



UNIVERSIDADE ESTADUAL DE CAMPINAS  
SISTEMA DE BIBLIOTECAS DA UNICAMP  
REPOSITÓRIO DA PRODUÇÃO CIENTÍFICA E INTELLECTUAL DA UNICAMP

**Versão do arquivo anexado / Version of attached file:**

Versão do Editor / Published Version

**Mais informações no site da editora / Further information on publisher's website:**

<https://gerenciaderiesgosyseguros.com/122/en/comprehensive-agricultural-risk-management/>

**DOI: 0**

**Direitos autorais / Publisher's copyright statement:**

©2015 by Mapfre Global Risks. All rights reserved.

DIRETORIA DE TRATAMENTO DA INFORMAÇÃO

Cidade Universitária Zeferino Vaz Barão Geraldo

CEP 13083-970 – Campinas SP

Fone: (19) 3521-6493

<http://www.repositorio.unicamp.br>

# Comprehensive Agricultural Risk Management

ANTÔNIO MÁRCIO BUAINAIN

Professor with the Unicamp Institute of Economics

PEDRO LOYOLA

Economist at the Paraná Federation of Agriculture (FAEP)



There is no better image to express the relationship between risk and agriculture than that of an island surrounded –and covered– by risks on all sides. Conventionally, at least the risks associated with the uncertainties of the weather and markets that affect production and prices have been discussed. A recent document by the World Bank, in collaboration with the Brazilian Agricultural Research Corporation (Embrapa) and the Ministry of Agriculture, Livestock and Food Supply (MAPA) of Brazil, mentions the eight dimensions of agricultural risk, classified in three groups: production risk, market risk and business environment risk.

TABLE 1. COMPREHENSIVE RISK MITIGATION POLICIES. TYPES OF RISKS:

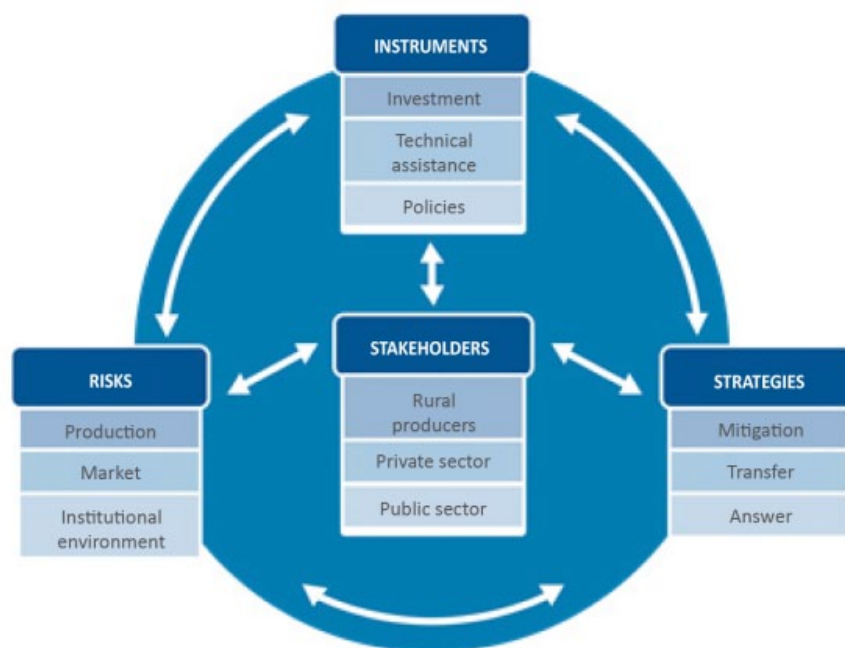
Risk groups	Thematic dimensions	Examples of events
Riesgo de producción	Extreme weather events and fires	Prolonged droughts, freezes, excessive rains and flooding, strong winds
	Animal health	Outbreaks of foot and mouth disease, BSE (mad cow disease), Newcastle disease, etc.
	Plant health	Introduction of new plagues and diseases to the country (e.g., the worm <i>Helicoverpa armigera</i> )
	Production and natural resource management	Changes in water concessions, in inspections, in the availability of labor
Riesgo de mercado	Commercialization (price of supplies and products) and credit	Significant variation in the price of products and supplies, in exchange rates, interest rates, modifications to the credit system
	External trade	Closing of export markets, modifications in access to imported supplies
Ambiente de negocios	Logistics and infrastructure	Port strikes, highway/waterway/railroad blockades, modifications in storage incentives
	Regulatory framework, policies, institutions and interest groups	Changes in laws, regulations (environmental, labor, supplies, land), changes of direction in public support institutions, modifications in the interpretation of regulations

