Agricultural Insurance

Ramiro Iturrioz

PRIMER SERIES ON INSURANCE
ISSUE 12, NOVEMBER 2009

NON-BANK FINANCIAL
INSTITUTIONS GROUP

GLOBAL CAPITAL MARKETS
DEVELOPMENT DEPARTMENT

FINANCIAL AND PRIVATE SECTOR
DEVELOPMENT VICE PRESIDENCY

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THIS ISSUE

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The *Primer Series* on Insurance provides a summary overview of how the insurance industry works, the main challenges of supervision, and key product areas. The series is intended for policymakers, governmental officials, and financial sector generalists who are involved with the insurance sector. The monthly primer series, launched in February 2009 by the World Bank's Insurance Program, is written in a straightforward, non-technical style to share concepts and lessons about insurance with a broad community of non-specialists.

The Non-Bank Financial Institutions Group in the Global Capital Markets Development Department aims to promote the healthy development of insurance, housing finance, and pension markets, and to expand access to a broad spectrum of financial services among the poor. These markets provide opportunities for household investment and long-term savings, and can buffer the poor against the risks of sickness, loss of breadwinner, catastrophic events, and other misfortunes.

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Agricultural Insurance

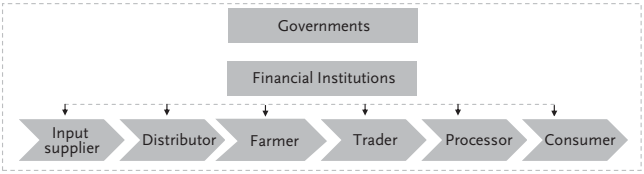
Ramiro Iturrioz

Introduction

Agricultural production faces a myriad of risks. Nevertheless, two major risks are of concern to the agricultural sector—price risk caused by potential volatility in prices and production risk resulting from uncertainty about the levels of production that primary producers can achieve from their current activities. It is likely that these major risks will increase in the future—price risk due to liberalization of trade and production risk caused by the effects of climate change. The trend towards agricultural specialization is likely to continue which will increase these risks as producers rely on the production of a smaller range of crops and consequently cannot diversify risks as effectively.

Agricultural risks not only affect farmers, they also affect the whole agribusiness value chain. Each of the participants along the supply chain, from the suppliers of inputs to the end consumer, are subject to these risks. As the interconnections between the participants in the value chain are becoming more close and complex, the possibilities of adverse events being transmitted between participants are increasing. The agribusiness value chain and the risks faced by each participant are detailed in figure 1 below.

Figure 1: Agribusiness Value Chain and Risk



Stakeholder		Risk
Goverments	→	Budget Risk/Social Stability
Financial Institutions	→	Credit Risk
Input Supplier	→	Sales volume / Product enhancement
Distributor	→	Sales volume / Product enhancement
Farmer	→	Production Risk / Revenue risk
Trader	→	Production Risk
Processor	→	Lack of Raw Material / Business Interruption

Source: Author

Agricultural risk management relies on an optimal combination of technical and financial tools. Agricultural value chain participants can use several tools, whenever they are available, to deal with these multiple sources of agricultural risk. Agricultural value chain participants may avoid risk; for instance, by choosing not to select a particular crop or crops which they consider of high risk for the area in which their farms are located. They may also mitigate risks; they may seek to lessen the risk through, for example, planting crops only in very favourable conditions or developing further their infrastructure to improve irrigation or minimize the effects of frost. Lastly, they may transfer all or part of the risks to a third party through an insurance contract. Of course, they may mitigate the financial effects of these risks by creating emergency reserves from profits in good years—a form of self-insurance

This primer is concerned exclusively with the use of agricultural insurance by firms in the agribusiness value chain to manage their risks. The primer defines what is meant by agricultural insurance, gives an overview of the market and explains the challenges of this type of insurance. Further, it discusses the range of agricultural insurance products and their practical application in the sector. It concludes with a description of the reinsurance market for agricultural insurance and an overview of public sector participation.

What is agricultural insurance?

In general, insurance is a form of risk management used to hedge against a contingent loss. The conventional definition is the equitable

transfer of a risk of loss from one entity to another in exchange for a premium or a guaranteed and quantifiable small loss to prevent a large and possibly devastating loss.

