

# Paraguay Agricultural Sector Risk Assessment

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This Note is based on an assessment undertaken by the World Bank following a request by the Government of Paraguay. The study evaluated agricultural risks, proposing solutions for reducing the volatility of both agricultural output and incomes of family farmers. The methodology includes a two-phase process. In the first phase risks are identified, quantified, and prioritized from the point of view of the supply chains and from an analysis of the public and private sector capacity to manage risks. The second phase defines the details of solutions to reduce exposure to the prioritized risks, proposing a strategy and action plan.

**Given that agriculture is a key sector of the Paraguayan economy (30 percent of gross domestic product [GDP] and 40 percent of exports), it is evident that agricultural risks have repercussions on economic growth, exports, public finances, and the development of agricultural supply chains and rural poverty.**

In particular, risks related to soy and livestock production have great importance in terms of country growth and economic stability. A significant drop in production and soy exports, as happened in 2011, has a significant impact on global economic activity, which translated, during the first quarter of 2012, into a drop in agricultural GDP of 28 percent and in total GDP of 3 percent.

This assessment was not limited to the commodities of macroeconomic importance; it also analyzed supply chains and agricultural commodities that are key from a social point of view in Paraguay, given that they involve

a great number of family farms. A particular focus was placed on risks and crops that provide employment to the majority of the rural population and that ensure national food security. Therefore, in addition to soy, maize, wheat, livestock, and rice, the following crops were included: sesame, cotton, sugar cane, cassava, and vegetables.

**Paraguay loses approximately \$US 237 million on average every year, or 5.4 percent of agricultural GDP, due to production risks that could be managed along the main agriculture supply chains.**

In the years in which extreme events have occurred, losses have reached \$US 1 billion. This represents a negative shock that impacts the agricultural sector, as well as other economic sectors. The recent study on volatility in Paraguay (World Bank 2014), shows that the activities most affected beyond agriculture are input provision, such as machinery, storage, and transport, and sectors like construction and

financial services. In 2011, \$US 920 million was lost in soy alone. This drop in soy production produced a loss of several percentage points in national GDP. Also in 2011, family farming incurred extensive losses due to drought: cassava, \$US 94 million or 38 percent of value of production (VOP); sesame, \$US 13 million (46 percent of VOP); and cotton, \$US 3 million (26 percent of VOP). Estimates of regional losses coincide with the supply chains with major production values (soy, maize, wheat) and with cassava. The departments with the largest losses in value have been Alto Parana and then Canindeyu, Itapua, Caaguazu, and San Pedro. The variability in the availability of basic staples, mainly cassava and beans, represents a permanent threat for food security of rural households.

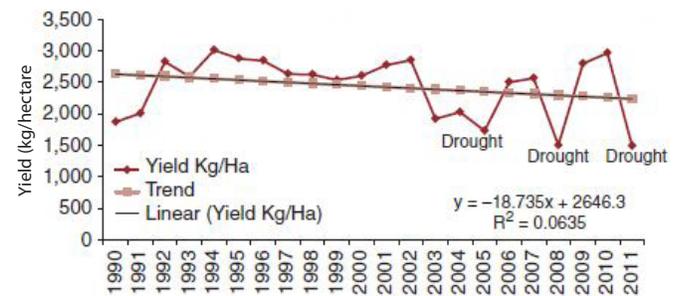
## MAJOR RISKS

Given the nature of the impacts and dimension of losses in the agricultural sector, it is clear that there is ample room to undertake investments in risk management programs. Paraguay could reduce losses significantly and make an important contribution to poverty reduction, stabilizing rural household income.

### Production Risks

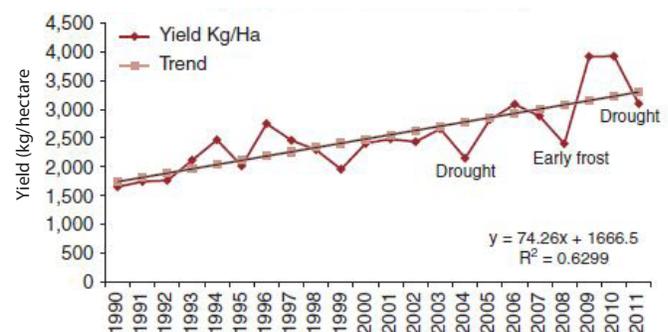
Production risks are the most frequent type of risk and have the greatest impact on the sector. The most notable risk, given the global magnitude of losses, is drought. In commercial farming, summer drought accompanied by high temperatures has a significant impact on soy, whereas maize, which is also relevant for family farming, is mainly affected by winter drought and early frosts. The family farming crops, like sesame, cotton, sugar cane, and vegetables, also suffer from the recurrent droughts. Cassava, the main consumption staple of family farms, is relatively tolerant to water deficits and is only affected by severe droughts.