Source: World Bank (2015)

A relevant question that many researchers have asked is if agricultural risks are increasing or decreasing. Buainain et al. (2014) ensure that, in Brazilian agriculture, the risks are increasing and multiplying, in addition to the potential negative impacts of undesirable events. On one hand, modern agriculture is capital-intensive, which increases sensitivity to variations in the conditions that surround the aforementioned relationship. On the other hand, agriculture is fully integrated in the global economy and it can suffer the consequences of the butterfly effect, as indicated in the chaos theory. la teoría del caos.

“There was a time when the risks for extensive producers were less because investment and expenses, in general, were less. Thus, the eventual losses caused by climate variations, market fluctuations and institutional changes were also less. However, risk factors have multiplied over recent decades: overspecialized producers are more subject to single-market conditions than those who have a more diversified production, because it is unlikely that all the markets will collapse at the same time. **Modernization, the intensification of production and the inclusion of multiple financial circuits are processes that generally increase producer vulnerability, besides demanding the use of complex risk management instruments in order to avoid or reduce the damaging effects of risks.**” (Buainain et. al., 2014, p. 179).

FIGURE 1. COMPREHENSIVE AGRICULTURAL RISK MANAGEMENT

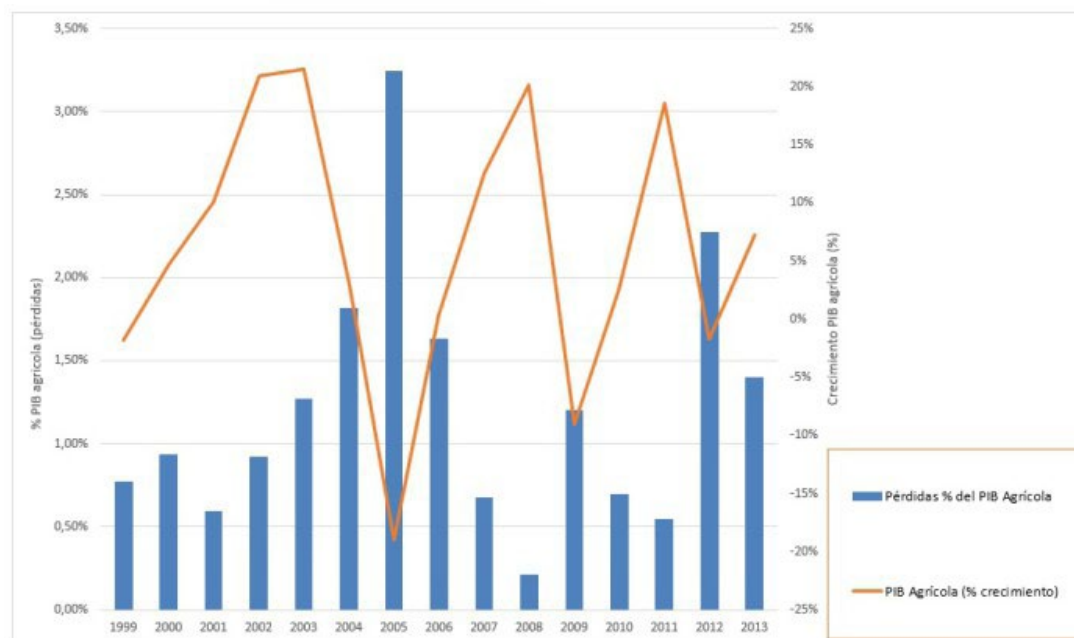


Source: World Bank (2015)

Without a doubt, risks are higher today for rural farmers than in the past, because the investments and assets entailed in agricultural production are substantially greater.

Agricultural risks are also relevant for countries. According to estimations from the World Bank and as can be seen in the following graph, Brazil loses 1 percent of agricultural GDP growth annually due to extreme risks, and practically every year that shows a negative agricultural GDP growth, it is associated with high losses due to extreme events, which could have been reduced with better risk management.