Agricultural insurance is a special line of property insurance applied to agricultural firms. In recognition of the specialized nature of this type of insurance, insurance companies operating in the market either have dedicated agribusiness units or outsource the underwriting to agencies that specialize in it.

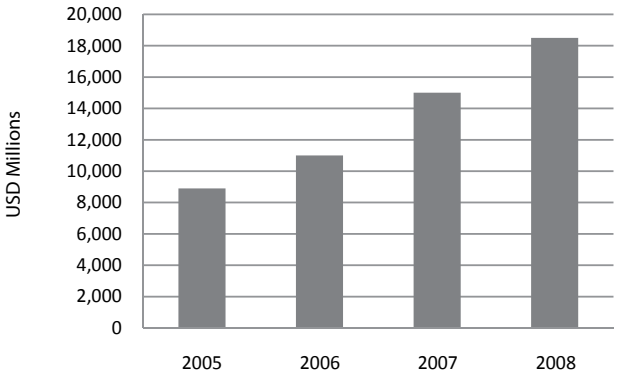
Agricultural insurance is not limited to crop insurance, it also applies to livestock, bloodstock, forestry, aquaculture, and greenhouses.

Overview of the agricultural insurance market

Direct premiums written for this type of insurance have grown rapidly in recent years—from US$8 billion in 2005 to an estimated US$18.5 billion in 2008. The growth is shown graphically in figure 2.

Three main factors have contributed to the growth in agricultural insurance. The first factor is the increase in the underlying value of agricultural production in recent years which has impacted directly on the agricultural insurance premium volume. The second factor is the increase in value of agricultural assets which has also increased the sensitivity of agricultural value chain participants to loss, consequently raising their demand for insurance. The third factor is the development of new markets for agricultural insurance and the increase of public sector support in existing markets, which have contributed to an increase in the demand for agricultural insurance.

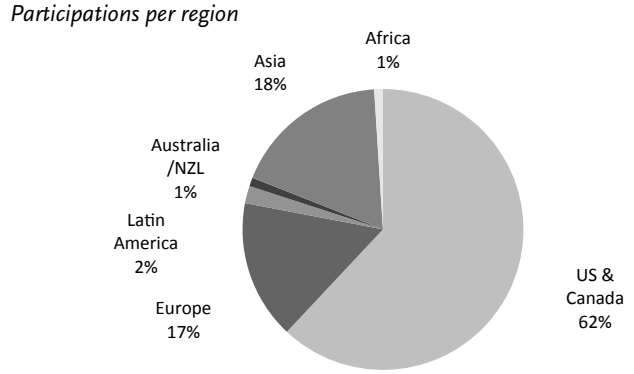
Figure 2: Agricultural Insurance Premiums. Period 2005–2008



Source: Author from Swiss Re, Hannover Re and Munich Re, 2009

From a geographical perspective, the bulk of the premium is written in the United States and Canada, with approximately 62% of the market. This is followed by Asia with 18% and Europe with 16%. The balance comprises 2% in Latin America and 1% in Oceania and Africa respectively. This distribution is represented in figure 3 below.

Figure 3: Agricultural Insurance Premiums (2008)



Source: Swiss Re, 2009

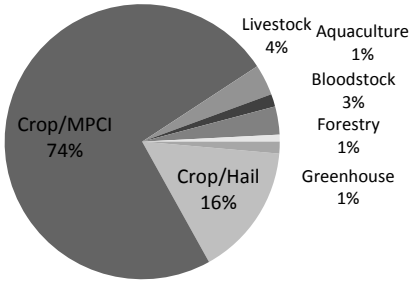
Crop insurance is the most developed sub-line of business of agricultural insurance, accounting for almost 90 percent of the total premium written worldwide. Multiple peril crop insurance, which is written mainly in the US and Canada, accounts for 74 percent of the total agricultural insurance premiums written worldwide, while named peril insurance (hail basically), which is mainly written in European countries, accounts for 16 percent of the total agricultural insurance premium written worldwide. The remaining sub-lines of business represent only 10 percent of the total agricultural insurance premiums. The distribution of the worldwide agricultural insurance premiums per sub-line of business is shown in Figure 4.

Why agricultural insurance is considered as a special line of insurance.

