB, 2003); compliance with bio-safety, food safety, worker safety, and sanitation regulations; and negotiating favorable terms for access to international markets²¹ (WB, 2003). The rationale for the government intervening in these areas is mainly related to providing an environment where the rules of the game are clear and respected, in order to foster market participation and food safety. This is true for the domestic market as well as for agribusinesses that are export oriented. Likewise, supporting producers in trade agreements and searching for new markets is seen from the point of view of correcting a market failure, primarily in the form of information externalities (see section below).

As to the second point, the government's role is to ensure the availability of information; to facilitate market activity and monitor market progress; to invest in or support risk management instruments; and to facilitate the financing of agro-food system investment (WB, 2003; Vorley and Proctor, 2008). Government interventions in these areas are aimed at facilitating access to information, insurance, and credit. Copeland (2007) notes that information costs, such as those incurred when identifying new markets; finding

²⁰ This conclusion is based on the authors' introduction and review of papers presented in a special edition of *World Development* on the agri-food industry in developing countries and its effects on small farmers.

²¹ The rationale for export promotion will be explored in more detail on the following section.

suitable and reliable suppliers; and dealing with local or international regulations and issues of asymmetric information, impede trade in a variety of ways. Some of these costs must be borne prior to, or early in the process of, attempting to get into new markets, either domestic or international. To the degree that they reflect a need to acquire relevant information in dealing with new markets, these costs can be categorized as sunk costs. Sunk costs can prevent many firms from investing in new local or international markets.

For the last point, the role of government in supporting agribusiness development is related to investing in necessary infrastructure (Vorley and Proctor, 2008), especially in the areas of telecommunications, transportation and energy (WB, 2003), as well as in facilities and systems to improve border control, laboratory services, and epidemiological surveillance to keep countries from receiving and/or spreading pests and diseases, thus maintaining animal and plant health. The logic for government intervention in these areas is due to the public-good nature of these types of investments and services. Investing in roads, for instance, can improve transportation, decrease transport costs, and stimulate local and international trade. Similarly, investing in systems that protect plant and animal health is beneficial for all consumers and sends a positive signal to would-be international consumers and tourists.

Government also has a role in investing in knowledge building, to accelerate the agribusiness learning process and enable the emergent private sector to participate and compete (WB, 2003). Improved knowledge also helps small-scale producers wishing to upgrade technical aspects of production, such as adopting new seeds and product handling (Vorley and Proctor, 2008).²²

A final role of government in supporting agribusiness is facilitating the development of agro-industrial clus-

ters, such as centers of production of flowers, horticultural crops, related export crops, etc. When firms are concentrated in a certain geographic region they may benefit from agglomeration economies since these help information flow, lead to lower costs when looking for workers with industry-related skills, and reduce costs associated with obtaining inputs and selling outputs. The activities of one farmer or agro-processing center in a region can have positive externalities for other farmers and agro-processing centers in the region. Since individual farms or firms do not incorporate these externalities in their decision making, they underinvest in the agricultural activity. Given this market failure, governments play a role in facilitating the development of clusters of agricultural activities (Porter, 2003; Pietrobelli and Rabellotti, 2005; FAO, 2007).

b. Export Promotion²³

One of the more common ways to foster export growth has been the creation of national export-promotion agencies (EPAs). According to Lederman, Olarreaga and Payton (2007), over the past two decades the number of EPAs has tripled. The general objective of an EPA is to help potential exporters find markets for their products as well as provide them with a better understanding of what products are in demand around the world (Lederman et al., 2007). The services offered by EPAs can be divided into four broad categories: (i) country image-building, which requires advertising and promotional events, as well as advocacy; (ii) export support services, which include exporter training, technical assistance, capacity building (including regulatory compliance), information on trade finance, logistics, customs, packaging, and pricing; (iii) marketing, including fairs and exporter and importer missions; and (iv) market research and publications (Lederman et al. 2007).

²² See the section on R&D, below, for an explanation of the logic of government intervention in this area.

²³ This section relies heavily on Lederman, Olarreaga and Payton (2007).

The justification for governments supporting export promotion is based on the theory of asymmetric information and other market failures: private producers, acting alone, will not obtain a sufficient amount of information on foreign markets since this can be expensive and difficult to obtain without also benefiting their own competitors (Lederman et al., 2007). Indeed, there are important positive externalities associated with the gathering of information on foreign markets that can benefit local producers who are in search of new markets. This makes a good argument for the public sector to fund EPAs and other forms of export promotion, since the social benefits from such investments may be larger than the social costs if there are large enough positive externalities associated with higher exports across firms, sectors, or time, within the exporting country (Lederman et al., 2007).

In recent years, the significant increase in international agricultural trade has been accompanied by growing concern over food safety and standards (Giovannucci and Ponte, 2005). In addition to the broader efforts to promote exports mentioned above, governments have also invested in projects to ensure that domestic and exporting farmers meet the health and quality standards required in national and international markets.

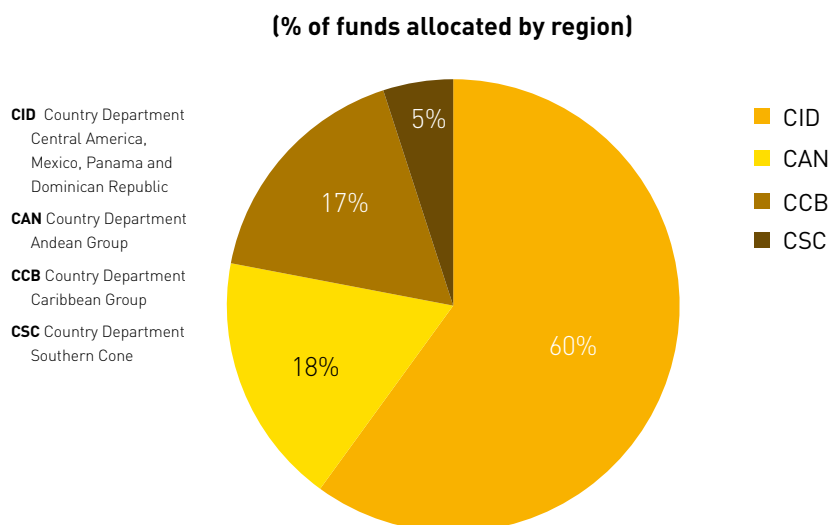
c. Agricultural Market Access and the IDB's approach

Over the past ten years, the IDB has supported a number of projects that foster competitiveness, diversification, and access to local and international markets. It has financed nine projects, one of which has been completed, five of which are under implementation and three of which are in the process of being approved. These projects are located in Costa Rica, Peru (2), Haiti, Panama, the Dominican Republic, Jamaica, Guatemala, El Salvador, Bolivia and Paraguay. The total portfolio for these activities amounts to US\$195 million, which represents about 4 percent of the total amount

allocated to finance agricultural projects. Of these funds, 17 percent are assigned to fund projects in the Caribbean Region (CCB), 18 percent in the Andean Countries (CAN), 60 percent in Central America, Mexico and the Dominican Republic (CID) and 5 percent in the Southern Cone Countries (CSC).

These projects aim to create opportunities at the global level for small- and medium-sized farmers by building and enhancing links between international markets and local agricultural production. This should help increase rural households' productivity and income. Through these projects, the IDB has adopted a comprehensive approach to promote market ac-

FIG. 5
Market Access Projects





cess based on five primary pillars. First, to encourage agricultural product quality by supporting governments in the implementation of norms and regulations to meet international quality standards. Second, to promote the implementation of export-oriented policies and to provide support to farmers that will enable them to export. Third, to provide technical assistance to farmers so that they obtain the necessary knowledge to adopt technical innovations. Fourth, to create incentives for public and private institutions to undertake agricultural research activities. Fifth, to strengthen institutions at the local and national level to foster market access.

The *Agricultural Competitiveness Program* in Peru, for instance, promotes the development of agricultural clusters and value chains through access to innovation and provision of knowledge in business management. It also focuses on strengthening the Agricultural Statistics Information System through the modernization of the National System for Agrarian Innovation in order to disseminate information and innovation to rural areas. Likewise, in Paraguay, the *Diversification of Agricultural Production* project encompasses access to technology, investment in infrastructure and institutional support. Finally, the project *Rural Supply Chain Development Program* in Haiti provides US\$8.6 million of funding for the rehabilitation of four research centers and

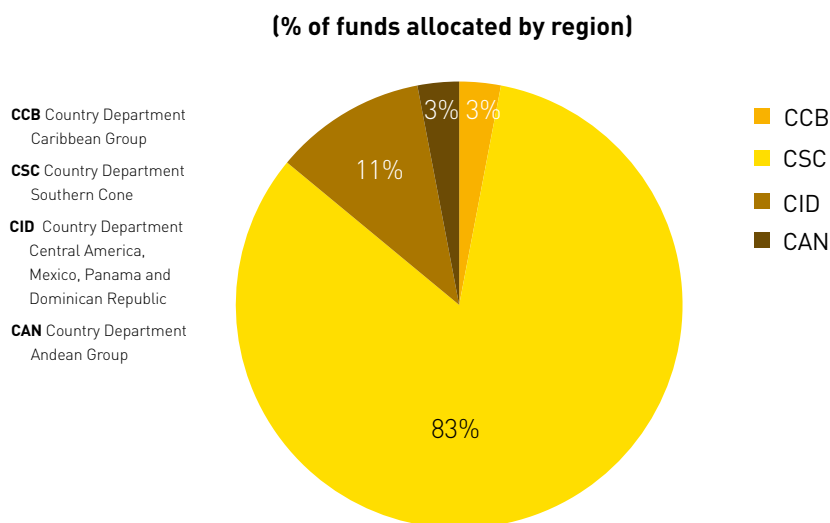
targets twelve research programs related to marketing of agricultural production, and improvement of agricultural varieties, among other topics.

Besides funding projects to foster access to markets by agricultural producers, the IDB also provides support for agribusiness development. In fact, over the past ten years it has financed fourteen projects, one of which has been completed, six of which are under implementation, to have been approved and five of which are in the process of being approved. The portfolio for these projects amounts to US\$629 million, about 13 percent of the funds for agricultural projects considered in this analysis. These projects have been developed in Argentina (6), Brazil

(2), Guyana, Nicaragua, Honduras, El Salvador, Bolivia and Colombia. The percentage of funds allocated to projects in the Southern Cone Countries (CSC) is 83%, 3% in the Caribbean Region (CCB) and 11% in Central America, Mexico and the Dominican Republic (CID) and 3% in Andean Countries (CAN).

Most of the projects financed by the IDB to foster market access through value chains, agricultural clusters and agribusinesses have two distinctive characteristics. First, they are mainly targeted towards small- and medium-size farmers and, second, they aim to incentivize private-sector involvement and reduce government assistance. For instance, the *Sustainable Development of the Food and Agriculture Sector* project in Costa

FIG. 6
Agribusiness Projects



Rica targets women's and indigenous organizations by providing them with the training and information they need to develop their own skills, acquire knowledge and become less dependent on government assistance. This project also aims to reduce farmers' dependency on government transfers by requiring them to contribute fifty percent of the cost of receiving technical assistance. In the case of indigenous groups the contribution is reduced to ten percent.

Similarly, the *Diversification of Agricultural Production* in Paraguay finances an integrated marketing system managed by private marketing units. These units assist fruit and vegetable farmers to develop business plans to market their products. The project gives financial support to hire private marketing unit managers and other specialists; to provide technical services to assure quality-control assistance and training; to promote products in new markets; to disseminate new technologies and information; to invest in productive infrastructure; and to support institutional strengthening. Finally, in Argentina, the *Project to Integrate Small Producers into the Wine Production Chain* aims to improve the profitability of small-scale grape and wine producers by promoting their integration into wine-production value chains. This is done by promoting arrangements among partners; supporting business-plan creation and implementation; and strengthening institutions.

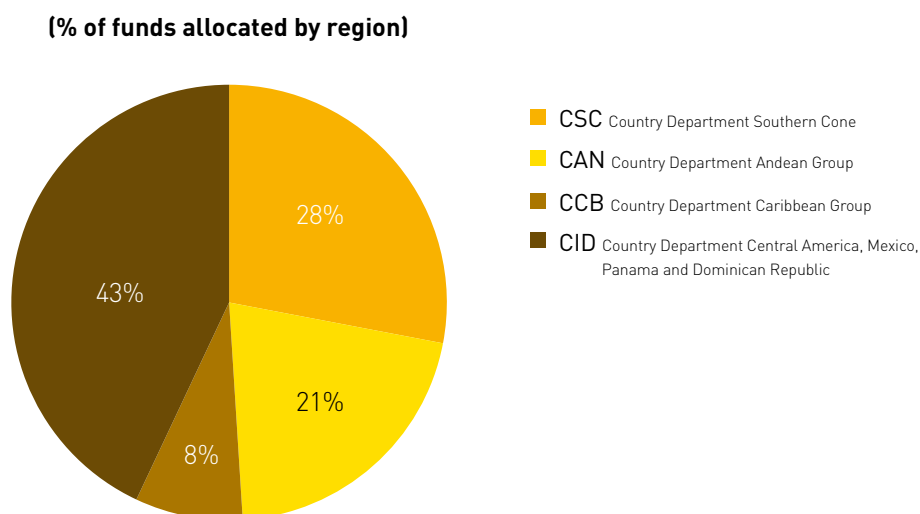
Other IDB projects in this area are directly associated with livestock production. For example, in Uruguay, the *Productivity Support and Development of New Livestock Products* and the *Cattle Development Program* finance the preparation and implementation of business plans proposed by the private sector. These plans aim to strengthen the livestock supply chain through innovations in production management at the breeding stage, in the sheep and cattle supply chain, and in the marketing of livestock products.

Given the increasing number of food safety concerns and standards in the agricultural and food industry, the IDB has been supporting projects, both domestically and internationally, aimed at improving agri-food



safety, including the improvement of plant and animal health. There are twelve projects in this category, nine of which are under implementation, one of which is awaiting approval and two of which have already been approved. These projects are being implemented in Argentina, Bolivia (2), Peru (2), Jamaica, Uruguay, the Dominican Republic, Belize, Mexico, Nicaragua and Barbados. The portfolio for these projects is US\$394 million, of which 43 percent is allocated to fund projects in Central America, Mexico and the Dominican Republic (CID), 8 percent in the Caribbean Region (CCB), 28 percent in the Southern Cone Countries (CSC) and 21 percent in the Andean Countries (CAN). To improve agricultural and animal health the IDB has focused on the following: enhancing phytosanitary surveillance services and plague-monitoring systems; strengthening national surveillance and quarantine systems; encouraging the promotion of seed-certification programs; implementing farmer training and public awareness campaigns; decentralizing responsibilities to local authorities; and incentivizing the modernization of the legal framework and the establishment of a national agri-food certification system, among others. In Peru, for instance, the *Pro-*

FIG. 7
Agricultural and Animal Health Projects



ject for Control and Eradication of Fruit-Flies has two main components: the eradication of fruit-flies and surveillance and quarantine (including farmer training and communication activities).

Similarly, in Nicaragua, the *Improvement of Plant, Animal and Forest Health Services* project allocates US\$857,000 to improve health, education and communication to increase awareness of the importance of food safety. It also provides US\$507,000 for institutional support to establish the Nicaraguan Integrated Food Safety System and to strengthen other agencies involved in national health-quality systems. Throughout these projects the main aims of the IDB are to reduce economic losses faced by farmers due to plagues and disease and to improve animal and food standards in order to meet international requirements and increase access to global markets through export promotion.

Volatile Agricultural and Food Prices

The volatility of agricultural and food prices can create 'winners' and 'losers', depending on whether one is a

net food producer or exporter, or a net food importer or buyer. However, drastic price fluctuations can have even more negative effects on governments and consumers, as well as the global economy. For instance, the spike in food prices of recent years benefited net food producers and exporters but had significantly negative effects (especially in some developing countries that experienced high food inflation) on local governments (due to social protests), and consumers, especially the poor. On the other hand, when agricultural and food prices experience a significant drop, food producers and exporters can be seriously affected, along with governments that must balance accounts.

When food prices experience a significant spike, the food security of poor households, particularly the urban poor and farmers that are net buyers in rural areas, may be at greater risk. In general, high food prices lead poorer households to limit their food consumption and shift to less nutritious diets, which could be harmful to their health (von Braun et al., 2008). Policy responses such as export bans or high export tariffs may reduce the risk of food shortages in particular countries in the short term, but are likely to

backfire by making the international market smaller and more volatile (von Braun et al., 2008). Likewise, export restrictions or price controls can decrease the incentives for farmers to invest in agriculture or to produce more food (van Braun et al., 2008). The FAO (2009) notes that the focus on short-term policy interventions has led in many cases to the neglect of medium- and long-term policies that are needed to raise production. The report further notes that efforts to protect consumers from higher food prices need to be balanced against maintaining incentives for producers to achieve the production levels necessary to stabilize prices and supplies.

A twin-track approach to addressing the problem of high food prices has been proposed by the FAO, the IFAD, and the World Food Program (WFP) (FAO, 2008); an FAO (2009) report; and by a publication by the International Food Policy Institute (IFPRI) as well (van Braun et al., 2008). Under this approach, policy measures would need to address the dichotomy between the short-term need to protect the welfare of the most vulnerable (by providing direct support on an emergency basis), and the medium-term need to revitalize rural economies (by providing public resources and designing policies to re-launch agriculture), (FAO, 2008). The FAO (2009) report further notes that “ultimately, it is increasing agricultural productivity and production that is the foundation for achieving adequate and stable food supplies and prices in the medium and long term, and care must be taken to ensure that short-run emergency measures do not comprise this goal.”

Policy recommendations for the short-term²⁴ include targeting the poor by expanding social safety-net programs that are already in place, such as food or cash transfers; and providing the small-farm sector with access to seeds, fertilizers and credit. Recommendations to improve trade-related policies include the elimination of agricultural export bans. This may help contain pressures on domestic prices initially, but ultimately may exacerbate price instability in world markets.

Using information from 81 countries worldwide, Demeke, Pangrazio and Maetz (2009) report that nine LAC²⁵ countries scaled up or expanded conditional cash transfers, while five provided food assistance.²⁶ As for short-term action to support producers and production, the authors report that interventions were mainly non-market based. Twelve LAC countries implemented production-support programs²⁷, five implemented productive safety nets²⁸, and three implemented fertilizer and seed programs²⁹. Only two countries implemented market-based interventions.³⁰ Recommendations for the medium to long term, or what the IFPRI policy brief calls “the resilience package”, are aimed at calming markets with market-oriented regulation of speculation; shared public grain stocks; strengthening of food-import financing; and reliable food aid. In the medium to longer term, increased productivity and production are seen as the structural solution for stable food supplies and prices (FAO, 2009).

In order to transform the crisis into an opportunity for farmers and to build resilience against future food

²⁴ von Braun et al. 2008 call this “The emergency package”, while FAO (2009) calls it “safety net” measures.

²⁵ Brazil, Chile, Costa Rica, Ecuador, El Salvador, Guyana, Haiti, Mexico, and Suriname.

²⁶ Bahamas, Guatemala, Haiti, Peru, and Suriname.

²⁷ Production support programs are mainly production subsidies, untargeted input subsidies and improved access to credit. The countries were Antigua and Barbuda, Belize, Brazil, Costa Rica, the Dominican Republic, Guyana, Haiti, Jamaica, Nicaragua, Peru, Suriname and Trinidad and Tobago.

²⁸ Productive safety-net programs are targeted input subsidies. The countries were the Dominican Republic, El Salvador, Jamaica, Nicaragua, and Trinidad and Tobago.

²⁹ Seed and fertilizer programs largely aimed at improving availability. The countries were El Salvador, Jamaica, and Trinidad and Tobago.

³⁰ Brazil and Honduras.



crises, a transition to viable long-term investments in support of sustained agricultural growth is needed (von Braun et al., 2008). Productivity increases will require significant and sustained improvements in areas such as Research and Development (R&D), extension services, agricultural and general infrastructure as well as access to credit and risk management instruments, all of which will complement increased price incentives (FAO, 2008). However, the needed supply response is not just a matter of farm-level expansion of production; it must also comprise the whole value chain, with private sector actors in the food-processing and retail industries playing key roles (von Braun et al., 2008).

a. Food Prices and the IDB's approach

IDB projects oriented towards the stabilization of food prices in LAC focus on medium- and long-term plans rather than short-term strategies. Such projects finance and/or create incentives for farmers to adopt new technologies and services that will increase food production; or support communitarian agro-food production and crop diversification, such as in the *Rural Initiatives to Support Food Security* – CRIAR in Bolivia, the Rural Economy Reactivation in Honduras or the

Program to Support Agri-food Production in Nicaragua. Other projects and technical cooperations fund research that aims to predict the possible impacts of food-price increases in LAC. For example, the *Assessment of the Poverty Implications of Rising Global Food Prices*, implemented by the integration and trade sector, developed analytical instruments such as CGE models to evaluate the impact of the increase in global food prices. This project aimed to provide governments with the tools needed to create policies to reduce inequality and poverty. Another approach to addressing food price volatility in the long-term is through projects that aim to improve agri-food safety and competitiveness, some of which have been mentioned in previous sections. The main objective pursued by the IDB throughout these projects is to improve food security and to reduce agricultural income volatility for the rural poor.

Access to credit

In Latin America, there are 108 financial institutions for development (FID), whose main objective is to enhance the development of specific sectors of the economy. These work in twenty-one countries of the region and can be public (69.4%), private (20.4%) or mixed (10.2%)

institutions. Around 30 percent of these institutions provide a percentage of their portfolio to credit for agricultural activities (Trivelli and Venero, 2007). However, rural financial markets in LAC continue to be weak and it has not been possible to provide enough coverage to serve the financial needs of the rural population, especially those with fewer resources.

Tivelli and Venero (2007) note that a diverse number of public projects have been implemented in the region attempting to improve the intensity and coverage of financial services in rural areas; however, the results of these projects have been mixed. More specific to agriculture, Meyer (2002) observes that, relative to total formal credit, agricultural credit from formal sources decreased significantly in the 1990s in ten out of ten countries for which data was available, while agricultural credit declined as a proportion of agricultural GDP in five.

During the 1990s, debate began on the need to develop a new paradigm for rural finance that would consolidate lessons learned from the “old” paradigm of lending with the microfinance revolution. The idea was to form a set of basic principles for the development of a financial system that facilitates rural development (Trivelli and Venero, 2007). Since then, financial institutions for development that provide credit to the agricultural sector have been redefining their lending services and have changed their sectoral focus on agriculture to a multi-sectoral approach. Rather than providing direct credit they have moved towards a second-tier approach, providing finance through intermediaries that specialize in providing credit to the agricultural sector (Trivelli and Venero, 2007).

In recent years, some of the more common approaches aimed at providing access to credit for the rural sector and small-and-medium enterprises (SMEs) have been through partial credit guaranteed loans (PCG), micro-credit through microfinance institutions (MFIs), and projects directly funded by the government. However, while certain agricultural activities have been increasing in recent years, and given the

fact that agricultural finance as a share of GDP has either remained constant or declined, most of this expansion has most likely been financed by informal and non-regulated sources that are not easily captured in official banking statistics (Wenner, 2007). The focus here therefore is on interventions that are more commonly found in the literature and which show the potential for providing credit to rural areas and agricultural producers.

a. Government guarantee funds

In recent years there has been an increasing interest in PCG schemes as an instrument to expand access of SMEs to loans from financial institutions (Levitsky, 1997; Honohan, 2008). PCG schemes are advocated in many developing countries as a means to entice reluctant lenders into lending to clientele groups of interest to governments and donors, such as small farmers, women, microenterprises, and the poor (Meyer and Nagarajan, 1996). Additionality refers to an increase in commercial bank loans to credible clients, in this case usually SMEs, including those working in agriculture, which did not previously have access to credit as a result of inadequate or nonexistent collateral. In this regard, PCG schemes aim to offset situations where borrowers with an equal probability of default have an unequal probability of obtaining credit since some have insufficient collateral (Green, 2003). As such, PCG schemes are a risk transfer and risk-diversification mechanism that lowers the risk to the lender by substituting part of the risk of the counterparty with that of the issuer of the credit guarantee fund, which guarantees repayment of part of the loan upon a default event (Beck, Klapper and Mendoza, 2009).

Credit guarantee schemes emerge for three main reasons (Honohan, 2008). Firstly, the guarantor may have an advantage over the lender in terms of information regarding the borrower’s creditworthiness. Guarantee schemes can help overcome such information asymmetries and improve access to and/or reduce the cost of borrowing for certain groups (Beck et al., 2009). Secondly, guarantees can diversify risk

across lenders, for example where the lender's portfolio is geographically concentrated, but the guarantor may have a diverse portfolio. Lastly, credit guarantees may be able to exploit regulatory arbitrage if the guarantor is not subject to the same regulatory requirements as the lender. By reducing default risk through a PCG, it is expected that lenders will make more loans to credit-rationed clients. Furthermore, the expectation is that lenders will learn that these new clientele groups are not so risky, and will thus be more likely to lend to them in the future without the need for guarantees.

While over two thousand such schemes exist in almost one hundred countries (Green, 2003), they are relatively recent in LAC, where, in general, they were created or expanded during the late 1990s or early on in the first decade of the new millennium (Llisterri et al. 2006). According to Beck et al. (2009), 45 percent of the schemes reviewed targeted SMEs and 41 percent of schemes that were sector specific specialized in agriculture or rural businesses (This 12 out of 29 sector specific programs were for agriculture or rural business)

b. Microfinance

In the last two to three decades, the development of the microfinance industry in Latin America has made considerable progress. In contrast to the promotion of rural credit programs, which absorbed large sums of money over several decades, support for microfinance institutions (MFIs) has increasingly relied on the design of viable financial institutions. In particular, credit programs for small productive units have received large sums of foreign aid to promote their growth and facilitate their access to the formal financial system (Sanabria, 2000).

Harper (2005) observes that microfinance has largely replaced old-style rural finance, which mainly took the form of subsidized low-cost farm credit. The author further notes that rural development finance institutions have in some cases disappeared, and in

others they have been converted into what are effectively specialist MFIs. MFIs are in sharp contrast to the subsidized agricultural credit model, in that they have adopted a financial market perspective in which participants are seen as clients rather than beneficiaries and expect to cover a large amount of their costs rather than rely on government and donor subsidies (Meyer, 2002).

Interestingly, the provision of microfinance is no longer exclusively the domain of institutions for the poor, since in recent years commercial banks and insurance companies are beginning to downscale to reach new markets (Karlan and Goldberg, 2007). In comparing the experience of MFIs in Asia and Latin America, Montgomery and Weiss (2005) observe that while microfinance in Asia was, and continues to be, more focused on servicing the rural poor, in Latin America the notion of commercial profitability was embraced relatively early in this approach, while the target groups have focused generally on microenterprises. The authors further note that in recent years, both regions are experiencing similar trends such as increases in the financial services offered, a move away from traditional group lending to individual lending, and a greater shift towards commercialization of the sector, with Latin America being more advanced in this process.

In general MFIs have avoided less densely populated or diversified rural areas and the financing of seasonal or longer-term crop and livestock activities. A few innovative MFIs, however, have recently led the way in adapting their operations and products to expand into agricultural lending (WB, 2006; IFAD, 2006). They have done so by tailoring procedures and products to seasonal agricultural needs, applying risk management techniques, and adopting new technologies (WB, 2006; IFAD, 2006). This has brought attention to MFIs as a potential mechanism to provide credit to agricultural producers. For instance, in 2002-03, the Consultative Group to Assist the Poor (CGAP), with funding from IFAD, assessed nearly eighty providers of agricultural microfinance to identify sustainable approaches to



providing these services. Successful MFIs have important strengths, such as financial sustainability, excellent portfolio quality, financial products that fit diverse client needs, and a clear commitment and orientation to the poor (WB, 2006; IFAD, 2006). Prudent risk management techniques can increase the outreach of MFIs to less affluent, more remote rural areas and more diversified farmers.

The case for microfinance as an instrument for poverty reduction is simple. If access to credit can be improved, it is argued, the non-destitute chronic poor will be able to finance productive activities that will allow income growth and may provide a path out of poverty, provided that there are no other binding constraints. As for the transitory poor, who are vulnerable to fluctuations in income that bring them close to or below the poverty line, microfinance provides the possibility of credit at times of need either through a loan or savings instrument.

The provision of financial instruments through MFIs can potentially partly address credit constraints and credit rationing experienced by the poor. The avoidance of sharp declines in family expenditure by drawing

on such credit or savings allows consumption smoothing (Montgomery and Weiss, 2005). The expectation is that this will also contribute to the promotion of productive investments that would otherwise be forgone. Moreover, MFIs can help the development of rural financial markets by increasing their pools of “credible” clients (those who have shown themselves to be bankable), while also providing additional financial services such as insurance and savings accounts.

c. Agricultural Credit and the IDB’s approach

There are very few agricultural projects that exclusively target access to credit services. In fact, most of the policies designed by the IDB to promote access to agricultural credit are small components of larger agricultural projects. Agricultural credit access is then perceived mainly as part of a comprehensive strategy to spur rural development rather than a goal per se. The general objective of projects aimed to enhance agricultural credit is to provide funding to grant access to financial services by agricultural producers in order to reduce their vulnerability to shocks and increase their working capital. In other words, the main approach implemented by the IDB has been to

undertake measures to increase the supply of credit in rural areas. Some of these projects are specifically designed to target the rural poor and small-scale producers which are less likely to obtain credit in the formal financial sector.

The main aim of the project *Supporting Food and Agricultural Sector Competitiveness* in the Dominican Republic, for instance, is to enhance agricultural efficiency by creating incentives to adopt new technologies and improve the food system. One of the main components of this project provides US\$0.75 million to establish the means to accomplish this goal, including improvements in the rural credit system. Likewise, in Brazil, the *Self Sufficiency Agrarian Reform Settlement* aims to reduce farmers' dependency on government assistance by creating a "graduation package." Through this program, settlers in rural communities in seven selected states will be granted funds to finance investments in exchange for their labor. This project will also provide assistance to farmers in applying for credit.