GRAPH 1 – ANNUAL LOSSES STANDARD DEVIATION OF AGRICULTURAL PRODUCTION OF BRAZIL (PERCENTAGE OF AGRICULTURAL PRODUCTION VALUE OF 2013)



Source: World Bank Brazil (2015)

These findings frame risk management, in its multiple dimensions, as strategic to the success and sustainability of rural undertakings, whether they be small, medium or large. Today, risk management is inseparable from productive, commercial and financial management, and it is (or should be) present in all the relevant decisions of producers, from seed selection, acquisition of supplies and the sale of products to which financing option to use.

## DIMENSIONS OF AGRICULTURAL RISK: FROM MITIGATION AND INTUITION TO COMPREHENSIVE AND TECHNICAL MANAGEMENT

Until recently, rural farmers managed risks intuitively, based on experience and traditional knowledge transmitted from generation to generation: corn should not be planted before September because it will not thrive, soy must be planted after the first rain of October, etc. They also worried more about mitigation and demanded guarantees and compensation from their governments, to whom the risks were (or should have been) transferred, usually in a costly and inefficient way, or to the producers themselves or society in general. The high cost to the National Treasury of the successive renegotiations of debts of rural Brazilian farmers, which accumulated due to adverse weather events and sudden modifications in market conditions –in part due to untimely interventions by the government–, is a confirmation of the fact that in the modern world risk cannot be ignored nor the consequences dealt with only once the worst is over.

Starting in the mid-nineties, both rural farmers as well as governments evolved toward comprehensive risk management after accumulating significant losses. After an objective analysis of the risks involved, management included everything from measures to eliminate, prevent and reduce risks to measures to mitigate the undesirable effects on producers and society in general. However, it must be clear that risk management is the responsibility of all interested parties, and not only producers or governments. In fact, success is unlikely without each one –producers, market and government– doing their part.

The following table shows the different risk management strategies and distributes actions/responsibilities among these three institutional levels: producers/communities, market and government.

Table 1– Agricultural risks management strategy

Strategies	Institutional level		
	Producers/Community	Market	Government
Prevention	Choice of technology	Training in risk management techniques	Políticas macroeconómicas; prevención contra desastres; prevención de enfermedades en animales
Mitigation	Product diversification; sharing knowledge	Derivative contracts; rural insurance; vertical integration; commercialization done throughout the year (not focused on the harvest); diversifying financial investments; work outside the farm	Progressive income tax system; counter-cyclical programs; biosecurity measures
Confrontation	Loans from relatives, friends and the community	Sale of assets; loans; income beyond agriculture	Welfare; farmers aid program

Source: adapted from the Organization for Economic Co-operation and Development (2009)

## PRODUCTION RISKS

Production risk is directly associated with the occurrence of climatic events and fires that, in most cases, are related to the climatic conditions. Prolonged droughts, freezes, excess or lack of rain during specific stages of the production process, wind and flooding directly affect the yields of agricultural production. Health risks, both plant and animal, are also particularly relevant in countries such as Brazil that do not have an effective health protection and alert system. Today, producers have good tools for addressing these risks such as monitoring the climate based on highly complex models, which process an inconceivable amount of information from up to a few decades ago, and the use of tools such as agricultural zoning of climate risks, which become climate forecasts, and more specific technological options to reduce production risks, or even the rural insurance resource that reduces economic and financial losses in the case of extreme events. Furthermore, the fact is that the increase in the frequency of extreme events has amplified production risks, challenging producers, governments and markets to improve the mechanisms for preventing and mitigating the consequences of events that negatively affect agricultural production.

## MARKET RISKS

Market risks are directly and mainly associated with commercialization and the conditions and availability of loans. Rural producers are at the mercy of fluctuations in the prices of products and supplies, exchange and exchange rate and the liquidity conditions of the financial market. It is true that today, a group of producers has a series of mechanisms to address these risks, from sales in future markets and *hedge* operations to production contracts. Even so, it cannot be said that there are less market risks than in the past since, on the other hand, an increase has been recorded in the volatility of the prices of agricultural

products and exchange markets, whose valuation/devaluation drastically modifies the basic parameters of national economies.

In modern agriculture, the availability and conditions of rural loans are key variables to the yields obtained by producers. The sudden reduction in liquidity due to the global financial crisis in 2008 clearly exposed this vulnerability.

In Brazil, many companies in the sugar-alcohol sector who were in the expansion stage and sought capital to finance ambitious plans for investing in the agricultural and industrial sector suddenly lost support and started to face financial and production problems due to modifications to financing conditions.

