

RISKS OF AGRICULTURAL PRODUCTS AND THE NEED FOR INSURANCE IN DEVELOPING COUNTRIES

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Abstract

The system of agricultural insurance is a key sector of the state economy and the development of agricultural sector in developing countries. As we may see now developing countries as China, Brazil, India, Ukraine and Russian Federation are the most leading agricultural countries showing good indicators of agricultural products export. By the aid of this insurance program farmers have become secure and make a significant contribution to the development of rural economy and, as a result, world economy. This article is aimed at the risks of agricultural products and agricultural insurance market, its success and failures. The article analyzes the risks of production of agricultural products, the structure of agricultural insurance systems, focuses on the sustainable development of the agricultural sector. Keywords: Agricultural insurance, developing countries, agricultural risks, risk management, crop insurance, insurance premiums.



Introduction. Risk management is critical to the investment and financial decisions of farmers in developing and transition economies. The main risk management measures in agriculture include the selection of plant and animal varieties, methods of growing crops and animals, the diversification of agricultural enterprises, as well as the adoption of precautionary measures against adverse weather events, such as the use of mulching and shelter belts, and possibly most important of all, providing access to additional irrigation facilities.

Agricultural insurance, although one of the most frequently cited risk management tools, can only play a limited role in managing agricultural risks. The applicability of insurance in any particular situation is based on a consideration of whether it is a cost-effective means of addressing a given risk. In practice, agricultural insurance is almost always a complement to a whole range of risk management measures, of which good farm management practices are an important element. Serious testing of the design and implementation of an insurance program, in addition to other risk management measures, depends on the balance of costs and benefits for both the farmer and potential insurance providers.

However, agricultural insurance is a growing business driven by the growing commercialization of agriculture, international trade and foreign direct investment, and the development of new insurance products. The changing economic environment has also sparked renewed interest in crop and crop insurance programs and products among governments and development professionals.

Materials and Methods. Natural disasters have dealt a major blow to agricultural production. They can cause great damage to farmers and forest owners. Insurance can help manage these losses, and crop insurance is that part of this financial mechanism that is specifically designed to cover losses from adverse weather conditions and similar events beyond the control of producers.

First, and this is the basis of understanding insurance, is the fact that insurance does not and cannot eliminate risk. It spreads the risk. This distribution has two aspects. The first dimension is the distribution by industry or economy, extended in the case of international reinsurance to the international sphere. The second dimension of propagation is through time. Most insurance programs work in both dimensions. It is important to note that insurance does not directly increase the producer's income. It just helps to

manage the risks for that income.

Second, insurance is a business. Insurance indemnity is payable only in the event of a claim under the policy. The policy must be in force with the premium paid by the time the insured event occurs. Most policies include an element of risk-sharing through a franchise (also known as a "franchise"). This amount is a percentage of the loss, which is fully covered by the insured person.

Third, insurance premiums should cover several areas of costs in addition to covering reimbursement costs in accordance with applicable policies.

Many attempts have been made in developing countries to establish crop insurance programs. Some of them have succeeded in laying the foundation for sustainable risk management. But there were also many failures. Most of these programs, which have not been proven to be reliable, were created based on unrealistic expectations.

In any business agreement, both parties to the transaction must expect benefits. Crop insurance deals are no different. This defines the first frontier: crop insurance is bought and sold on the market. Buyers should be aware that premiums and expected benefits are valuable; sellers should see the opportunity to generate a positive actuarial result over time and make a profit. The consequences of this condition will be detailed later in this publication.

Crop insurance is not a one-size-fits-all solution to the risks and uncertainties that are inherent in agriculture. Rather, insurance can cover part of the losses caused by certain hazards. The second boundary is that insurance plays a limited role in risk management in agriculture. Again, the implications of this will be discussed below.

The third frontier is that any limitations to effective and economical crop insurance, while real at any given moment, may change over time. Agricultural enterprises and systems are dynamic. They change over time and in doing so represent different patterns of risk and new ways in which agricultural technologies and farm management practices can cope with production and other risks. The design of insurance solutions is an equally dynamic area of research and development. New methods for identifying the existence of risks that have resulted in losses, together with more efficient and cost-effective methods for measuring losses, mean that new types of insurance products can be developed. When companies see a business opportunity here with obvious demand, then these products will be refined, financed and sold. This dynamism will be reflected

later in this brochure.

Before looking into the future, it is helpful to take a detailed view of the crop insurance business in today's world. While this brochure is primarily about crop insurance, which accounts for the majority of agricultural product insurance, some data will include livestock and aquaculture insurance. These areas of insurance will be the subject of the FAO brochure accompanying this publication.