Other projects such as the *Multisector Credit Program* in El Salvador aim to increase the supply of agricultural credit by funding public financial institutions such as the Multisector Investment Bank which focuses on credit provision to small businesses including agricultural producers. In Argentina, *La Riojana* is a project under preparation which aims to provide US\$2.9 million in funding to a cooperative of wine and fruit producers called "Cooperativa Vitivinifrutícola de La Rioja Limitada" in order to create a microcredit fund which will improve financing opportunities to small producers who are also members of the cooperative. Additionally, through the Capital Markets and Financial Institutions Division, the IDB has also implemented projects that target agricultural producers. For example, in Paraguay, the *Second Program to Provide Financing to the Development Finance Agency* provides funds to finan-

ce, among other things, agricultural machinery, working capital, and investment in farm projects among production cooperatives in rural areas.

Most of the IDB's efforts to improve access to credit for small farmers in Latin America are channeled through projects developed by the Multilateral Investment Fund (MIF)³¹ with the objective of fostering agricultural productivity through increasing credit supply in rural areas. For example, the project *Rural Productive Credit and Microsavings in Bolivia* aims to expand access to credit to small producers in seven underserved regions in Bolivia. A similar approach has been followed in Jamaica with the program *Expanding Access to Rural Micro Credit in Jamaica*. This project provides financial support to a microfinance organization called Micro Enterprise Financing Limited in order to increase their financial services provision to microenterprises and small producers in rural areas. In addition to targeting small producers, some of these projects explicitly target women and indigenous producers. For example, the *Institutional Strengthening Micro Credit Program* (MUDE) aims to increase the supply of credit for women with microenterprises in rural areas in the Dominican Republic.

Another approach undertaken by the IDB to reduce farmers' financial constraints is to provide cash transfers to small- and medium-scale farmers. By doing so, the IDB aims to increase farmers' liquidity, and increase productivity and competitiveness. For example, one of the components of the *PROCAMPO Support Program* implemented in Mexico aimed to provide payments to farmers before the planting season in order to improve producers' liquidity, lower financial costs and therefore increase their income and productivity. Also, in Paraguay, the IDB supported the development of an agricultural subsidy scheme with the purpose of increasing small- and medium-scale producers' productivity through the project *Moderni-*

³¹ For information regarding the MIF: <http://www.iadb.org/mif>

zation of Agricultural Support Management. As with cash transfer programs, some projects promoted by the IDB reduce farmers' liquidity constraints by providing funds to finance rural investment directly. For example, in Nicaragua, the *Rural Production Reactivation Program* (PRPR) provides liquidity to groups of organized farmers to undertake productive investments. Also, through this project, the IDB provides assistance to Ministerio Agropecuario y Forestal, the Ministry of Agriculture and Forestry in order to enhance credit supply mechanisms.

Access to Insurance

The high degree of risk in the agricultural sector, especially given that it is often dominated by producers with low-incomes and scarce assets, has serious implications for economic growth, social equity and poverty alleviation. Yet modern insurance instruments are still not easily accessible to most farmers in the developing world, and the insurance market in LAC is still quite small. For quite some time, the more traditional agricultural insurance instruments have consisted of single-peril or multiple-peril instruments that cover losses due to hail, wind, flood, fire, frost, etc. The former pays indemnities for losses incurred for a single risk, while the latter pays for losses incurred from a broader range of risks. These instruments require an insurance adjuster to verify assets (*ex ante*) and losses (*ex post*) on individual farms.

Historically, private crop insurance in developed countries has been limited to single-peril products. However, and due to market failures, governments have used the failure of the private sector to provide affordable insurance products as a justification to enter as a direct or indirect insurance provider (Wenner and Arias, 2002).

While government-backed programs have generally been good in terms of coverage in developed countries, they have not been successful in terms of economic soundness in either developed or developing countries. Indeed, as Wenner and Arias (2002) note, traditional

agricultural insurance programs have been financial failures due to high administrative costs and unresolved adverse selection and moral hazard problems. These programs have been characterized by a significant reliance on subsidies on premiums to farmers, operational subsidies to insurers, and subsidized reinsurance. Until now, no agricultural insurance program in the world has been able to fully cover its own indemnity payments and administrative costs with the collected premiums. Perhaps the one exception would be an insurance program in Mexico (AGROASEMEX), which has been spearheading the sale of index-based insurance instruments with the support of the government and with innovative approaches.

In recent years, innovative insurance instruments have been developed to provide alternatives for dealing with agricultural risk. These instruments are tied to the performance of some indices, where the probability distribution of a risk taking place can be estimated and the actual event can be measured. In this regard indemnity payments are contingent on an objective index reaching a predetermined trigger level. Thus, the protection granted to clients is based on the assumption that the index correlates with expected production losses to a certain degree (Arias and Covarrubias, 2006). Under this approach, these schemes also aim to address traditional problems related to adverse selection and moral hazard. The two main categories of index-based insurance products are weather-based and area-yield index products; however, new instruments have been developed using the same principles.

a. Weather-based and Area-yield Indices

Weather-based index insurance has been in use recently in Mexico, Morocco, India, and Nicaragua. Under this approach, indemnity payments are made if a specific event, such as rain, reaches a pre-determined level or index in a given time period and a given geographic demarcation. The index can be a variety of weather indicators, such as temperature, humidity, wind speed, days of sunshine, or rainfall. Key to this approach is the fact that there is no need for on-farm

verification of losses; indemnification takes place for those insured at the onset of the event, whether or not the insured suffered losses during the event. Weather-based insurance thus allows individuals to mitigate against production risk through a system that is independent of individual production (Arias and Covarrubias, 2006).

Area-yield index insurance has been used in the U.S., India, Brazil, Canada, and Sweden. Under this approach, indemnity payment contracts are based on average area yields in a pre-specified area or region. If the average yield of a given agricultural product (livestock or crop) falls below a certain level, indemnity payments are triggered (Arias and Covarrubias, 2006).

Weather-based and area-yield index insurance schemes help address issues of adverse selection and moral hazard. The method by which a payout is made is based on an exogenous, verifiable event whose occurrence is not tied to client behavior. By eliminating the individual determination of indemnification, moral hazard is reduced or eliminated (Skees et al., 2002). Moreover, the fact that the measurements of the indices used under this framework are performed by independent entities makes these instruments more transparent and objective, further reducing moral hazard (Arias and Covarrubias, 2006). Given the fact that all buyers in a region pay the same premium and receive the same indemnity per unit of insurance, it also avoids adverse selection problems (Hazell and Skees, 2005). Administrative costs are also lower since it is unnecessary to supervise and/or monitor each client.

b. Agricultural Insurance and the IDB's approach

During the last ten years the IDB has not executed any loans for agricultural projects that directly finance the implementation of agricultural insurance. Most of the projects related to this topic aim to study the issues associated with the organization, implementation and sustainability of agricultural insurance in rural areas such as the technical cooperation *Managing Climatic Risks in Rural Areas of Latin America*.

Investment in Agricultural Innovation

Due to the public good nature of R&D, insufficient access to capital, and a misunderstanding or misperception of the opportunities arising from innovation, farmers and private-sector companies generally invest less in innovation than is optimal at the individual and social levels. As a result, in recent years governments and development agencies have supplemented private innovation efforts by providing funds and establishing research capacity in publicly-funded research organizations (Pomareda and Hartwich, 2006). Two of the more common instruments used to foster and/or disseminate new agricultural innovations are competitive funds for R&D, and extension services.

a. Competitive funds or Grants

While the private sector may expand its role in developing agricultural technology in the future, the public sector is still the main source of funding for agricultural research in developing countries (Echeverría, 1998). However, the more traditional forms of direct appropriations for research institutes have been changing, and new instruments for funding have been created. In particular, efforts have been made in recent years to revitalize agricultural R&D by relating funding more closely to performance. Competitive grants or funds are one of the more common instruments of this kind and are a pool of public funds designed to support the development of new technologies, and in many instances these grants are specifically allocated for the development of agricultural technology (Gill and Carney, 1999). These approaches can cover research and technology delivery. When they are established a set of rules guiding the use, management and accountability arrangements of the funds are put in place in order to ensure objectives are met.

A key component of competitive grants is open competition to work on an agreed agenda for the development and delivery of agricultural technology (Gill and Carney, 1999). Although specific objectives vary,

Kampen (1997) identifies a number of features common to many competitive agricultural funds, such as: (i) an autonomous or semi-autonomous status in relation to all stakeholders; (ii) priority areas clearly derived from national policy priorities; (iii) a requirement to provide evidence that the proposed research is demand-driven; (iv) a set of rules that encourages the widest possible participation; (v) a widely-advertised program and conditions for application; (vi) peer-review procedures that are clear, transparent, professional and anonymous; (vii) a financial and administrative review process that balances priority and quality with cost; (viii) adequate financial provision; (ix) integrity, independence, accountability and quality management; (x) non-intrusive monitoring of progress by competent reviewers; and (xi) institutionalized evaluation and impact assessment.³²

More specifically, competitive schemes can be classified according to three characteristics: their national, regional, or international reach; their stated objectives and governance; and whether they are from endowed trusts or one-off funds (Echeverría, 1998). At the national level, they are supported by, among others, science and technology (S&T) councils (which cover multiple sectors) and agricultural technology funds. The former, usually falling under the ministry of education or ministry of S&T, offer competitive grants for the advancement of science, prioritizing basic research. The latter focus on applied research expected to contribute to developing the agricultural sector.

Most agricultural funds operate on competitive principles and evaluate research proposals on their perceived merit according to predefined national agricultural research priorities. The defining criteria for such priorities is usually the extent to which the research project contributes (with a new technology) to the potential development of the sector (Echeverría, 1998). Market and enterprise development grants play an

additional role in innovation development and can be given to private enterprise, including farms and other household enterprises, for investment efforts, especially in training, technology, and innovation. With community-driven development, grants are used for income-generating investments in community-managed projects and for economic activities at the household level (van der Meer and Noordam, 2004). Under the competitive grants approach, individuals, communities or firms compete for grants to either demand or develop and provide agricultural technologies.³³ In this regard, competitive grants aim to foster demand-driven development of agricultural R&D.

The prime justification for encouraging firms to invest in R&D through public financing is the need to correct market failures in innovative efforts arising from financial constraints and lack of appropriability (Hall and Maffioli, 2008). Competitive agricultural technology funds, it is argued, can spur a virtuous cycle of more relevant, demand-driven and cost effective R&D, and this in turn will lead to increased sustainability of funding (Gill and Carney, 1999). The expectation is that state support in the provision of grants will stimulate private sector involvement and investment in the development of new technologies. It is hoped that the demand-driven approach of these schemes will foster the development of this market for innovation. Likewise it is hoped that their structure will improve governance, client-orientation and increase diversification of research suppliers. The dissemination of new technologies should also contribute to improvements in productivity and in the reduction of poverty.

Competitive funds are not necessarily confined to individual LAC countries. In fact, there is growing support for regional and international partnerships in agricultural research, which appear to have proved successful in allowing countries to keep up with global scientific developments and issues, and have allowed

³² As presented in Gill and Carney (1999).

³³ There are obviously other sectors that participate in these schemes, since they are not restricted to agriculture.



different research networks to specialize in particular areas (Stads and Beintema, 2009). Such collaboration also allows for spillover effects through the ease of technology transfer. One way to facilitate such collaboration is through regional competitive funds.

b. Extension

Agricultural extension can be defined as “both a system and the set of functions performed by that system to induce voluntary change among rural people” (Feder, Willett and Zijp, 1999). Among these functions one can include the transfer of technology, the transfer of management and the transfer of knowledge and capacities.³⁴ This conception of extension as a system distinguishes it from the traditional definition, of a single organization providing agricultural advice. The system includes public, private and semi-public agents that fund and provide services related to the above-mentioned functions (Zijp, 1998). Since the function of extension is now seen as broader than providing agricultural advice, the rationale behind its public funding has changed. Alex and Rivera (2005)

broaden the limits of extension even more. By reviewing a vast number of case studies, they suggest that extension should be linked not only to agricultural development, but also to rural development. Thus, they contemplate other functions of extension such as marketing, environmental conservation and farmer organization development.

The two general objectives of extension programs are then: (i) providing technical educational services to farmers and, (ii) fostering a two-way flow of information between farmers and the suppliers of technology (Evenson, 2001). The latter objective is closely related to the accountability problem of traditional public extension services, which was one of the main arguments for their reform. The aim of extension programs then is to empower farmers through information so that they can participate in the extension process (WB, 1999).

The main argument for public financing of extension services is that some of the assumptions regarding Pareto optimality may not be satisfied under pure

³⁴ Similar definitions are found for example in Birkhaeuser, Evenson and Feder (1991), Evenson (2001), and Owens, Hoddinott and Kinsey (2001).

private provision. The classic justification for public funding is that the knowledge gained through extension services is by nature a public good. Instructions on how to use productive resources or on the usefulness of new technologies are, in general, public goods, since they are non-rival, non-excludable and their benefits are difficult to appropriate. The transmission of this kind of knowledge between farmers is usually free and difficult to prevent. When a good is characterized by easy-to-copy techniques fee-for-service extension is unlikely to work, unless the technique is embodied in a rival and excludable product or their purchases are tied to one of these products, such as a machine or a productive input (Hanson and Just, 2001). The discussion on excludability and rivalry has dominated the literature in considering whether extension services are private or public goods (Anderson and Feder, 2003). The strict definition of a “pure public good” would imply that the knowledge transmitted in extension could not be excluded, not even partially. In other words, because its benefits could not be internalized by an agent, it would not be possible to delimit property rights or, therefore, to prevent this good from being used by charging a price.

The classic work by Coase (1974) makes it clear that no good is public in essence. In fact, knowledge transmitted by extension can be embodied in another product, or it can have a specific character, such as advice regarding a particular problem in the production process of one farmer. In these latter cases, excludability is possible and extension becomes a private good for which farmers could be disposed to pay, according to its perceived productivity (Anderson and Feder, 2004; Dinar, 1996). Furthermore, information embodied in a locally available input that must be purchased becomes a rival common pool good (Anderson and Feder, 2003; Umali and Schwartz, 1994). This implies that the characteristics of the transferred knowledge determine the best way of producing or financing extension services. As Anderson and Feder (2004) remark, information associated with market goods is generally left to private hands, while that related to toll goods (with high excludability but low rivalry) is left to a com-

bination of public and private provision. On the other hand, they suggest that information on common pool goods (with high rivalry and low excludability) would be better managed by cooperatives or NGOs. Only in the case of non-rival, non-excludable information do they recommend public financing, with the possibility of privately-producing extension services.

The traditional public extension system has taken exclusive responsibility for financing extension on the basis of its public good quality, without considering the limits of this approach. In some other cases, public funding has been justified by social goals such as fighting poverty and aiding disadvantaged groups (Feder et al., 1999). As we discuss below, this makes sense under some circumstances in which private sector provision cannot reach these groups. However, due to the inability of the public sector system to achieve a broad coverage, it would be necessary to explain how it would efficiently serve these disadvantaged populations. The literature usually recommends improving the targeting and the scope of public programs, leaving some functions to the private sector.

There are also other interesting theoretical problems related to private extension services. Hanson and Just (2001) note that the original objective of U.S. Cooperative Extension in 1914 was to diffuse information on new technologies, which is justified under the assumption of asymmetric information between farmers and extension agents. In particular, the fact that there could be asymmetric knowledge of the value of the service itself implies that benefits are difficult to appropriate through market prices, even in the case of rival and excludable information. The problem of asymmetric information can be made even more acute by remoteness and sparseness. Remoteness provides another argument for public provision, since in order to profitably reach remote areas it is necessary to have economies of scope, and having a broad range of products to offer is more difficult for a private agent than for the public system. Furthermore, the difficulty in identifying the effects of new techniques suggested by the extension agent makes the appropriability is-

sue of extension services more compelling. Once these new techniques are standardized, benefits become identifiable and it becomes easier to put a value on the extension service and to charge a fee for it. (Hanson and Just, 2001).

Under imperfect markets with credit constraints the issue of affordability also becomes relevant. Low-income farms, especially those with no land titles, may not be able to purchase extension services even with social and private profits higher than costs. Again, asymmetric information between lenders and farmers and the uncertainty in agricultural production leads to imperfect credit markets. However, the solution does not necessarily imply public provision. Subsidized credit at the beginning of the diffusion process can change the perception of lenders and diminish the problem of credit constraints (Sunding and Zilberman, 2001).

Duflo, Kremer and Robinson (2004) detect a problem of commitment in the purchase of fertilizer that could be relevant for extension. They find that, in their case, farmers behave as hyperbolic discounters who, more than subsidized credit, need a device that commits them to purchasing fertilizer when they have the money to do so. Finally, environmental issues create another source of externalities that the private sector cannot deal with. Educating farmers about pollution control and the use of clean technologies is increasingly incorporated in the agenda of public extension programs all around the world.

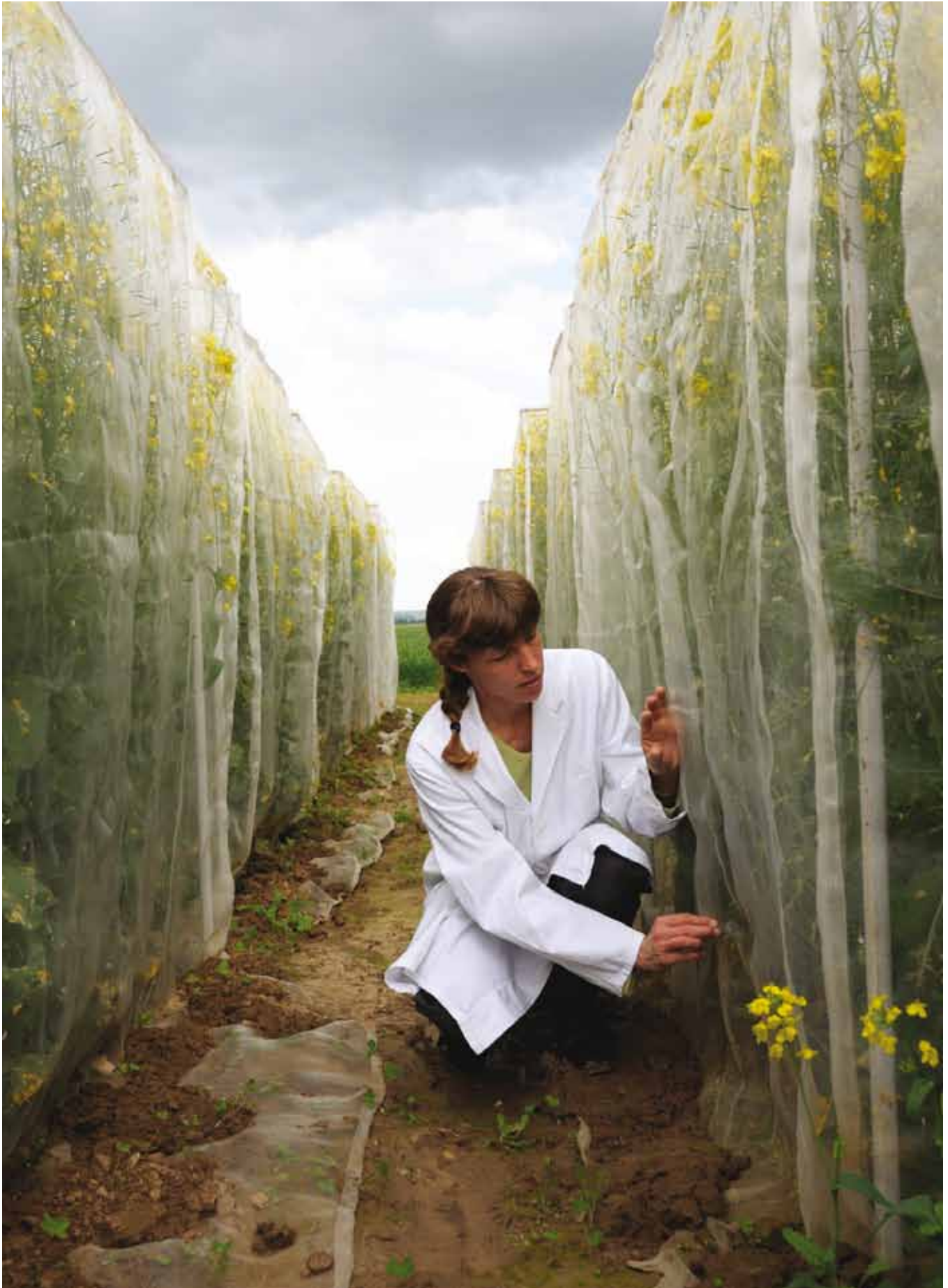
Demand-led, participatory targeting and prioritization approaches are being increasingly applied in agricultural research, extension and development (Scoones and Thompson, 1994). In this area there has been an explosion in the number and variety of methods and tools, from the more traditional participatory technology development and rapid rural appraisals, to the promotion of local farmers' research committees and farmers' field schools, participation of farmers and farmers' organizations in the boards of the research and extension agencies and the relatively recent development of competitive agricultural technology funds.

c. Agricultural Research, Innovation and Extension: the IDB's approach

Many of the projects mentioned in previous sections (such as access to markets, land titling, irrigation, and livestock, among others) include agricultural research as one of their main components rather than a purpose per se. However, three additional projects (in Argentina, Brazil and Venezuela) have explicitly named agricultural research as their major component, one of which is in preparation and two of which are being implemented. These projects amount to US\$205 million. Additionally, most of the IDB operations aimed at supporting national S&T programs throughout the region allow the financing of agricultural research and innovation activities.

The IDB strategy with respect to agricultural research has been focused on three main pillars: first, to finance research on high-value and high-quality products that will increase agricultural competitiveness and promote exports; second, to support collaborative research among private and public institutions and other organizations to increase regional and international integration; and third, to strengthen institutional capacity in order to undertake research projects at the local and national level. This approach is consistent with the general IDB approach to S&T policies. As highlighted in Chapter IV of Part II of the *Development Effectiveness Overview 2008-2009*, this approach focuses not only on typical market failures related to research and innovation activities, but also supports the development of both national and sub-national systems of innovation.

The Bank finances various loan operations to promote scientific research and to support innovation in the private sector, including competitive research grants, matching grants, horizontal subsidies, guaranteed loans, targeted credit lines, and procurement programs. It also supports the reinforcement of the absorptive capacity of the region via the development of human capital, with scholarships for post-graduate studies, incentives for the insertion of post-graduate



students into the business sector and incentives for scientists based on performance. Finally, the Bank finances the modernization or replacement of deteriorating research infrastructures.

An example of a Bank operation specifically targeted at agricultural research is the Brazilian project *Technological Innovation & New Management Approaches in Agricultural Research (AGROFUTURO)*. The project provides US\$14.18 million which is expected to finance 135 research projects in five years. These research projects are related to agri-food health, biodiversity conservation, organic agriculture, hydroponic and family agriculture. Another US\$33.15 million has been allocated to conduct research on natural resource sustainability, genetic resources, biotechnology and biosafety. In addition, the project stipulates US\$3 million to finance collaborative research between Empresa Brasileira de Pesquisa Agropecuária, the Brazilian Agricultural Research Corporation (EMBRAPA), the Consultative Group on International Agricultural Research (CGIAR), the Regional Technical Cooperation Program with Institutions in the Southern Cone (PROCISUR) and the Technology Transfer Research Cooperation Program for the South American Tropics (PROCITROPICOS). With respect to institutional strengthening, the IDB has allocated US\$22.5 million through the *Agricultural Technology Program* project in Venezuela in order to reform Instituto Nacional de Investigaciones Agrícolas, the National Institute for Agricultural Research (INIA). The components from this project include, among others, technical modernization, consolidation of the financial administration information system, advisory services, implementation of the INIA Foundation, and purchase of equipment and infrastructure, among others.

The Bank's traditional S&T operations usually support agricultural research and innovation through multi-sector lines of financing. In a few cases, they also include specific instruments, such as the agro-industry

research and innovation sectoral fund developed in the context of the Argentinean Technology Modernization Program. In addition to financing, these operations play a key role in fostering the integration of agricultural research agents into broader national innovation systems, significantly reducing the negative effects of historical coordination failures.³⁵

In terms of extension services, the Bank has focused its efforts on identifying new models of interaction between public and private agents involved in the transfer of agricultural technology. *The Modernization of Agricultural Services I* (PROMSA) financed in Ecuador by the IDB in 1996 was the first of a series of operations where the private sector played an important role in the provision, management and financing of agricultural extension services. In the specific case of PROMSA, not only were the services performed by certified private providers, but also the contracting, monitoring and evaluation of these providers were the responsibility of an executive technical unit run by a private consortium. Thus, the role of the public sector was restricted to the co-financing of the services, monitoring and supervision of the system.

The main purpose of such a structure was to allow for some administrative flexibility which is often lacking when services are directly provided by public agencies. Each provider offered its services to assigned locations (village, community), where they organized groups of farmers to whom they would provide agricultural extension services for a certain period of time. Grouping farmers together in this way intended not only to reduce unit costs for the provision of extension services (and other financial and non-financial services), but also to lay the groundwork for other valuable associative projects that could add economic value to their productive efforts. Similar mechanisms with some degree of variation were adopted in other subsequent IDB operations, such as the *Farm Modernization and Development Program* (PREDEG),

³⁵ See Chapter IV section D for a complete review of the intervention logic and development effectiveness of the IDB's S&T operations.

the *Cattle Development Project and the Productivity Support and Development of New Livestock Products* in Uruguay, and the *Agricultural Modernization Program* (PROMOSA) in Panama. They were also adopted in some components of the *Provincial Agricultural Services* (PROSAP) in Argentina and, more recently, in the *Agricultural Innovation Supports Program* (PATCA) in the Dominican Republic, among others.

Although the compensation schemes varied across the different projects, they always aimed to facilitate the creation of a market for agricultural services. In the PROMSA case, for example, the providers would receive a fixed annual fee for each group of farmers. However, the public-private composition of the funding was to vary over time; the first year 95 percent of the money came from the program, but that amount was gradually to be reduced until contributions by farmers represented about a third of the total cost. This financing mechanism is key to the consolidation of a private market for technical assistance as it contributes to the growth of a culture among small-scale farmers of paying for this kind of service. It also entitles farmers to demand a high-quality service.

IV. RESPONSES TO POLICY ISSUES

Current Policy Bias Against Agriculture

Although there has been some shift in policy (noted in Chapter I with respect to “getting prices right”), there remains a substantial degree of urban bias in development policy due to a combination of domestic and international factors (Bezemer and Heady, 2008). This has been reflected in official development assistance (ODA) provided in the last few decades. Brathwaite (2009) reports that between 1985 and 2002, ODA to agriculture declined by about 66 percent in real-dollar

terms. The World Bank’s funding for agriculture fell from 30 percent in 1980 to 7 percent in 2003 and in 2002 only three percent of the IDB’s loan portfolio was devoted to the food and agriculture sector. Further, Brathwaite reports that according to FAO statistics, although 40 percent of the population of LAC lives in rural areas³⁶, only 6.6 percent of public budgetary expenditure is devoted to agriculture and related rural activities. The amount being invested in the rural economy in LAC declined from \$205 per capita between 1985 and 1990 to \$140 per capita between 1995 and 2001. Although this shift in funding may partially reflect the emergence of other sectors, it does not suggest that a shift towards agriculture has occurred to compensate for earlier policy bias. Finally, he notes that in recent years this trend appears to have shifted, with rural areas receiving greater funding.

Smallholder-targeted Policies

As mentioned in Chapter I, in an age of market liberalization, globalization and expanding supermarkets and agribusinesses, there is fear that small-scale farmers will find it difficult to fully participate in and take advantage of the new agricultural economy. In many countries, such farmers could become more marginalized as large-scale farmers become increasingly necessary for a profitable operation (Eaton and Shepherd, 2001). Market liberalization raises a number of issues from a poverty alleviation standpoint. For instance, it is clear that changes in patterns of agricultural production are taking place on a global scale in terms of the composition of production, the expectation of higher quality products and food standards, and an increasing demand from local markets, particularly supermarkets and agribusinesses (Reardon and Berdegúe, 2002). Yet it is not clear who will benefit from these changes. There is a risk that sma-

³⁶ This is higher than reported elsewhere (generally 25%) since FAO has developed an alternative method for defining rural.

llholders in developing countries will become more marginalized and be left out of the increase in wealth arising from the liberalization of domestic and international markets (Simmons, 2002).

There have been a number of approaches aimed at supporting the inclusion of small-scale farmers in domestic and international markets. Some have been spearheaded by the private sector, such as contract farming, while other efforts have been carried out by a collaboration of NGOs, aid agencies, and local governments. Governments have also played a role in supporting small-farmer participation in local and international markets through the financing of projects that incorporate small-scale farmers into the local and international agro-industry, while others have focused on product differentiation or niche markets, such as Fair Trade or organic agriculture.

Primarily with the support of NGOs, aid agencies and to a certain degree local governments, small farmers have been able to gain a foothold in Fair Trade markets. In recent years, the 'fair trading' of agricultural products has emerged as a key tool to create markets for poor and small-scale farmers and simultaneously promote pro-poor development (Farnworth and Goodman, 2006). Indeed, LAC accounts for around two-thirds or more of the certified producers in the world (Farnworth and Goodman, 2006; Lyon, 2006, as presented in Berdegue et al., 2006).

Similarly, in recent years, agencies working with poverty-reduction projects have viewed organic agriculture as a promising alternative for small farmers (IFAD, 2003). Organic agriculture has also attracted great interest in LAC, mainly because of the rapid growth in demand for organic agricultural products which many governments see as a potential source of agricultural diversification (IFAD, 2003). In some countries, the production of certain organic products has become quite significant. For instance, 70 percent of bananas produced in the Dominican Republic are organic; more than 50 percent of sugar produced in Paraguay is organic; and 20 percent of coffee produ-

ced in Bolivia is organic (International Federation of Organic Agriculture Movements [IFOAM], 2006).

