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Fast and integrated revision of agricultural risk management in Brazil

Authors: Diego Arias⁽¹⁾, Pedro Abel Vieira Junior⁽²⁾ and Paulo Mendes⁽³⁾.

Abstract: The agricultural sector is strategic for the Brazilian economy and society, nevertheless, the fluctuation in Gross Domestic Product (GDP), which can reach 1% per year, indicates the weakness of risk management in the sector. This study identified that Brazil has good policies dedicated to risk management, although focused on risk mitigation. Response and transfer mechanisms, especially insurance, are still insufficient. The results also strongly suggest that the integration of policies and programs dedicate to agricultural risk management in Brazil is still low, consequently, it may be difficult to reduce the losses in a systematic way.

Key words: Agricultural development, Agricultural economics, Risk management.

Authors' details: (1) World Bank. Brazil. (2) Embrapa. Parque Estação Biológica (PqEB). Brazil.(3) Embrapa, Parque Estação Biológica (PqEB). Brazil.

1. INTRODUCTION

Agricultural activity is a strategic sector for the Brazilian economy and society. In 2015, this activity accounted for about 5% of Gross Domestic Product (GDP), an amount that exceeds 20% when considering the spillovers to industry and services, 39% of exports, besides being responsible for the employment of 16 million people. It is the basis of agribusiness, which, in the same year, generated approximately 21% of GDP, accounted for 46% of Brazilian exports and employed about 40% of the active economically population of the country (IBGE, 2016).

These indicators give an idea of the importance of agriculture in Brazil; however, the annual loss due to extreme weather events can represent up to 1% of Agricultural GDP (IBGE, 2016). It is important to notice that the damage caused by weather events is not limited to these statistics, since the economic and social performance of agriculture is determined by the combination of a set of factors with significant impact on the sector's results. Weather events, for example, can determine significant losses in production, decline in exports, reduced employment and greater volatility in output and income of producers, price increases for consumers and food insecurity. Understanding the factors that affect agricultural production is extremely important, especially for a country like Brazil, where the agricultural sector has significant socioeconomic participation. In the country, consequences of hazards in the agricultural sector vary by region, by type of producer and by value chain. For example, agriculture in the Northeast region had losses of 90% in the production of rain-fed grains in 2012 due to the lack of water, and it had a negative growth in the following 3 years with an average loss of 3 days per year for rural families. Finally, certain risks can spread for entire chains such as the foot and mouth disease in Brazilian states of Mato Grosso do Sul and Paraná in 2005, that resulted in the suspension of meat exports to Russia for 28 months and the reduction of one third of the volume exported, causing significant impact on the income of producers, as well as affecting the competitive position of the chain in international markets (Costa et al, 2011; MB Agro, 2012).

The consequences of agricultural risk are not restricted to market; agricultural risks also imply significant government spending. Events affecting the income of the agricultural sector, like natural disasters, pests and/or diseases and significant price variations in agriculture, in labor, in input and energy, in addition to actual agricultural production, imply emergency government spending, with consequences for the economy as a whole. Federal government estimates that the response to the drought of the last three years in the Northeast represented additional expenses of US\$ 3.5 billion, and that this spending tends to grow, considering that the frequency of droughts increased about 50%: there used to be one in every 6 years, but now there is one in every 3 years (Brazil, 2016). Concerning tax revenue, a reduction of around 10% in Brazilian soybean production could result in an annual reduction of US\$ 0.8 billion in federal revenue, equivalent to 16% of the Ministry of Agriculture, Livestock and Food Supply budget in the year 2015 (Figure 1).