There are several features of this type of insurance that validate it being treated as a special line of business. Difficulties in achieving adequate diversification because of the nature of the risk, asymmetries of information in underwriting, the geographical dispersion of agricultural production and the complexity of the biological processes of produc-

Figure 4: Agricultural Insurance Premiums

Participations per sub-line of business



Source: Swiss Re, 2009

tion, which requires skilled and expert underwriting, justify it being considered a special business line.

Diversification is difficult to achieve for agricultural insurers. Crops are planted in geographical regions that are subject to the same probability of occurrence of adverse events. The likelihood of large numbers of claims and even catastrophe claims arising from the same event is magnified.

Asymmetries of information lead to the possibility of adverse selection and moral hazard. Without adequate technical expertise, underwriters are unable to distinguish between high-risk and low-risk producers and, if they set premiums on the basis of averages, they may attract only high-risk applicants. Additionally, the existence of this type of insurance may motivate producers to take additional risks such as using less fertilizer, planting out of season or planting in less fertile areas. The consequences of asymmetries of information can lead to increases in premiums which will further increase the possibility of adverse selection by discouraging low-risk producers from taking insurance. The problems associated with asymmetries can only be addressed through ensuring that underwriters have the technical expertise to assess the risks properly.

The geographical dispersion of agriculture production makes the operational and administrative costs of delivering insurance high in comparison with other types of insurance. Overcoming high transaction costs for agricultural insurance represents an additional challenge for the insurance industry. The distribution network is widespread and products are not standard. These factors mean that insurance companies have to be innovative in their approaches to both product design and distribution systems.

Agricultural insurance is a technically complex activity. Agricultural production is governed by complex biological processes that must be understood by agricultural underwriters. The cause-and-effect relationships in agriculture are not always readily observable. There are many variables that affect agricultural production, not all of which are insurable. An insurer must be able to establish the link between a loss that is insurable and the cause of the loss.

Again, modern agricultural production is highly technical and skilled underwriters are needed to understand the biological and technical processes not only to set premiums commensurate with the risk but also to assess the producers' own risk management practices and assist in improving them.

Agricultural insurance products

Agricultural insurance products can be classified into three main groups based on the method of determining how claims are calculated. These classifications are summarized in table 1 below.

Table 1: Classification of Agricultural Insurance Products

Type of Agricultural Insurance Product	*Payouts*	*Availability*
a) Indemnity Based Agricultural Insurance ***(insurance payouts based on the actual loss at the insured unit level)***		
1. Named Peril	Percentage of Damage	Widespread
2. Multiple Peril	Yield Loss	Widespread
b) Index based Agricultural Insurance ***(insurance payouts based on an index measurement)***		
3. Area-Yield Index	Area-yield Loss	USA, India, and Brazil
4.Crop Weather Index Insurance	Weather Index payout scale	India, México, Malawi, Canadá, USA
5.NDVI[1] Index Insurance	NDVI Index payout scale	Mexico, Spain, Canada
6. Livestock Mortality Index Insurance	Livestock mortality index payout scale	Mongolia
7. Forestry Fire Index Insurance	Ignition focus/ burnt area payout scale	Canada, USA
c) Crop Revenue Insurance ***(insurance payouts based on yield measurement and crop prices)***		
6. Crop Revenue Insurance (CRI)	Yield and Price Loss	Limited to USA

Source: World Bank, 2009

1. NDVI: Normalized Deviation Vegetation Index

Indemnity based agricultural insurance products

Indemnity based insurance products determine claim payment based on the actual loss incurred by the policy holder. If an insured event occurs, an assessment of the loss and a determination of the indemnity are made at the level of the insured party. The classification is often divided into two subclasses—*named peril* and *multiple peril* agricultural insurance.

Named peril agricultural insurance products (Damage-based products)

Named peril (damage based), as the name suggests, provides indemnity against those adverse events that are explicitly listed in the policy. This subclass has a number of distinctive features:

- The sum insured is agreed at the inception of the contract and may be based on production costs, or on the expected crop revenue;
- The loss is determined as a percentage of the damage incurred by the insured party as established by a loss adjuster as soon after the damage occurs;
- The indemnity is calculated as the product of the percentage of the damage and the sum insured;
- Deductibles[2] and franchises[3] are normally applied to reduce the incidence of false claims and to encourage improvements in risk management.