As can be seen in the previous sections, many IDB-funded agricultural projects include a focus on small- and medium-size farms. For example, projects that focus on land titling attempt to target smallholders, agribusiness targets small- and medium-size enterprises, special projects often seek to link smallholders to high value markets, credit components in projects specially focus on smallholders and extension services seek to promote technology among this population. By emphasizing smallholders in these projects the IDB helps support the inclusion of small-scale farmers into the new agricultural economy so they can remain competitive and benefit from new opportunities.

Investments in Agricultural Infrastructure

The importance of good infrastructure for agricultural development is widely recognized. Numerous studies demonstrate that investment in infrastructure is fundamental to increasing farmers' access to input and output markets, to stimulating non-farm activities, vitalizing rural communities, increasing consumer demand in rural areas, and to facilitating the integration of poorer areas into local, national, and international economies (Pinstrup-Andersen and Shimokawa, 2006). Yet despite the well-documented importance of rural infrastructure in promoting growth and poverty alleviation, the high economic rates of return to investment in rural infrastructure, and the major deficiencies of rural infrastructure in most developing countries, neither national governments nor international aid agencies seem to prioritize investment in new infrastructure or the maintenance of existing infrastructure (Pinstrup-Andersen and Shimokawa, 2006).

Recent studies on the general topic of "rural infrastructure" tend to define it broadly as including not only productive investments for agricultural development, but also consumptive investments such as public health services, basic education, and residential

water supplies and sanitation. A recent report by the FAO (Warner, Kahan and Lehel, 2009) takes a more narrow approach to the definition.³⁷ It defines infrastructure as “physical structures that aid the competitiveness of the productive agricultural sector, and the related organizational systems that support their planning, procurement, design, construction, regulation, operation, and maintenance”. The focus here is on the following five areas, outlined in the above mentioned report: (i) farm-to-market roads; (ii) water for irrigation; (iii) wholesale markets and trading centers; (iv) agro-processing facilities; and (v) information and communication. Water for irrigation is discussed under resource-related challenges, so the focus here is on the other forms of infrastructure.

a. Rural roads

An efficient and adequate marketing system is a precondition for agricultural diversification, providing better prices to producers and making competitively-priced produce available to consumers. Tracey-White (1999) notes that physical improvements are usually addressed in two ways: (i) by providing improved market infrastructure (both rural and urban); and (ii) by improving rural access roads.

Focusing on the delivery side alone, by reducing transport costs, roads are expected to generate market activity, affect input and output prices, foster economic linkages that enhance agricultural production, and alter land use, crop intensity and other production decisions, while also stimulating off-farm diversification and other income-earning opportunities and encouraging migration (van de Walle, 2009). The rationale behind government investment in roads lies in their public good quality. Roads are typically indivisible, have low excludability, long life, and are ra-

rely traded. This is particularly true in the case of the agricultural sector and rural areas, since the private sector is principally attracted to urban and intercity projects where traffic volumes are high and reliable (Warner, Kahan and Lehel, 2009). On the other hand, rural areas are characterized by low-income levels and low-vehicle volumes, which means that in many rural areas neither road construction, rehabilitation nor routine maintenance can be financed from user fees or tolls alone (Warner, Kahan and Lehel, 2009).

b. Wholesale markets

Wholesale markets have long been considered an essential component of any agricultural marketing system (Seidler, 2001; Shepherd, 2004), particularly horticulture (Seidler, 2001). However, there has been a debate as to whether wholesale markets are needed, in light of the rapid changes taking place within the food-marketing chain, particularly in the direct marketing between large farmers and the increasingly integrated food marketing chains, represented by hypermarkets, supermarkets and chain stores (Seidler, 2001; Shepherd, 2004). Yet despite these significant changes, Seidler (2001) posits that in countries where the farm structure and the marketing system remain fragmented, and cooperatives and farmer associations are largely underdeveloped, wholesale markets are still needed to provide farmers with effective and profitable marketing outlets for their produce.

Wholesale markets and trading centers include all physical structures and related facilities for the primary and secondary storage, assembly, trading, and pre-distribution of agricultural inputs, produce and livestock (Warner, Kahan and Lehel, 2009). Tracey-White (1999) identifies internal and external factors that are putting pressure to change on marketing

³⁷ For alternative definitions of “rural infrastructure” see Ahmed, R., and C. Donovan (1992): *Issues of Infrastructural Development: A Synthesis of the Literature*. International Food Policy Research Institute. Washington, D.C.: IFPRI.



systems. Internal factors are related to changes that are taking place in the organizational structure of commerce³⁸ and operational practices within markets.³⁹ External factors are related to demographic factors⁴⁰, changes in transportation patterns⁴¹ and changes brought about by new legislation and greater public awareness.⁴²

In Latin America, public wholesale markets constructed between the 1960s and 1970s (e.g. in São Paulo, Mexico City and Bogotá) have failed to keep pace with new developments in food marketing, such as the emergence of supermarket chains. Infrastructure in these locations, and in Caracas and some Central American capitals, have now deteriorated. In other locations, such as La Paz, Bolivia, initial enthusiasm for wholesale markets has not been carried past the feasibility stage (Warner, Kahan and Lehel, 2009).

c. Agro-processing facilities

Agro-processing facilities that add value to products produced by private sector farmers are essentially commercial ventures and can include facilities for freezing and processing meat and fish; milk cooling and dairy processing; cereal milling and refining plants; fruit processing; and various forms of bottling and packing. Yet there are many circumstances in developing countries in which the provision of such facilities would not take place if left to the free market, and their development and efficient operation could be considered a public good, not least in the form of improved farm income, employment opportunities, food security and tax revenues (Warner, Kahan and Lehel, 2009).

³⁸ Increasing volumes of produce handled; alterations to commercial practices and trading patterns; and the emergence of professional, specialized wholesalers.

³⁹ Examples are the introduction of fork-lift trucks and other mechanical methods; introduction of new grading standards and different packaging methods; and changes in user requirements that lead to a need for modernization and repair.

⁴⁰ Overall increases in population that overwhelm existing market capacity and road systems.

⁴¹ Increased traffic growth and resulting congestion; shifts in transport mode and in the capacity and size of delivery and distribution trucks.

⁴² New town-planning controls and zoning regulations; environmental impact and energy-conservation controls; and increasing consumer-protection laws, including public health, food quality and safety regulations.



As well as helping farmers access new urban and international markets, agro-processing facilities are a means to prevent economic losses (Larsen, Kim and Theus, 2009). Post-harvest losses in Africa average around 50 percent for fruit, potatoes and vegetables, twice that of developing countries as a whole. Without cold storage and related cold-chain facilities, farmers are often forced to collectively sell their produce immediately after harvesting, resulting in low prices. Ten-year economic returns for investment in post-harvest and related infrastructure in Africa, such as refrigeration, are estimated at around 500 percent (Warner, Kahan and Lehel, 2009). In recent years, access to processing facilities in intermediate urban centers has been viewed as a key element in promoting market linkages between rural and urban areas, and fostering rural and regional development and poverty reduction (Satterthwaite and Tacoli, 2003; Tracey-White, 2005).

d. Rural information and communication

At the beginning of the 21st century, the average number of mobile phones per 100 people in Asia, Africa, and LAC has risen by 100 to 400% in a span of just five years (Orbicom, 2007 as presented in Rashid and Elder, 2009). In recent years, mobile phone techno-

logy has been recognized as having great potential to contribute to development policies, especially in rural areas. For instance, mobile phone technology can provide access to information that helps increase income in low-income communities by reducing the disparity in market prices and enabling producers to adjust production to demand (IDB, 2008). Indeed, information is regarded by economists as a fundamental element in the efficient functioning of markets (Bhavnani et al. 2008). Likewise, mobile phones can also expand access to public services (IDB, 2008).

e. Agricultural infrastructure investment and the IDB's approach

As mentioned in previous sections, the IDB has strongly supported projects that finance agricultural infrastructure. These projects are usually implemented in the form of direct investments by providing funds to central and local governments to undertake infrastructure construction and maintenance or by financing private infrastructure-related projects.

Most of the agricultural infrastructure projects financed by the IDB are related to rural road construction and maintenance and improvement of agro-processing facilities. The former are mainly implemented

by the Transportation sector of the IDB through direct financing to central or municipal governments. For example, the *Sustainable Rural Roads Program* in El Salvador provides US\$105 million line of credit to rehabilitate and maintain rural roads. A similar project was also implemented in Peru (*Rural Transportation Infrastructure*) and Ecuador (*Rural Transportation Infrastructure PIRT*), among others. Other projects such as the *Tucuman Sustainable Development project* in Argentina provide funding to build and rehabilitate rural roads and water infrastructure. Yet other projects, such as the *Supplementary Financing Program for Sustainable Development in Darien* project in Panama, the *South West Tocantins Region Development Program* in Brazil and the *Provincial Agricultural Services II-PROSAP II* in Argentina, also provide funding for building or rehabilitating complementary infrastructure such as rural roads, ports, small airports, etc. These projects aim to increase agricultural competitiveness by linking farmers to markets and reducing transaction costs.

As mentioned earlier, agricultural infrastructure projects tend to create positive externalities and therefore, their supply is less than is socially optimal. To create incentives to increase the supply of these projects, the IDB also provides incentives to private investors to undertake agricultural infrastructure projects to improve agro-processing facilities, enhance access to storage and packing, undertake productive investments, among others. Examples of such projects are the *Diversification of Agricultural Production* in Paraguay and the *Rural Economy project* in Honduras.

Many developing country governments and development institutions are focusing on extending telecommunications services into rural areas, as they aim to alleviate poverty, encourage economic and social growth, and overcome a perceived digital divide (Bha-

vnani et al., 2008). The IDB has made progress in promoting the use of mobile technology. For instance, in 2008 it launched an initiative for inclusive innovation, helping underserved groups to use mobile phone technology to improve access to health information (m-Health) and government services (m-Government).

Likewise, the IDB recently implemented the *Mobile Citizen Program* in partnership with the Italian government through the Italian Trust Fund for Information and Communication Technology for Development. The program aims to accelerate the development and implementation of mobile services to address acute social and economic problems. It will provide support in developing citizen-centric solutions that target low-income groups in urban and rural areas of the LAC region. The main program objectives are: (i) to strengthen local technical capacity to design and develop mobile services; (ii) to seek empirical evidence of social and economic impact that can demonstrate the genuine potential of mobile services to policy makers and entrepreneurs; and (iii) design and establish business models that would enable replication and scaling up of mobile services developed through the program. In particular the program will focus on the following areas, with special attention given to gender and diversity issues: health, education, government, commerce, social protection, and employment.⁴³

Institutional Transformation⁴⁴

With respect to institutional transformation of the agricultural public sector, rather than specific policies, there have been various key changes made over the years. These changes reflect the need to make the public sector more responsive to the complexities of an integrated global economy and that takes into consideration the heterogeneity of producers and

⁴³ See For more information see http://www.mobilecitizen.bidinnovacion.org/en/the_program.html

⁴⁴ This section relies heavily on Martínez Nogueira (2001, 2006).



the need to provide incentives for greater private participation or public-private participation. Some of the main strategies for overcoming previous challenges are: changes in management approach (by results, by projects, by private law, and by third parties); changes in coordination (by interagency committees, greater areas of responsibility, and territorial integration); changes in participation (including other stakeholders and the private sector, in coordination, in implementation, and based on demand); and changes in decentralization (transfer of responsibilities to regional or local entities, NGOs and farmer associations).

In an analysis of critical components of pro-poor agricultural growth and policies (which focused on the role of the public sector and, particularly, Ministries of Agriculture), Martínez Nogueira [2006] concludes that there are four aspects that are particularly relevant for public-sector effectiveness: (i) structural differentiation and fragmentation; (ii) financial resources; (iii) professional human resources; and (iv) information and knowledge availability and management. On the first point, the author notes that agricultural ministries have replaced their traditional structures with new organizational structures. Compared to traditional structures, these new structures have different degrees of operative discretion and more complex mandates that respond to new conceptions of public service, such as partnerships with the public sector, outsourcing of services and activities, innovative ways of financing and advances in managerial deregulation. Yet, despite these innovations, in many instances, the recent proliferation of public or quasi-public organizations led to the fragmentation of the public sector, which led to inefficiencies, confusion, lack of cooperation, inter-agency distrust and loss of capabilities for integrated policy implementation.

On the second point, the author explains that while traditionally Ministries of Agriculture were financed via the national budget, in recent years specialized funding mechanisms from various sources, such as donors, civil society and producer associations, and international financial institutions, have become

common. This multiplicity of sources is important, particularly in the case of specific projects that have clear objectives, activities, targets and different administrative procedures, all of which can lead to greater transparency and accountability. However, this new scenario may also inhibit the dissemination of norms, ways and procedures and may restrict the social learning to those involved in the projects. The duplication and lack of coordination within ministries can also mean that resources are not always used most efficiently. Particular needs may remain underfunded, revealing weaknesses or limitations in priority setting and programming.

On the third point, Martínez Nogueira [2006] describes the distinctive new features of the new ministries, including the presence of many different professional and specialized actors, such as economists, institutional analysts, and information technologists. While these actors play important roles, the new agricultural economy also requires professional managers with the knowledge, skills, and motivation to innovate and to respond to the new challenges brought by closer relationships with the private sector and social organizations.

Lastly, on the fourth point, the author explains that policy formulation demands more convenient and valid information and knowledge. Analytical capabilities play a fundamental role in identifying and evaluating policy alternatives, processes and outcomes.

a. Institutional Strengthening and the IDB's Approach

The IDB has recognized the importance of supporting institutional strengthening at the national and local levels as a tool to foster agricultural productivity. Institutional reforms that enhance agricultural productivity are viewed as crucial components in most of the projects discussed in this chapter, from water management to R&D and climate change. For instance, projects such as the *National Irrigation Program with a Watershed Approach* in Bolivia, the *Land Use*



Policy and Administration Project in the Bahamas and the *Program of Support Services to Rural Markets* in Peru, have addressed institutional challenges related to specific project objectives. Other projects such as the *Rural Production Reactivation Program (PRPR)* in Nicaragua and the *Diversification of Agricultural Production* in Paraguay, provide direct assistance through funds and training to Agricultural Ministries in order to implement plans and strategies that foster rural production, deliver agricultural support services, undertake research projects and enhance agricultural competitiveness. Institutional strengthening is also being addressed in the environmental sector through projects such as *Environmental Management* in Panama, which aims to modernize the environmental authorities at the national and local levels in order to

deal with current and future environmental challenges that might harm the country's competitiveness.

V. CONCLUSION

Based on a review of the literature, this chapter has examined the projects most commonly adopted in LAC (and in other developing countries) that play a key role in promoting agricultural production and productivity. The underlying logic of supporting these particular actions and their expected goals has also been noted. A wide range of projects identified in the literature that aim to address the challenges mentioned in the previous chapter have also been supported by the IDB and others, each seeking to play a part in overcoming the challenges faced in promo-

ting agricultural production and productivity. Whether the portfolio of projects supported by the IDB (and other development agencies) is sufficient to achieve agricultural development is open to question. There does seem to be some areas which receive more support than others. However, this question is beyond the scope of this report.

Instead, this *DEO Special Topic to the Development Effectiveness Overview 2008-2009* seeks to determine whether these particular set of projects were successful in achieving the expected goals. Answering this question requires careful evaluation of the impact of these projects, using appropriate methods. In many cases, such evaluations have not been done, while in others the results have been mixed. The next chapter assesses what is known about the effectiveness of these projects and looks at where gaps lie in the understanding of the effectiveness of these instruments.



III

Chapter



Evidence on Project Effectiveness

I. INTRODUCTION

While Chapter I provides an overview of the challenges of promoting agricultural production and productivity and Chapter II provides a description of the projects used to promote the sector, this chapter provides a review of the existing literature on the effectiveness of these projects. Further, this chapter identifies where gaps lie in our understanding of the effectiveness of these interventions, what needs to be evaluated in the future, and how this might be done.

This review focuses on survey papers, as well as stand-alone papers that have made efforts to provide robust evaluations using appropriate methodologies and quality data. The methods considered appropriate for evaluation can be found in Ravallion (2008) and reflect current practices in impact evaluation. Given the difficulty in designing evaluations using an experimental approach—considered the gold standard of impact evaluation—this report has given preference to those studies and surveys that have made efforts to create a proper counterfactual, or to control for endogeneity of key explanatory variables. Papers that did not have ideal data, but that at least used secondary or tertiary data to correct this limitation, have also been considered. Lastly, when no studies were found that used data or econometric approaches to evaluation, this report includes reviews from reputable sources and authors as a way to fill in the gaps wherever they appear using the available information, even if this was of a more descriptive and informational nature.

Before reviewing the efficiency of projects in addressing the issues highlighted in Chapter I, each of the following sections will first briefly summarize the expected goals or outcomes these projects intended to obtain. Moreover, the focal point is based on the evaluation of actual projects, with a particular focus on the biggest or most common projects in LAC, including in some cases those funded by other development agencies. The analysis will then be expanded to include empirical results even though these are not necessarily evaluations of a particular project but are

key relevant studies that add to the assessment of the project effectiveness. Similarly, relevant empirical papers from other countries and regions will be included to fill-in the gaps, wherever they may appear.

II. EFFECTIVENESS OF PROJECTS ADDRESSING NATURAL RESOURCE-RELATED CHALLENGES

Land

a. Land Titling

The primary goals of land-titling projects can be summarized as follows: to increase land security and reduction of conflicts or land disputes; to incentivize productive investments, which could improve productivity and efficiency and through these means income; to facilitate access to credit and stimulate credit markets, using land titles as collateral; to stimulate rental and land sale markets; and to increase the value of the property. In assessing the impact of land titling on land security, it is important to consider that this can be manifested through various channels, in fact, this can actually be manifested in all the expected outcomes listed above. However, it can be argued that land security is first manifested through increases in investments and a decrease in land disputes or conflicts. With this in mind, the evidence from the literature on the effect of land titling on land security in terms of investments and land disputes has been mixed.

For instance, looking at the effects of land regularization (titling program) in Nicaragua, Deininger and Chamorro (2002) find that the project resulted in a significant increase in tenure security and land-attached investments. These results are similar to those found by Torero and Field (2005) who looked at the initial impact of the *Special Rural Cadastre and Land Titling Project* (PETT) initiated in Peru in 1993, which is possibly one of the largest title formalization projects targeting rural areas in the developing world. The authors find evidence of a significant reduction in the risk of expropriation resulting in greater investment. Also looking at PETT and after separating far-



mers who are quantity constrained (those that applied for a loan and were rejected or did not apply because the subjective probability of rejection was high), from those that are risk constrained (they did not apply for a loan for fear of losing the collateral), Zegarra, Escobal and Aldana (2008) find that the land-titling program had significant impacts on agricultural investment.

Similarly, in Argentina, and taking advantage of a natural experiment in the allocation of land titles, Galiani and Schargrodsky (2005) find that moving a poor household from usufructuary land rights to full property rights substantially increased house investments and investment in child education. Finally, looking at the effect of property rights on investment and collateral-based credit supply in three distinct regions of rural Paraguay, Carter and Olinto (2003) find that tenure security had a strong investment demand effect and that it induced a shift in the portfolio composition of capital for smaller farms, towards more attached capital. However, they add that only for larger farms was an unambiguous increase in total investment found.

A positive relationship between land titles and land security and investments was not found in all studies however. For instance, in a thematic evaluation of Land Tenure Regularization projects in Latin America, the Office of Evaluation and Oversight (OVE) at the IDB found an ambiguous effect on productive investment, ranging from no effect in Paraguay, to a substantial

and positive effect in the case of Nicaragua (IDB, OVE, 2005). As for a decrease in land conflicts, Boucher, Barham, and Carter (2005) note that despite major investments in titling and national land administration initiatives, the reforms remain incomplete or non-credible in Nicaragua since much of the newly-titled land is subject to competing claims. Moreover, Jansen and Roquas (1998) found that the land titling program in Honduras unintentionally exacerbated land conflicts by creating multiple claims to land and by undermining existing institutions for conflict resolution.

In terms of increases in productivity, efficiency and income, the results are also mixed. For instance, Zegarra et al. (2008) find that PETT, in Peru, had a significant impact on agricultural income. Likewise, Deininger and Chamorro (2002) find that in Nicaragua, the titling program shifted investments towards land-related items with high economic returns, while Deininger, Zegarra and Lavadenz (2003), also focusing on Nicaragua, find that there is a positive and significant relationship between land ownership and profits, meaning that titling could make a significant contribution to increasing agricultural productivity. These results were also confirmed by OVE's thematic evaluation, in which it found that the titling program led to a positive impact on agricultural productivity, but only in Nicaragua.

As for income, Galiani and Schargrodsky (2005) find that land titling had no positive impact on income for

the treated households. Few studies looked directly at efficiency with the exception of Deininger et al. (2003). Looking at Nicaragua, they find that their results point towards an inverse relationship between farm size and productivity, which, they argue, suggests that by bringing land from large to small producers, land markets could perform an important function that would increase overall efficiency as well as equity.

As for land titling facilitating credit access, the results seem to be consistent and point to the fact that this did not really materialize. For example, looking at Peru, Torero and Field (2005) note that with respect to access to credit, their results are inconclusive and they observe that this may be partly due to credit-supply factors. Similar results were found by Deininger and Bresciani (2002) who examined the extent to which constitutional reforms implemented in 1992, and the systemic implementation of a program of land rights regularization for the Mexican *ejido* sector (PROCEDE), improved the functioning of factor markets in rural areas. The authors find that neither the reforms nor PROCEDE appeared to have much effect on *ejidatarios'* credit access. Likewise, Carter and Olinto (2003), building on the work of Feder et al. (1990), developed an econometric model to separately identify the effects of property rights on investment and collateral-based credit supply. They find that the credit supply effects of tenure security are non-existent for the smallest farms and only become substantial for farms greater than 15 hectares. Similarly, none of the three projects evaluated in OVE's thematic evaluation were found to have a clear impact on access to credit. Perhaps the only exception was seen in Argentina, where Galiani and Scharfgrösky (2005) report that there was a modest but positive effect on access to mortgage credit but no impact on access to other forms of credit. Finally, Boucher, Barham, and Carter (2005) observe that in Honduras and Nicaragua even though land titling increased substantially, formal credit access did not improve for the majority of households. In fact, the authors note that credit remains strongly skewed against low-wealth households and they further note that the failure of credit



markets to perform is reason for concern that land market activation policies need to be supported by other policies to ensure the efficacy of complementary factor markets.

As for rental and sales markets, in general, the literature shows that rental markets were activated in most of the cases, but this was not the case for land sales. For instance, in Mexico, Deininger and Bresciani (2002) find that land rental markets function better in *ejidos* that underwent PROCEDE, while neither the constitutional reforms nor PROCEDE appeared to have much of an impact on land sales. Boucher, et al. (2005) also find that land rental markets became more active in the wake of the reforms in Nicaragua. OVE's thematic evaluation also found the treatment effects on rental markets to be positive, but only in the case of Nicaragua and not in the case of Peru or Paraguay. Deininger, et al. (2003) note that in Nicaragua, lack of a land title is likely to be a strong disincentive for renting out land. Moreover, Zegarra et al. (2008) find that in Peru, in some cases, land rental

markets can be used as a self-financing mechanism, but note that the density of titling is an important condition for land markets to be activated by the titling program. For instance, their theoretical model suggests that there is a threshold for titling density and other exogenous parameters, such that farmers, are more likely to offer land in the rental market when they are above that threshold. A farmer with a title to his/her land who lives in an area of low-density titling will have fewer incentives to supply land than a farmer who is located in an area of high-density titling (Zegarrra et al., 2008).

Another positive outcome of titling that showed consistent impact was an increase in property values. Tórrero and Field (2005), for instance, find that the value of plots increased in the case of PETT in Peru, and similar results were reported by Deininger and Chammorro (2002) in Nicaragua, where the program caused an appreciable increase in land prices. When all three cases (Paraguay, Nicaragua, and Peru) were evaluated by OVE's thematic evaluation, the results showed that the only treatment effect that was clearly identifiable was property values, which experienced an increase in all three projects.

Since titling involves assigning property rights to an individual or set of individuals, reforms may impact women differently depending on its details. In a review of seven major land-titling projects in Latin America with gender-disaggregated data (Chile, Colombia, Ecuador, Honduras, Mexico, Nicaragua and Peru), Deere and León (2001) find that reforms were often designed without sufficient attention to the civil codes and marital regimes that protect women's property rights. Reforms also often ignored the fact that a household's land endowment may consist of three forms of property: the wife's, the husband's and that acquired jointly. By assuming that the family farm is owned by the male head of the household, some of these projects trampled upon women's rights (Deere and León, 2001). Nevertheless, the authors observe that the share of female beneficiaries of land-titling projects has been much higher than under the agrarian

reforms of previous decades. Colombia, Nicaragua, and Honduras in particular have the most favorable norms in support of gender equity, since joint titling is mandatory in Colombia and Nicaragua, while in Honduras it is at least optional (Deere and León, 2001). However, projects that purport to be "gender neutral" and do not make specific reference to women's land rights, such as in Mexico, Peru, and Ecuador, tend to have less favorable gender-specific outcomes. The authors observe that it is in these countries that legislation only recognizes the land rights of "natural and juridic persons." However, they point out that progress towards improving the prospects of women has been made in several cases such as in Ecuador, where titling of land to couples was adopted at the project level in one rural development project.

While most of the projects above note positive, or at least no impact, effects of titling, some analysis can be seen as reason for concern. For instance, Zegarrra et al. (2008) find that in the case of PETT, in Peru, a negative effect in the use of conservation practices is found due to more intensive land use. Moreover, in Nicaragua Deininger, et al. (2003) find that contrary to what was expected, instead of supplying land to the market, large land owners are potent demanders of land. This suggests that land sales markets are not responding to efficiency considerations and that land sales have contributed to land concentration.

Similar points are made by Carter and Olinto (2003) who note that the provision of tenure security in Paraguay does not make institutions right for all farmers and that a generalized land-titling project would be expected to disproportionately benefit larger-scale farmers who would experience both investment demand and credit supply effects, while smaller farmers would, at best, experience only a muted set of benefits from land tenure. With this in mind, the authors warn that the differential advantage created by tenure reform will encourage land accumulation by larger farmers which would lead to negative spillover effects for poorer households.



With this in mind, the idea of complementary policies was advocated by most authors who note that land titling on its own cannot deliver all the expected outcomes if unaccompanied by other types of support, especially credit. For instance, Deininger et al. (2003) note that if the liberalization of land sales markets is to contribute to equity and efficiency, then this needs to be complemented by measures to reduce the attractiveness of land speculation and accumulation (such as land taxes). Meanwhile, measures to reduce the transaction costs of land rental (such as titling) and to increase effective demand from small producers, such as technical assistance and credit, will be necessary. Indeed, the authors report that results from their pseudo profit function and regression analysis showed that having technical assistance is estimated to increase profits by about 22 percent, while the point estimate for availability of credit is almost 30 percent, which suggests that there are high returns for the provision of credit and public goods.

Based on results obtained in Honduras and Nicaragua, Boucher, et al. (2005) also note that the failure of credit markets to perform is reason for concern that land market activation policies need to be supported by other policies to ensure the efficacy of complementary factor markets. More specifically, the authors make it clear that the vast majority of poor rural households do perceive themselves as constrained by formal credit markets. Policies to connect the rural poor to financial instruments are, they state, “almost surely a necessary condition to success if a next generation of reforms is to deliver on the growth-with-equity promise of the prior round of liberal agricultural reforms” (Boucher et al., 2005).

b. Negotiated or Market-assisted Land Projects

The goals of negotiated or market-assisted land purchase projects are very similar to those mentioned above for land-titling programs. However, the market-assisted approach, in general, is supposed to come with a bundle of additional elements aimed at complementing land acquisition. In some respects,

this bundle includes some of the items noted as missing in land-titling programs, such as access to credit in the form of a loan, or subsidy for investing in a farm project, as well as access to technical assistance aimed at helping develop and/or implementing a farm project. In this regard, this approach is meant to influence productive investments, productivity, and income more directly through the provision of loans and technical assistance.

Although several countries have implemented market-led agrarian reforms, such as South Africa, the Philippines, Colombia, and Guatemala, according to Sauer (2006), in terms of the number of participant families and amount of resources spent, Brazil’s experience with market-led agrarian reform programs is the most extensive in the world. From 1997 to 2002, the *Cédula da Terra* program enabled 15,267 families to purchase and settle on 398,732 hectares of land (Childress and Muñoz, 2008). The program was succeeded by *Crédito Fundiário* in 2001.

Unfortunately, no robust empirical evaluations were found for Brazil, Colombia or Guatemala. Although various studies mention initial and follow-up evaluations done on certain projects, such as the ones in Brazil, finding these evaluations proved unfruitful. For instance, when questioning market-led agrarian reforms, Borras (2003) notes that while he used several unpublished papers for his own study on Brazil, most of these are not easily accessible to the general public. Similarly, Deere and de Medeiros (2005) note that market-led agrarian reform in Brazil has yet to be rigorously evaluated. Borras (2003) further notes that information on Colombia is also rather scarce.

Most of the information found and presented here thus comes not from thorough impact evaluations, which attempted to create a reasonable counterfactual, but from studies that review the implementation and ‘outcomes’ of some of these projects. It is included to give some indication of how these projects have fared, thus far. The fact that it has been difficult to find empirical papers on this market-assisted approach

ach is in itself an important detail to keep in mind, given that these projects continue to be implemented in some countries in LAC.

In terms of investments the results are not conclusive. In Brazil, Roumani (2004) reports that on-farm investments designed to launch and improve production were diverse but that the most commonly-requested were electricity and water supply, both of which are essential for productive activities. The author also notes that family farms initially concentrated on subsistence production, but that once housing and basic productive activities were established, more complex, diverse and higher-value activities were slowly introduced. However, Borras (2003) contradicts this finding about Brazil, by noting that subsistence crop production has dominated the actual farm projects. Moreover, the author notes that in terms of credit and investment, the outcomes are not as predicted since beneficiaries did not use their land titles to secure bank loans despite the rapid exhaustion of their grants. There seems to be no hint that they will use them in the future either, as there are no signs of external investment coming in.