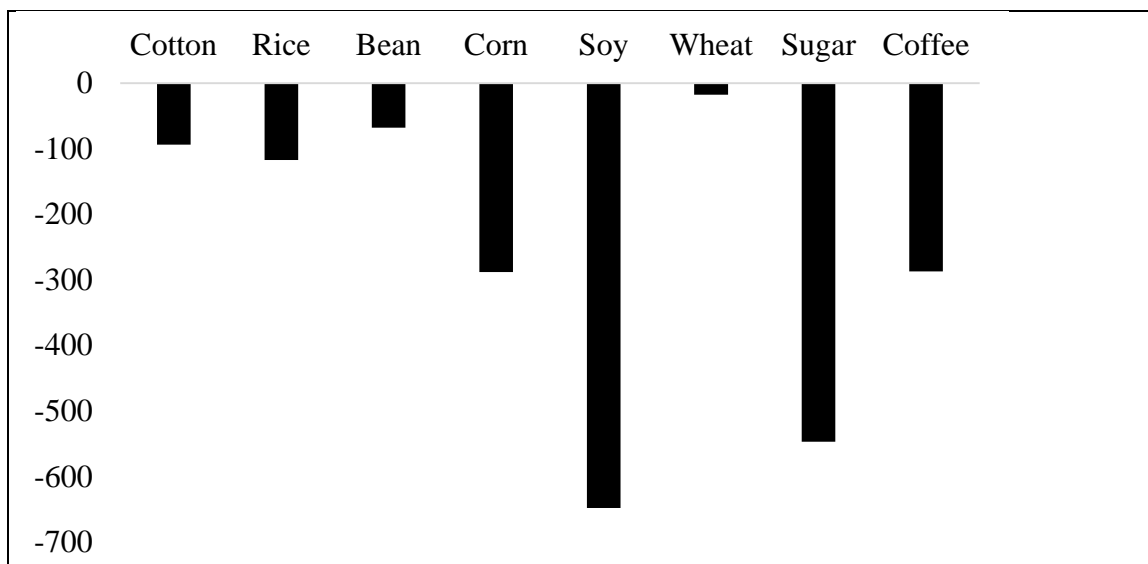


Figure 1. Loss of tax revenue (US\$ million), considering 10% reduction in agricultural production of some products (WORD BANK, 2015).

Agricultural activity is marked by a specificity that distinguishes it from industrial production and service sector: the strong dependence on nature; earth – its supply is relatively inflexible –, climate and biological processes, which, being extremely dynamic, together play an active role in the organization, production process and results of agriculture. In particular, these features involve: i) greater rigidity of the production process, resulting in less flexibility to adjust to economic cycles and changes in the junctures of the relevant markets; ii) seasonality of production, which, even today, in many branches, is entirely determined by nature; iii) dependence on biological processes that are directly responsible for the major operations of the production process. This dependence reflects the risks affecting the activity of agriculture; indeed they are greater than the set of the other activities. Agricultural production is exposed to the rain and the lack of it, cold and hot weather, pest attack; it is more difficult to respond quickly to favorable market situations, or to adjust to negative; it incurs additional costs to cope with the seasonality of production, leading, in many occasions, to a mismatch between the flows of revenues and expenses. Therefore, agriculture is characterized as an activity surrounded and covered by risks, like an island in a sea of risks (Marcovitch, 2010; Buainain, 2011). Concerned with the issue of risks in Brazilian agriculture, the World Bank, together with the Secretariat of Strategic Affairs of the Ministry of Agriculture, Livestock and Food Supply and the Brazilian Agricultural Research Corporation (Embrapa), supported by Sociedade Rural do Brasil (SRB), Organização das Cooperativas Brasileiras (OCB), Confederação Nacional da Agricultura (CNA), Confederação Nacional dos Trabalhadores na Agricultura (CONTAG), Federação Nacional de Seguros Gerais (FENSEG), Banco do Brasil (BB), Inter-American Institute for Cooperation on Agriculture (IICA), Inter-American Development Bank (IDB) and Food and Agriculture Organization of the United Nations (FAO), developed a quick review to get an integrated view of agricultural risk management in Brazil. This work, which its methodology and results are as follows, was motivated by the fact that, despite the economic and social importance of the agricultural sector to Brazil, it is the most economically volatile sector.

The objective of this work was to perform a rapid and integrated review of agricultural risk management in Brazil, facilitating the identification of gaps and opportunities to contribute to the improvement and efficiency of federal programs and policies on both short and long terms. In addition to possible improvements in agricultural policies and programs, risk management in the rural property, better coordination and integration of existing tools can reduce the sector's risk profile.

2. METHOD

In recent years, Organization for Economic Co-operation and Development (OECD) has been developing a holistic conceptual framework to manage agricultural risks, based on which the World Bank produced a methodology for integrated risk evaluation in agricultural chains. This methodology considers that risk involves a numerical knowledge of probability and impact of the event, while the uncertainty implies that results are not known yet (Knight, 1921).