An example of indemnity under a named peril contract is illustrated in figure 5 below.

Named peril is a popular type of insurance and accounts for a significant portion of the agricultural premiums worldwide. From the perspective of the insured parties, it appeals where firms are located in areas frequently subjected to one of the perils covered; from the insurer's point of view it is suitable to situations where the damages caused by the named perils are both measurable and have sudden impact.

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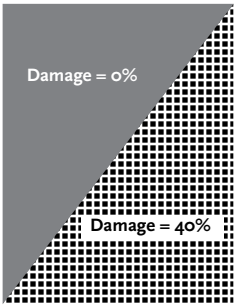
2. A deductible is an amount or a percentage of the loss that is deducted from the indemnity and represents the first portion of the claim that the insured bears. The purpose of a deductible is to reduce moral hazard by encouraging the insured to prevent losses. Deductibles can be either a percentage of the sum insured or a percentage of the loss and can be applied to each and every loss or to the total losses over a specified period, normally the currency of the contract.
3. A franchise is a loss threshold that the insured has to reach in order to be able to receive the indemnity. Once the threshold is reached the amount of any subsequent loss is paid in full. The purpose of a franchise is to reduce claim frequency.

Figure 5: Example of Indemnity of a named peril insurance contract

Insurance contract Conditions:
Insured Peril: Hail
Sum Insured: US$ 10,000
Indemnity Limit: Full Value
Deductible:
Option A) 5% of the total sum insured
Option B) 10% of the loss

Loss Adjustment:
- 50% of the insured unit with 0% damage.
- 50% of the insured unit with 40% damage.
Consequently,
Total Damage = 50%*0% +%50*40% = 20%



Indemnity Calculation:
Indemnity = Damage (%) * Total Sum Insured— Deductible
Option A) 20% * US$ 10,000 – US$ 10,000*5% = US$ 1,500
Option B) 20% * US$ 10,000 – US$ 10,000*20%*10% = US$ 1,800

Source: Author

Named peril agricultural insurance products account for a considerable proportion of agricultural insurance worldwide. Named peril insurance contracts are used extensively to protect against hail damage and are used in horticulture and floriculture in addition to crops and fruit but are also used in livestock, bloodstock aquaculture, forestry and greenhouses insurance.

Multiple peril agricultural insurance products (yield-based products)

Multiple perils (yield based) (MPCI) provides insurance against all perils that affect production unless specific perils have been explicitly excluded in the contract of insurance.

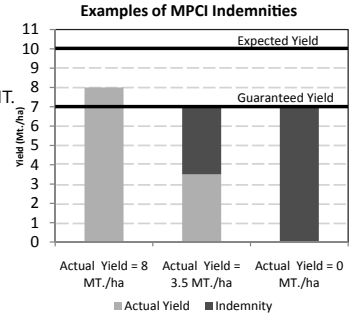
Under this type of insurance, the sum insured is defined in terms of the expected yield to the producer. Cover is normally set in the range of 50 percent to 70 percent of the expected yield. In turn, the expected yield is determined on the basis of the actual production history of the producer or the area in which the producer operates. The sum insured can be based on the future market price of the guaranteed yield if the producer has an insurable interest or alternatively, if the producer has taken a loan to finance the crop, the sum insured may be based on the amount of the loan if the financier has an insurable interest in the crop. The calculation of the payout is based on the extent to which the actual yield falls short of the guaranteed yield at the agreed price or as the shortfall in yield as a percentage of the guaranteed yield applied to the

Figure 6: Example of Indemnity of a multi peril insurance contract

Insurance Contract Conditions:
Insured Peril: MPCI
Crop: Corn
Expected Yield (EY): 10 MT./ha
Guaranteed Yield (GY): 7 MT./ha
Future market price (FMP): US$ 100 /MT.
Insured Unit Area (IUA): 100 hectares
Sum Insured (TSI): US$ 70,000

Loss Adjustment:
Case A: Actual yield (AY)= 8.0 Mt./ha
Case B: Actual yield (AY)= 3.5 Mt./ha
Case C: Actual yield (AY)= 0.0 Mt./ha

Indemnity Calculation:
If AY < GY, then:
Indemnity = (GY–AY) * FMP* IUA



Indemnity Case Analysis:
A: US$ 0
B: (7 MT./ha.—3.5 MT./ha)* US$ 100/MT.*100 has = US$ 35,000
C: (0 MT./ha.—3.5 MT./ha)* US$ 100/MT.*100 has = US$ 70,000

Source: Author

sum insured. An example of an indemnity calculation is provided in figure 6.