Similar findings are presented by Daub (2007) with regards to the market-assisted agrarian reform in Guatemala, *FONTIERRAS*. For instance, using in-depth qualitative research in the field, Daub (2007) observes that participants faced barriers when attempting to secure adequate infrastructure and felt that start-up capital provided by the program was minimal. They also had problems developing productive plans and accessing credit due to language barriers and bureaucratic procedures.

In terms of productivity, the evidence shows the reform had a positive impact. Roumani (2004) notes that for those that benefited from the Brazilian program between 1998 and 2000, agricultural production increased by some 360 percent and by another 204 percent from 2000-03. The author further notes that this indicates markedly better use of land on properties post-settlement and that beneficiaries are dedicating

more time and family labor to agricultural activities on farm and less to off-farm work. In some ways, de Souza Filho et al. (2004) support this theory of increase in family labor, but based on efficiency grounds, their findings are negative. For example, in one of the few examples found where program data is used to empirically test a hypothesis, de Souza Filho et al. (2004) evaluate the *Cedula da Terra* pilot project using a stochastic frontier production efficiency evaluation and find that there are high levels of technical and allocative inefficiency. The authors find that the factor that most determines production is essentially labor, whose estimated parameters are high and statistically significant. On the other hand, they find that the use of variable inputs is still low, or almost nil for beneficiaries. However, they note that the two main factors that reduce technical inefficiency are monthly technical assistance and access to credit. With this in mind, the authors explain that this reveals that access to land, by itself, is not enough to have an efficient use of resources and high production because farmers do face dire external restrictions.

The provision of technical assistance to beneficiaries in the case of Brazil and Guatemala did not meet expectations. This is mentioned by Roumani (2004), although the author gives mixed messages in this regard. For example, she notes that increased access to inputs including credit and technical assistance prompted the launching of more complex and lucrative productive activities; however, she also states that some of the benefits in the program in terms of production and income occurred despite drought, and the less than anticipated availability of credit and technical assistance. Likewise, in Brazil, de Souza Filho et al. (2004) advise that one should make note of the renowned precariousness of the technical assistance services in most states. Deere and de Medeiros (2005) make similar observations about Brazil and note that access to technical assistance and extension was quite precarious. In Guatemala, Gauster and Isakson (2007) also note that the market-assisted campaign has not been accompanied with the technical assistance or access to capital that would enhance the pro-

ductivity of land. Daub (2007) also notes that the quality of farmers' land was not high while the technical advice they received was inappropriate and minimal.

As for income, the results are contradictory. For instance, doing a review of land reform in Brazil, with a special focus on the market-assisted model, Lambais (2008) states that income has increased significantly, with peasants rising from poverty under the market-assisted land reform. Likewise, from 1998 to 2003, Roumani (2004) reports that beneficiaries' nominal income rose by an average of 180 percent, which put them significantly above the poverty line. Along these lines the author also states that beneficiaries were earning enough to repay their contracted loans. However, also looking at Brazil, de Medeiros (2007) mentions that the income analyses produced in the different research reports show that, despite the feeling that conditions had improved, as well as having greater access to consumer goods, beneficiaries' income still remained below the poverty line.

Similar points are made in the case of Brazil and Guatemala in terms of participants' ability to repay their loans. For instance, in Brazil, de Medeiros (2007) warns that clear signs of families falling into debt need to be taken into account since this makes adherence to the program more difficult. The author makes reference to a simulation conducted by DESER in 2000, shortly after the creation of the Land Bank, in which it was concluded that the payment conditions were prohibitive for the large majority of family farmers. Likewise, also in Brazil, Sauer (2009) argues that the peasants' dream of accessing land has been transformed into a nightmare of indebtedness, as most of the families involved are unable to pay the loans. Similar claims are made about the market-assisted programs in Guatemala by Gauster and Isakson (2007) who note that rather than alleviating poverty, this approach has burdened many of its intended beneficiaries with debt. Cases of indebtedness were also found in Guatemala by Daub (2007).

In terms of targeting, in the case of Brazil, Borrás (2003) notes that program beneficiaries were generally

from the rural poor, but not the poorest of the poor. Similar observations are made by Gauster and Isakson (2007) who note about Guatemala that given the program's dependence on repayment of loans, the reforms do not necessarily benefit the neediest peasants; instead, they target farmers with the greatest entrepreneurial potential. Borrás (2003) also notes that due to the difficulty of the process and large volumes of required paper work many poor families were excluded from the program in Colombia. Similar conclusions are made by de Souza Filho et al. (2000) who used program data to empirically assess the selection process for the program in Brazil. The authors find that beneficiaries are poor, but not extremely poor and not discriminated against or excluded from the local economy. However, in the case of Brazil, de Souza Filho et al. (2000) and Roumani (2004) observe that through the selection targeting strategy, the program did indeed shape a distinctive group of "self-selected" beneficiaries. Beneficiaries are characterized as being poor, but not extremely poor, with low levels of education, larger families and a higher percentage of children in their families than potential beneficiaries. They live in rural villages and work mostly as day-paid rural workers and landless small farmers, typically as both.

Despite the concerns expressed by some of the authors about the program not targeting the poorest of the poor, it is important to note that the criteria used by these programs was structured in a way that, perhaps, did intend to include only beneficiaries with the potential to take advantage of the bundle of elements encompassed under this approach. Indeed, de Souza Filho et al. (2000) mention that "the program has selected the most qualified individuals among the poor, which is a great achievement." However, the authors go on to say that given the low levels of education, educational policies and technical assistance should be considered in order to increase the probability of the program's success.

Although most of the information presented by the studies covered in this report provides, in general, two different sets of outcomes, perhaps, each of the two sides



show some indication of how effective these projects have been. However, the lack of appropriate empirical evaluations is in itself an important finding, which clearly points to the need to appropriately evaluate these projects to provide more concrete information.

Water Management

a. Irrigation Management Transfer (IMT) and Water Users' Associations (WUA)

Broader and more direct farmer participation in Irrigation Management Transfer (IMT) schemes, such as WUAs, is expected to lead to stronger incentives to improve monitoring and system maintenance, to more efficient and equitable delivery of water, to expansion of areas under irrigation, to improvements in farm income and yields arising from such increases, to improvements in the collection of fees, and to a decrease in government financial costs. Even though a significant number of countries around the world have turned over the management of irrigation systems from government agencies to farmer or other local, non-governmental organizations, Vermillion (1997) notes that little international information was available about its impact at the time of his study, particularly on the effects of management transfer on maintenance and economic performance of irrigated agriculture. The author also warns (i) that most re-

ports about impacts have been qualitative and hard to validate since it is often difficult to distinguish the effects of management transfer from rehabilitation or changes in inputs or technology; (ii) that some of the results presented may be quite positive but this may be partly due to the bias in sites selected or the possibility that many authors are promoters of the reforms; and (iii) that the evidence of impacts in the literature comes from qualitative reports and case studies and simple with-and-without comparisons or before-and-after comparisons. The author does not mention anything about evaluations using econometric approaches and it is rare to find empirical studies done using quantitative impact evaluation methods that create a comparable counterfactual group for comparison, with one or two exceptions.

With this caveat, using information from twenty-nine studies of irrigation management transfers around the world, including Colombia, Mexico and the Dominican Republic, Vermillion (1997) synthesized the most significant evidence available about the "impacts" of management transfer programs. Summarizing the results, Vermillion observes that the most commonly reported positive impacts were as follows: reduction in the cost of irrigation to farmers and to the government; enhanced financial self-reliance of the irrigation schemes; expansion of service areas; reduction in the amount of water delivered per hecta-

re; and increased crop intensity and yields. The most commonly reported negative results were related to costs to farmers, failing financial viability of schemes and deteriorating infrastructure. Lastly, Vermillion observes that reported impacts on government resource allocation, total costs of irrigation, and environmental stability are relatively rare in the literature.

In 2000, the Food and Agriculture Organization (FAO) in collaboration with the International Water Management Institute (IWMI) tried to fill in the gaps in this topic by designing a program on the subject of irrigation sector reform, with IMT as their main focus. A 2007 report by Garcés-Restrepo, Muñoz and Vermillion (2007) (henceforth referred to as “the 2007 Report”) brings together current information on the subject from five continents and more than thirty countries around the world that have implemented IMT programs. Unfortunately, the 2007 Report, and most sources used in this section, suffer from the same weaknesses described by Vermillion (1997). With that caveat in mind, the results from the 2007 Report are presented below including information for Argentina (Mendoza), Colombia, Costa Rica, the Dominican Republic, Ecuador, Mexico, and Peru.

In terms of maintenance, the 2007 Report notes that in all seven cases there was an improvement in quality. Likewise, using data from the irrigation transfer in Mexico, Johnson III (1997) notes that maintenance activities carried out by the WUAs have stopped the deterioration in infrastructure. Similarly, using a partial budget analytical framework to analyze the social benefits and costs of IMT in two irrigation modules in Sinaloa, Mexico, Arredondo Salas and Wilson (2004) note that improvements in distribution systems and water-service delivery procedures have reduced the time required for irrigation, as well as its costs. Reporting results from a study of the Alto Rio Lerma Irrigation District in Mexico, Urban and Wester (2003) also mention that the willingness of farmers to participate through their organizations and also through higher financial contributions after the IMT, has led to an improved provision of maintenance services as well as the execution of more

maintenance. Reporting about Alto Rio Lerma as well, Kloezen, Garcés-Restrepo and Johnson III (1997) note that one of the most positive impacts of the WUA has been the considerable improvement in maintenance services, especially at lower-system levels. However, Vermillion and Garcés-Restrepo (1998) report that while the functional condition of infrastructure was good in three of the schemes they reviewed, this was not the case for two others.

As for efficiency, in general the results are positive but not always consistent. For example, in terms of timeliness of water delivery the 2007 Report notes that there was an improvement in six of the seven countries, with the exception of Colombia for which there was no information. Arredondo Salas and Wilson (2004) report that in the two modules they studied in Sinaloa, Mexico, all growers reported an improvement in the accuracy and timeliness of water service. However, Kloezen et al. (1997) report that while farmers in the Alto Rio Lerma Irrigation District did increase their levels of control, this did not translate into major improvements in operational performance, such as in the way that water is allocated or distributed. Similarly, Vermillion and Garcés-Restrepo (1998) give mixed results from five irrigation districts they reviewed in Colombia and note that while farmers reported no changes in adequacy or fairness of water distribution in three out of five cases, the other two planned improvements in relative irrigation supply.

In terms of equity, the 2007 Report notes that this improved for Argentina, the Dominican Republic, and Ecuador. Arredondo Salas and Wilson (2004) also report that in Sinaloa, Mexico, all growers reported an improvement in the equity of water service. On the other hand, the 2007 Report notes that the equity of water delivery decreased in Peru and remained about the same in Colombia, Costa Rica and Mexico. Vermillion and Garcés-Restrepo (1998) also give no results from Colombia, and report that in three of the five schemes they reviewed, the majority of farmers reported no changes in terms of the fairness of water distribution.

As for increases in area under irrigation, the results are also mixed, but in general are positive. For instance, the 2007 Report shows that while area under irrigation decreased in Mexico and remained about the same in Peru, it actually increased in Argentina, Colombia, Costa Rica, the Dominican Republic and Ecuador. Arredondo Salas and Wilson (2004) also report increases in Sinaloa, Mexico.

In terms of improvements in crop yields, in general, most results showed improvements or no changes, but no deterioration. For example, in the 2007 Report there were improvements in yields in Argentina, the Dominican Republic, Ecuador, and Peru, but none in Colombia, Costa Rica, or Mexico. Likewise, no significant changes were reported in Colombia by Vermillion and Garcés-Restrepo (1998) and no changes are also reported by Johnson III (1997) from Mexico. In the two modules studied in Sinaloa, Mexico, Arredondo Salas and Wilson (2004) report that while yields per hectare were not reported as an added IMT benefit by the respondents, double cropping in the post-IMT period increased some growers' annual productivity. Another interesting result from their study is that given the significant improvements in the delivery of water, farmers report spending less time and money on water monitoring and delivery, which has allowed them to reallocate their time to activities more related to agricultural production and marketing. Likewise, export-oriented farmers report that water-delivery dependability has enabled them to compete in competitive markets for fresh fruits and vegetables, while some growers have increased the acreage of medium and high water demand crops, which represent a higher profit margin for growers.

Arredondo Salas and Wilson (2004) also note that farmers' ability to double crop has increased some growers' annual income. Similarly, the 2007 Report shows that farm income increased for Costa Rica, the Dominican Republic, Ecuador, and Mexico, but it de-

creased for Argentina and remained unchanged for Colombia and Peru. No changes were reported from Colombia by Vermillion and Garcés-Restrepo (1998).

With regards to the ability to collect water users' fees, the results are in general positive, with a few exceptions. For instance, the 2007 Report notes that while efficiency of fee collection improved in Argentina, Costa Rica, the Dominican Republic, Ecuador, and Mexico, this efficiency decreased in Colombia and remained unchanged in Peru. Improvements in fee-collection rates were reported by Vermillion and Garcés-Restrepo (1998) in the case of the Dominican Republic and Mexico.¹ Kloezen et al. (1997) also report that in the Alto Rio Lerma Irrigation District WUAs were able to achieve fee-collection rates of over 100 percent. Likewise, Johnson III (1997) notes that in Mexico water fees collected by the users have not only supported operation and maintenance activities but have also funded most of the operation and maintenance activities by National Water Commission staff at the main canal and water source levels.

In terms of monitoring, Johnson III (1997) reports that in Mexico, the elimination of unionized staff controlling operation and maintenance activities has satisfied one of the major complaints of farmers. The ability to hire and fire their own staff has improved the responsiveness of the operational staff to the needs of the farmers. Similar observations are made by Kloezen et al. (1997) who report that in their review of the Alto Rio Lerma Irrigation District, farmers' increased involvement in decision making and control has increased managerial accountability. As for operation and management costs to farmers, the results are mixed. The 2007 Report notes that operation and management costs increased in Argentina, Colombia, and Mexico, while they decreased in Costa Rica, fluctuated within the systems in Ecuador and remained unchanged in the Dominican Republic. No information was available for Peru. Vermillion and Garcés-Restrepo (1998) also

¹ See Table 2 for appropriate sources cited by Vermillion (1997).



report an increase in Colombia, especially for pump schemes, and Arredondo Salas and Wilson (2004) also report higher water rates in Sinaloa, to finance operation and management responsibilities. As for government expenditure on operation and management this only increased for Costa Rica. It remained unchanged for Argentina and the Dominican Republic, but decreased for Colombia, Ecuador, Mexico and Peru, according to the 2007 Report. The cost of irrigation to the government also decreased in Colombia according to Vermillion and Garcés-Restrepo (1998).

In terms of environmental impacts of IMT, with regards to salinization and water logging the information in this area is hard to find. This is confirmed by the 2007 Report, which notes that information on environmental impacts is scarce. Of the information reported in the 2007 Report for the Americas (excluding a case in the US of the Columbia River Basin), soil salinity is reported as "Not Applicable" in the case of Argentina, Costa Rica, Mexico and Peru, while it is reported that this remained unchanged in Colombia and Ecuador, and the Dominican Republic being the only country to report

that salinization did increase. As for water logging, this is reported as "Not applicable" in three countries, while three others reported no changes. Only Argentina reported a decrease in water logging.

While the 2007 Report does bring a vast amount of information in terms of countries covered, and while it also partly addressed one of Vermillion's (1997) concerns, in terms of environmental stability or impact, this report, and the literature in general, do not provide information on the impact of government resource allocation, total costs of irrigation, or a more clear attribution of the program to key indicators such as productivity or income. Likewise, it has been difficult to find empirical papers that utilize econometric or evaluation methods that can shed more light on the 'actual' impacts of IMT on key indicators. Vermillion (1997) acknowledges that it is quite difficult to make a compelling analysis that can convincingly attribute changes in agricultural and economic productivity to management transfer, since there are so many potential determinants of change in these measures. However, and given the fact that manage-

ment transfer can potentially have a major impact on the performance of irrigated agriculture in developing countries, the author states that it is important that researchers rise to the challenge of making more careful assessments of its impacts.

b. Watershed Management

Although the LAC region is well endowed in terms of water resources, accounting for 31 percent of the world's renewable fresh-water resources, the risks connected to watershed mismanagement are serious. Agriculture tops the list in fresh-water withdrawal in LAC and failure to properly manage watersheds may lead to a severe reduction of agricultural productivity due to land degradation and inappropriate on-farm water use. In addition, watershed mismanagement may also generate significant negative externalities for downstream users, such as water contamination and land erosion, which creates severe risk of landslides for both rural and urban settlements and can lead to the siltation of dams, reducing their ability to generate hydroelectric power. Such serious potential consequences have led LAC governments to seek to improve watershed management through investment in infrastructure, regulation (through the establishment of watershed authorities) and the diffusion of water conservation practices to final users.

The use of watershed management interventions in different contexts (such as agricultural development, natural disaster prevention and environmental protection) implies that the expected impact may vary greatly. For instance, watershed management programs may be expected to increase the efficiency of water distribution for agricultural production, which may lead to increases in productivity. Other watershed programs may be expected to enhance vegetative cover and reduce flooding or to reduce runoff and enhance the ecological functions of watersheds. Given the vast differences in expected outcomes, and the necessary impact indicators, it is difficult to systematically quantify and accurately measure the impact of watershed management interventions. Moreover, spatial interlinkages, externalities and temporal dimensions of watershed activities

further complicate the process (Kerr and Chung, 2001; Gottret and White, 2001).

Despite the difficulty of measuring the impact of interventions, an emerging thread of literature provides useful reviews of existing evaluations and lessons for future evaluations. Focusing on India, Kerr et al. (2000) note that historically, most impact evaluations of watershed management interventions have been qualitative in nature and lacking in rigorous quantitative methods. Pattanayak (2004) presents a rigorous method for evaluating a watershed intervention by applying a three-stage approach to estimating a shadow price (or profit function) on water collection. Focusing on a case study from Flores, Indonesia, Pattanayak's results provide evidence of a substantive, quantified economic benefit of watershed service.

Hope (2007) considers the household-level impact of a watershed intervention by using data from treatment and control groups and propensity score-matching to analyze gross agricultural returns and domestic water-collection times for the state of Madhya Pradesh, India. Findings indicate that the majority of farmers planting kharif crops were no better off in income terms after the project, with no significant variation amongst social-, income- or land-stratified groups. A smaller group of rabi-planting farmers fared even worse, on average, but significant variation was found across social groups and land ownership (the author explains that this was partly due to data attrition in matching and advises that the results for rabi-income impacts should be interpreted with caution). It is important to note that own-project evaluations reported an 84 percent increase in kharif yield and a 60 percent increase in rabi yield, and while the data used is not necessarily comparable, the authors' evaluation lead to questions about reported large yield increases from the project. From the point of view of effective evaluation, this exemplifies the need for using more suitable methodologies for identifying program impacts.

Within the context of LAC (specifically Honduras, Nicaragua and Colombia), Gottret and White (2001) suggest that integrated natural-resource management interventions, such as watershed management schemes, require a more holistic impact assessment that evaluates economic, environmental, social, and organizational changes. They propose a “paths of development impact” that maps out research outputs, intermediate outcomes, and development impacts while also using participatory approaches to empower local stakeholders. Darghouth et al. (2008) echo several of Gottret and White’s suggestions, but also emphasize the importance of tracking downstream environmental outcomes. Projects must establish baseline information against which project impacts can be measured. Due to the spatial nature of watershed interventions, geographic information system (GIS) databases and/or remote sensing systems are often needed to capture biophysical changes. However, monitoring and evaluation systems should be selective and as low cost as possible. For institutional development components, a range of techniques may be necessary, such as looking at leadership changes in local user groups or the enactment and enforcement of water and natural resource management laws by the government.

The IDB has also contributed to this literature. In particular, studies have been conducted on the performance of the Environmental Program of El Salvador (PAES). The program was developed with the goal of improving household income through improved soil productivity, the adoption of conservation technologies and product diversification. Using a quasi-experimental approach with matching techniques, Bravo-Ureta et al. (2006a) conducted the impact evaluation of the program and found that PAES beneficiaries significantly increased the area treated with conservation between 2002 and 2005, while the results confirm that the frequency of extension visits and years in the project was positively associated with adoption of soil-conservation technologies. Likewise, and focusing more on the degree of output diversification experienced by PAES participants, Bravo-Ureta et al. (2006b) found that farmers

involved with the program significantly increased the number of agricultural activities on their farms over a three-year period. The results of these evaluations are further confirmed by Bravo-Ureta and Cocchi (2007) who find that crop diversification and soil conservation practices exhibit a strong positive association with the length of farmers’ involvement with PAES and their participation in social organization.

The main lesson from the review of environmental protection interventions is that watershed management activities have multifaceted outcomes and thus often require multifaceted impact evaluation approaches. Whether the project is aimed at reducing poverty and establishing food security or preventing and/or mitigating the damaging effects of extreme weather events, projects should be clear in determining expected outcomes, the mechanisms or theories by which the outcomes will be achieved, and the externalities associated with the project.

Climate Change

a. Payment for Environmental Services (PES)

As noted in the previous chapter, in recent years, markets for ecosystem services have been promoted in international policy and development practice as an instrument for enhancing environmental conservation and improving human well-being. PES programs recognize the role played by land-use activities in regulating the global carbon cycle, particularly the potential of forest management to store carbon dioxide and ameliorate climate change, as well as watershed management to protect valuable ecosystems that provide significant amounts of natural resources, especially water. As noted, three of the more common instruments under this approach are: payments for watershed management; reforestation and afforestation (closely related to carbon markets); and conservation services in agricultural landscapes.

While the conservation of ecosystems through these separate interventions has been seen as fundamen-



tal to environmental conservation and climate change mitigation, covering these schemes is beyond the scope of this paper, despite the fact that their preservation is important for agriculture, and the focus of this review is directly related to agricultural production and productivity. However, given the fact that many of the projects for watershed management include the adoption of new agricultural techniques and varieties, a brief review of recent findings for payments for watershed management schemes is presented below.²

While the number of PES agreements specific to watershed management have been growing over the years (Landell-Mills and Porras, 2002; Porras, Grieg-Gran and Neves, 2008) little information is known about their impacts. This is due to the fact that most initiatives are still relatively recent and most of the information available is about estimated or predicted costs and benefits to different groups, rather than based on observed ex-post impacts. Porras et al. (2008) provide the most recent review of the evaluation of these schemes and they note that there are several constraints involved in arriving at clear evidence on the impact of these schemes. For example, they note that information on the costs and benefits is often incomplete and much attention is given to the providers rather than the users of these services. Likewise, some studies provide misleading information since they do not account enough for possible confounding factors. Lastly, few initiatives have been the subject of rigorous evaluations based on field surveys among local communities upstream and downstream.

III. EFFECTIVENESS OF PROJECTS ADDRESSING MARKET LIMITATIONS

Access to Markets

a. Agribusinesses

Government support of the agri-food industry is expected to benefit not only individual agribusinesses, but the entire food chain through backward and forward linkages. This support should increase productivity and efficiency as well as enhance access to new markets. The expectation is that this will lead to improvements in income for producers and agribusinesses, and growth and development for the nation, partly from increases in exports and investments.

Given the fact that most of these types of projects entail a number of interventions within the value chain, evaluating these types of projects would entail a comparison between a 'treated' value chain and a counterfactual one. To the best of our knowledge, no impact evaluations have been performed using this approach. Nevertheless, in this section some of the available evidence is presented to give an indication of the effectiveness of interventions in the agri-food industry sector. The problem with reporting such results is that it is not really possible to attribute the reported results to the project since the results may be due to the selection or self-selection of the beneficiaries. Given that this is the case, the results should be viewed with some skepticism.

In an assessment of the PRODAR network (Cooperative Program for the Development of Rural Agro-industry³) in LAC, Weber, Bridier and Fiorentino (1997) conclude that PRODAR, in general, had positive effects on the welfare of participants. Eleven of the fifteen PRODAR member countries were visited, and detailed information was collected on the activities and impact of each rural agro-industry network (REDAR) and its members. The information collected was based on questionnaires sent to participants and interviews with network leaders as well as field visits. However, it is

² For a general review of watershed management and its effects on agriculture, the reader is referred to the previous section.

³ PRODAR was officially formed in 1989 to link a variety of institutions concerned with promoting the potential of rural agro-industry and improving the social and economic well-being of rural people and their communities.

important to note that the information provided in the report is aggregated, does not involve a counterfactual, and is of a more descriptive nature.

The authors note that, overall, there was strong evidence that PRODAR facilitated the growth of national networks (involving up to fifteen national networks) which, in some cases, made possible the dissemination of improved production, processing and technology utilization. Additionally, new markets and products were identified in a few countries, such as Chile and Argentina. The authors conclude that, where relevant support was given, the very poor could benefit through local transformation of their production and through improved livelihoods. Similarly, they note that rural agro-industries can integrate underprivileged rural women into growing markets and provide opportunities for increased family income. However, they also note that, in general, there were some concerns about the long-term feasibility of microenterprise production competing with medium- and large-scale processors in terms of their stable supply, quality of products and the logistical problems of assembling sufficient product volumes to interest larger and more sophisticated and demanding markets. The authors also note that in several cases, land resources were deteriorating due to over cultivation (Weber, et al. 1997).

An assessment of the FondeAgro program in Nicaragua, which benefited 12,544 producers and promoters mainly in the coffee and cattle sectors, Fajardo, Ammour and Cruz (2006) present similar positive results. However, as in the case of PRODAR, the “evaluation” included data collection from interviews, focal groups, field visits, and surveys from beneficiaries and stakeholders but did not include a counterfactual for an appropriate comparison. The report notes that in most cases, there were improvements in average daily income, technology adoption, productivity, diver-

sification, new local and international markets, and institutional strengthening. For instance, through technical support, producers acquired new knowledge and coffee growers, in particular, increased their coffee production from 7 qq/mz to 13 qq/mz. Additionally, coffee producers improved their production technology which allowed them to decrease production costs and increase their volume sales.

Producers, primarily female producers, also began to diversify their production activities, moving to honey, medicinal plants, cocoa, bananas, and fish, among others. The report also makes note of the benefits accrued due to investments in appropriate equipment (such as storage facilities), as in the case of milk producers who obtained better prices and improved their incomes. As in the case of PRODAR, participants in FondeAgro, particularly coffee growers, found new local and international markets. Likewise, institutional strengthening investments targeting public personnel led to improvements in the capacity of the personnel, which led to improvements in technical capabilities to public sector workers in the region.

Even though these two “evaluations” are not based on a robust empirical approach, taken at face value they point to the potential of the agri-food sector to create employment and income opportunities, stimulate backward and forward linkages, improve productivity and provide access to new markets.

A few relevant empirical papers are presented to illustrate these points. For example, using information from national accounts and other government data, Lach Harriague and O’Connor (2004) estimate the total employment contribution of the agricultural and agro-industry sectors in Argentina. They find that for each 1.15 jobs in the primary production stage, 3.83 jobs are created on other stages. In other words, there is al-

⁴ The authors also include the USA and Canada.

⁵ This is arrived at by fining the average of all nine LAC countries.

most a five-to-one ratio (4.83:1) between agricultural employment and total agro-industrial job creation.

The potential for job creation is also described by Díaz Rios (2007), who detailed the characterization and appraisal of the asparagus agro-industry in Peru. He notes that employment rates in regions where the asparagus agro-industry has mushroomed are some of the highest in the country (especially in Ica and La Libertad) and that since 2003, employment rates have grown by 25 percent in Ica, 12 percent in Piura, 9 percent in Chincha, 8 percent in Pisco, and 6 percent in Trujillo, seemingly as a result of agro-export activity.

Using information from Social Accounting Matrices (SAM) of eleven countries in this hemisphere (including nine Latin American countries⁴), as well as calculated percentages of the productive sectors' share of GDP, and an estimate of the relative share of "agriculture and agri-food", Trejos, Arias and Segura (2004) empirically address the concept of extended agriculture, calculate agricultural linkages, and simulate the impact of agriculture on the countries' overall economic activity. The authors note that if the contribution of agriculture to GDP was limited to primary agriculture (agriculture, forestry, and fisheries), this would undervalue the true contribution of the sector to a nation's GDP. When adding processed foods and manufactured goods derived either from the primary sector or from agro-industry, the contribution to GDP significantly increases. For instance, the average contribution of the primary sector to GDP for all nine Latin American countries was about 6.1%, but when including the agro-industry contribution, the percentage goes up to an average of 29.6%⁵, almost five times as much as the initial assessment. Similar findings are presented by Abbey, Baer and Filizzola (2005) on Brazil, which show that while agriculture's share of GDP in 2003 was 9.6%, the contribution of agribusiness was estimated to be almost 31% of GDP.

Trejos et al. (2004) also find strong linkages between the primary sector and the rest of the economy in all eleven countries in their study. On average, three-

quarters of agricultural production is used as input for other industries or sectors. Likewise, Díaz Rios (2007) reports that in the case of Peru, the growth of asparagus exports has developed related industries. For instance, while 35.7% of the value generated from production to port-of-dispatch corresponds to farm activities, 15.8% of value is from activities performed in the packing houses, 1.6% to land transportation, 1.6% to storage, loading and export logistics in the port, and 45.24% to air transportation.

Although most of the country data used by Trejos et al. (2004) for the eleven countries in this hemisphere does not break down information about payments made to primary agriculture, the authors suggest that most of the remuneration for skilled and unskilled labor, land and capital stays in the regions where the primary agricultural product is produced. About 53 cents of every dollar generated in primary agriculture remains in rural areas. Likewise, the authors note that barely 1 percent of the costs of the primary sector of agriculture involve payments for skilled labor, while the percentage for unskilled labor is 19 percent. On the other hand, in the case of agriculture and agri-food, the percentage for skilled and unskilled labor is 3.5% and 14.8% respectively. The authors note that this confirms the link between agricultural production and unskilled labor, and the fact that the link with skilled labor increases as we move from primary to agriculture and agri-food.