Although the World Bank has developed a methodology for the analysis of risks along supply chains – off-farm risks are as or more important than in-farm risks, due to limited resources, especially time –, only risks that affect rural producers were considered. This methodology includes events that may result in off-farm risks (unexpected closure of a highway, regulatory changes, etc.), provided it has an impact on producer's income. This work, considering that agricultural sector has cyclical variations, is only concerned with risks associated with extraordinary and systemic events that may affect the rural producer's income. Extraordinary, extreme and systemic events are those which cause losses of more than one standard deviation from the average or historical trend. Income reductions lower than one standard deviation (about 10%) were not considered. Local catastrophic losses were not considered when they had no impact at national level. Therefore, the concept of risk was associated with negative results exclusively from the rural producers, due to the volatility in biological, climatic, market and institutional factors.

The variables considered include natural adversities (eg. pests and diseases), uncontrollable climatic factors (eg. droughts and floods) and changes in input and/or final product prices. It also considered institutional risk, which is the risk generated by unexpected changes in regulations affecting agricultural sector. For the purposes of this study, it is important to stress the distinction between risk and limiting factors. For example, in the agricultural sector, the flow of products is critical for their sale. A poor logistical access to markets is considered a limiting factor for the producer; but if the producer had always had good logistics and the access to market is unexpectedly interrupted, it is a risk. Finally, it is important to differentiate risks from trends. For instance, if there is a gradual and predictable increase in the frequency and impact of droughts in a specific area (due to climate change or other factors), this trend is not considered a risk. Risk would be the deviations from this trend of drought in the area.

Based on these concepts, risks of the agricultural sector were grouped into the following: production, market and business environment risks. According to the World Bank classification, production risks concern the production itself and its management, which may include extreme weather events and fires, unexpected events related to animal and plant health, as well as sudden changes in property and natural resources management. Market risks include mainly significant changes in prices of products and inputs, unforeseen changes in access to credit and issues affecting trade, even foreign trade. Business environment risks include events that change the policy and institutions context (changes in the legal/regulatory framework, in the sector institutions and in the interpretation of rules and laws), and infrastructure and logistics (Table 1).

Table 1. Types of agricultural risks in Brazil (Word Bank, 2015).

RISK GROUP	RISK	EXAMPLE OF EVENT
PRODUCTION RISK	Climate	Prolonged droughts, frost, excessive rain, floods and high winds
	Animal health	Outbreaks of foot-and-mouth disease, mad cow disease (BSE), Newcastle, etc.
	Plant health	Introduction of new pests and diseases in the country
	Management of production and natural resources	Production and natural resources management; changes in: water concessions, technical assistance, inspection and labor availability; Poor in natural resources management
MARKET RISK	Market (price of inputs and products) and credit	Significant variation in the products and inputs prices, exchange rates, interest rates and changes in terms of loans
	Foreign trade	Markets closure for exports and changes in access to the import of inputs
BUSINESS ENVIRONMENT	Regulatory framework, policies, institutions and groups of interest	Changes in laws / regulations (environmental, labor, inputs, land), changes in orientation in public institutions and changes in the interpretation of regulations

Typically, risk assessments require quantification, prioritization, capacity analysis and search for solutions. Given the cost of these methodologies, the basic premise was that specialists' consultation can replace, even with limitations, empirical research on the damage caused by the various dimensions of risk to the income of rural producers. Therefore, based on the so-called impact on the income of rural producers, eight risk topics were established (Table 2), they were grouped into three dimensions (production risk, market and business environment). Thus, it was decided to conduct a quick review based on consultation during a workshop and an electronic survey was distributed to over 5,000 sector representatives.