This subclass of insurance offers comprehensive cover to the producers but comes at significantly higher cost compared with named peril insurance. Rates for MPCI insurance contracts offered to individual producers range between 5 percent and 20 percent of the sum insured, depending on the crop, the region where the crop is located and the level of coverage. The premium reflects not only the additional cover but the costs of minimizing the chances of adverse selection and moral hazard through risk inspections, enforcing sales deadlines and overall monitoring of the insured. The cost generally makes this form of cover unattractive to marginal or small producers.

Revenue agricultural insurance products

Revenue agricultural insurance products protect insured parties from the consequences of low yields, low prices or a combination of both. It is essentially MPCI cover with a price hedge. This is a relatively new sub-class and moves away from more traditional products where the insurable interest is the size of the crop to products where the interest is a revenue stream.

Figure 7: Example of Indemnity of a Revenue insurance product

Insurance Contract Conditions:
Coverage: Crop Revenue
Crop: Corn
Expected Yield (EY): 10 MT./ha
Coverage level (CL): 70% of the EY
Guaranteed Yield (GY): 7 MT./ha
Future market price (harvest) (FMP): US$ 100 per MT.
Insured Unit Area (IUA): 100 hectares
Sum Insured / Guaranteed Revenue (TSI/GR): US$ 70,000

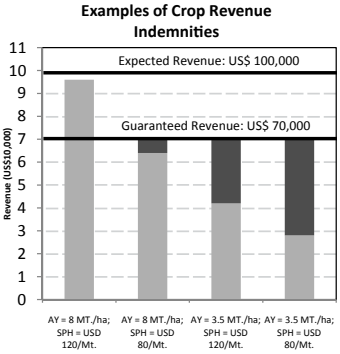
Loss Adjustment:
Actual yield (AY)= 8.0 MT./ha; Spot harvest price: US$ 120/ MT
Actual yield (AY)= 8.0 MT./ha; Spot harvest price: US$ 80/ MT
Actual yield (AY)= 3.5 MT./ha; Spot harvest price: US$ 120/ MT
Actual yield (AY)= 3.5 MT./ha; Spot harvest price: US$ 80/ MT

Indemnity Calculation:

If AY* Spot Price at harvest < GY* FMP , then:

Indemnity = GR—AY* Spot Price harvest *IUA

Indemnity Case Analysis:
A) US$ 0
B) US$ 70,000 -8.0 MT/ha*US$ 80/MT.*100 has.= US$ 6,000
C) US$ 70,000 -3.5 MT/ha*US$ 120/MT.*100 has= US$ 28,000
D) US$ 70,000 -3.5 MT/ha*US$ 80/MT.*100 has = US$ 42,000



Source: Author

This product provides significant benefits to producers that rely on short term crop financing which is repaid from agricultural revenues and financiers who have extended the crop finance. It gives both the producer and the financier certainty that revenues estimates on which loans are based will largely be realized.

A necessary precondition for this sub-class is the existence of developed commodities and derivative markets that enable insurers to protect themselves from price decreases and to pass all or part of the price risk to other risk takers. This explains why revenue insurance for soybeans and corn crops is available in the United States, where markets for these commodities are highly developed.

An example of indemnity under a revenue insurance product is illustrated at figure 7.

Index based agricultural insurance products

Index based agricultural insurance products pay out based on the value of an "index", not on losses measured in the field. The index is a variable that is highly correlated with losses and that cannot be influenced by the insured. Indexes can include rainfall, temperature, regional yield,

river levels etc. For example, for regional yield for a particular crop, an index is created based on the expected regional yield. A threshold is created which is less than the index. The insurer indemnifies the insured party where the regional average yield is less than the threshold.

The precondition for successful implementation of this subclass is that both parties to the contract have confidence in the objectivity and transparency of the index. To achieve the necessary degree of objectivity and transparency, there must be sufficient data, a strong correlation between the index and the losses at the producer level and freedom from influence by either the insurer or the insured party.