Trejos et al. (2004) also look at multiplier effects and find that each additional unit demanded from the primary sector produces strong impacts on other sectors, generating a multiplier effect on total output of the economy, ranging from 3.076 additional units in Canada to as many as 5.495 in Argentina. Likewise, for every additional unit of primary agricultural production demanded, there is a strong positive effect on factor payments (labor, capital and land). Further, every additional dollar increase in demand for primary agricultural products increases household income, by US\$1.42 in Canada to US\$3.34 in Argentina.



The reviewed studies suggest that the agri-food sector has the potential to contribute to the growth and development of LAC countries. However, given the limitations of these studies, results should be viewed with some caution until verified using appropriate quantitative methods. The results do suggest that agribusiness enterprises at the local level could offer the possibility of capturing value added and thereby increasing local incomes (Stanton, 2000). Government involvement through the provision of public goods such as transport, technical assistance, processing facilities, etc., could be important and may be warranted.

b. Export Promotion

Government support for export promotion, especially in the case of small enterprises with no export experience, can be justified by imperfections in the market regarding agricultural exports described in the previous chapter. The objective of such support is to lower the transaction costs associated with exporting, particularly the costs of entering the market. Many of these costs are related to obtaining information on how to meet the demands of foreign markets and in creating the necessary linkages to enter them.

Although they do not focus specifically on agriculture, an increasing number of studies present evidence on the potential effectiveness of strengthening the capability of design and implementing trade agreements.

The recent IDB report *Bridging Regional Trade Agreements in the Americas* (Estevadeordal, et al. 2009) shows, based on econometric evidence, that LAC economies would significantly augment gains from trade through improved convergence among their manifold common trade agreements. The current web of agreements has been a positive force for the region, but it has also created complexities of overlapping trade rules and regulations that increase transaction costs for entrepreneurs and enterprises aiming to operate regionwide. In particular, restrictive product-specific rules-of-origin undermine aggregate trade. Indeed, stringent rules-of-origin are key in countering the Regional Trade Agreement (RTA)-inspired boost to trade. In contrast, the combined effect of regime-wide variables that instill flexibility into the application of product-specific rules-of-origin boosts trade. Among RTA pairs, the opposite effect of permissive facilitation terms compensates for this negative impact of product-specific rules-of-origin.

Overall, the empirical evidence seems to confirm that export promotion policies, by attenuating information problems, can reduce transaction costs, thus fostering trade. First, a group of analyses finds a positive relationship between the level of expenditure in trade promotion and aggregate export outcomes. Coughlin and Cartwright (1987) report that state export-promotion spending affected total state exports in the United States positively in 1980. Consistently, using data on a cross section of countries for 2005, Lederman, Olarreaga, and Payton (2006) present evidence showing that the size of the budget of export promotion agencies is positively related to countries' total exports.

A second group of studies shows that export promotion abroad seems to positively affect countries' aggregate trade outcomes. Based on a sample of twenty-two developed economies for the years 2002-03, Rose (2007) shows that the presence of diplomatic missions is positively correlated with exports. However, according to Gil, Llorca and Martínez Serrano (2008), offices of Spanish sub-national export promotion organizations do have a significant impact on total regional exports. A third set of recent papers has used firm-level data to evaluate more rigorously the impact of public policies on firm export behavior in developed countries. Görg et al. (2008) analyze a sample of 11,730 manufacturing firm-year observations in Ireland over the period 1983-2002 and conclude that grants aiming at increasing investment in technology, training, and physical capital, when large enough, are effective in increasing total exports of already exporting firms but not in encouraging new firms to enter international markets.

Until very recently, evidence for the region was notoriously scarce and limited to two studies on the case of Chile. Alvarez and Crespi (2000) examine the impact of the activities performed by Chile's export promotion agency, ProChile, on a sample of 365 Chilean firms over the period 1992-96. Unfortunately, although they control for sectors, they do not mention what those sectors are and it is therefore difficult to make inferences as to the performance of the agriculture-

agri-food industry. Nevertheless, they find that instruments managed by this agency had a positive and direct effect on the number of markets and, indirectly, after a period of four years, on diversification of products. Alvarez (2004) investigates whether ProChile's trade promotion instruments affect the probability of becoming a permanent export on a sample of 295 Chilean manufacturing firms. The author creates two categories of sectors—those with a comparative advantage in the Chilean economy for exports (food and beverage, wood and furniture, pulp and paper, and chemical products), and those that do not possess a comparative advantage but that have export potential (textiles and apparel, and metallic products). His results suggest that trade shows and trade missions do not significantly affect the probability of becoming a permanent exporter, but exporter committees do. In terms of the likelihood of participating in export promotion programs, the author finds that other available export promotion instruments, such as FomExp, are complementary to ProChile.

While recent studies have attempted to evaluate the average effectiveness of export promotion, these estimates may mask important differential impacts, particularly if a firm is small or in the early stages of its internationalization process. It can be expected therefore that trade promotion programs may have heterogeneous impacts over the distribution of export outcomes. In one of the first attempts to look at how export promotion services affect firms' export performance over its whole distribution, Volpe Martincus and Carballo (2009) provide some evidence on this topic by using semi-parametrically quantile treatment effects using annual data on assistance by ProChile, as well as total sales and highly disaggregated export data for the whole population of Chilean exports for the 2002-06 period.

The authors find that the impact of trade promotion assistance does, indeed, vary significantly over the distribution of export outcomes. Particularly, they find that stronger effects are found on the lower end of distribution of growth of total exports and the lower

and upper ends of distribution of growth of the number of countries and number of products. Combining these estimations, the authors observe that smaller and relatively inexperienced firms, as measured by their total exports, benefit most from promotion actions. They go on to note that this coincides with their priors since these firms are more affected by obstacles associated with internationalization.

While these findings are important in gauging the effectiveness of export promotion instruments, unfortunately, the information is not disaggregated to look at the impact on the agricultural sector. To the best knowledge of this review, there are no empirical evaluations of export promotion interventions that specifically look at agriculture and agro-industry. However, various papers do note the important role of government support in accessing new markets for the agricultural sector, particularly in relation to meeting food standards in international markets, providing access to credit, support in financing technology, promoting associations of small- and medium-scale producers, and attending fairs in major markets.

Sanitary and phytosanitary (SPS) standards and measures have been found to be a major factor influencing the ability of developing countries to exploit export opportunities for agricultural products in developed countries; in some cases these standards and measures have been found to be the most important impediments to agricultural and food exports to the EU (Henson and Loader, 2001). Díaz Ríos (2007) reports that Servicio Nacional de Sanidad Agraria, the National Agrarian Health Service (SENASA) in Peru has played a key role in consolidating market opportunities for the Peruvian agro-export sector, by facilitating access to specific markets through compliance with sanitary and phytosanitary requirements.

Similar findings are reported in various studies recently carried out by the IDB as part of the LAC Research Network project “The Emergence of New Successful Export Activities in Latin America”.⁶ For instance, looking at the emergence of wine, pork, and blueberries as successful export activities in Chile, Agosin and Bravo-Ortega (2009) report that public goods provided by the government were indispensable for all three products when it came down to negotiating sanitary agreements. Bonelli and Castelar Pinheiro (2008) note that while public sector involvement in the discovery process of swine-meat exports was nil in Brazil, the government did play an important role in terms of being a source of export finance (especially through Banco Nacional de Desenvolvimento Econômico e Social, the Brazilian Development Bank, BNDES). It is also up to the public sector to negotiate sanitary agreements that establish with each individual country the sanitary rules with which producers have to comply. In this regard, the authors note that because phytosanitary trade barriers are so fundamental, success in bilateral negotiations is critical in creating market access.

Hernández et al. (2007) report that, for mango exports in Ecuador, private-public actions were key to complying with phytosanitary market requirements for the USA, Mexico, Chile and Japan. Efficient and successful support on the part of the public sector in this area, however, was not consistent in all the studies. For instance, looking at the case of exports of blueberries in Argentina, Sánchez et al. (2008) describe how interviewees stressed the deficiencies of local institutions in comparison to those of other countries. For example, interviewees emphasized that SENASA had been a constant barrier to importing the required plants or agrochemicals, and that it had been of little help in controlling the Mediterranean fruit fly or in helping producers to negotiate new protocols with the United States Department of Agriculture (USDA).

⁶ The reports use an in-depth case study approach based on interviews with key actors to investigate the emergence of new successful export activities in several countries including, Brazil, Chile, Ecuador, Uruguay, and Argentina.

Returning to the specifics of export promotion, the IDB has also significantly contributed to the literature. The forthcoming report *Odyssey in Outer Space: Finding your Way around International Markets* (2010) thoroughly and consistently investigates for the first time the impacts of export promotion in several LAC countries and presents robust evidence of positive effects on the declaredly primary variable of interest, exports. The first part of the report presents an organizational characterization of the entities tasked with export promotion in over thirty-five countries and regions, based on an extensive survey and in-depth case studies on six countries in the region: Peru, Costa Rica, Uruguay, Chile, Argentina, and Colombia. It concludes that specialized export promotion agencies with their own network of foreign offices perform better than traditional diplomatic representations, in particular in terms of export differentiation.

The second part of the report offers a unique contribution towards improved evaluation practices by estimating the impact of export promotion activities on alternative measures of firm export performance (e.g. total exports and diversification in terms of destination countries and products). The estimates are performed using non-experimental impact evaluation techniques applied to unique datasets of firm-level export data virtually covering the whole population of exporters and annual lists of assisted companies for the six countries listed above.

Four main conclusions emerge from the analysis. First, trade assistance has larger effects on the extensive margin of firms' exports, i.e., when firms attempt to increase the number of destination countries and/or to expand the set of goods exported and, specifically, when they pursue entering an entirely new country or product market. Second, export promotion activities are more likely to generate larger export gains when products traded are more differentiated, i.e., when information barriers are the highest. Third, export support has stronger effects on the export performance of firms that are relatively small, and whose previous involvement in international markets has

been limited, as they face tighter limitations in accessing relevant export information. Finally, bundled support services entailing a systematic accompaniment throughout the export process, from the beginning of the commercial contacts to the establishment of the business relationships, seem to be more effective in enhancing firms' export perspectives than individual actions. In particular, firms combining counseling, missions and fairs, and trade agendas have significantly higher export growth, along the country and product extensive margin, than if they had used each of these services separately.

Historically, the agricultural export sector in LAC has been based on traditional cash crops such as coffee, bananas, livestock, cotton, sugar and cereals. However, trade and exchange-rate liberalization implemented in the 1990s improved producer incentives, diversifying the region's rural economy considerably with the emergence of other crops such as soybeans, milk products and ornamental flowers, as well as the beginnings of potentially significant ventures for their agro-industrial processing. This greater efficiency in allocating resources leads to more overall economic growth, improves the country's balance of payments, and places the government in a stronger budgetary position. Continued expansion of agricultural exports requires a deepening of agro-industrialization and certain forms of support from the public sector. Government support for export promotion, especially in the case of small enterprises with no export experience, can be justified by imperfections in the market for agricultural exports (Lederman, et al. 2006).

Volatile Agriculture and Food Prices

As mentioned in the previous chapter, due to the significant increase in food prices in recent years, an international movement sought to address the problems related to this, particularly as they affected food security and agricultural production. In this regard, short-, and medium-, to long-term recommendations were made. For the former, recommendations were made to make better use of and expand safety-net



programs to enhance food security for more marginalized groups, for example by providing cash transfers or food. Recommendations also were made to provide immediate support to promote agricultural growth, such as support to access seeds, fertilizers, and credit for the small-scale farming sector. For the medium-, to long-term, recommendations were made to support the agricultural sector via long-term investments in support of sustained agricultural growth (von Braun et al., 2008). In this regard, there seemed to be common agreement that increased productivity and production are seen as the structural solution for stable food supplies and prices (FAO, 2009).

With this in mind, the reader is referred to the literature on the effectiveness of safety-net programs to alleviate poverty and improve food security. As for the short-term interventions to support agricultural production, given that these were emergency measures, as far as this review is aware, no evaluations were conducted to determine their effectiveness. For the medium-, to long-term recommendations prescribed, valuable information regarding the interventions needed to im-

prove productivity and food security (and their effectiveness in doing so) are found elsewhere in this review.

It is important briefly to mention that in the past, efforts have been made to provide a more stable agricultural price market. However, commodity price risk-management instruments of the past, such as stabilization funds and international commodity agreements, are well known to have failed (Goo Kang and Mahajan, 2006). In addition to these international efforts, efforts have also been made to protect farmers from various risks through traditional insurance, and more recently through new index-based instruments (covered below). New, market-based instruments have been introduced to protect farmers specifically from volatile agricultural prices. Yet, as Goo Kang and Mahajan (2006) note, these have been embraced less thoroughly in developing countries where weak institutions and a lack of awareness of the use of these instruments have deprived farmers of their potential benefits. These instruments include forward contracts, futures, options, swaps, and insurance. The last will be covered in the following section, while the

reader is referred to Goo Kang and Mahajan (2006) for an introduction to the first four of these instruments.

Access to Credit

a. Government guarantee funds

Credit guarantees have been advocated for many developing countries as an important instrument to entice reluctant lenders into lending to clientele groups of interest to donors and governments, such as agriculture, small farmers, women, micro-enterprises, and the poor (Meyer and Nagarajan, 1996). It is typically assumed that a major obstacle to formal-sector lending is the perceived risk associated with such loans, and that by diminishing default risk through a guarantee, the expectation is that lenders will make more loans to clients that are credit rationed. An additional expectation is that the lenders will realize that these clients are not so risky, which will induce them to provide more loans in the future (Meyer and Nagarajan, 1996). The expected outcome of such interventions is therefore expanded access to credit.

Considering the relatively long time that credit guarantees have been used in the U.S. and other countries to influence lending, it is surprising how few good comprehensive evaluations have been conducted on the subject (Meyer and Nagarajan, 1996; Honohan, 2008). There have been some attempts in recent years to empirically evaluate the effectiveness of credit guarantees; yet most of these focus on developed countries, particularly in U.S., Canada, and Japan. Importantly, and for the purpose of this review, no empirical evaluations have been found on the impact of credit guarantees that specifically target the agricultural sector. However, this section presents the more current and innovative attempts to evaluate credit guarantee schemes around the world in the hope of shedding some light on the subject, even if it does

not provide specific information on the role of these schemes in agricultural production and productivity.

Before proceeding, it is important to note that a credit guarantee scheme involves three stakeholders: guarantors, lenders, and borrowers. As such, the evaluation of the performance of each of them would be of interest to different audiences, depending on their background, interest, and the questions they seek answered. Yet while the performance of individual stakeholders is important in its own right, it is also important to consider them all as a whole, since positive performance by each component is necessary for the sustainability and success of the schemes as a whole. Unfortunately, there are still gaps in the literature in terms of evaluating each of the three stakeholders. Most studies primarily focus on financial additionality, while very few focus on the impact on the borrower.⁷

Guarantee Schemes in developed countries are found to have positive effects across a number of countries. For the United States, the levels of Small Business Administration (SBA)-guaranteed lending in a local market is found to be linked to future per capita income growth (Craig, Jackson III and Thomson, 2007) as well as the average annual level of employment in a local market, particularly low-income markets (Craig, Jackson III and Thomson, 2008). There is also evidence that SBA-guaranteed loans raise economic growth rates, employment, wages, and salaries, and non-farm proprietors' income (Hancock, Peek and Wilcox, 2007). In Canada, the loan guarantee program appears to lead to additional lending—measured as loans received that would have been turned down in the absence of the program—by 75 percent (Riding, Madill and Haines Jr., 2007). Similarly, government loan guarantees in Japan were found to increase the supply of guaranteed loans as well as non-guaranteed (Wilcox and Yasuda 2008).

⁷ One of the rare early attempts to comprehensively evaluate credit guarantees was carried out by Levitsky and Prasad (1987). The authors showed that it was difficult to demonstrate that much additional lending actually took place resulting from small and medium business loan guarantees.

Also in Japan, Uesugi, Sakai, and Yamashiro (2006) find that: (i) credit allocation (particularly in terms of long-term loans) increased more among guaranteed loan users than non-users; (ii) economic efficiency, as measured by profitability, improved with the less risky guaranteed users (no significant change for risky users); and (iii) the overall change in efficiency was positive for loan-guaranteed users. In Korea, access to credit guarantee enabled guaranteed firms to achieve improved performances, particularly through growth of sales and improved productivity, although they failed to stabilize employment (Kang and Hesmati, 2008). A study in Spain, however, suggests that advantages can be observed mainly in the weakest companies where the capacity to tackle projects is facilitated through the scheme (Garcia-Tabuenca and Crespo-Espert, 2008). Overall, the schemes in these developed countries do point to positive effects in credit access and in some cases to broader effects of this access.

Looking at five case studies of closed deals, where the World Bank provided credit guarantees to private financiers of large infrastructure projects in developing countries, Huizinga (1999) examines whether these guarantees improved the credit terms (in terms of interest rates and credit duration) pertinent to the non-guaranteed part of the overall financing. The author uses a “stripping” approach to separate credit terms for the part of the loan covered by the World Bank and for the part not covered by the program (sovereign debt). With this approach, the author calculates credit terms separately for the two parts and examines the sovereign part of the transaction to other sovereign interest rates for the same country. This comparison shows whether the World Bank’s involvement provides synergies in also improving credit terms on the credit not covered by the guarantee. The author finds that there is no evidence that guarantees have affected non-guaranteed interest rates favora-

bly, and that they do not appear to increase the duration of the non-guaranteed financing.

Unfortunately, based on this review, empirical evidence on the effectiveness of credit guarantee schemes in LAC is scarce and only two such papers were found, one for FOGAPE⁸ in Chile and another one for Mexico. In the case of FOGAPE, as presented in Benavente, Galatovic and Sanhueza (2006), Larraín and Quiroz (2006) take advantage of a “designed experiment” by identifying a treated and a control group in Chile. The treated group consists of those firms that participated in the program when it first began (initially only a small group of banks bid for guarantee rights). The control group is made up of those firms that entered the program at a later stage (when other banks began to bid for guarantee rights). The authors’ assumption is that firms that participated in the program only later on would have participated earlier had their bank bid in earlier Fogape auctions.

The authors find that the average firm that participated in the scheme increased their debt by around \$18,000 and that the increase was statistically significant for loans issued in the metropolitan region of Santiago. They also find that the probability of getting credit increased by 14 percentage points and thus, firms that had access to FOGAPE earlier were more likely to get funding in the banking system. Likewise, a statistical comparison between the “treated” and “control” groups shows that firms that received FOGAPE support increased their sales and profits after five years and, on average, sales increased by 32 percent and profits by 24 percent. It is important to note that Benavente et al. (2006) do not describe the empirical approach used by Larraín and Quiroz (2006).

Using monthly data from the Comisión Nacional Bancaria y de Valores from September 2001 through

⁸ The results of the FOGAPE study are presented by Benavente, Galetovic, and Sanhueza (2006). Efforts to track down the original paper proved unsuccessful. It is a document written in Spanish, which was cited as a mimeo and as a bank document, and slightly changed titles over time, based on reference pages of several publications.

June 2007, and relying on three measures of supply elasticity of credit (one based on observed data from a Vector Autoregression Model [VAR] implemented by the authors and two from similar studies for the U.S. and Argentina), Benavides and Huidobro (2008) investigate if loan guarantees from Mexican government banks are effective. In particular, they study if the Mexican government-owned banks have succeeded in promoting a break-even increase in the credit offered by private banks to non-financial small- and medium- sized firms by means of their loan guarantee programs. From the government perspective, they note, the trade-off between the overall subsidy and the net benefit of the extra credit encouraged can be expressed in terms of a “break-even” quantity of credit that would finance the subsidy. The authors find that the outstanding stock of credit increased, but that it is considerably above the break-even quantity.

Given that there are several sources for guarantees, in addition to those from the government, the authors find that about 47 percent of the increase observed in commercial loans is explained by the presence of credit guarantees. Yet they note that these results are not necessarily good news, since they may indicate that guarantees could be inefficient and possibly ineffective. Inefficient because premiums and coverage might be incorrectly fixed (away from their “fair” level), or because premiums do not fully reflect the risk involved; or, given the current premiums, because coverage is excessively high and so private bankers try to make the most they can out of that situation. Based on their results, the authors recommend further research, particularly on properly measuring additionality, a revision of “perverse incentives”, and on finding the optimum guarantee premium.

While these recent studies are helping better understand the role and effectiveness of credit guarantees, it is important to note that more research is needed,

particularly in LAC. Given the fact that credit is relatively scarce in rural areas as well as the potential benefits of providing credit to the agricultural sector, more research in this area is also of great importance.

The IDB has made efforts to gather more information on this topic. In 2006, the Bank published *Sistemas de garantía de crédito en América Latina: orientaciones operativas*, to shed some light on the state of these schemes in the region. Some of the key findings and trends of this undertaking are as follows. Credit guarantees have experienced a significant increase in recent years, particularly since 2000. Yet despite this clear growth, the share of these schemes within the banking (credit) system is small, with the exception of Chile and Colombia. Importantly, due to implemented financial supervision and regulations towards the end of the 1990s, this has increased the level of trust of private banks and has promoted a more active use of these schemes. However, there is no evidence of additionality created by the case studies covered, with the exception of Chile.

In terms of capitalization, the public sector has been the main, and at times the sole provider of financial resources for credit guarantees. In terms of financial sustainability, the schemes reviewed are being well managed, in a professional and transparent manner, and in recent years have reached a level of financial sustainability greater than a decade ago, with one exception. The report notes that these positive results have been attained in the context of an expansive economic cycle, with moderate default rates.⁹ In terms of beneficiaries, these have mainly been micro-, small-, and medium-scale enterprises. Lastly, in most cases financial institutions require additional complementary guarantees.

Despite finding some positive signs of the effectiveness of some of the guarantee schemes reviewed, the re-

⁹ Niveles de morosidad y siniestralidad moderados.

port concludes that more robust analyses are needed and more research is necessary, particularly to provide evidence of additionality, quantification of the obtained incentives for each of the main stakeholders, and a cost-benefit analysis of the current credit guarantee schemes. The report's suggestions fall well in line with Honohan (2008), who, twelve years after Meyer and Nagarajan (1996) reviewed these schemes. He also alludes to the difficulty of measuring the possible additionality associated with a credit guarantee scheme and notes that this problem still persists today, despite the small number of studies that have tried to throw some light on this question by means of formal econometric methods. The author also observes that credit guarantee schemes can be quite costly, and that these costs are not widely known. Moreover, the benefits are also often vague and have been little studied.

Even though credit guarantee schemes will never be a substitute for reform of the underlying institutional requirements of an effective credit system, Honohan (2008) states that credit guarantees do have a natural place in the market, and where they are not sufficiently forthcoming, there may be scope for well-designed government-sponsored programs that are part of a welfare-improving policy to improve the performance of financial intermediation, particularly with respect to SMEs. With this in mind, Honohan (2008) suggests that those planning to introduce a loan-guarantee scheme should ensure: "(i) clearly defined, precise and coherent welfare improvement goals; (ii) a reliable and realistic approach to accounting so that costs can become clear early; (iii) built-in data collection that allows prompt evaluation of outcomes; and (iv) attention to scheme design that maximizes the chance of successful goal achievement."

b. Microfinance

Microfinance schemes are one particular approach to addressing the shortcomings of credit markets noted previously. As with credit guarantees, the expected benefit is to expand access to credit. However, since they are often initially subsidized, there is an addi-

nal issue of sustainability and whether they are the most efficient way of delivering credit. Impact evaluations of microfinance services are therefore seen as essential for assessing the commercial profitability, operational efficiency, and poverty outreach and alleviation of such schemes. For borrowers, the expectation is that Microfinance Institutions (MFIs) will contribute to the promotion of productive investments that would otherwise be forgone, while also helping smooth consumption during difficult economic times. Moreover, MFIs can help the development of rural financial markets by increasing their pools of "credible" clients (those who have shown to be bankable), while also providing additional financial services such as insurance and savings accounts.

Even though there has been a significant increase in the provision of financial services through microfinance in the past 30 years, including in Latin America, and even though there has also been a growing body of literature written on the range of institutional arrangements pursued in different organizations and countries, Hulme (2000) notes that knowledge about the achievements of such initiatives remains only partial and is contested. Montgomery and Weiss (2005) note that rigorous research on the outreach, impact, and cost-effectiveness of microfinance programs is rare.

Contrasting the empirical research done in Asia with that of LAC, the authors state that in Latin America, in general, the impact of microfinance on poverty has been less well documented, both in a methodological sense and in terms of coverage in individual studies. The authors add that most of the studies that have been done tend to be concentrated on a small number of countries, primarily Bolivia and Peru. Similar points were made on a paper prepared for the IDB (Bebczuk, 2008), which found only ten academic studies in LAC countries. As with Montgomery and Weiss (2005), most of the papers reviewed by Bebczuk focus mainly on Bolivia; however, they also cover programs implemented in Ecuador, Peru, Chile, Brazil, Guatemala, Haiti, Nicaragua and Paraguay.



As noted in the previous chapter, microfinance has recently been seen as having the potential also to support agricultural endeavors. Unfortunately, based on this review, no empirical evaluations on LAC have been found in this regard. However, this section briefly summarizes the literature on the impact of microfinance in LAC to shed some light on methodology and trends in indicators observed. This is followed by information from relative case studies on microfinance and agriculture, as well as several papers that highlight the importance of access to credit in enhancing agricultural productivity.¹⁰

Hulme and Mosley (1996) look at a small sample of BancoSol borrowers in Bolivia and, using approved borrowers who had not yet taken out a loan as a control group, find an average annual increase in income of 28 percent for borrowers compared with an average of 14.5 percent for the control group.¹¹ Likewise, using information from a sample¹² selected from four microfinance institutions and the “creation” of a treatment

and control group¹³ in two points in time in Bolivia, Mosely (2001) examines the impact of microfinance on poverty. The author relies on information from a questionnaire, focus group interviews, and key informant interviews. Using a range of poverty concepts, the author finds that all institutions studied had, on balance, positive impacts on income and asset levels. However, he finds that microfinance may augment vulnerability, given the high average debt-service ratios found.

Drawing on two unique sources of data and the use of propensity score-matching techniques, Aroca (2004) evaluates the impact of microcredit programs administered by NGOs and banks in Chile (2) and Brazil (5) on micro-entrepreneurs’ income. The author finds microcredit programs have a high positive impact on income, especially for those associated with banks in Brazil, while in the Chilean case the evidence is weaker. As for NGO-based programs, the evidence suggests that their impact on their clients’ average

¹⁰ The papers included in this section were reviewed in this study; however, when these could not be accessed, the reviews done by the cited review papers are presented.

¹¹ Montgomery and Weiss (2005) note that their study suffers from several problems: a very small sample of 36 borrowers; unclear information about the role gender or sector activity played; and recall income estimates.

¹² However, it is important to note that their samples were relatively small.

¹³ Treatment for those that started the program earlier and control for those that started afterwards.

income is actually negative. Unfortunately, while the author controls for those that work in the productive, retail, and service sector, this does not add any information on the impact on agricultural endeavors.

Banegas et al. (2002) look at two microfinance institutions in Ecuador (Banco Solidario) and Bolivia (Caja los Andes). Using control groups selected from households working in the same sector and relying on a logit regression model, the authors find that for both institutions, taking a loan is associated with increase in income. However, their results may be suspect since that may not be the best way to identify income changes. Montgomery and Weiss (2005) note that income change was captured by a simple scoring system (1=income decreased, 2=unchanged income and 3=income increased), and not on the actual size of monetary values. The authors further note that other limitations exist in their analysis. For instance the issue of self-selection bias was ignored and the authors do not control for factors like education and skills. Again, no information is provided on the break-down by sectors to gauge the impact on agricultural households.

Drawing on data from two points in time (1997 and 1999) Dunn and Arbuckle (2001a, 2001b) examine loans to micro-enterprises for 305 households in Lima, Peru by Mibanco. Relying on a covariance (ANCOVA) model that statistically “matches” observations in the treatment and control groups that have the same 1997 values (for selected variables), the authors find that, on average, there was a significant difference in terms of enterprise revenue, fixed assets, and employment creation. Moreover, microcredit appeared to have positive impacts in the manner in which ‘treated’ entrepreneurs purchased inputs. Finally, participants experienced positive impacts in terms of household income.¹⁴ While the positive results seem quite substantial, the authors recognize that it may be difficult to attribute all of the changes to the microcredit program, since their model does not properly address self-selection bias.

As in previous cases, while the authors include sector variables, these are rather broad (commercial, service, and industrial) and do not shed light on the impact of the program on agricultural production.

Using information from surveys and anthropometric data at two points in time, and based on a quasi-experimental design with the use of three sets of groups (treated, non-treated in participating communities, and control communities), McKnelly and Dunford (1999) look at the impact of Credit with Education (CRECER) loans to women in rural Bolivia. The authors find that for the vast majority of participants, their incomes increased. Most participants attributed this to improvement in the expansion of their income-generating activities, reduced input costs as a result of buying in bulk or with cash, or the new activities or products made possible by access to credit and selling in new markets. The authors also find improvements in health and nutrition knowledge and practices; however, on the key focus of the study, namely nutritional improvements, they find little evidence of impact. Importantly, however, they do find that for households suffering ‘food stress’, participants were less likely to sell off animals and more likely to take out loans as a coping strategy, compared to non-participants.

Using three different datasets and relying on regression analysis, Maldonado (2005) examines the impact of microfinance on the education decisions of rural households in Bolivia. The author finds results that challenge common assumptions of microfinance programs. Particularly, he finds that for some ranges of household income and certain types of borrowers, access to loans has conflicting effects on school enrollment. For instance, while loans increase the demand for education credit-constrained households that cultivate land or operate labor-intensive microenterprises exhibit new demands for child labor, either for farming, working in the microenterprise, or

¹⁴ These are some of the key findings; for more detailed information on other findings, see sources.

taking care of siblings while mothers operate new or expanded business.