Over 100 representatives of the sector attended the workshop. After some conceptual talks, ten experts of each of the risks were brought together, representing various segments of the agricultural sector, divided into eight thematic panels. To select the experts, institutions representing different branches in the sector were consulted, and there were ensured representation of different actors: public institutions, private sector (agribusiness), academia and research, productive sector and financial institutions. The basic principle adopted was that the experts have great knowledge about the risk theme and, encouraged to participate in a collaborative process, they could identify the main challenges and opportunities for the sector. Each panel had an independent moderator (employees of IICA, IDB, IFC or World Bank) and a rapporteur (Embrapa researchers). A set of questions was developed to guide the discussions of experts who, under the guidance of the moderator, reviewed the literature of policies and the results of the survey regarding the type of risk related to his group. The panel discussed the

different perceptions, seeking, whenever possible, to come up with conclusions and recommendations.

The survey consisted of questions for each of the themes, considering an intensity scale (1 = very low to 5 = very high) of losses and the frequency in which they occur. Based on this information, they calculated the average impact and the average frequency of each event.

This work was also substantiated by an empirical evaluation of two Brazilian states (Bahia and Paraíba) and one municipality (Piquet Carneiro, Ceará) and the results of experts' consultation and the survey were compared with literature review of recent studies on risk assessment and the main federal public plans and programs for the management of agricultural risks in Brazil, according to criteria of budget and coverage dedicated to mitigation, transfer and response of agricultural risks.

After systematized, preliminary results were presented to various institutions related to the agricultural sector and the implementation of public policies to validate and improve the results obtained.

3. RESULTS AND DISCUSSION

3.1. Mapping of the main public policies and programs

In relation to other countries of the Organization for Economic Co-operation and Development (OECD) and developing countries, Brazil has a relatively high level of anti-cyclic agricultural support or variables (support that varies according to the production and/or the income of farmers). The anti-cyclic support variables include policies and response programs to natural disasters, product price compensation and emergency programs. Only Japan, Russia and Canada have anti-cyclic support higher than Brazil. However, anti-cyclic support in Brazil fell 50% between 1995/1997 and 2010/2012 in relation to the overall level of producer income, from 5.0% to 2.5% of the producers' income (OECD, 2013). Therefore, Brazil has various policies and public agricultural programs with direct and indirect impacts on agricultural risk management. These programs and policies cover the various dimensions of risk management, including mitigation, transfer and response, and are addressed to different strata of farmers (family, medium and enterprise). The analysis of the 25 programs and the most important federal public policies in terms of budget and coverage related to the three groups of agricultural risks (production, market and business environment) indicates that these policies and programs favor the mitigation strategy (Figure 2). Prioritizing mitigation is wise, however, this analysis indicates there is room for implementation of response strategies and transfer. In the case of response, especially risks with low frequency and high economic impact, like health problems, the country has a relatively low number of contingency plans. Even considering that not all agricultural risks can be transferred, there are opportunities in the areas of production and market risks, such as access to future markets. This reality is an excellent opportunity for both the generation of tax income from new business, such as financial services and technical assistance, and for the reduction of tax expenditures for the simple integration of existing strategies. It is important to mention that the implementation of this integration does not require significant application of additional public funds.

The analysis also indicated that there are several overlaps between policies and programs. It indicates that policies and public programs do not cover the losses of small and medium producers in an integrated manner. Large farmers have access to sophisticated financial instruments, to which the medium and small producers do not have. Family farmers rely on support as the Garantia Safra program, which producers receive indemnity payments from losses above 50%, and that still does not cover the amount lost. Other programs, such as Programa de Garantia da Atividade Agropecuária (PROAGRO), only cover the cost of credit, but do not compensate for the loss of producers' income. A similar situation occurs with the market risk and the risk of logistics. Importantly, despite the work to stick to federal policies, there are multiple programs and state policies, and even municipal making the mapping of government actions challenging. Despite the large number of policies and insurance programs to

guarantee production and prices, the implementation of programs is complex and requires greater coordination.

As an example, the integration of price risk programs with insurance programs, which can and should result in producer income cover, Figure 3 makes clear that the programs rely on different institutions, are operated by different intermediaries and achieve farmers in a dismembered form. So, to avoid duplication of efforts – and seeking to enhance the coverage and services to enable an improvement in income to the producer –, inter-institutional coordination between different programs shown to be critical to greater effectiveness of them.