**FIGURE 1.1 Soy yield evolution and main causes for losses**



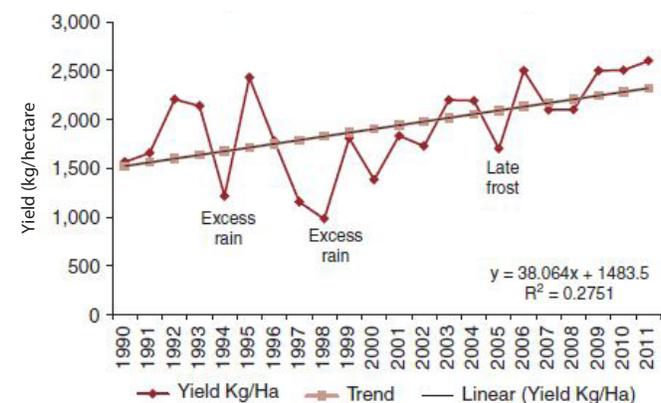
Source: World Bank data based on data from MAG and field information.

**FIGURE 1.2 Maize yield evolution and main causes for losses**



Source: World Bank data based on data from MAG and field information.

**FIGURE 1.3 Wheat yield evolution and main causes for losses**



Source: World Bank data based on data from MAG and field information.

Pests and diseases also impact production, although in general, they do not represent the main risks. Outbreaks occur every year, although intensity varies as a function of climatic conditions and crop management (monocropping contributes to the development of diseases like rust and other fungus). These events are generally controlled by agrochemicals or resistant varieties, and therefore the main impact is due to increases in production costs, which particularly affect family farming.

Animal health problems like foot and mouth

disease (FMD) outbreaks have had catastrophic economic consequences. Outbreaks have caused almost total paralysis of meat exports, resulting in losses of foreign currency and fiscal resources, and affect all participants along the production chain. Paraguay suffered FMD outbreaks in 2002 and 2011. Currently, there is periodic vaccination, and the Permanent Veterinary Committee of the Southern Cone and Panaftosa are monitoring the National Animal Health and Quality Service (SENACSA). Weather risks, like drought, floods, and frosts, also cause important losses to farmers, but

### BOX 1. Family Farming in Paraguay

Conceptually, Family Farming (AF) is defined as “the rural productive activity that is executed using mainly family labor for production in a farm; and that hires in one year over 20 days of temporary labor in specific seasons related to the productive process, residing in the farm and/or nearby communities and that do not utilize—under any condition of ownership, rental or other relation—more than 50 hectares in the Eastern Region and 500 hectares in the Western Region, independently of the product produced.”

The rural population segment defined as AF possesses an important representation in numbers and in production in the country. AF represents 91 percent of all farms under the CAN 2008, above other countries in the region. In productive terms, according to the last census (CAN 2008), the contribution of AF reached more than 90 percent of the volume produced in maize chipá, beans, cassava, banana, and pineapple; between 50 percent and 90 percent of sesame, milk, and sugar cane for industrial production; and less than 50 percent for maize tupí regular harvest and peanuts.

However, even with the relevant economic and social weight, the capacity of the family farming units to be integrated competitively in productive chains and dynamic businesses has been varied, with a high percentage of them staying below productive efficiency levels. Average physical yields from most productive activities of AF (cassava, beans, peanuts, sugar, cotton) have remained stagnant and, in some cases, experienced decreasing trends compared to averages from 1981–89, 1990–99, and 2000–08. Some exceptions to the rule are tomatoes, locote, and maize, crops that have shown significant increases in yields for those periods.

The lack of productive efficiency is in part attributable to weak access to strategic resources that could promote change, including institutional credit and technical assistance. The proportion of AF productive units serviced by institutional credit has decreased from 33.6 percent in 1991 to 17.7 percent in 2008. Technical assistance covers only 44,000 farms, about 15 percent of total farms responding to the census in 2008.

These characteristics contribute to high poverty levels, which in 2011 affected almost 45 percent of the rural population, or 1.2 million people, of which 782,000 people were in a situation of extreme poverty.



unlike foot and mouth disease, which can be mitigated with vaccination, extreme weather events have more limited mitigation potential.

### Market Risks

Prices of agricultural products from family farms, like sesame and cotton, are subject to high volatility, which is directly transmitted to producers. In cotton, the significant domestic price fluctuation associated with low-productivity results have been progressively discouraging farmers and causing the decline of production in this crop.