Using a random sample of surveyed active borrowers in 1995 in Bolivia, Navajas et al. (2000) rely on an index of basic needs fulfillment to investigate the depth of outreach of MFIs. The authors find that most of the poor households reached by microfinance organizations were near the poverty line and these were the richest of the poor, indicating that the poorest households are not being reached. As can be seen from this review, most empirical papers undertaken thus far focus primarily on improvements in income. Moreover, even though a couple of these papers look at improvements in assets, little information is provided on whether these are directly related to productive investments. Likewise, even though a couple of the studies include variables to control for sector-related impacts, the sector variables used are quite broad, and in no instance is the role of microfinance in agricultural enterprise and productivity clearly covered. Information on case studies on the role of microfinance and agriculture is presented below, followed by several empirical papers that more clearly inform on the relationship between access to credit and improvements in agricultural productivity.

Recognizing the importance of access to credit to those dependent on agriculture, the Consultative Group to Assist the Poor (CGAP), with funding from the International Fund for Agricultural Development (IFAD), conducted research to highlight the emerging lessons in agricultural finance around the world (IFAD/CGAP 2006). In particular, and based on desk reviews, consultant site visits and stakeholder consultation, CGAP identified a short list of institutions actively engaged in agricultural finance that showed the potential to achieve scale and sustainability. Among the final case studies included in their publication are two (out of five) from Latin America: Confianza, from Peru, and Caja los Andes, from Bolivia. These case studies focus more on

innovative approaches undertaken by the institutions to maintain financial sustainability, while little is mentioned about the impact of borrowing customers involved in agriculture. Information about these two case studies is nonetheless presented below to shed some light on what each of these two entities have done to reach a certain level of financial success, while continuing to support those that depend on agriculture.¹⁵

Confianza is a small regulated MFI in central Peru that provides agricultural loans, alongside a range of rural, urban, small business, housing, and consumer loans to low-income clients. From its inception as an NGO until it became a regulated microfinance provider in 1999, Confianza's loan portfolio was almost exclusively devoted to solidarity group loans for agricultural purposes. After undergoing among other things some significant institutional changes and a drop in potato prices, which reduced the capacity of many clients to repay their loans, Confianza improved the quality of its portfolio from 2000-01 with support from the IDB, through write-offs and the introduction of a new lending methodology that responded to the foregoing challenges. Some of these changes included portfolio diversification (recognizing the inherent risks in agricultural lending), stricter lending requirements, rigorous loan monitoring, a reduction in geographic coverage, and a production-based agricultural lending.

For the last point, Confianza implemented several key measures to adapt its lending to the context and specific characteristics of agriculture. For instance, it designed its agricultural loans to fit the income and expenditure cycles of agricultural production more closely. It extended loans for specific crop production and made loan terms flexible, tying disbursements and payments to income flows. Emergency lines of credit were made available to clients with good repayment histories. Additionally, loan officers used new data-collection techniques to develop realistic business plans for specific crops and to analyze the potential income

¹⁵ This section relies heavily on IFAD and CGAP (2006).



source for repayment. Likewise, strategic partnerships were formed with local public and private sector institutions that monitored weather patterns and agricultural commodity prices. This allowed Confianza more accurately to predict repayment rates. Finally, agricultural clients were required to contribute, in cash or in kind, a portion of the total financing requirements for an agricultural production cycle.

The changes implemented by Confianza have led to changes in financial sustainability. For instance, three years after the default crisis, Confianza's operational self-sufficiency ratio reached 1.75, and the financial self-sufficiency ratio reached 1.22. Importantly, the growth in the agricultural portfolio has almost kept pace with that of the total portfolio, expanding by 40 percent in 2001 and 64 percent in 2003. This is partly due to Confianza's concerted efforts to increase penetration in rural areas, including agricultural zones. Lastly, it is important to note that arrears in the agricultural portfolio also remained lower than the arrears in the overall portfolio from 2001–03.¹⁶

Caja Los Andes (CLA) opened in La Paz, Bolivia in 1995 and was an offspring of Procredito, a financial NGO founded in 1992 with support from the German consulting firm Internationale Project Consult. After inheriting a three-year-old urban lending portfolio from its parent company in 1995, CLA immediately began expanding its operations to rural areas and adding agricultural loans to its portfolio. As with other MFIs around the world that have attempted agricultural finance, CLA faced a variety of challenges. These were overcome with innovative steps related to making adjustments for offsetting higher costs of reaching rural clients; mitigating agricultural risk; adapting loan products to meet rural needs; managing borrower-specific risk in a more complex environment; and the use of a turnaround application-and-disbursement process.

More specifically, CLA strategically selected the location of its rural offices by focusing on small-town hubs in more densely populated rural areas, while also favoring areas that had good irrigation systems and a sound base of crops with well-established markets. Additionally, in these rural offices, lending is not limited to rural clients and through this approach, the lower costs of lending to clients in town, combined with the slightly higher interest rates charged for agricultural loans, helps the institution cover the expense of lending to clients in more isolated areas. Likewise, CLA bases its loan sizes on repayment capacity whereby borrowers establish a credit history by starting with smaller loans and working their way up. CLA also moves up-market with its clients, by making increasingly larger and longer-term loans as the clients' enterprises grow. In this regard, CLA boosts efficiency and balances the agricultural portfolio, which allows it to continue reaching lower-income borrowers.

In terms of risk mitigation, CLA works with clients who diversify their own risk through the cultivation of multiple crops, planting in several locations, or combining dairy farming, livestock, or other income-generating activities with crop production. As for adapting loan products to meet rural needs, CLA uses a flexible approach where loans were collateralized with farm household assets and non-registered land titles. Likewise, disbursements could be made in installments corresponding to the crop cycle, while payments were set according to revenue flows.

In terms of managing borrower-specific risk in a more complex environment, an important ingredient in CLA's approach is the expertise of rural loan officers, who have degrees in agriculture or backgrounds in agronomy and who are familiar with agricultural endeavors and the regional context. CLA recognizes the challenge of establishing a reputation for not tolerating

¹⁶ Throughout its development, Confianza has benefited from donor and investor support in the following forms: (i) grants for technical assistance, staff training, systems development, product revisions and branch expansion, principally from the IDB, with small grants from the Netherlands Organization for International Development Cooperation (NOVIB) (ii) Subsidized loans for on-lending from social investors such as NOVIB, Oikocredit and Appui au Développement Autonome (Support for Independent Development); and (iii) commercial loans from the Latin American Challenge Investment Fund and other international investors.

delinquency. Thus, loan officers visit clients immediately after the first missed payment and penalty interest rates are charged to delinquent clients, while reduced interest rates are given to repeat clients in good standing. Lastly, through the use of sophisticated software and a decentralized approach, CLA emphasizes a rapid application and disbursement process.

Between 1995 and 2002, CLA's loan portfolio grew at an average annual rate of more than 40 percent. However, while the CLA portfolio in agriculture is well managed, sustainable and significant in terms of volume and clientele, it now represents less than 10 percent of CLA's overall portfolio. This diminished agricultural portfolio can be traced to high delinquency rates in two rural offices and to a broader undercurrent of political instability over the past few years.¹⁷

As can be seen from these two case studies, microfinance institutions can play an important role in providing credit to the agricultural sector. While this is not a straightforward endeavor, innovative steps can be taken to modify financial lending to the needs, realities, and context of rural agricultural workers. This brief review does not provide enough evidence on the relationship of access to credit and agricultural production and productivity since no empirical evaluations have been found to shed light on this topic

Access to Insurance

a. Weather based and area-yield indexes

While there is ample evidence on the performance of agricultural insurance schemes in the developed world, particularly in relation to crop insurance, the results are usually not positive (Skees, Hazell and Mi-

randa, 1999). As noted in the previous chapter, while government-backed programs have generally been good in terms of coverage (in developed countries), they have not been successful in terms of economic soundness (in developed and developing countries). Wenner and Arias (2003) note that traditional agricultural insurance programs have been financial failures, due to high administrative costs and unresolved adverse selection and moral hazard problems.¹⁸

In recent years, innovative insurance instruments have been developed to provide alternatives for dealing with agricultural risks. As noted, these instruments are tied to the performance of an index, where the probability distribution of a risk taking place can be estimated while the actual event can also be measured. The two main categories of index-based insurance products are weather and area-yield; however, new instruments have been developed using the same principles. Since these instruments are relatively new, little and mixed evidence has been found on the impact of these schemes. However, given the increasing interest in agricultural insurance in LAC as an instrument to protect farmers from risk, this section will provide a brief synthesis on this topic. A synthesis of recent empirical work that aims to provide useful information about index-based schemes in developing countries will follow.

In recent years, several undertakings have been carried out by the IDB¹⁹ (Wenner and Arias, 2003; Wenner, 2005; Arias and Covarrubias, 2006) to look at the current state of agricultural insurance markets in LAC. However, these are restricted to providing a historical review of the insurance schemes implemented in the past and to describing some of the recent developments, since, as mentioned, this market is

¹⁷ Over the years, CLA and Procrédito have received technical assistance from Internationale Projekt Consult, the multilateral financial institution Corporación Andina de Fomento and the Multilateral Investment Fund of the IDB, plus financing from an array of international and Bolivian investors.

¹⁸ See for example Just, Calvin and Quiggin (1999), Smith and Goodwin (1996), Makki and Somwaru (2001), and Roberts, Key and O'Donoghue (2006).

¹⁹ Or by IDB staff that have presented papers at international conferences.

relatively nascent and small. While some LAC governments have played a role in providing or supporting insurance provision to the agricultural sector for quite some time, such as Mexico, whose first agricultural insurance program dates back to 1942, these early schemes experienced financial losses and eventually closed (Wenner and Arias, 2003). In recent years, there have been new attempts to provide insurance to the agricultural sector, most of them in a combined partnership between government entities and the private sector, such as in Mexico, the Dominican Republic, and Uruguay. However, the number of entities providing insurance is still rather small.

Wenner (2005) details some of the key characteristics of the insurance markets in the Dominican Republic, Uruguay and Peru. Among other things, the author describes the levels of coverage, the legal and regulatory frameworks in place, and farmer perception of insurance, making recommendations for each country. Coverage, as noted, it is quite sparse. For instance, in the Dominican Republic, out of thirty-six insurance companies active in the country, only AGRODOSA, a public-private company, provides crop insurance. Likewise, in Uruguay, out of eighteen companies that provide insurance, only three provide agricultural insurance. In the case of Peru, the author mentions that some of the fifteen active and regulated private insurance companies offer single-peril insurance products but does not give a concrete number. This may be due to the fact that data on single-peril agricultural coverage is not disaggregated and is classified as general insurance (Wenner, 2005). Similarly, there are only ten agricultural insurance companies between Guatemala, El Salvador, Honduras, Nicaragua, Costa Rica, and Panama (Arias and Covarrubias, 2006).

As for the legal and regulatory framework, in the case of the Dominican Republic, this is based on a law governing insurance that dates back to 1968, one that, as Wenner (2005) notes, is in need of updating to international insurance standards. In the case of Uruguay, the legal and regulatory framework is characterized as being generally open and without undue barriers

to foreign companies. Likewise, in Peru, the general law that governs insurance is reported to be generally adequate. One of the general suggestions made in this area by the author regards the issue of arriving at the right levels of reserves for appropriate solvency. For instance, the author notes that in the case of the Dominican Republic, the law grants a great deal of discretion to the superintendent in establishing reserves for current risks and special reserves and how they are invested. In this regard, the author observes that the most relevant implication within this framework would be to constitute large reserves for agricultural operations in order to insure solvency. As for Peru, and given the great losses arising from El Niño, the author observes that one possible area of concern for companies interested in offering crop insurance on a large scale would be the requirement for catastrophic reserves. On the other hand, the author notes, in Uruguay, the required reserve for crop insurance at 70 percent of premiums may or may not correspond well to real risk, given the fact that Uruguay is not as vulnerable to catastrophes as the Dominican Republic or Peru (Wenner, 2005).

In terms of the possible demand for insurance, the author notes that according to farmers this is generally positive but there is not enough data to substantiate this. For instance, while no formal elicitation of farmers' attitudes to risk has been conducted, qualitative data suggests that farmers are quite interested in insurance in the Dominican Republic, especially against wind damage caused by hurricanes and drought, which reduce the productivity of pastures. However, the highest priority for farmers was price stabilization. Similarly, in Uruguay, there have not been any formal studies conducted on farmers' attitudes to risk, nor on the capacity to pay for insurance; however, farmers are reported to be seeking greater access to insurance products and financial risk-management tools. As for Peru, farmer groups in general express an interest in insurance protection, and while exporters tend to be more interested in price hedging, domestic producers are interested in yield protection (Wenner, 2005).



One of the common themes found in the author's review is a growing interest in agricultural insurance among governments, the private sector, and farmers. This has been manifested in new partnerships between public entities and private insurers, studies conducted by governments and the preparation and implementation of pilot projects in this area. For example, in 2003 the government of Peru formed an Agricultural Insurance Commission to study the feasibility of introducing and expanding agricultural insurance. It is also expected that the commission will draft agricultural legislation. Similarly, in Uruguay, an interdepartmental working group was formed in 2003 to promote the introduction of agricultural insurance with the stated purpose of drafting a new law and starting a pilot project with BSE, MAPRE -One of the three insurance companies for agriculture in Uruguay-, and MGAP. A draft Agricultural Insurance Law has been prepared and the pilot launched (Wenner, 2005).

In sum, the agricultural insurance market in LAC is in its early stages, with low levels of coverage, insufficient information on the demand side and on whether farmers are capable of paying for it. There is also a need to arrive at a desired level of reserves to provide solvency

based on the needs of each region/country. Regarding regulatory framework, based on the cases covered, this is usually adequate but there is room for improvement, especially in the case of the Dominican Republic. However, there is a growing interest in agricultural insurance on the part of governments, the private sector and farmers. Recent analyses of some possible insurance schemes to employ are now considered.

Using information on annual rainfall from the Romanian National Institute of Meteorology and Hydrology (NIMH) from 1969 to 2002 for seven *judets* (counties)²⁰, Spaulding et al. (2003) develop a priced precipitation contract for these counties to investigate the impact of weather derivative contracts (WDC) on farm-level risk-management decisions. Using quadratic programming techniques that incorporate profit and risk considerations, and making use of a microeconomic farm-level model for one of the counties, the authors find that if sufficient partnerships are forged to share risk, weather derivative contracts can prove useful in Romania. Moreover, across levels of risk preferences, contracts were found to increase mean profits and reduce the coefficient of variance in net returns when compared to a base scenario with no contract. The authors state that

²⁰ Translation obtained from http://en.wikipedia.org/wiki/Counties_of_Romania.

market-based insurance with minimal government intervention is the key to the development and success of weather-derivative contracts. However, they caution that one of the unknowns concerning index-based insurance is the fact that demand for these types of instruments is not easy to predict, especially in situations where farmers are unclear about how a new insurance instrument works or how they would benefit from it.

Giné and Yang (2009) partly address this question by making use of a randomized field experiment in Malawi. Using a sample of about 800 maize and groundnut farmers, the authors offered a random group of half the farmers credit to purchase high-yielding hybrid maize and roundnut seeds before the planting season. The other half was offered a similar credit package, but was also required to purchase a weather insurance policy that partially or fully forgave the loan in the event of poor rainfall. The authors test whether reducing risk induces greater demand for loans to finance technology adoption. In this regard, their main focus is on farmer's demand for insurance

Surprisingly, the authors find that the take-up rate among farmers who were offered the uninsured loan was 33 percent, 13 percentage points higher than among farmers offered insurance with the loan. The authors state that there is evidence to suggest that reduced take-up of the insured loan was due to farmers already having implicit insurance from the limited liability clause in the loan contract. They provide other potential explanations for take-up differences and suggest that some of these may be related to issues of uncertainty about the risk characteristics of the hybrid seeds as well as farmers not being completely clear about the perceived default costs of the two products. In a previous version of their work, the authors suggest that "marketing efforts devoted to reducing the complexity of the insurance from the farmer perspective can help ease the acceptance of such insured or contingent loans" (Giné and Yang, 2007).

While innovative microinsurance schemes are seen as a tool that can help farmers cope with climate va-

riability and change, one of the main challenges, as seen in the case of Malawi, is to develop strategies to help potential participants understand how insurance operates, so that such risk-transfer programs can be successfully implemented. This is particularly true for smallholders who usually have low levels of formal education. In recent years, a handful of researchers have attempted to develop tools to help farmers understand how insurance operates. One of the proposed tools is a simulation game, through which farmers can gain first-hand experience of a functioning insurance market.

Using an experimental approach conducted in Ethiopia and Malawi, Patt, Suarez and Hess (2010) designed a game where a treatment group and a control group received information about index insurance through two distinct methodologies. While the control group received this information through a conventional process (which mirrored the explanations used in the Malawi pilot program described above), the treatment group received no direct explanation about the index insurance, but rather received instructions for an index insurance role-playing game. The authors' findings suggest a generally poor understanding of basic insurance concepts among the study population, which is consistent with past results in suggesting that better understanding correlates with greater willingness to purchase. Their results also suggest that role-playing games may be an important tool for improving understanding, but that they do not necessarily outperform more conventional training practices.

Using a small panel data set from a representative survey, collected at the end of the 1990s and the start of 2000, as well as recall data for three additional complete crop cycles, Zant (2008) simulates the impact of crop index insurance on household income of typical cash-crop (pepper) growers in India. The author finds that yield risk is high and of a comparable size to price risk, while crop revenue is even higher. The simulation of the index insurance, which insures a combination of crop price risk and crop yield risk, indicates that an affordable, ideal crop index insuranc-

ce substantially reduces variability in crop revenue, reducing crop revenue risk by 50 percent of its original level. He also finds that higher premium rates, or higher rates of protection, are required to achieve more attractive levels of risk reduction.

The author also finds that basis risk (the difference between feasible and ideal insurance) increases with risk aversion and with premium rates; however, the size of the basis is only large for a small fraction of farm households. As for the take-up rate, the author finds that depending on the degree of risk aversion, a share of around 5-30 percent of farm households is willing to pay for index insurance and this improves to 12-50 percent with a 50 percent premium reduction. The author also finds support for the contention that consumption smoothing is achieved at the cost of productivity in agriculture, thus, opportunity costs of consumption smoothing in the form of lower productivity levels suggest potential welfare gains of specialization if adequate insurance is in place.

Using historical rainfall data in India, Giné, Townsend and Vickery (2007), estimate the distribution of payouts on a rainfall index insurance product developed by the general insurer ICICI Lombard and offered to rural Indian households since 2003. The authors aimed to address two principal questions: (i) does the insurance contract pay off regularly, providing income during periods of moderate deficient rainfall?; or (ii) does it operate more like disaster insurance, infrequently paying an indemnity but providing a high payout during extreme rainfall events?

Analyzing fourteen insurance policies, each linked to a different rainfall gauge, the results provide support for the second scenario: indemnities are concentrated

in the extreme tail of adverse rainfall events, which insures households against severe shocks, but it also creates a highly skewed distribution of losses for an insurer writing rainfall insurance policies. The authors suggest that this balance sheet exposure can be ameliorated, in part, by holding a geographically segmented insurance contract portfolio or by using reinsurance markets. The authors emphasize that much more research is necessary to evaluate the promise of weather index insurance. Indeed, as Sharma and Vashishtha (2007) observe, the weather-indexed products developed by ICICI and IFFCO have been very recently launched and it would be premature to comment on their effectiveness as risk-hedging tools.

As can be seen from this brief synthesis of the literature, little is still known about the possible impact and success of index-based agricultural insurance and more research is necessary. This review has shown that index-based insurance can potentially have a positive effect on income (Romania), in decreasing the variability of crop revenue (India) and of returns (Romania); likewise, in the absence of a similar insurance, it can have negative effects on productivity forgone (India) in favor of consumption smoothing. However, little information is known on the demand side (Romania), since low take-up rates (Malawi) may be due to a lack of understanding about how these schemes work (Malawi and Ethiopia). There is some evidence that greater understanding (Ethiopia and Malawi) and a reduction in the premium (India) may increase the probability of purchasing insurance. However, evidence on the financial sustainability of the insurer is scarce and the only study that covered this finds that index insurance is usually used as disaster insurance, leading to financial losses to the insurer (India).²¹

²¹ The case of AGROASEMEX, from Mexico, is frequently cited as one of the only few examples where a private and public partnership has turned the agricultural insurance market into an efficient and profitable one (Arias and Covarrubias, 2006). However, most of the references made to the success of AGROASEMEX are made based on terms of profitability of the company itself. Based on this review, little or no empirical evidence has been collected to evaluate the impact of these programs on farmers themselves.

Investment in Agricultural Innovation

a. Competitive funds or grants

The prime justification for promoting firm investment in research and development (R&D) through public financing is related to the need to correct market failures in innovative efforts arising from financial constraints and lack of appropriability (Hall and Maffioli, 2008a). Competitive agricultural technology funds can spur a virtuous cycle of more relevant, demand-driven and cost effective R&D, leading to increased sustainability of funding (Gill and Carney, 1999). The expectation is that with the support of the state in the provision of grants, private sector involvement and investment in the development of new technologies will be stimulated. One of the key features of these schemes is that they take a demand-driven approach, which ideally would foster the development of this market. The structure of these schemes also can improve governance, increase diversification of research suppliers, and improve client-orientation. It is also expected that the dissemination of new technologies, will contribute to improvements in productivity as well as in the reduction of poverty.

Unfortunately, empirical evaluations on the effectiveness of competitive grants for research in agriculture for LAC are scarce. The few empirical studies found come from developed countries, primarily the U.S.²² Likewise, the few empirical evaluations for LA, including some carried out by the IDB's Office of Evaluation and Oversight (OVE), focus on evaluating competitive

grants that are open to other sectors besides agriculture. While these provide useful information, little information is provided in terms of the impact on the agricultural sector. Nonetheless, some "evidence" for the agricultural sector is provided below, although it is of a more descriptive nature. This will be complemented by the evaluations carried out by the IDB's Office of Evaluation and Oversight (OVE).

It is important to note that the literature is still not in agreement as to what indicators to use to measure the effectiveness of competitive grants. Ekboir et al. (2009) observe that several authors have looked at the impact of these grants on the research system, including redirection of research activities, changes in governance, transformation in research institutions, institutional and individual reputation building, increased collaboration and partnerships, and impact on research competitiveness. Yet the authors note that most of these studies do not consider that most of these effects can also be obtained through other allocation mechanisms. Echeverría and Elliot (2002) proposed a criterion for measuring the performance of competitive grant programs within the following categories: (i) increased effectiveness; (ii) increased efficiency; (iii) the promotion of favorable institutional change; and (iv) observance of accepted public finance criteria.²³ Nonetheless, Ekboir et al.'s (2009) critique that these indicators may well be affected by other factors is still valid.

For purposes of this review, the criterion proposed by Echeverría and Elliott (2002) is used here. This first

²² These reviews are not included, given the fact that the context and type of farmers in this country is significantly different from those in LAC. Moreover, the government has a long history of providing formula funds for agricultural research

²³ See Table 14.4 from their publication. A brief synthesis is as follows. For increased effectiveness, some of the indicators or benchmarks are related to factor productivity, resource degradation, social rate of return to research, adoption rates, scientific quality and spillover benefits (publications, citations, peer evaluations). For increased efficiency, the authors suggest using the level of outsourcing, levels of delivery, number of projects that achieved their planned objectives, punctuality of project implementation, and the length of a project cycle. For the promotion of institutional change, they suggest using number of partnerships in a given year, trends in funds allocated to these schemes, share of private sector funding, stakeholder participation, and institutional capacity, such as qualification index or annual turnover rate. As for sustainable and efficient use of public funds, they suggest using additionality of resources attracted by these schemes, change in resource allocation to new goals, administrative costs of collection and disbursement funds (relative to total grant activity), and transaction costs and preparation costs for applicants, reviewers and panels. While these set of indicators will provide a complete picture of the performance of competitive grant programs, it seems that this will entail a significant amount of planning and expense.



section relies on three sources: a comparative report carried out by Independent Evaluation Group (IEG) of the World Bank (IEG, 2009) of four similar and contemporaneous research projects (which in some cases included extension services) in Brazil, Colombia, Nicaragua and Peru; an evaluation, financed by the IDB (Ardila et al., 2007), of potential impacts of regional projects financed by FONTAGRO (Fondo Regional de Tecnología Agropecuaria)²⁴; and an evaluation of the North Central Region SARE Research and Education Grants program in the U.S. (Suvedi and Smalley, 2008). The first report uses program documents, as well as discussions with stakeholders, including beneficiaries of the projects implemented. FONTAGRO's evaluation is based on a survey specifically designed for it and completed by program implementers (primary data), and on information from project documents, including original project documents and final reports.²⁵ The last evaluation relied on information from a mail survey sent to farmers that participated in the program (response rate was 72 percent). Before proceeding, it is also important to note that these evaluations do not use econometric techniques and do not use a counterfactual to assess project impacts. Likewise, a lot of the information can be biased, given the fact that some (or all) of the information is either provided by program implementers or by beneficiaries. However, their findings are included here, since they can shed some light on the effectiveness of these interventions with regards to the role of competitive grants in agricultural research.

In terms of effectiveness in inducing adoption, the results are mixed. For instance, the IEG (2009) report found that the evidence on rates of adoption of developed technologies was nil, with the exception of Peru. On the other hand, Suvedi and Smalley (2008) find evidence of technology adoption, primarily when participating

farmers saw that this enhanced profitability or improved the environment. The authors also report some spillover effects (diffusion) on non-participating farmers who implemented some of the new approaches.

In terms of productivity, the IEG report found that there was no evidence that the funded projects had an effect on productivity or income, again, with the exception of the Peru project. Yet, even for the case of Peru, the report notes that there are doubts as to which of the steps in the results chain were most critical for achieving the increase in farm incomes. On the other hand, Suvedi and Smalley (2008) report that one-third of respondents noted improvements in yields.

As for effects on resource degradation, Ardila et al. (2007) note that most of their results are positive, particularly through research that led to the development of new improved varieties that are more resistant to illnesses and plagues, decreasing the amount of agrochemical usage. Positive social returns are also reported by Ardila et al. (2007) mainly through improvements in nutrition and health of consumers and farmers arising from this decrease in agrochemical usage and improved varieties. Likewise, Suvedi and Smalley (2008) find that about one-third of respondents reported decreases in agrochemical use and losses due to diseases and weeds, and around 40 percent reported reductions in soil erosion.

In terms of efficiency, as reflected in the diversification of service providers, the IEG report finds that, even though each of the projects included diversification of service providers among its objectives, this did not lead to a significant increase in participation by the commercial private sector. Importantly, and given that these schemes aim to be demand driven, the report does find that the design of the projects was

²⁴ The Technical-Administrative Secretariat of FONTAGRO is responsible for carrying out the technical, administrative, legal and financing functions needed for the Fund's operation as a competitive research grant program.

²⁵ It is important to note that the 'potential' impacts were arrived at using simulations and sensitivity analyses with certain assumptions that are described in the document.

explicitly client responsive. Based on the view of informants, the process of priority setting was more transparent than under the previous system of direct assignment of funds for research extensions; however, the report notes that “outreach to the poorest groups and regions calls for special measures.”

As for institutional change, Ardila et al. (2007) find that their results are positive. For instance, some of the projects have influenced the modification of regulating frameworks, especially in areas of environmental protection for genetic resources. Likewise, some projects have influenced the acceptance of new products by the private sector. On the other hand, the IEG report notes that while all four projects sought to promote decentralization, the progress in this regard was uneven, with the strongest evidence of boosting the capacity of public research agencies coming from Brazil. Similar results were found by Ardila et al. (2007) in this regard, who found that there were positive impacts in terms of capacity training and increases in knowledge. For instance, there were important improvements in the level of capacity and technological training, and in networking capacity as well.

In terms of the sustainability of this approach, Ardila et al. (2007) find that investments in the “Fund” have potential rates of return large enough to cover the costs spent in research: the internal rate of return is around 28.6%, and the benefit-cost ratio is more than three.²⁶ These returns, they note, are above the return levels cited in the literature (10–12 percent). The IEG report notes that all of the projects reviewed raise concerns about the long-term sustainability of competitive funds. However, it states that where there is a strong public sector apparatus, there is likely to be a sound enabling environment for competitive funds over the longer term. In this regard, the report makes it clear that competitive funds can be an important vehicle for research financing, but they are most likely to make a sound and lasting contribution when they

complement a relatively strong public-sector framework for research.

Along with the general reviews, there has been empirical analysis of some competitive grant programs for research in LAC including: FONDECYT and FONTEC (Chile), FONTAR-ANR and FONTAR-TMP I (Argentina), ADTEN (Brazil), and FOMOTEC (Panama). These were primarily carried out by the IDB’s Office of Evaluation and Oversight (OVE) and are discussed here. Before proceeding, it should be made clear that these competitive funds allocate only some of their financing to agricultural research. For instance, the Chilean National Science and Technology Research Fund (FONDECYT) is the largest and oldest competitive grant program in Chile and it provided the largest absolute amount of funding for agricultural research (Echeverría and Elliot, 2002). While FONTEC is open to all sectors, it allocated around 29 percent of its funds to agricultural and fishery sectors. Unfortunately, the evaluations do not separate the impact of these funds by sector.

In terms of the projects’ performance, the results are mixed. For instance, Benavente, Crespi and Maffioli (2007a) find that although FONTEC (Chile) increased sales, employment and exports, it did not significantly foster productivity. Similar results are found by Hall and Maffioli (2008b) when looking at ADTEN (Brazil), where they find a positive and significant impact on employment and sales, but a non-statistically significant impact on productivity, although the sign of the coefficient is negative. On the other hand, Hall and Maffioli (2008b) find a positive impact on productivity in FOMOTEC (Panama) and in FNDCT (Brazil) but the results are statistically significant only in Panama.