As a measure of the size and distribution of the global agricultural insurance market, Swiss Re (2019) has estimated that total agricultural insurance premiums collected in 2017 (including premium subsidies) were worth about USD 30 billion (see Table 1 for regional distribution). Europe and North America accounted for 53 per cent of all premiums collected while the Asia Pacific region accounted for much of the rest (42 per cent). Africa and Latin America and the Caribbean (LAC) represented a small share, collecting one per cent and four per cent of total premiums, respectively.

Table 1.
Estimated Agricultural Insurance Premiums Collected and Level of Coverage in 2007 And 2017, By Region

REGION	AGRICULTURAL INSURANCE PREMIUMS COLLECTED (USD BILLION, 2017 PRICES)		REGION	INSURANCE PENETRATION (PREMIUM AS A PERCENTAGE OF AGRICULTURAL GDP)***	
	2007*	2017**		2007*	2017**
Africa	0.09	0.3	Africa	0.13	0.08
Asia Pacific	3.73	12.6	Asia Pacific	0.31	0.60
Europe	4.0	3.9	Europe	0.64	1.19
Latin America and the Caribbean (LAC)	0.77	1.2	Latin America and the Caribbean (LAC)	0.24	0.45
North America	15.07	12.0	North America	5.01	5.52
Total	23.6	30.0	Total	0.92	0.91

* The 2007 data only covered 65 countries, which together accounted for 75 per cent of estimated global premiums collected that year (Mahul and Stutley, 2010). The data in this column has therefore been scaled up and adjusted for inflation.

** 2017 data are taken from Swiss Re (2019).

*** Insurance penetration rates were calculated by the authors using the "FAO Statistical Yearbook: World Food and Agriculture 2020"

The Swiss Re data shows there has been considerable growth in agricultural insurance in LMICs since a 2007 World Bank survey (Mahul and Stutley, 2010) estimated total global premiums at \$20 billion (\$23.6 billion in 2017 prices) – a 30 per cent increase and a real growth rate of 2.4 per cent per annum. As shown in Table 1, nearly all this growth was in the Asia Pacific region where premiums increased from an estimated \$3.73 billion in 2007 to \$12.6 billion in 2017 – an annual growth rate of nearly 13 per cent. Africa experienced similar growth, but because it started from a very low base in 2007 (\$90 million), the region only accounted for \$300 million in 2017. LAC was also a minor player in 2017 despite a 50 per cent increase in collected premiums between 2007 and 2017.

It is the opposite story in high-income countries. Between 2007 and 2017, total agricultural insurance premiums collected in Europe and North America actually declined. Despite recent growth in agricultural insurance, penetration rates (as measured by the ratio of total agricultural premiums collected, an approximate measure of the value of coverage)8 to agricultural GDP remain small in Asia, Africa and LAC compared to North America and Europe (Table 1). The penetration rate was only 0.08 per cent, 0.45 per cent and 0.6 per cent, respectively, in Africa, LAC and Asia Pacific in 2017, compared to 5.5 per cent and 1.2 per cent in North America and Europe (Table 1).

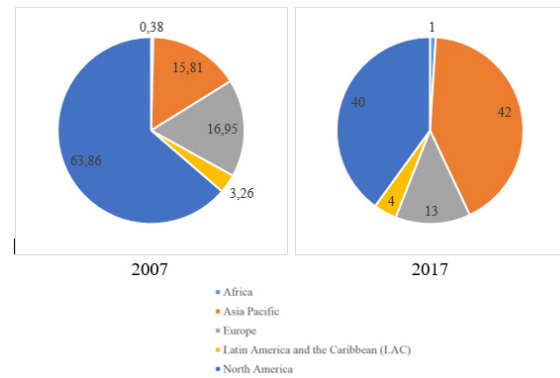
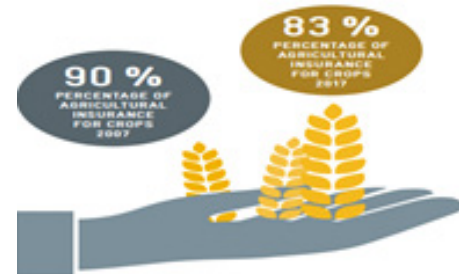


Figure 1. Regional share of agricultural insurance premiums collected in 2007 and 2017 (%)

These figures present a snapshot view of agricultural and crop insurance. A dynamic rather than static view indicates a changing situation. Agricultural insurance is a growth business area. This growth is driven not only by the increasing commercialism of agriculture and the availability of new types of insurance products, but also by international trade policy developments. These points are covered in greater detail in Section 2, Growth in Demand for Crop Insurance Products.