The risk associated with external trade conditions is in this same line. This risk is not limited to price fluctuations but to the institutional instability, that characterizes agricultural trade flows. These are strong and increasingly regulated markets, in which different governments continue to intervene *ad hoc*, not always guided by objective reasons but protected by standards established in the framework of relevant international bodies. The arguments range from guaranteeing the food security of the country – this is still confused with food self-sufficiency – to health problems, which are sometimes unfounded. Effectively, this risk cannot be ignored and must be handled in the political and diplomatic sphere, whether through clearer rules that reduce opportunistic interpretations or by strengthening commitments with world trade rules.

Regarding market risks, the biggest challenge is to increase producer access to the protective mechanisms offered by the market, specifically to small producers, and working to improve the governance of agricultural markets, both in national and international plans.

## BUSINESS ENVIRONMENT RISK

The business environment, and not only its nature, entails several risks for farmers and contributes to increasing and/or mitigating them. Regarding Brazil, the study of the World Bank/Empraba/MAPA indicated the risks associated with the logistical deficit and the country's infrastructure, which in a certain way, make the conditions and costs of commercializing the agricultural harvest, access to markets and, therefore, fulfillment of the contracts entered into unpredictable. In many cases, this specific risk joins climatic factors such as rain – which does not have to be in excess exactly – to impede access to production areas and compromise commercializing the harvest or delivering supplies for production.



This also includes risks associated with regulatory frameworks whose changes often significantly modify the current rules and cause losses and/or the need for relevant reorganization expenses that were not expected by the producers. In the same way, public policies and institutions of great importance for agriculture have the role of protecting the sector but can also bear and improve risks associated with unexpected interventions and adopt procedures that impose losses on the producers.

*Ad hoc* interventions in agricultural markets are not actions of the past. Between 2008 and 2014, the price of gasoline and diesel practically froze in Brazil. This seriously compromised the alcohol fuel market and increased the price risk, something that producers never considered given the excellent perspectives of the market established in all scenarios designed before the *ad hoc* intervention in the fossil fuels market.

In this same sector, modifications to tax rules that ensured a competitive window for alcohol fuel against gasoline are an example of how institutional changes and the action – legitimate, incidentally – of interest groups also entails risks for producers.

## THE (BARELY SPOKEN OF) TECHNOLOGICAL RISK

Buainain et al. (2014, p. 194) state that the productive dynamic based on the intensive use of technology entails a technological risk that has been hardly spoken of but that always threatens the sector. It depends on the “continuity of the innovation process, whether to respond to problems created by technology, from plague resistance to reducing production, or to ensure new productivity earnings and profitability,” increasingly, we add, to adapt agricultural production to the increasing socio-environmental demands and food safety. They conclude: “this is one of the dimensions of technological risk. There are others, and even some technologies that contributed to the success of Brazilian agriculture, for example transgenic events, have undefined conditions.”



## RISK MANAGEMENT MECHANISMS IN BRAZIL

There are many management mechanisms and strategies to reduce and/or coexist with the risks, and according to Buainain, Cury and Vieira (2011, p. 15), “rural Brazilian farmers have a set of mechanisms to manage risks. Some are more developed and have more widespread use, while others are embryonic and/or have more selective uses among producers.” The World Bank groups them into three major pillars, as shown below.

### TABLE 2– AGRICULTURAL RISK MANAGEMENT STRATEGIES

**Mitigation:** Actions to prevent, reduce or eliminate the occurrence of events/negative economic impacts on agricultural production, such as: investment in infrastructure and logistics for commercializing production and storage; infrastructure of agro-climatic data and information systems (zoning, alerts), drainage, irrigation systems, diversification of production, preventive genetic improvement, the adoption of more adapted and conservationist practices and systems, etc.

**Transfer:** Actions for transferring the risk to a third party, at a cost (premium). Financial instruments such as insurance, reinsurance, price coverage, etc., are mentioned as examples.

**Response:** Actions performed after the event (ex post), for the purpose of reconstructing or compensating the losses caused by the incident, and that can be exemplified by: emergency support for producers, debt restructuring, reconstruction of productive or transport, etc., infrastructure. An important ex post response action is strategic planning or contingency planning, where the response mechanisms are checked in advance in order to respond to the incident in the most efficient and effective way, (e.g., contingency

plans to fight against fires or for the control and containment of quarantine pests).