As for innovative outputs, Hall and Maffioli (2008b) find positive impacts on the number of patents in ADTEN (Brazil) and in the number of patent applications in FNDCT (Brazil), with statistical significance only for

²⁶ The authors note that these values remain high even when simulation examine 25 percent lower benefits and 25 percent greater costs.

the latter. The authors also find positive impacts in terms of sales of new products in FONTAR-ANR (Argentina) and the share of sales of new products in FOMOTEC (Panama), although with statistical significance only for the latter. On the other hand, Benavente et al. (2007a) find that FONTEC did not significantly foster patenting activities and had no significant impact on the creation and adoption of new products.

As for an efficient use of public finance, the results²⁷ are, in general, positive. For instance, Benavente et al. (2007a) find that FONTEC effectively promoted process innovation and induced changes in the innovation strategy of the firms. Likewise, Hall and Maffioli (2008b) found positive and significant impacts on product innovation, process innovation, financial access, and use of external sources of knowledge in FOMOTEC (Panama).

In terms of input additionality (attracting of new resources or crowding in)²⁸ the results are overall positive. In the case of FONTEC, Benavente et al. (2007a) find that, although the program increased the overall R&D budget of the firms, it did not stimulate additional private investment in innovation activities. On the other hand, Hall and Maffioli (2008b) find a positive and significant impact on additionality for ADTEN (Brazil), FNDCT (Brazil), and FONTAR-TMP I (Argentina), and find no crowding-out effects in FOMOTEC (Panama), and FONTAR-ANR (Argentina).

In terms of the heterogeneity of impact or targeting issues, it is important to look at two informative findings from Chile and Argentina. When Benavente, Crespi and Maffioli (2007b) evaluated the impact of FONDECYT, the authors found that the program had no impact on the number of publications or in terms of the quality of publications in the proximity of the

program threshold ranking.²⁹ The authors note that the evidence suggests that the FONDECYT's lack of impact was due to targeting problems in terms of both researchers and research projects.

Binelli and Maffioli (2007) looked at different public funding mechanisms in Argentina, through the FONTAR program. While they find a significant and positive impact on private investments in R&D as a result of the program, when they do an analysis by type of financial support, they find that the impact is mainly due to targeted and fiscal credit, with no evidence that funding received through matching grants has an additional effect on private investment. The authors further note that this result is in line with the theory that when firms' preferences are not directly observable, the provision of direct subsidies is more likely to incur the risk of adverse selection by attracting firms that would have invested in innovation even in the absence of public support, thus leaving unchanged the overall level of expenditures in R&D. It can be argued that these two seemingly unrelated evaluations do show that a certain level of targeting may be necessary.

Based on this empirical review, the results are somewhat discouraging in terms of productivity, with only one example found that clearly identified a statistically significant positive impact. While two showed positive effects and two others showed negative effects, none was statistically significant. However, it may be important to note that some of the programs may have shown positive results in the evaluation including data for more years. In terms of innovative outputs, the results are mixed. While the results on patents varied, for new products they were a bit more positive and clear. As for innovation processes and additionality, the results are a bit more consistent and positive. Importantly, little information was found

²⁷ What the authors in this sub-section call behavioral additionality.

²⁸ What Echeverría and Elliott (2002) categorize under Sustainable and Efficient Use of Public Finance Allocations.

²⁹ However, they note that the project was partially effective in identifying the best projects in terms of expected quality.



on adoption. In this regard, it is likely that the creation of new innovations and new products may necessitate additional interventions to promote technology adoption (see following section).

This brief review adds to the growing literature on this topic although there is still no agreement on how effective these schemes are, since in most developing countries the results have been disappointing (Gill and Carney, 1999). There is also not enough robust and consistent empirical evidence to provide more clear information (Ekboir et al., 2009). The literature seems to agree that competitive grants have a place in agricultural research to stimulate development of this market; however, its role should be more complementary to the role of governments (Echeverría, 1998; Pray and Umali-Deininger, 1998; Echeverría and Elliott, 2002; IEG, 2009). Indeed, the literature also agrees that the government has a very important role to play in supporting R&D (Huffman and Just, 1999; IEG, 2009) to address market failures (van de Meer and Noordam, 2004), especially since the private

sector will not fill in the gap if it does not see profits on the horizon (Pray and Umali-Deininger, 1998; Huffman and Just, 1999).

b. Extension services

Evenson (2001) describes the two general objectives of extension programs as (i) providing technical educational services to farmers and, (ii) fostering a two-way flow of information between farmers and the suppliers of technology. As such, among the functions that characterize extension one can include the transfer of technology, the transfer of management and the transfer of knowledge and capacities.³⁰ In this sense, a diversity of inputs are taken into account that help farmers make their micro decisions, which are among the key determinants of the success of rural and agricultural development programs (Alex and Rivera, 2005). With this in mind, it is important to emphasize that knowledge, information, technologies, and incentives all play an essential role in the decision regarding what crops to grow, which market

³⁰ Similar definitions are found for example in Birkhaeuser, Evenson and Feder (1991), Evenson (2001), and Owens, Hoddinott and Kinsey (2001).

to sell to, and the technologies that are desirable to adopt to increase productivity. Thus, extension is related to the process of adoption and diffusion (Sunding and Zilberman, 2001). The expectation then is that extension services will improve technology adoption and diffusion, which may lead to improvements in productivity and therefore income and welfare.

In recent years, the definition of extension has been broadened. For example, by reviewing a vast number of case studies, Alex and Rivera (2005) suggest that extension should be linked not only to agricultural development, but also to rural development. Thus, they contemplate other functions of extension such as marketing, environmental conservation and farmer organization development. Furthermore, they mention additional functions not exclusively related to agricultural production. Among them, the diffusion of information on family issues such as nutrition, health and adult education for off-farm employment opportunities. However, the focus here will be on those extension functions more closely related to agricultural production, since most of the projects funded by the IDB have followed this approach.

In order to estimate the impact of agricultural extension on relevant farm outcomes, researchers have followed different strategies. Given that different methodologies may yield different results when evaluating extension services, a review of the literature is presented below, which traces some of the more common approaches used, their limitations, and impacts found. However, there will be a greater focus on studies that try to estimate a causal effect of extension programs by emulating an experimental approach. The distinctive feature of this approach is the availability of data for a group of farms that have not

participated in a particular extension program and the use of these observations to estimate what would have happened to participants had they not been in the program (the counterfactual outcome). This will be followed by some of the findings found in empirical papers carried out by the IDB's Office of Evaluation and Oversight (OVE).

Given that the "ideal"³¹ evaluation method, based on a two-step randomization of extension programs, has not been undertaken yet by the agricultural extension evaluation literature³², the evaluation literature has developed new strategies to deal with the problems of endogeneity generated by selection bias, simultaneity or omitted variables. In particular, as Birkhaeuser, Evenson and Feder (1991) and Evenson (2001), among others, have noted the problem of endogeneity is pervasive in the estimation of extension impacts. These biases arise in the estimation when differences between participant and non-participant groups are reflected in variables that affect both treatment (the participation in extension services) and the relevant outcome. If it were possible to control for those variables, there would be no bias; as Heckman (1979) explains, all sources of bias can be reduced to an omitted variables problem.

The simplest method to control for these omitted variables is to include the available variables as controls in a regression assessing impact and to suppose that only these observable variables influence the outcome. This has been done under the production function approach.³³ Results using these methods show positive but not very high contributions of extension programs (Evenson, 2001). An alternative that rests upon the same assumption, but avoids assuming functional forms, is propensity score matching. The first and one

³¹ For the advantages of randomization in development economics program-evaluation studies see Duflo and Kremer (2003). However, not even randomization is a panacea; it has its own assumptions and problems as Heckman (1992) and Heckman, LaLonde, and Smith (2000) emphasize.

³² One remarkable exception is the series of field experiments undertaken by Duflo, Kremer, and Robinson (2004) in order to understand the reason why Kenyan farmers are not using efficient amounts of fertilizer.

³³ See Birkhaeuser et al. (1991) and Evenson (2001) for a survey of the papers using this simple regression with controls method, although most of the papers surveyed therein do not follow a pseudo experimental approach.

of the few applications of matching techniques to the evaluation of agricultural extension programs is Godtland et al. (2004). They use a regression with controls and a propensity-score-matching model to evaluate the impact of a farmer field school program and a traditional extension program on farmers' knowledge of integrated pest management practices. Results from the parametric model and alternative matching strategies³⁴ show a significant positive effect of both programs, but a greater effect for the farmer field school.

However, the main problem with methods that rest upon the "selection on observables" assumption is that selection bias could also be originated by unobservable variables such as farmers' skills, extension agents' efficiency, soil quality, and so forth. In some cases it is possible to include some proxies for these variables, but as Feder, Willett, and Zijp (1999) remark and Purcell and Anderson (1997) note in their review of World Bank agricultural extension programs, data constraints are a key obstacle for incorporating all the relevant outcomes affecting participation and production outcomes. An illustrative example of the possible bias generated by omitting relevant variables is the difference in results found by Bindlish and Evenson (1993, 1997) and Gautam and Anderson (1999). The former works find that extension services under a training and visit program have a positive significant impact on production for Kenyan farmers, while the latter, using the same data, finds no evidence of a significant impact once district fixed effects are incorporated. This brings evidence for the above-mentioned endogenous program-placement bias, taking into account that the program was allocated to areas with the greatest productive potential. However, as Evenson (2001) warns, another reason for the elimination of the impact once district dummies are introduced is

the presence of substantial within-district spillovers from the use of extension services.^{35,36}

Godtland et al. (2004) recognize that they cannot control for unobservable variables and try to estimate the impact of the potentially generated bias. They show that for their data, selection on unobservables and selection on observables have a comparable influence in magnitude on the output, and thus, selection due to unobservables is unlikely to eliminate the impact they find for the farmer field school program.

However, when selection on unobservables is a serious problem, other methods have been utilized. One option is the use of difference in differences (DD) and fixed effects models to remove possible bias generated by time-invariant unobservable variables. Several works using this approach have been carried out. Owens, Hoddinott and Kinsey (2003) and Romani (2003) estimate the impact of traditional extension services using panels of farmers for Zimbabwe and Ivory Coast, respectively.³⁷ Both studies find a positive impact of extension services on productivity and yields. However, they note that this impact is neither present for all the years nor for all the crops studied.

With regards to farmer field school (FFS) interventions, the results are mixed. For instance, in an analysis of Indonesian FFSs Feder, Murgai and Quizon (2003) use a modified DD model and find no impact on yields, on pesticide use, or on diffusion. On the other hand, Praneetvatakul and Waibel (2006) claim that two time-point observations are not enough to estimate the impact of this kind of programs. They use a panel of four years that comprises eight rice-growing seasons in Thailand and find a positive impact on knowledge and pest management practices both in

³⁴ They use nearest neighbor and kernel matching, restricting the sample to the common support.

³⁵ The presence of spillovers is a problem for all of the estimation techniques mentioned in this section. Evenson (2001) notes that many studies have ignored the issue, and only a small number have utilized geo-climate regional data or have defined spillover barrier measures to specify them.

³⁶ It is important to remember that the T&V model relies on the dissemination of knowledge through contact between farmers, and thus it is logical to expect spillovers in the estimation of the results of this kind of programs.

³⁷ Owens et al. (2003) also control for time effects, use clustered standard errors at the village level and count with a measure of farmers' skills.

the short and long run. Yet in a companion paper they do not find the program has any impact on rice production yields.

Finally, the possibility of heterogeneity of results is a relevant topic to mention. Romani (2003), following the model of Feder and Slade (1986), shows that farmers with better education, more skills and more wealth are more likely to adopt certain kinds of innovations that are dependent on knowledge. This makes them more likely to benefit from extension services that promote these kinds of innovations. Sunding and Ziberman (2001) make a distinction between three groups of farmers in terms of the moment of adoption of an innovation: early adopters, followers and laggards. The point is that in general early adopters are the ones making profits for innovations, but not the others; thus extension services promoting the incorporation of new products or techniques can decrease the welfare of some groups of farmers. Wealth and farm size can have similar effects on extension through the adoption rate. This accords with the results of Godtland et al (2004) who find that the farmer field school approach is effective for wealthier farmers.

In the following paragraphs, a brief summary of evaluations carried out by the IDB's OVE are presented. These primarily focus on agricultural production, since most of the projects funded by the IDB have followed this approach, and since this is a key theme in this review. All of these papers were part of the project "Ex-post Evaluation of the IDB's Agricultural Technology Uptake Projects".

In Argentina, Cerdán-Infantes, Maffioli and Ubfal (2008) carried out an impact evaluation focusing on an extension services program (PROSAP) financed by the IDB in Mendoza. PROSAP aimed to improve the value of agricultural exports by improving the quality and increasing the production of grapes in this region. The authors note that since the program did not collect

information on outcome variables, they had to rely on secondary data provided by Instituto Nacional de Vitivinicultura, the National Institute of Vitiviniculture (INV).

Although their data set contained information on total land size, productive land, basic input information like access to irrigation systems, and yearly information on production and varietal use for all grape producers in the region starting in 2002 (before the program), and up to 2006, the authors note that there were limitations to the data provided. For instance, there was no demographic information on the producer (such as age, education, years of experience in grape production, etc.), nor was there information on specific fertilizer or water usage, or information on the types of training received by each beneficiary; finally there was no information on prices received by the producers.

However, these limitations were addressed by controlling for time-invariant characteristics by including producer fixed-effects. As for produce prices they used the yearly average prices for varieties traded in the Mendoza market to assign a value to traded produce. Likewise, in order to assign a monetary value to unsold produce, the authors assigned the value of the lower quality varieties traded in the Mendoza market as a proxy in order to homogenize the measure of production.³⁸ Although the authors may be inflating the prices of the unsold grapes, they do acknowledge this fact, and go on to say that because not all varieties are traded in the market they cannot differentiate prices received by different producers.

Using fixed effects, matching techniques and non-parametric regression analysis, the authors identify a comparison group of producers that are similar to the beneficiaries in observable characteristics to disentangle the program's impacts. Although the authors do not find a significant average treatment effect on yields, they do identify a large and positive effect on productivity for producers who were in the bottom

³⁸ Their rationale is that produce not sold is of an inferior quality, thus the assignment of the value of the lower quality traded grapes.

of the productivity distribution before the program started. Additionally, they find evidence of increased quality of grapes, particularly for large producers and for producers in the middle of the yield distribution *ex ante*. However, and given the fact that the program was open to anyone who wanted to participate, the authors find that large groups of producers did not experience any impact on yields or quality. They suggest that there is a need to balance the flexibility of the program with reliable targeting mechanisms that can improve the effectiveness of the program.

Following a very similar approach, Cerdán-Infantes, Maffioli and Ubfal (2009) look at the “Farm Modernization and Development Program” (PREDEG) in Uruguay to assess the program’s impact on technology adoption and productivity. The program adopted a “partially public-funded private services” approach, where beneficiaries were required to finance part of the costs of the training and technical assistance, while the services were to be delivered by private companies and NGOs. The target groups were mainly small- and medium-scale producers, although there was a separate sub-component specifically to offer services to agribusinesses. For the evaluation, the authors constructed a unique panel data set using the 2000 National Agricultural Census as a baseline, fruit censuses carried out between 2002–06, and the program’s administrative records to identify treated farmers.

Using fixed effects and propensity score matching, the authors find that, although the results vary by type of crop, there is evidence that the program increased the rate of adoption of certified varieties as well as the density of plantation. They find limited evidence of the program’s effects on productivity but suggest that this may be due to the limited time frame of the evaluation; however, they do find evidence that program participation assisted peach producers in coping with the severe root asphyxia that had affected the sector in the early years of the decade. Conversely, they find some indications of negative lagged productivity effects for apple producers, although the authors su-

ggest these might be related to a short-term cost of transitioning to new varieties or technologies.

The authors suggest that public intervention in extension services can lead to faster technology uptake while it may also incentivize the adoption of necessary changes in production methods that might be stalled due to inadequate individual incentives to pay for these services or to the absence of the supply of these services. Along these lines, they suggest that cofinancing of these services by producers coupled with private provision might be an effective tool to target certain types of producers, namely those that have the resources but may be hesitant to implement changes due to lack of incentives. They warn however that this method may have a limited reach for low income producers.

González et al. (2009) evaluate the effect on farm-level income and productivity of the Program for Technological Support in the Agricultural Sector (PATCA) in the Dominican Republic, financed by the IDB. The general objective of the program was to increase competitiveness and reduce poverty in the Dominican Republic agriculture sector. This was to be done by increasing the efficiency of the agricultural sector through actions in three areas: (i) support for technology adoption; (ii) improvement in agricultural health and food safety; and (iii) provision of technical assistance for commercial and institutional reforms.

The authors’ evaluation focused on the first component, supporting technology adoption, which consisted of matching-grants to support producers in the implementation of five technologies: 1) land-leveling; 2) zero or non-farming (minimum plowing); 3) introduction of new tree species; 4) modernization of water irrigation techniques; and 5) pasture conservation. Since the Central Executing Unit (CEU) did not construct an ad-hoc baseline for the program evaluation and since agricultural statistics in the Dominican Republic are quite scarce, the authors relied solely on the 2008 ex-post survey gathered by the CEU. The dataset contains information on beneficiaries as well as a control group selected from producers with similar characteristics.



The authors use propensity score matching to identify the differences in productivity and income between technology adopters and non-adopters. The data structure allowed them to analyze specific impacts for land-leveling and pasturing conservation primarily related to rice producers and livestock breeders, respectively. Their results show that PATCA effectively improved the productivity of these two types of participants. As for income, the program did have a positive impact on rice producers but not on breeders. The authors suggest the negligible impact on income for breeders may be due to the longer amount of time it takes for productivity shifts to translate into higher values of production. Additionally, the authors did not find any significant evidence of a positive impact on the producers of other crops or on milk producers. Nor did they find clear evidence on the quality of production. The authors suggest that the heterogeneity of impacts may be due to the different levels of effectiveness of the different technologies adopted in the short-run and over different crops. They also make recommendations that in order to implement a better

heterogeneous analysis it would be ideal to expand the size of the sample.

Cerdán-Infantes and Maffioli (2009) analyze the impact of the '*Programa de Modernización Agropecuaria*' (PROMOSA) on the productivity and production quality of farmers in Panama. The authors use a unique dataset and, through propensity score matching techniques, they find evidence that PROMOSA positively affected the technological uptake of beneficiaries. Further, the authors find consistent evidence of technology and productivity improvements. However, despite these positive results, they note that the Panamanian government discontinued the PROMOSA program without replacing it with alternative measures, leaving many low- and middle-income farmers without an affordable source of technology.

Using program data, secondary data (including National Agricultural Census data), and information from surveys, Maffioli, Valdivia and Vazquez (2009) analyze the impact of the Ecuadorian Agricultural Services

Modernization Program (PROMSA) on the productivity, technology adoption and managerial practices of small farmers. Using propensity score matching and DD techniques, the authors find consistent evidence of PROMSA's impact on productivity; however, they find less conclusive evidence on technology adoption indices at aggregate levels. The authors also find evidence of impact on associability, access to credit and access to alternative commercial channels. These last results, the authors note, suggest that the program helped farmers realize the benefits of associativity.

However, qualitative evidence suggests this mechanism did not work as desired, because farmers did not contribute to the costs as expected. Total costs and contributions by PROMSA were adjusted every year, from US\$130 per farmer year by 2000 to US\$165 by 2002, and were supposed to increase to US\$200 by 2004. In principle, farmers' contributions were also supposed to increase over time, although records by private providers are not clear, as they reported flexible collection mechanisms including in-kind payments.

In sum, the extension service operations aimed at supporting the private providers of extension services to encourage them to work in new areas with a reasonably large number of small farmers with productive potential. The approach of these programs was intended to be largely demand-driven, offering a series of services and allowing farmers to choose among them. The idea was that by forcing producers to pay part of the cost of the extension services, they would have influence over the quality of the delivery. The programs were designed to expand services for small farmers, and to be cofinanced by farmers and the program, with the objective of making the program self-sustainable and creating an active private market for extension services in the medium run. In practice, in most cases this did not happen and producers ended up paying only a small amount of the costs of the services. In some cases the fees were eventually waived.

Using program data and information from the Uruguayan Livestock Survey of 2001 and 2003, Lopez and Maffioli (2008) analyze the effectiveness of one of the components³⁹ of the "Livestock Pilot Project" in Uruguay in fostering the efficiency of Uruguayan livestock producers. Using propensity score matching and DD techniques, the authors found that the program had an overall positive impact on the adoption of managerial practices, but no significant impact on either productivity or specialization. However, they did find positive effects on productivity when the analysis was restricted to the sub-sample of producers specializing in the breeding stage.

As can be seen from this general review of the literature and from the evaluations undertaken by the IDB's OVE, evidence of the impact of extension services is mixed and at times contradictory. For instance, in general terms, some studies find a small but positive contribution (Evenson, 2001), while others find a significant and positive effect (Godtland et al., 2004). In other instances results are contradictory, even when the same datasets are used (Bindlish and Evenson, 1993, 1997; Gautam and Anderson, 1999). The results are also mixed for farmer field schools (FFSs). Some studies identify a greater impact by FFSs than traditional extension services (Godtland et al. 2004), while others find no impact by FFSs (Feder et al. 2003). Yet others find mixed results (Godtland et al. 2004; Praeetvatakul and Waibel, 2006).

In terms of productivity, the results are also mixed. Some studies do find evidence of improvements in yields (Bindlish and Evenson 1993, 1997; Maffioli et al. 2009; Cerdán-Infantes and Maffioli, 2009) while others do not find a clear impact (Gautam and Anderson 1999; Feder et al. 2003; Godtland et al. 2004; Cerdán-Infantes et al., 2009). Yet others find mixed results, depending on the sample or crop and period under investigation, (Owens et al., 2003; Romani, 2003; Lopez and Maffioli, 2008; Cerdán-Infantes et al., 2008; González

³⁹ Component 1.

et al., 2009). The same holds true for impact on technology adoption. Some studies find a positive impact (Praneetvatakul and Waibel 2006; Cerdán-Infantes et al., 2009; Cerdán-Infantes and Maffioli, 2009), while others find less conclusive impact (Maffioli et al., 2009). In terms of diffusion, only one study looked at this and found no impact (Feder et al., 2003)

Based on this review, it is important to emphasize that further research is needed. In particular, the channels through which each effect is achieved should be analyzed in order to give a more complete idea of the functioning of the program. For example, the effects of extension on productivity go through at least three channels: (i) disseminating new technologies and speeding up the rate of adoption of inventions; (ii) facilitating inventions by providing inventors signals from farmers (Evenson, 2001); and (iii) increasing technical efficiency by improving farmers' human capital and skills (Dinar, Karagiannis, and Tzouvelekas, 2007). Conducting separate analysis whenever possible, by sub-group (such as small-, medium-, and large-scale farmers), by crop under observation, and by considering the heterogeneity of farmers, for instance, is also important. Lastly, improvements in data collection are also fundamental.

IV. EFFECTIVENESS OF PROJECTS ADDRESSING POLICY FAILURE

Smallholder Farmers

There is widespread evidence indicating that smallholders are more likely to face market imperfections that limit their ability to access markets. Many of the projects supported by the IDB and development agencies, including those noted in this chapter, seek to help overcome these market imperfections and specifically target smallholders. In this section, however, the focus is on projects that seek to assist smallholders in obtaining access to higher value agricultural markets. The success of these projects rests on providing smallholders the same benefits of market access that larger farmers enjoy.

In recognition of the rapid changes taking place in the structure and governance of national and regional agri-food markets in developing countries, and their possible impacts on the contribution of agriculture to economic growth and development, as well as on small-scale farmers, research organizations from around the world set up *Regoverning Markets*, a two-year program (2005-07) to conduct collaborative research and policy support in this topic. One of the products of this effort is a synthesis paper by Berdegue, Biénabe and Peppelenbos (2008) which is part of the *Regoverning Markets Innovative Practice* series. The paper encompasses thirty-eight empirical case studies where small-scale farmers and businesses connected successfully to dynamic markets, doing business with agro-processors and supermarkets. While these are not impact evaluations, they use quantitative information to understand these connections.

The authors conclude that while many of the drivers of agri-food system restructuring are inevitable it is possible for governments, development agencies, and farmers' associations to prepare themselves and act proactively to benefit from these changes. Yet, they note, the adaptation responses have often been initiated after changes have already taken place. In this regard, there was limited time to develop better conditions to take advantage of the new opportunities or to minimize the social costs. They suggest that governments and donors should shift emphasis from compensatory and reactive initiatives, to more proactive and anticipatory policies and programs.

The authors observe that there is significant scope for the government to introduce pro-poor policies, even within a free-trade and liberalized market framework. In fact, they state that if the objective of a policy is inclusion of small-scale farmers in dynamic markets, pro-poor policies that are not also pro-market are most likely to fail. Along these lines, they observe that there is a significant role for the private sector to promote economic growth of the countryside since it has the potential to be very effective in linking smallholders to dynamic markets, as illustra-



ted in several of the examples included in their report. They note however that their review did not encounter many strong examples where the development impact of the private sector was enhanced through smooth cooperation with the public sector.

One of their key conclusions is that collective action remains an important strategy for increased smallholder participation in dynamic markets, since lower transaction costs and greater effective transfer of capacity mean private companies often prefer to work with organized farmers rather than individuals. However, they explain that while NGOs and donors often place great importance on building value chains that are owned by farmer organizations (vertical integration), their review showed that the net economic benefits for farmers in value chains owned by farmers' organizations did not seem higher than in private sector initiatives, although the impacts are higher in terms of capacity building.

They also note that their review did not find an example where collective action or a farmers' organization had become independent of external support. In terms of financial services, they comment that these are still largely separated from market access/value-chain development and that it is crucially important to create links and develop innovative financial products that cater to the needs of small-, and medium-scale enterprises in value-chain development.

In order to achieve and sustain inclusion of small-scale farmers in restructured and dynamic markets, the authors note that different agents need to participate and cooperate; yet, this can be a big challenge. The successful case studies, in this regard, share the following characteristics: i) collaborative arrangements between trained and organized farmers; ii) a receptive business sector; and iii) conducive public policies and programs. They further observe that in most cases these arrangements are supported by specialized partnership facilitators.

One recent example of this approach that includes all three of these elements, and that has been empirically evaluated, is the case of the *Plataformas de Concertación* program from the Sierra region of Ecuador. The program was implemented by the Instituto Nacional Autónomo de Investigaciones Agropecuarias (INIAP) through the FORTIPAPA (Fortalecimiento de la Investigación y Producción de Semilla de Papa) project and supported by the International Potato Center (CIP) through its Papa Andina Partnership Program. The program brought together potato farmers and a range of suppliers of research and development services, with the aim of linking farmers to higher-value markets for their produce. High-value market purchasers included local fast food restaurants, supermarket chains and the multinational food processor Frito-Lay. By establishing direct linkages between farmer organizations and these purchasers, the Plataformas partly displaced traditional intermediaries, potentially providing the smallholders with greater opportunities to obtain benefits from the changes in agricultural marketing systems.

Using a rich dataset from 1,000 household surveys collected by FAO and the CIP from thirty-four communities (participants and non-participants), and using three econometric approaches, including propensity score-matching techniques as well as weighted least squares regression analysis, Cavatassi et al. (2009) find that the program was successful in improving the welfare of beneficiaries, while potential negative environmental impacts, particularly with relation to agrobiodiversity and use of agrochemicals, were of no concern. More specifically, they find that participating farmers increased their yields, gross margins and seed input-output ratio (a measure of potato productivity). However, while these results are quite positive, the authors do not speak of the actual cost-benefit analysis of the whole program, since it has depended highly on outside funding since its initiation. To be fair, this issue was beyond the scope of their analysis.

A similar question on the sustainability of NGO support of small tomato farmers in Nicaragua is expres-

sed by Balsevich, Berdegué and Reardon (2006). Using information from 145 tomato farmers and interviews with supermarket chains, NGOs, wholesalers, and farmer organizations in 2004, the authors examined the determinants and effects of farmers' participation in supermarket channels, with and without assistance from NGOs in "business linkage" programs. The authors found that without NGO assistance, farmers that work with supermarket chains tend to be the "upper tier" of small farmers who are better capitalized, with various assets, commercially oriented and more specialized. Smaller and less-capitalized farmers who work with supermarkets tend to do so with NGO assistance, particularly with regards to organizational capital, technical assistance and quasi-fixed assets such as post-harvest collection facilities and irrigation systems. The authors note that it is uncertain if the smaller producers would sell to supermarkets if these supports (subsidies) were not present.

As mentioned in the previous chapter, fair trade and organic agriculture have been seen recently as one possible way to include small farmers in the new agricultural economy. While there is some evidence to show that small-, and medium-scale farmers have benefited from these schemes, as far as this review is concerned, very few (if any) successful empirical evaluations that use controls and econometric techniques have been carried out. Indeed, Paul (2005) notes that most evaluations to date have been in-house or commissioned reviews, and hence, have not followed a consistent approach. Likewise, based on this review, most of the "evaluations" or "impact" assessments rely on self-reported data from farmers as well as project stakeholders. After reviewing the literature on the scarce number of evaluations carried out on fair trade, Mayoux (2001) also notes that different frameworks have been used in the evaluations and many limitations still exist. For instance, most of the evaluations do not use control groups for comparison, others do not provide information on their methodologies, and there is, again, a significant reliance on self-reported and recall data, as well as data from program stakeholders.

Despite these shortcomings, the literature seems to agree that fair trade and organic agriculture can have a positive impact on production, productivity, income and welfare (Mayoux, 2001; Valkila, 2009). However, it has also been recognized that there are may be limits to the extent that fair trade can significantly raise the standard of living of small farmers (Utting-Chamorro, 2005), especially for the most marginalized farmers (Valkila, 2009). Nevertheless, it is important to note that a number of fair trade organizations and international aid agencies are in the process of introducing monitoring and evaluation systems for the purpose of conducting more rigorous evaluations (Mayoux, 2001). Likewise, new efforts have been made to provide guidance on impact evaluation methods (Paul, 2005).