Globally, about 83 per cent of agricultural insurance in 2017 was for crops (Swiss Re, 2019), down from about 90 per cent in 2007 (Mahul and Stutley, 2010), while insurance for livestock, horticulture (including greenhouses), aquaculture/fisheries, and forestry has been growing.



Discussion and Results. The expected growth in demand has its origins in changes in the farming sector.

- Evidence is accumulating of connections between climate change, and the increasing incidence of crop damaging weather events of extreme severity.
- Farming is becoming steadily more commercialized, with greater levels of financial investment. Farmer/investors and their banks will frequently examine the feasibility of using a financial mechanism i.e. insurance, in order to address part of the risk to their financial investment. As a part of this trend to commercialization greater use is now being made of contract farming arrangements, where insurance is one of many services provided, along with inputs, to growers. In summary, there is a trend to formalize risk management in farming, with insurance being one obvious mechanism which can be harnessed for this task.
- The World Trade Organization (WTO) regulations generally forbid governments from subsidizing agriculture directly; however, they permit the subsidization of agricultural insurance premiums. For those countries wanting and able to effect transfer payments into their farming sectors, insurance provides a convenient channel for doing so. In the face of this WTO regulation, it is clear that demand for crop insurance will increase in those

economies that wish to implement a policy of permitted subsidization of their farmers.

- The dynamism of the farming sector, and its environment, is reflected in developments in the design of new insurance products. In the last decade two types of new products have been introduced. In some cases these have partially displaced existing covers; in others they have resulted in demand from new clients. The products are firstly, Crop Revenue products, secondly, Index or Derivative products.

- Accidental introduction of exotic pests/diseases is something which concerns all countries where agriculture is an important part of the economy. Insurance can address the risk of a breakdown of these measures.

- Insurance can also assist in managing the on-farm production risks consequent to changes in pest management practices. Such changes are increasingly required in order to address environmental protection and food safety concerns.

Many of these apparently diverse influences have a major common theme. This is that any insurance arrangement will involve not only the farmer and the insurer, but also important third parties. Consideration is now given to these changes to the business of farming, and to how they have increased demand for crop insurance, or might be expected to do so in the future.

The scientific community is not unanimous in attributing the increases in extreme weather events to global warming. However, there is a strong body of opinion which holds that this is the case. Their thesis is that global warming means more energy in the system. A consequence of this is a rise in the frequency and magnitude of extreme weather events.⁹ This is considered one of the causes of the increases in losses noted in the previous paragraph. The other major cause is linked to socio-economic factors such as increasing wealth (so there is more to be lost), and movements of populations to coastal areas which, although more productive in some senses, are more vulnerable to windstorm, storm (tidal) surges and flood damage.

The increasing incidence of crop damaging weather events is likely to continue to push demand for insurance coverage of losses. At the same time the insurance industry is mindful of increasing exposures, and is exploring new financial instruments to assist in managing this exposure.

A listing of key risks for agriculture across the world would be long. For the present purposes it is useful to focus on those which are of major concern to developing countries. Further, they can be clustered into a number of groups. One such clustering would produce a list as follows:

- Production risks;
- natural resource risks;
- financial risks;
- marketing and price risks.

Production and natural resource risks are relevant to this discussion of crop insurance, and are discussed in greater detail below. Financial and marketing/price risks fall outside the scope of the present publication, except in the case of crop/revenue insurance products, as discussed above.

Production Risk Perils are the main category of insurable risks. Both quantity and quality losses can result. Perils included are:

- Adverse climate conditions: drought, excessive rain, flood, windstorm, frost, hail, sunburn, snow;
- pest and disease attack;
- fire.

Drought. Drought is both a major concern of many developing countries, and the natural weather event which causes most problems for insurers. The reasons for this are many. Firstly, insurers feel most confidence when an adverse event has a clearly defined time of impact, coupled with a clearly defined geographical area. The classic example is hail, which may do its damage in a matter of a few minutes, or even seconds, and will typically impact an area confined to a few hundred square meters up to a few square kilometers. Hail damage is clearly attributable to the adverse weather event, and is readily verified as such provided that a field inspection is undertaken.

By contrast drought has a vague beginning, its effects linger for a very long time, and can extend over more than one growing season. Moreover, it typically impacts a very wide land area. Production loss caused by drought can be aggravated by the incidence of other problems, e.g. diseases attacking plants weakened by water stress.