In soy, on the other hand, prices received by producers are subject to international price volatility and a strong seasonal and interannual variation of price differentials (specific price discounts for Paraguay in relation to the prices in Chicago). But given the high level of current prices, the volatility has resulted in a relatively low impact on production decisions, although it does impact significantly the family farming cooperatives and small-scale traders, due to changes in the differential between selling and buying the commodity.

### Enabling Environment Risks

Enabling environment risks are important for the agricultural sector of Paraguay, partially due to its landlocked situation and to previously low levels of public investment in basic infrastructure and technology. Both commercial and family agriculture are exposed to these risks. For example, the market oversupply due to the extraordinary entry of commodities from neighboring countries motivated by exchange rate differentials (tomatoes) or the frequent regulatory changes in boarding ports in Argentina resulting in costs and business losses (soy). In rice, the erratic policies followed by Brazil regarding imports, and with frequent changes in sanitary and tariff barriers, impact exporters and the entire rice supply chain.

### ADVERSE IMPACTS OF RISKS

*The distributional impact of risks throughout the supply chains varies.* The stakeholders most affected tend to be producers, and the final result is often increased indebtedness and reduced investment capacity. At the family farm level, drought can cause severe losses to crops and have significant impacts on farm income, resulting in unsustainable debt levels, to the point of forcing households to sell assets. A portion of the production and loss variations faced by supply chain actors, especially family farmers, is the result of unmitigated risks. These risks could be managed *ex ante* with good agricultural practices, infrastructure investments, and timely access to information.

*The rural poverty situation of Paraguay (almost half of the rural population is poor) is intrinsically connected to the vulnerability to agricultural risks.* Family farmers and their households are the ones most at risk of continuing or falling into poverty, first due to their initial vulnerability situation and second due to their low capacity to efficiently manage agricultural risks. In order to change this situation, it would be necessary

both to improve the conditions by which small farmers manage risks and to modify the causes of the initial vulnerability situation of those families.

## RISK MANAGEMENT

The Government of Paraguay is implementing a series of programs and projects that address resilience and many of the identified risks. A special mention is warranted for the Agriculture Risk Management Unit of the Ministry of Agriculture and Livestock of Paraguay (MAG), which represents the most clear institutional response to agricultural risks in the context of sectoral public policies. For the moment, it is a project in development that does not reach the producers at a massive scale and that would be necessary to strengthen and integrate with other ongoing initiatives. Other relevant projects include the Pequeños Perímetros de Riego (International Fund for Agriculture Development [IFAD]), Proyecto de Desarrollo Rural Sostenible (World Bank), Agriculture Supports (Inter-American Development Bank), Proyecto de Manejo de Recursos Naturales, Paraguay Inclusive Project (IFAD), the Family Farming Food Production Development Program (MAG), and others.

### Priority Solutions

Given the ongoing programs and projects, the proposed strategy intends to tackle risks in an integrated manner through better management and with the objective of reducing rural poverty and increasing the resilience of family farms. The priority solutions proposed include instruments for responding, transferring, and mitigating production and market risks, and for providing public services and agricultural innovation.

**1. The best risk management for family farmers is through the development of a more efficient and coordinated Agricultural Innovation System, and through a mechanism for compensating incomes in case of extreme weather contingencies.** The objective is to respond to

technological and market problems that produce the initial exposure of family farms to great production risks, and in the case of catastrophic events, to provide orderly and objective emergency support to those families.

The most important family farming crops suffer from weather risks, particularly severe droughts. There are innovative technologies and practices that can reduce the vulnerability to weather risks. The following is recommended for the family farming sector in Paraguay, as their implementation would allow farmers to mitigate risks associated with weather variability:

- Diversify crops
- Increase soil capacity to store water, requiring improving and conserving soils, vegetative cover, and adequate soil management
- Use cultivars and/or drought resistant seed varieties
- Use greenhouses and half-shade vegetable crops
- Introduce irrigation where feasible and with appropriate techniques
- Improve efficiency of water management
- Implement pest monitoring and early warning systems.

It is important to have a research agenda that



Photo credit: Andrea Pavanello



Photo credit: Andrea Pavanello

includes adapting technologies to the local context. Although almost all techniques and technological practices mentioned can be adopted without major difficulties by family farmers (taking into account that some of them require investments), in many cases a higher level of detail will be needed in terms of the techniques and the agricultural research background needed to adapt them to the local conditions of family farms. IPTA should develop a specific research agenda for the generation of technological innovations adapted to family farming, in particular to mitigate risks and achieve greater resilience.

**2. With respect to animal health risks, the strategy includes measures for protection of export markets and for improving the country's sanitary conditions and safety of food products.**

The proposed measures have SENACSA at its

center and are, to a great extent, directed toward the mitigation of FMD risk and other important disease risks to meat exports and national production. However, the strategy does not stop at the external requirements but also goes into the consequences of the sanitary deficiencies related to human health.