Investments in Agricultural Infrastructure

a. Rural Roads

As mentioned in the previous chapter, by reducing transport costs, roads are expected to generate market activity; affect input and output prices; foster economic linkages that enhance agricultural production; and alter land use, crop intensity and other production decisions. They should also stimulate off-farm diversification and other income-earning opportunities and encourage migration (van de Walle, 2009). Yet, while rural roads have been championed as an important instrument for economic development and poverty reduction, (Gannon and Liu, 1997; IEG, 2007), van de Walle (2009) states that very few aid-financed rural road projects in developing countries have been the subject of rigorous impact evaluations. The author further notes that given the fact that investments in roads are relatively expensive, from the point of view of donors and policy makers, understanding the impacts of these investments is fundamental.

However, there are significant challenges to properly evaluating the impact of roads. For instance, van de Walle (2009) states that while recent attempts have been made to empirically evaluate these projects, much of this new research primarily underlines the

enormous difficulties inherent in estimating the magnitude of the benefits attributable to these types of infrastructure investments.⁴⁰ Recently, efforts have been made to overcome some of these difficulties. To this end, the first evidence from empirical papers on the relationship of roads is examined, although the main focus is on productivity, even if this is not related to agriculture.

Given the fact that there is legitimate concern over the simultaneous causality between the effects of rural roads and productivity, only empirical papers that addressed these problems are presented. This will be followed by empirical evaluations that make use of control or comparison groups as well as evaluation and econometric techniques. Before proceeding, it is important to note that, given the importance of rural roads in promoting economic development and reducing poverty, the IDB's OVE is in the process of conducting independent evaluations of projects financed by the Bank, through the *Thematic Review of Rural Roads Programs and the IDB*.

In general terms, a reasonable amount of evidence shows a positive relationship between road investments and productivity gains; this is true independent of the country/region under observation. For instance, relying on a system of equations to account for simultaneous effects, evidence has been found on the importance of road investment in promoting production growth as well as poverty alleviation in India (Fan, Hazell and Thorat, 2000), China (Fan, Zhang and Zhang, 2002), and Thailand (Fan, Jitsuchon and Methakunnawut, 2004). Likewise, focusing on France and Germany, Stephan (2000) finds that differences in the level and quality of transportation infrastructure are significant in explaining regional economic performance. The author finds that regional road infrastructure has a significant and positive impact on regional output.

Using data from manufacturing industries in the U.S. from 1953 to 1989, Fernald (1999) finds causation between roads and productivity. Likewise, Deichmann et al. (2000) find that, when looking at the importance of differences in the quality of infrastructure in explaining productivity differentials (with the use of a market access indicator to account for quality), a 10 percent increase in market access increases labor productivity by 6 percent. Similarly, Fan, Hazell and Thorat (1998) find that in rural India, public investment in rural roads was found to have had the largest positive and significant impact on agricultural productivity growth. Lastly, using provincial-level data for 1982-1999 in China, Fan and Chan-Kang (2005) find that while high-quality roads do not have a statistically significant impact on agricultural GDP, investments in low-quality roads are positive and statistically significant: for every Yuan invested, this generates 1.57 Yuan of agricultural GDP.

Turning to impact evaluations of rural roads, note that evaluations of roads have encompassed a variety of indicators, including those related to access to health or education, among others. Given the focus of this review, the main focus will be on indicators more relevant to agriculture. In this regard, this section will focus on indicators related to transportation or time, non-agricultural work, access to markets (input and output), agricultural production and income.

In terms of improvements in access to transportation, using comparison groups and relying on double difference and propensity score matching techniques, van de Walle and Cratty (2002) evaluate a rural road rehabilitation project in Vietnam and find that the project increased access to freight transport services, while it reduced the availability of two- or three-wheel motorcycle services. The authors note that there was probably a substitution effect whereby people preferred freight transport, since they could also bring their produce and belongings. Likewise, the authors

⁴⁰ See van de Walle (2009) for a discussion of these obstacles in evaluating rural roads projects and a discussion on some practical implementation issues related specifically to conducting an impact evaluation.

find that on average, in all project communes travel time decreased, particularly for poorer households.

In terms of transportation costs, comparing two geographic areas with different degrees of accessibility (one connected to markets by a motorized rural road and one connected to the same markets through a non-motorized rural road), Escobal (2000) measures the transaction costs associated with marketing potatoes in Peru. The author finds that these types of costs are significantly higher in areas connected to markets by non-motorized roads than those observed in areas connected by motorized roads. Using a panel regression model with fixed effects, Khandker, Bakht and Koolwal (2009) also report reductions in transportation costs in Bangladesh.

In terms of finding new (and better) employment opportunities, particularly in non-agricultural work, the results seem consistent. For instance, using propensity score techniques to compare households located near rehabilitated roads to suitable controls in Peru, Escobal and Ponce (2002) find that the rehabilitated road enhanced non-agricultural income opportunities. Similar findings are reported by van de Walle and Cratty (2002) who found evidence on the reduction in days of labor sold to off-farm businesses in trade in services, while there was an increase in the number of wage-labor days in industry and cottage industries (almost by the same amount). The authors note that those living in project communes may be switching to jobs that pay better.

Using propensity score matching and double difference techniques, Lokshin and Yemtsov (2005) looked at the impact of road rehabilitation in Georgia and find that opportunities for off-farm and female wage employment were significantly increased in project versus control villages. Similar findings on the effects of road rehabilitation in off-farm employment in Vietnam are presented by Mu and van de Walle (2007). Importantly,

based on the indicators the authors looked at, they find that the impacts are stronger in poorer communes.

In terms of access to markets, the results also seem to be consistent and positive. For example, using time series data from India, Binswanger, Khandker and Rosenzweig (1993) find that road infrastructure investment increased fertilizer usage and led to a larger credit supply. Likewise, comparing four rehabilitated rural roads with two non-rehabilitated roads in Morocco, Levy (1996) finds that the road rehabilitation increased the use of inputs and technologies. Similar results are presented by Khandker et al. (2009) who report reductions in input costs in Bangladesh.

In terms of agricultural production and income, the results also seem to be consistent and positive. For example, using a sample of 129 villages in Bangladesh, Ahmed and Hossain (1990) find that villages with better road access have a greater agricultural output as well as greater total incomes.⁴¹ Likewise, Levy (1996) find a significant increase in agricultural output as well as significant changes in the portfolio of crops cultivated in Morocco. Binswanger et al. (1993) also found that road infrastructure fostered agricultural output growth. Similarly, they found that road infrastructure investment fostered agricultural output growth. Similar results on Bangladesh were presented nineteen years later by Khandker et al. (2009). Using a panel regression model with fixed effects, the authors find that road investments reduced poverty significantly by raising agricultural production, wages and output prices.

b. Wholesale markets

As mentioned in the previous chapter, wholesale markets have long been considered an essential component of any agricultural marketing system (Seidler, 2001; Shepherd, 2004). There has been some debate as to whether wholesale markets are needed,

⁴¹ This was perhaps the first study that sought to systematically control for key explanatory variables in order to estimate the impact of a rehabilitated rural road.

given the rapid changes in the marketing systems of foods, particularly as they relate to significant increases in international trade, the significant presence of multinationals in the food retailing industry trade, and the increasing importance of supermarkets. Seidler (2001) posits that in countries where the farm structure and the marketing system remain fragmented, and cooperatives and farmer associations are largely underdeveloped, wholesale markets are still needed to provide farmers with effective and profitable marketing outlets for their produce. Unfortunately, while the literature on price discovery, market structure, and the role of government in markets is quite significant, published research on the structure and function of wholesale markets in developing countries is extremely limited (Ahmadi-Esfahani and Locke, 1998). Likewise, based on this review, evaluations of interventions to support or expand wholesale markets have not been undertaken.

Nevertheless, it is important to note that given the significant changes in the marketing systems noted above, research has been undertaken to learn more about how these changes are affecting different actors and structures, such as wholesale markets. For instance, Echanove and Reardon (2006) analyze the participation of wholesalers in the main wholesale market of Mexico City (Central de Abasto, or the Ceda) and the marketing channels of supermarkets in Mexico. Their findings represent one of the first attempts to quantify the preferred suppliers of supermarkets in the Ceda. They find that chains tend to buy from a preferred set of wholesalers (mainly larger, “elite” wholesalers), who in turn source either directly from farmers or from a limited number of other wholesalers.

Similar work has been carried out by Torres (2003) to gauge the degree to which the expansion of supermarkets had reduced wholesalers’ sales. In sum, while there has been an increasing interest in the role of wholesale markets as an essential component of marketing systems (Tollens, 1997; Ahmadi-Esfahani and Locke, 1998; Seidler, 2001; Shepherd, 2004; Tracey-White, 2005), based on this review, no empirical



evaluations have been found that can shed light on their effectiveness or their impact on agricultural production or productivity.

c. Agro-processing facilities

Access to processing facilities in intermediate urban centers has been viewed as a key element in promoting market linkages between rural and urban areas to foster rural and regional development and poverty reduction (Satterthwaite and Tacoli, 2003; Tracey-

White, 2005). While some of these ventures are essentially commercial ventures that can be undertaken by the private sector, as noted, there are many circumstances in developing countries where the provision of such facilities would not take place if left to the free market, and their development and efficient operation could be considered a “public good”, not least in the form of improved farm income, employment opportunities, food security and tax revenues (Warner, Kahan and Lehel, 2009).

While the importance of agro-processing facilities in enhancing market linkages and providing a means to store and preserve agricultural produce has been recognized (Larsen, Kim and Theus, 2009), based on this review, no empirical studies have been found that can shed light on their contribution to agricultural production or productivity. For the role of the agri-food industry in creating forward and backward linkages, the reader is referred to the section on Agribusinesses.

d. Rural information and communication

Until recently, much of the literature on the effects of access to mobile technology on agriculture was based on anecdotal evidence, with a lack of use of quantitative data and without concerning analyses with endogenous placement of mobile phones, which may confound the relationship between phones and outcomes of interest. However, more quantitative studies have been conducted in recent years and in general terms, most of the studies find positive effects.

For instance, using panel data from 856 households in ninety-four communities in Uganda, Muto and Yamano (2009) test the hypothesis that mobile phone coverage expansion induces market participation of farmers in remote areas. The authors look at banana and maize producers and find that mobile network expansion has a larger impact on market participation for banana producers in areas farther away from district centers than in closer areas, while they find no impacts on maize producers, most likely since maize is less perishable than bananas.

Taking advantage of the staggered introduction of mobile phones in the south-western state of Kerala, India, and using micro-level survey data from 1996 to 2001, Jensen (2007) studies the effects of the introduction of mobile phones on the market for sardines. The author finds that the adoption of mobile phones by fishermen and wholesalers was associated with a significant reduction in price dispersion, the complete elimination of waste (unsold fish in markets with high supply), and near perfect adherence to the law of one price. Likewise, the author finds increases in both consumer and producer welfare, with consumer prices decreasing by 4 percent and producers' profits increasing by 8 percent.

Taking a similar approach to Jensen (2007), Aker (2009) assesses the effect on traders' behavior and grain market performance of the staggered introduction of cell phone coverage in Niger, using a panel market and trader dataset that includes information on prices, transport costs, rainfall and grain production, along with cell phone market performance. The author finds that mobile phones increased the number of markets that traders searched, there was an important reduction of price dispersion (from 10 to 30 percent), an increase in trader's profits (29 percent), and improvements in consumer welfare, including a consumer price decrease of around 3 percent.

It is important to note that while these studies have focused on the impact of mobile phones on the ability of farmers to obtain and make use of market information, other studies that have also looked at the role of access to information through other means have found similar results. For instance, Svensson and Yanagizawa (2009) use panel data to examine the impact of a project in Uganda that provided market price information for nineteen agricultural commodities by radio. Using the Uganda National Household Survey of 2005, as well as program data, they take advantage of the variation across space between households with and without access to a radio and find evidence that better-informed farmers managed to bargain for higher farm-gate prices (15 percent higher) on their

production surplus. This they attribute mainly to the greater bargaining power on the part of farmers once they had access to information on prices.

Using market-level data from five different sources, Goyal (2008) assesses the effect of the establishment of internet kiosks and warehouses by a private company that provided wholesale price information and an alternative marketing channel to soybean farmers in the central Indian state of Madhya Pradesh. The author finds a significant increase in the monthly wholesale market price of soybeans after the introduction of the kiosks. This resulted in a 33 percent profit increase to farmers. Likewise, the author finds a significant increase in the area under soy cultivation due to the intervention. The author further notes that the results suggest that information can enhance the functioning of rural markets by increasing the competitiveness of local buyers.

Based on this review, the empirical results suggest that having access to a mobile phone has the potential to decrease information asymmetries and price dispersion, and improve consumer and producer welfare. However, valuable market information can also come through other means. In sum, these results provide significant support in favor of access to information, whether this is acquired by a mobile phone, a radio, or by entities that disseminate market prices. Unfortunately, no empirical evidence was found for LAC.

Investments in Institutional Transformation

It is clear that in recent years all governments, to varying degrees, have been engaged in public sector modernization and reform. An important element of this process has been an emphasis on the importance of capacity development and the role of knowledge, which has moved to center stage of the agenda of development organizations (Horton et al., 2000; WB, 2000) and governments. Most of the reform processes have entailed multiple and, at times, simultaneous changes to different areas of the public sector, as noted in the previous chapter. To this end, an array of levers has been used by

governments to reform their public sectors, such as: more open government; performance budgeting and management; accountability and control systems; restructuring organizations and reallocation; introduction of market-type mechanisms; and changing public employment (Organization for Economic Cooperation and Development [OECD], 2005), among others.

While there have been some evaluations done to measure public sector reform, most of the literature has been based on developed countries, while other studies have been sector, or country specific. Unfortunately, based on this review, there are no empirical evaluations that focus on the reform of government agencies that work with agriculture. Likewise, in terms of knowledge and capacity development (OECD, 2005). programs or reforms, few of these have been evaluated, particularly since few capacity development programs have systems for monitoring or evaluating, and since there seem to be few appropriate methods to evaluate such programs' processes, outputs, and impacts (Kruse et al. 1998 as presented in Horton et al. 2000).

It is important to note that while the literature on public sector reform and performance is growing, it seems that there is still no agreement on the best way to bolster public services (Schick, 2003; Rodrik, 2008). Similarly there is no agreement on the best way to evaluate public reforms or the quality of institutions (Busse et al., 2007) or on the sets of indicators needed to gauge the effectiveness of these reforms (Schick, 2003; Wollmann, 2003), especially given the fact that there are significant problems in evaluating public-sector reform (Pollit, 1995; Pollitt and Bouckaert, 2000; Jones and Kettl, 2003; Wollman, 2003). With this in mind, it is important to note that a review of public sector reforms, which would entail multiple, interlinked interventions in various areas of the public sector and diverse sets of actors, is beyond the scope of this paper. Nonetheless, a brief review of the literature on the importance of institutions is presented below, with a special focus on the role of institutions in income, productivity, and agriculture.



In recent years, the literature on empirical studies that focus on the relationship between institutions and economic performance has been growing. While a significant number of studies find a positive relationship between institutions and economic performance, the results are not always robust and some studies arrive at differing conclusions. For instance, using information from 1960 to 1986 for nineteen countries in LAC, Campos and Nugent (1998) find that institutional quality is associated with higher economic growth and income levels. In particular, their institutional development index (which measures the quality of institutions) helps explain the variations of income per capita growth across countries and time. Likewise, Hall and Jones (1997) find that differences in levels of economic success across countries are driven mainly by institutions and government policies. Similarly, using various indicators of institutional quality, Keefer and Knack (1997) find that the ability of poor countries to catch up with more developed countries is determined in large part by the institutional environment in which the economic activity in these countries takes place. Other authors have also found a statistically signifi-

cant impact from institutional measures on GDP per capita (MacFarland et al., 2003; Easterly and Levine, 2003; Rodrik, Subramanian and Trebbi, 2002).

Not all papers find a clear relationship in this regard, while other studies find different results. For instance, in a review of the literature on growth and institutions, Aron (2000) concludes that while the evidence suggests that there is a link between the quality of institutions and investment and growth, the evidence is by no means robust. A different result is found by Glaeser et al. (2004) who conclude that human capital is a more fundamental source of growth than institutions. Additionally, the authors find that in some instances, their evidence shows that while some poor countries have been able to escape poverty through good policies, these policies have often been implemented by dictators, and have subsequently improved their political institutions.

In general terms, and despite some mixed results, Lio and Lui (2008) note that empirical studies tend to confirm that cross-country differences in productivity are

related to institutional heterogeneities. However, it is important to note that while the literature on the impact of institutional quality on various economic and social indicators has been growing, there are far fewer studies on the determinants of institutions themselves (Busse et al., 2007). More specific to agriculture, Lio and Liu (2008) observe that a substantial body of the literature in this area mainly attributes the divide in agricultural productivity to cross-country heterogeneity in tangible assets and technologies. Moreover, while there has been a growing interest in the effect of governance on agricultural performance, the authors note that most of the research has consisted of case studies, and little cross-country evidence has been presented.

In this regard, the work of Lio and Liu (2008), based on this review, is one of the scarce recent empirical papers that looks at the relationship between governance and agricultural productivity. The authors use governance indicators and rely on various cross-country datasets that make up a balanced three-period (1988, 2000, and 2002) panel data for 127 countries. Using two methods (inter-country aggregate agricultural production function, and a structural equation), the authors examine the relationship between governance and agricultural performance. With the first method, they find that given the same amount of agricultural inputs, the same education level, and the same climate condition, a country with better governance can generate more agricultural outputs. As for their second method, the results are also consistent: better governance brings about higher agricultural labor productivity. Importantly, they find that better governance not only directly fosters agricultural productivity but also indirectly enhances agricultural productivity by driving the accumulation of agricultural capital stock.

Similar results are found by Bharati and Fulginiti (2007) for ten Mercosur countries. The authors use data for 1972 to 2001, including variables to proxy institutional and socioeconomic environment, as well as variables for institutional and sociopolitical indices, and estimate a translog flexible functional form using OLS and an ML frontier approach to estimate differen-

ces in agricultural productivity across countries. The authors find that differences in performance across countries are associated with differences in public investment in R&D, in public health, in the natural environment, and with differential ability to access international markets. Importantly, they also find that institutional factors, and in particular public inputs and regulations, are important determinants of agricultural productivity growth, as well as per capita GDP growth, which is consistent with other studies noted above.

Of course, some of the indicators used to capture institutional quality in the literature are just proxies to measure this characteristic. However, and as Glaeser et al. (2004) note, these indicators may not be conceptually suitable for the purpose of measuring institutional quality and thus, more research and innovative approaches are needed in this regard.

This brief review has shown that little information is available on the evaluation of public sector reforms related to government agencies that work directly with agriculture. Some of the works synthesized in this section provide some indication of the importance of institutions for improvements in income, economic performance and agricultural productivity. Yet the literature in this topic is scarce, and there is obviously a need for more research in this regard.

V. CONCLUSIONS

This chapter provides an extensive review of the existing literature on the effectiveness of projects related to the promotion of agricultural production and productivity. Further, this chapter identifies where there are gaps in our understanding of the effectiveness of these sets of interventions, what needs to be evaluated in the future, and how this might be done. This review focuses on survey papers and stand-alone papers that provide robust evaluations using appropriate methodologies and quality data. Papers that did not have ideal data, but that at least used secondary or tertiary data to correct this limitation, have also been considered.

The review of the available quantitative evidence evaluating agricultural projects presented above provides some clear lessons on the effectiveness of certain types of projects. Some of the key messages that come out of evaluations that use empirically-based evidence are as follows:

- Consistent results were found on the link between land titling and increased investment and property values. On the other hand, another consistent result was the lack of effect land titling had on facilitating access to credit. Further, while titling leads to the activation of land rentals, it does not appear to significantly influence the buying and selling of land. The results suggest that land titling on its own cannot deliver all the anticipated outcomes if projects are not accompanied by other types of support, especially credit.
- When watershed management projects have clearly defined objectives, they can have positive effects in terms of conservation, productivity, and agricultural diversification.
- The empirical evidence seems to confirm that export promotion policies, by attenuating information problems, can reduce transaction costs, thus fostering trade; they may also have a positive effect on product diversification. There is also some evidence that export promotion may have a greater impact on smaller or less-experienced firms/enterprises. However, little information has been found specifically on the relationship between export promotion and agriculture/agribusinesses.
- Although the results are mixed (mainly in terms of magnitude) and different methodologies were used in assessing these schemes, guarantee funds seem to have an effect on additivity, productivity, employment, and economic growth (at the local level). However, most of the

results come from developed countries and more research is needed for LAC.

- While only one competitive grant project for R&D clearly identified a contribution to productivity, a good number of projects appear to make important contributions to increases in sales, product diversification and process innovation. Competitive grant projects also seem to have a consistent, although not conclusive, effect on increases in R&D budgets and additivity, with no signs of crowding out effects.
- Results on the impact of extension programs on productivity are mixed. Some studies find evidence of improvements in yields while others do not find a clear impact. Others still, find mixed results, depending on the sample or crop and period under investigation. The same holds true for impact on technology adoption. Some studies find a positive impact while others find less conclusive impact. The results suggest a need to understand why the results vary across project.
- A reasonable amount of evidence shows a positive relationship between rural road investments and productivity gains; the result holds independent of the country or region under study. Generally consistent results are also found on improvements in access to transportation, greater employment opportunities and in some cases better pay, increased access to input and output markets, and increased production and income.
- The empirical results suggest that having access to a mobile phone has the potential to decrease information asymmetries and price dispersion, and improve consumer and producer welfare. However, the provision of valuable market information, as noted, can also come through other means. In sum, these results provide significant support for the role of access to information, whether this is acquired by



mobile phone, radio, or by entities that disseminate market prices.

- While the results are mixed, a reasonable number of empirical papers find that good institutions play an important role in improving income, growth, and productivity. This is also true when looking at the role of institutions in agricultural productivity, based on the scarce sources found.

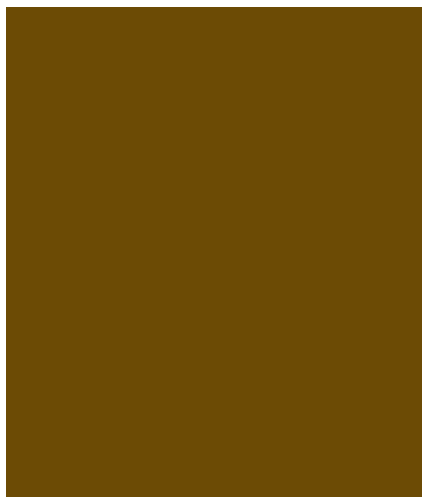
Along with these lessons on these specific areas, a key message from this chapter is that more needs to be done to evaluate the impact of agricultural projects. In many cases, evidence on the effectiveness of

interventions using quantitative impact evaluation is quite limited. The only area in which there have been a number of evaluations is land titling. In a number of the areas discussed above, no empirical evaluations were identified, making an assessment of their effectiveness impossible. Even when some evidence is available, the mix of results requires further analysis to fully understand why certain types of results emerge in different settings. In the case of land titling, where a number of evaluations have been completed, further lessons could be learned by combining evaluations with innovative approaches to titling projects which include complementary actions. More clearly needs to be done.





IV
Chapter



Conclusions and
Recommendations

I. INTRODUCTION

The recent food price rise and general changes in the global agricultural economy have created a number of challenges for the agricultural sector in LAC. Agricultural productivity must continue to increase, if the agricultural sector is to remain competitive and continue to serve as a source of food security for consumers through stable and relatively low prices and for smallholders through improved production. This report identifies and assesses the available evidence on the effectiveness of projects designed to improve agricultural production and productivity, in LAC and elsewhere. It also determines in which areas additional information on the effectiveness would be helpful.

This chapter summarizes some of the lessons from this exercise and offers recommendations on how to move forward in expanding knowledge on the effectiveness of projects designed to improve agricultural production and productivity. This is done in three steps. First, following the information provided in Chapter III, conclusions are drawn on the effectiveness of projects that have been used in the last decade to support agricultural production and productivity. Second, an assessment of what is missing in terms of understanding the effectiveness of these particular interventions is made. Finally, recent activities with respect to filling in these missing elements are considered.

II. OVERVIEW OF EVIDENCE ON AGRICULTURAL PROJECTS EFFECTIVENESS

Evidence on the effectiveness of different types of development projects in agriculture varies considerably across projects. A good example of where a considerable body of evidence is available is land titling. While there is confirmation of the benefits of titling agricultural land in terms of increasing agricultural spending and investment, there is mixed evidence on whether this leads to increases in productivity, efficiency and income from farming. Further, two anticipated bene-

fits—increased access to credit and increased land market transactions—did not appear to materialize, although there is evidence of increased land values and increased rentals due to titling.

Limitations in the credit market are found to be a particularly important constraint on poorer farmers and have led in some cases to limited land transactions, with larger farmers buying out smallholders, resulting in greater land concentration. If this were because larger farmers are more efficient, it might not be viewed as problematic, but it appears to be the result of credit market constraints rather than underlying efficiency. Overall, these results provide a clear potential direction for future titling projects. Namely, land titling must be accompanied by complementary policies, especially credit access, if it is expected to deliver all the anticipated outcomes.

Another area in which there have also been a substantial number of impact evaluations is investment in agricultural innovation, particularly extension services. In general, studies find that participants in extension programs tend to adopt promoted technologies, although in a few cases there is limited or no significant adoption. This adoption often leads to yield improvements, although again this is not a generalized result. The mixed findings may not be surprising given the expectation that some technologies are more likely to be successful than others. However, it may be the case that the mixed results are driven not by the type of technology, but rather by the approach to promoting the technology through the extension services; or they may be due to other limitations that farmers might face. The results clearly suggest the importance of promoting further analysis of the effectiveness of extension projects and the channels through which each effect is achieved in order to provide a more complete idea of how extension programs function and the means by which these projects benefit farmers

Some evaluations have been done on other sets of projects such as credit guarantee schemes, insuran-

ce and rural roads access, but there is a less critical mass of results from which to draw general conclusions. These evaluations provide interesting messages, as highlighted in Chapter III, but show the limitations of only evaluating a few projects. The titling and extension services examples suggest how impact evaluations can help to design future projects. They also point to the need to continue to evaluate agricultural programs to seek a deeper understanding of the reasons behind their success and the conditions under which they tend to be successful. The paucity of results on effectiveness in other areas related to agriculture shows the limitations of haphazard evaluations of a few scattered projects that prevent us from understanding the actual impact of these interventions. This is rather worrisome as it makes it more difficult for policy makers to identify the types of projects that might be better suitable to assure increases in agricultural productivity in a given context.

III. IMPROVING THE ASSESSMENT OF THE DEVELOPMENT EFFECTIVENESS OF AGRICULTURAL PROJECTS

The previous section has already highlighted the fact that the coverage of agricultural impact evaluations is limited in most areas. Even where there is a greater critical mass of evaluations, additional information could be helpful. Beyond the degree of coverage, there are also issues regarding the approaches to evaluation. In many cases, only qualitative information on development effectiveness is available and little attempt is made to identify a counterfactual—that is, what would have happened in the absence of the project. In other cases, even when empirical evidence is presented, it is quite often based on evaluations that were designed *ex post*—that is, after the project was implemented. Such evaluations are not ideal in that attempts have to be made to identify a proper counterfactual after the program has been implemented. Further, the lack of baseline information collected prior to project implementation creates additional challenges for evaluation since it limits the ability to

check if the identified counterfactual is reasonable and to control for any initial differences. Overcoming these limitations requires incorporating impact evaluations as components in the design of agricultural projects. This ensures that the highest possible standards of impact evaluation are used, including experimentally-designed evaluations and the use of baseline data collection.

Beyond expanding the range of agricultural projects being evaluated and improving the methods of evaluation, the review of projects suggests other potential improvements. First, the focus of most evaluations is on short-term impact during the life of the project. These, of course, are easier to conduct since the project team is in place and are useful in that they allow adjustment during the implementation of the project or in the design of follow-up projects. However, they might miss both long-term effects and project sustainability assessments. More evaluations that examine these issues would provide useful insights into project design and execution.

Second, projects tend to focus on average treatment effects—that is, the average impact of the project on beneficiaries. In some cases, the reviewed evaluations of agricultural projects do specifically analyze the impact on smallholders and other sub-populations of beneficiaries. However, there is still scope to assess the heterogeneity of impact on different groups. One area of concern is the lack of evaluations that consider the impact of agricultural projects on different household members, particularly women. With the exception of a review of impact evaluations on land titling, few evaluations consider the possibility that agricultural projects might affect men and women differently. Conducting such an evaluation requires careful design of projects and their evaluations to include such an analysis.

Finally, the review of impact evaluations shows that, with some notable exceptions, the environmental consequences of agricultural projects are rarely considered. Agricultural projects may shift land-use patterns

and alter the intensity of chemical inputs, which may have consequences for the environment. In some cases, these effects are worth being carefully analyzed to identify complementary policies that might reduce environmental damage.

IV. CURRENT STATE OF AFFAIRS AND MOVING FORWARD

Although there are clear steps that can be taken to increase our understanding of the development effectiveness of agricultural projects, in recent years there has been a general increase in the number of impact evaluations of agricultural projects being carried out, as well as a move towards conducting them in a manner consistent with the best practices in impact evaluation. Along with the general trend in this direction, the IDB has continued to expand the number of

evaluations being done and efforts have been made in operational departments to include evaluations as part of project design. As noted, this is likely to greatly enhance the ability to properly evaluate projects.

The key to successful impact evaluations is that they are part of the initial project design, they use appropriate techniques and they move forward with the project implementation. This requires operational specialists and country counterparts with a sufficient understanding of evaluation issues to manage this process and with the ability to identify individuals who can conduct such evaluations. In addition, it is crucial for project managers and other project participants to implement a more comprehensive approach to impact evaluation by involving local policy makers and emphasizing the benefits of implementing proper impact evaluation for future project design.





CHAPTER I: PROMOTING AGRICULTURAL PRODUCTION AND PRODUCTIVITY TO FOSTER COMPETITIVENESS AND ENSURE FOOD SECURITY

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- ## CHAPTER II: PROJECTS DESIGNED TO SUPPORT AGRICULTURE
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CHAPTER III: EVIDENCE ON PROJECT EFFECTIVENESS

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