From a purely underwriting point of view drought poses great difficulties for a standard crop insurer offering what is in effect a yield guarantee. Firstly, because drought affects a large number of growers in the same season – perhaps the whole of a country – the production losses are very large. This systemic or catastrophe exposure means there are problems in mobilizing sufficient insurance capacity to cover the sum at risk, even with recourse to substantial reinsurance. Secondly, droughts in recent years, at least in many parts of Africa, have tended to extend over more than one year. This experience means that it is extremely hard for insurance companies to obtain reinsurance for crop insurance portfolios which carry drought risk. Thirdly, the magnitude of the risk in most developing countries means that actuarially calculated premiums would be very high – too high perhaps to attract all but the most at-risk growers. No insurer wants to build a portfolio based entirely on such a clientele.

For these reasons insurers are very wary of covering drought as an inclusion in standard crop insurance policies. This is particularly the case in those parts of the developing world where drought is the major weather constraint to crop production: Southern and Eastern Africa, Sahelian Africa, Horn of Africa, North Africa/Near East, Eastern Europe, Central and East Asia, South Asia, Central and South America. The list illustrates the key role which drought plays in the lives of much of the developing world's rural population.

Given the almost insurmountable problems involved in including drought in standard crop insurance policies for developing areas, attention in recent years has turned to examining whether index (coupon) policies could provide a useful measure of security. Initial developmental work in this field is promising.

Excessive rain. Crops need water, and much of the developing world's arable and horticultural production relies on rainfall. Too much rain at any time can damage a crop, but there are periods of special vulnerability, described below.

The first danger point is excessive rain just after germination and emergence. Entire crops can be washed out of the ground, necessitating resewing. This is an insurable risk, where the indemnity which would be written into the policy would be the costs of re-sowing, plus a possible additional amount in those cropping situations (common in tropical, rain fed agriculture) where a delay in sowing means that the eventual harvested crop is smaller than would have been the case had the crop been able to take advantage of the whole of the normal growing season.

The next common point of vulnerability is at or near to harvest. Maize and other grains can sprout prematurely while still growing in the field. Various fruits (e.g. cherries) can be damaged by excessive rain or even any rain just prior to harvest. Other crops can be lost when excessive rain prevents harvest. An example is a crop such as tomatoes grown for processing. The processing factory schedule of crops for harvesting means that the date of harvest is fixed. Moreover, it is now common practice with commercial tomato crops to spray with ethrel (ethephon) in order to accelerate the ripening (reddening) of fruit which are still green, in order to allow once-over harvesting. If excessive rainfall is experienced just when the critical readiness for harvest is achieved, then harvest may be prevented, and the crop lost.

Flood. Flood damage may be due to on-site excessive rainfall, but it can also be caused by excessive precipitation elsewhere, and the subsequent rise of river and lake levels, to cause flooding of crop land. The risk is usually insurable. Exceptions would be crop land which is insufficiently drained or where existing drains are not maintained, and also flood plains exposed to a very high risk of flooding.

Flood is sometimes one of the results of severe storms. Examples are the frequent tropical cyclones experienced in the Bay of Bengal. These usually cause flooding of low-lying farmland along the affected coastal zone. Records indicate that although the fundamental peril is windstorm, the actual losses on farms – to livestock as well as to crops, have been due to flood damage resulting in turn from wind-induced high sea levels, which are known as storm surges.

Windstorm. Crop insurance programs in the Windward Islands (bananas) and in Mauritius (sugar cane) have already been mentioned. Both were set up to assist in managing the losses from excessive wind – cyclones in Mauritius and hurricanes in the Caribbean. High wind speeds affects nearly all crops – and can cause serious damage in forests.

As with other weather perils, the first move in risk management lies in appropriate farm management – correct attention to plant density (for mutual support), to the provision of shelter belts for those crops highly sensitive to wind (e.g. kiwifruit), and care with harvesting in the case of forests. It is not uncommon for problems to arise when partial harvesting takes place in forests.

Frost. Although not at all common in developing countries generally, there are some regions where this is an occasional risk, especially to vegetable and fruit crops. This applies especially to Eastern Europe and the Middle East.

Frost causes damage by the freezing of the water content of plant cells, and their subsequent rupture. It will be evident that it is not only the temperature which matters; it is also the time when the temperature is below a certain minimum level which causes a damaging event. Crop insurers write policies accordingly, sometimes constructing a damage point (i.e. insurance trigger) curve which plots temperature against time.