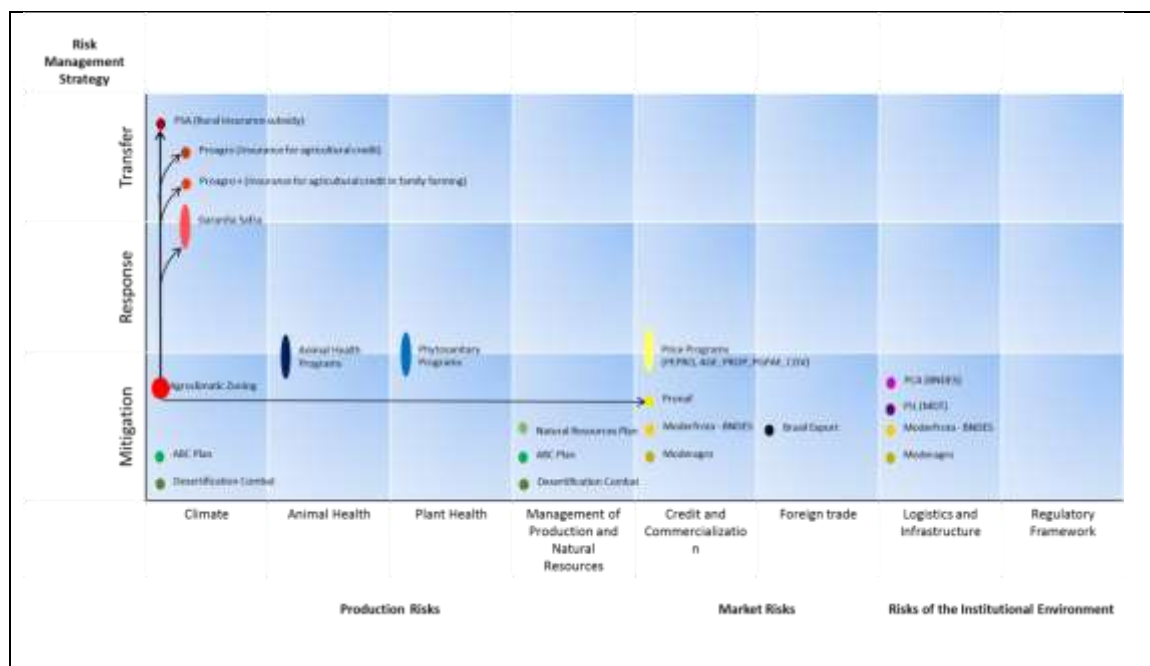


Figure 2. Main policies and agricultural risk management programs in Brazil.

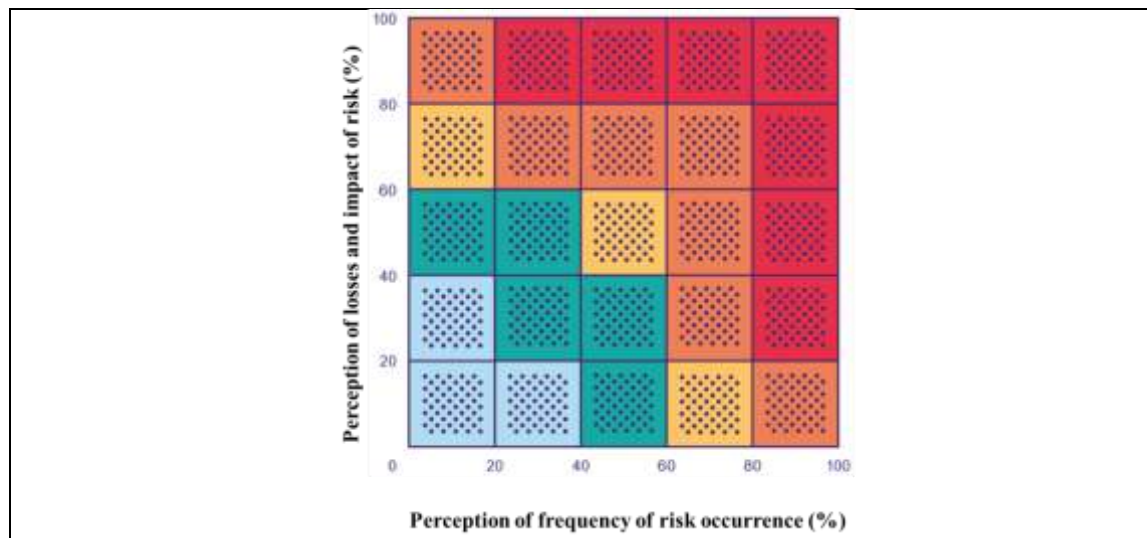
Figure 3. System of agricultural insurance and price guarantee.