This improvement requires the consolidation and sustainability of animal and food safety services, which will also contribute to increase national production of quality livestock products for national consumption and export, improve public health, and protect the environment.

Specifically, the strategy prioritizes the following objectives:

- Maintain the free of FMD with vaccination status
- Move forward in the eradication of prevalent

diseases of economic and human health importance like bovine brucellosis and tuberculosis

- Reach the free of PPC and free of Newcastle status
- Extend the control and inspection of slaughterhouses for national consumption
- Establish an integrated system that can offer efficient technical assistance to family farmers
- Consolidate the management and administration of animal health and food safety services.

### 3. The strategy also proposes the development of an Agricultural Commodity Exchange to mitigate and eventually transfer market risks.

Price volatility was assessed as a significant risk not easily mitigated by large- and medium-sized soy producers, producers of other commercial commodities (maize, wheat, rice), or family farmers for whom price volatility (international prices and exchange rates) can be critical for survival (cotton producers). Addressing price volatility requires strong institutions to enable more transparent markets and mechanisms for price coverage, which can be achieved by the development of an agricultural commodity exchange.

The process for the development and implementation of an agriculture commodity exchange should start with a feasibility analysis about which commodities and instruments could be introduced for the launching of operations. The launch of an exchange with a series of products and successful instruments is crucial to generating trust in the market and thus attract further commodities and actors. This allows the development of more instruments (cash or financial). To launch an Agricultural Commodity Exchange, the following is recommended:

- Develop an integrated proposal that examines the current legal framework; analyzes which products and type of contracts could be negotiated; designs a model that is most appropriate for Paraguay; determines the

level of investment required to launch; and estimates the financial viability of the exchange

- Establish a working group composed of the public and private sectors
- Design a business plan that contains a work program with precise objectives; a strategic plan to define the commercial aspects linked to the project; and an organogram with functions
- Establish the projected cash flow
- Develop the bylaws and operating regulations. The working group should write the bylaws and operating regulations for the functioning of the exchange, and the organization and operation of each contract
- Finally, launch. It is recommended that detailed activities be established in order for the exchange to fully function from day one.

### Risk Financing Strategy

The financing of agricultural risks is done through a structure based in different simultaneous instruments designed to cover various risks efficiently, based on estimated risk impact per frequency and severity. This risk financing modality allows for integral coverage and for maximum financial efficiency, in addition to providing transparency to public management and very likely achieving a higher level of effectiveness in *ex post* emergency assistance. Furthermore, it is considered that the optimization of agricultural insurance would have positive impacts on family farming and other agricultural segments.

## IMPLEMENTATION: PROPOSED RISK MANAGEMENT POLICY MEASURES

The proposed measures are not easily implemented and require a concerted effort between public and private sectors. It is worth highlighting, however, that the annual cost for this strategy is significantly lower (\$223 million over five years) when compared with the actual annual

**TABLE 1: Estimated costs for the Agricultural Risk Management Action Plan (US\$)**

Strategic line	2014	2015	2016-19	Total
Solutions for sanitary and food safety risks of livestock supply chains	19,883,660	51,296,167	126,905,167	198,085,001*
Strengthening of the Agricultural Innovation System for the mitigation of family farming risks	3,105,000	6,726,500	13,541,500	23,373,000
Price risks and the development of an agricultural commodity exchange	70,000	58,000		128,000
Agricultural risk financing strategy	123,400	874,300	1,067,150	2,064,850
<b>Total</b>				<b>\$223,650,851</b>

\* This cost includes all actions identified in the gap analysis undertaken by the World Animal Health Organization (OIE).

losses of non-mitigated risks, which average \$237 million. The short-, medium-, and long-term costs are presented in Table 1.

In parallel, a series of policy measures was identified as essential to achieving an appropriate agricultural risk management framework and to put into practice the identified actions. These measures include:

- Expansion of the control and inspection of slaughter houses for local consumption
- Establishment of a coordinating body for family farming risks that facilitates the creation of an agricultural innovation system
- Budget approval of the Integrated System for Agricultural and Rural Development's institutions in a coordinated fashion and with MAG participation
- Strengthening of the regional coordination of actions related to family farming risks
- Approval of a new regulatory framework for agricultural commodity exchanges, differentiating between the physical and financial market
- Approval of incentives for agricultural sector actors to trade/register physical goods at the exchange
- Establishment of weather contingency financing mechanisms for family farmers (such as drought)
- Guarantee that agroclimatic information is permanently shared among data producers and user institutions.

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