Source: World Bank (2015)

Farmers can take preventative measures to reduce the possibility of adverse events occurring. They can also adopt measures to reduce the potential negative impact from adverse events and to improve relationships with this type of event. They can use mechanisms to compensate, at least partially, for the negative consequences from the materialization of risks, whether due to the climate or the market. Among the diverse actions known and commonly practiced by Brazilian farmers, it is worth mentioning the substitution of certain crops, such as what happened with coffee in many traditional areas of São Paulo and Paraná regularly affected by frosts, which compromised the productive and financial sustainability of the activity. Or the introduction of risk systems, which reduce the risk of drought and hydrological irregularity, the use of selected seeds, more resistant to climatic stress or certain pests, the adoption of productive techniques, such as direct sowing and contour plowing, which improves the interaction with nature and reduces risks associated both with excessive rain and a lack of rain. Previously, farmers reacted *ex post* to adverse situations, usually after experiencing their negative effects personally, and now they have tools that are almost scientific, as is the case with agroclimatic zoning, or the selection of seeds and appropriate technology, that help them prevent losses.

More recently, the use of rural insurance has increased, which covers part of the losses deriving from extreme climatic events, and the adoption of mechanisms to control market risks, such as the reconciliation of production costs, through the anticipated purchase of supplies, as well as the anticipated sale of production, or future market operations and/or those with stable supply contracts with agricultural industries – such as that of tobacco – and traders.

Rural insurance is one of the most important instruments for reducing the risk of production losses, as it allows the farmer to be protected against losses primarily resulting from adverse climate events. However, it is more general; it does not just cover agricultural activity but also livestock, the assets of the rural farmer, his/her produce, the commercialization credit of these products, as well as life insurance for the producer. Its application in Brazil is recent and still only covers a relatively small part of the agriculture and livestock production. It also leaves the majority of farmers exposed and subject to production and market risks.

### TABLE 3 – TYPES OF RURAL INSURANCE AND THEIR RESPECTIVE COVERAGE

**Agricultural Insurance:** This insurance covers agricultural exploitation against losses primarily resulting from meteorological phenomena. It essentially covers the life of the plant, from the moment it sprouts until it is harvested, and protects against most external risks, such as fire and lightning, deluge, strong winds, hail, frost, heavy rains, drought and extreme temperature variations.

**Agricultural Insurance:** The purpose of this insurance is to guarantee compensation payment in case of death of animals exclusively intended for consumption, production, breeding, rearing, fattening or traction.

**Aquacultural Insurance:** This insurance guarantees compensation for death and/or other risks inherent to aquatic animals (fish and crustaceans) because of accidents and illnesses.

**Insurance for Improvements and Agricultural Products:** The purpose of this insurance is to cover losses and/or damages caused to property directly related to agriculture, livestock, aquaculture or forestry, which have not been given as a guarantee for rural credit operations.

**Rural Security Insurance:** The purpose of this insurance is to cover losses and/or damages caused to property directly related to agriculture, livestock,

aquaculture or forestry, which have not been given as a guarantee for rural credit operations.

**Forestry Insurance:** The purpose of this insurance is to guarantee compensation payment for damage caused to forestry areas that are insured, identified and characterized by the policy.

**Life Insurance:** This insurance is aimed at the rural producer, debtor of rural credit. Its validity will be limited to the financing period and the beneficiary will be the financing agent.

**Brazilian Agricultural Bond – CPR – Insurance:** The purpose of this insurance is to guarantee compensation payment to the insured party in case of proven non-compliance, on the part of the policy holder, with the obligations established in the CPR.

Source: SUSEP

It can be concluded that Brazil does not lack instruments for managing risks, but rather lacks an effective and efficient management of the available instruments; coordination and integration in the application and usage of diverse instruments is lacking and, most of all, there is a lack of scope in territorial, proprietary and economic coverage for Brazilian agriculture. ■

### BIBLIOGRAPHY

World Bank (2015). *Revisão rápida e integrada da gestão de riscos agropecuários no Brasil: caminhos para uma visão integrada*. World Bank Brazil.

Buainain, A.M., Cury, W.J.M. and Vieira, P.A. (2011). *Gestão do risco e seguro na agricultura brasileira*. Rio de Janeiro Funenseg, 311 p.

Buainain et al. (2014). *Quais os riscos mais relevantes nas atividades agropecuárias?* Buainain, A.M., Alves, E., Silveira, J.M. and Navarro, Z. (technical editors). *O Mundo Rural no Brasil do Século XXI: a formação de um novo padrão agrário e agrícola*. Brasília, Embrapa.