3.2. Summary of risk perception

After the survey, over 700 responses were received (out of about 5,000 questionnaires) from all regions of the country. Results indicate that the risks related to production management, such as the absence or inadequacy of projects and estate planning can be so important as other “traditional” risks, such as weather events and sanity. In Brazil, despite the difficulty in quantifying the losses linked to production management, the perception of the economic impacts of these risks on the income of rural producers is increasing. The results indicate that the sector attaches importance to a systemic integrated view of all risks, without favoring only the most traditional risks, such as: climatic, health and price ones.

Risks associated with infrastructure and logistics are priority due to greater impact on the economy, although public policies seem to be less concerned about them than other assessed risks (Figure 4 and Table 2). Nevertheless, it was provided that this perception may be in accordance with news and current logistics problems in Brazil. The risks associated with extreme weather events were considered the second most important by experts, getting the priority score 5 (very high), as well as the risks associated with credit and marketing.

For all dimensions of agricultural risks, improvement of current policies and federal program opportunities were identified. However, the workshop and the validation had some divergent points on the challenges and policy improvement opportunities and existing federal programs for risk management. Consensus was required to implement an integrated management system of agricultural risks.



Very low	Hail	Standard classification changes		
	Frost	Business promotion changes		
	Wind			
Low	Rain	Inadequacy of mechanization	Default Changes and	Anti-dumping and safeguards
	Inundation	Lack of inputs	insufficient credit	Commercial agreements
	Fire	Inadequate inputs	Interest Rates	Interruption of transport ways
	Brucellosis/Tuberculosis	Uncertainty in public polices	Unexpected growth in	
	Newcastle	Changes/uncertainty in taxes and fees	imports	
	Nematode			
	Weed Plants			
Medium	Foot-and-mouth disease	Labor shortage	Regulation of work	Regulatory framework
	BSE	Exchange rate fluctuations	Disputes between public institutions	
	Bird flu	Health harmonization in bureaucracy	Regulatory framework	
	Swine Fever		Inspection	
High	Pests	Lack technical assistance	Price changes	Strikes in the transport system
	Diseases	Inadequate water management	Credit release Changes in tariff and non-tariff	Transport interruption ways

Very High	Management capacity	Inadequate management	soil barriers	Environmental laws	Energy interruption/oscillation
	Training workforce	Inadequate management	input		Infrastructure warehouse
	Inadequate technology				
	Drought				

Figure 4. Perception of impact and frequency of agricultural risks, according to the results of the electronic survey.

Table 2. Perception of experts participating in the workshop on the impact of the risks associated with thematic dimensions addressed in the study and the degree of compliance of current public policies for the sector.

Public Policy Attendance	Impact of Risks		
	Low	Medium	High
Alto	International Trade Credit		Animal Health
Medium	Regulatory Framework Production and natural resources management Market		Plant Health
High	Climate events		Logistics and Infrastructure

4. Final considerations

Integration was the focus of discussions and an important conclusion, supported by the experts, is that, although there are still gaps, Brazil has good mechanisms for risk mitigation, regular mechanisms for risk transfer and insufficient response mechanisms – however, it is not possible to treat these mechanisms in an isolated way. For example, foreign trade panel showed a clear need for integration and coordination with the risk management of animal and plant health agenda. Another example is the recommendations of the natural resources risk management panel in relation to the incorporation of climate risk management tools in the sector. That is, the

results show that Brazil has a great number of good public policies for the management of agricultural risks and that this situation can be improved without increasing government spending; it is only necessary to plan in order to improve the integration between them. The results made it possible to list the challenges for the management of the main agricultural risks in Brazil (eight risk dimensions of were considered according to the following groups: risk production, market risk and business environment risk at national level), indicating opportunities for improvement of current policies and public programs. More than the opportunities, the results point to the need for integration of agricultural risk management, since without the integrated management of risks, it is difficult to reduce the losses in a systematic way in the sector.

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