Frost conditions can impact a wide area, causing extensive damage. However, the micro-climate in a given site can increase the likelihood of frost damage. For example, fruit and vegetable production often takes place in valleys because of the presence of deep topsoil, washed down from surrounding hills, together with the availability of water from surface or groundwater sources. These same valleys can also be 'frost-pockets' because freezing, still air

accumulates readily in this type of topography.

Hail. Hail holds a special place in the history and also the current practice of crop insurance. It was the first crop peril to be insured by a modern insurance company – the first policies being issued, in Germany, in 1791. It is also the simplest of weather perils to handle from an insurance point of view. Its incidence is readily confirmed by observation of damage, and compensatory growth factors are reasonably well understood for most major insured crops (see also under Loss Assessment below).

Moreover, over time, the likelihood of hail events in any given agricultural area can be estimated in a manner that permits actuaries to confidently set premium levels at values which both sides, insured and insurer, find reasonable. This is due also to its long history, and the manner by which records of damage have been prepared and retained over the years. This means that there is a wealth of data on the incidence of the peril, and of the crop damage which has been caused as a result.

Sunburn (sunsald): Sunscald, under exceptionally adverse conditions, causes damage to fruits such as pip and stone fruit, grapes and nuts. It is associated with the premature loss of foliage from the plant. The risk is insurable, often as an extra-cost option under multi-risk policies.

Snow. Snow can damage all types of crops, including fruit trees and it also a peril of note in forests, where excessive weight loading can cause breakage of parts of trees, or even toppling of the whole tree. Developing countries vulnerable include those in Central Asia, Eastern Europe and the Middle East regions. Snow is an insurable peril in many circumstances. In forests damaged by breakage through snow loading, the presence of broken tree parts can facilitate the buildup of pest and disease organisms.

Pest and disease attack. Insurance cannot substitute for sound management of the risk of pests, parasites and diseases. Indeed, this is a significant area of modern farm and forest management, with very substantial losses resulting from failures in this area.

Moreover, the growing importance of international trade in agricultural commodities impacts on the pest and disease issue in developing country farming in several ways:

- Phytosanitary regulations mean that any evidence of pest or disease in a consignment may disqualify produce from entry to the country of destination;
- similarly, pesticide residues are subject to very tight limits under the standards for international trade;
- competition in the market is fierce, and even if produce is allowed to enter, blemishes on fruit etc. mean the produce is unlikely to find a buyer.

Fire. One of the oldest perils to be covered in property insurance, fire is a major peril for many crops (especially broad field crops such as grains) and for virtually all forests. It is commonly included in multi-peril crop insurance, and is frequently the key peril under forestry covers (which may also include wind and snow damage).

Fires are caused by human action (and carelessness) and also by lightning strikes during electrical storms. Whatever the cause, there are control measures to reduce any losses. These may be through early detection and the subsequent means to take action and/or through the use of cleared firebreaks.

Insurance policies will normally state the expectations under the policy of the means to control fire losses. Again

this is an example of insurance being just a part of a cluster of measures used to control risk.

Natural Resource Risks. These include:

- Adverse soil conditions, e.g. salinity, erosion of topsoil and loss of soil nutrients;
- deterioration in water quality e.g. due to pollution of the water table or natural water courses;
- lack of water from the irrigation source.

In the main these risks are best addressed by farm management practices. However, some of the underlying causes of these problems may themselves be insurable. For example, soil erosion may follow excessive rainfall and/or wind. Pollution of water may be beyond the control of the farmer drawing from wells or rivers.

Related to this is the risk that a water source used for irrigation may fail. Prolonged drought means that water tables fall, necessitating the boring of deeper wells. Similarly, rivers and streams can dry up, due again to drought, or to an increase in uptake of water upstream. Where this involves another country then this falls into the political risk zone, something that many insurance policies specifically exclude.

Conclusion. Risk management is an important task in the sustainable development of the agricultural sector. Foreign practice shows that the mechanism of risk management in agriculture is unique in each country, formed and developed in accordance with the culture of agricultural management. Many years of experience in agricultural insurance have been accumulated in developed countries. Effective mechanisms have been introduced to financially support agricultural producers and insure them against various risks. Agricultural crop insurance, income insurance and income stabilization are recognized as the most common areas of insurance.

Agricultural insurance is a confident supporting tool for financial resources of agricultural producers and investors. It is an effective tool for risk management in agriculture and its adoption by farmers as a new technology is dependent on many factors.

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