There are significant advantages to this subclass. It avoids the issues of moral hazard and adverse selection found in other classes as individual producers are only one of a large number of producers whose output determines the index or the data used to construct the index, physical phenomena such as rainfall are observable and cannot be affected by either party. Because the payment of the indemnity is based on deviations from the index not individual losses, no assessment of losses at the individual insured party level is needed. The indemnity process is quick and inexpensive to administer. Again, the design features of the product lessen administrative and operational expenses. Lastly, due to the objectivity in constructing the index, insurers are able to obtain reinsurance more easily.

Despite these advantages, take up of this product by both insurers and insured parties is still low. This can be explained by considering some of the constraints. From the perspective of insured parties, as the insurance product is based on an index and indemnity is based on the regional deviations from the index, individual producers still face some basis risk[4]. From the point of view of the insurer, it can be a costly and time consuming task to assemble the data and construct the appropriate indexes.

Once the indexes have been created, further operational costs are low and this translates into lower premiums for insured parties. The lower premiums are very gradually attracting smaller producers who otherwise would not be inclined to take out insurance.

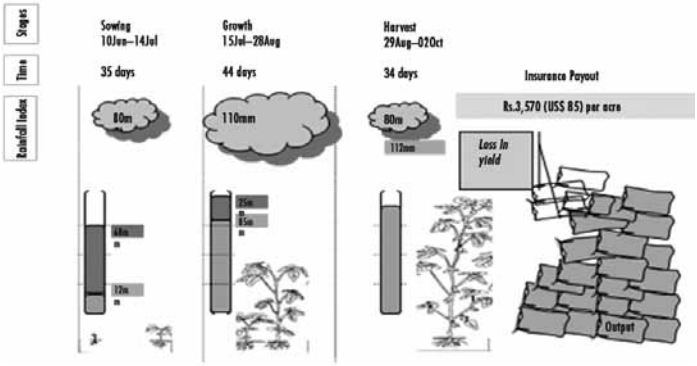
The flexibility in design of these products allows insurers to create insurance products that to date have not been possible. For example, the development of weather indexes has fostered the design of products to cover quality requirements in fruit production, and the development of area yield indexes has encouraged insurance products to cover business interruption risk for companies handling crops where production shortfalls may occur.

4. Basis risk can be defined as the deviation of the losses at the individual producer level from the regional average.

New sources of information such as information provided by satellite imagery have allowed some innovation in the insurance industry. The development of coverage for grassland production developed by Agroasemex, the public agricultural reinsurer in Mexico, and based on Normalized Difference Vegetation Index can be attributed to the availability of new data.

An example of Weather Index Agricultural Insurance is shown in Figure 8 below.

Figure 8. Example of Weather Index Agricultural Insurance. India: Multi-Stage Rainfall Deficit Index Cover, Groundnuts



Source: World Bank, 2005

Product applications in agricultural insurance

Crop Insurance

The most developed form of agriculture insurance is crop insurance which accounted for 90% of the premium written in the sector in 2008. Insurers writing crop business offer all four types of cover.

Named peril crop insurance

The traditional named peril crop insurance product is hail insurance. Insurance companies offer hail insurance for crops and fruits as well as for horticulture and floriculture production. Hail insurance can be offered on a standalone basis or in combination with other perils like fire, freeze, and/or wind as additional risks. The main feature of this type of crop insurance is that the insurance claim is calculated by measuring the percentage of damage in the field soon after the damage occurs. The percentage damage measured in the field, less a deductible expressed as

a percentage, is applied to the pre-agreed sum insured. Under this type of insurance, the sum insured is defined on an agreed basis, based on the production costs or on the expected crop revenue. Where damage cannot be measured accurately immediately after the loss, the assessment may be deferred until later in the crop season. The quantity of the deductibles and franchises depends on how vulnerable the crop is to hail damage and the prevalence of hail within the growing area. Insurance on annual crops, considered to be of moderate risk, is offered at rates of between 3% and 5% of the sum insured subject to a non-deductible franchise of 6%. If the crop or the growing areas are considered to be high risk, the premium can be as high as 10% with deductibles of 20%.

Multiple peril crop insurance (MPCI)

Coverage under MPCI is expressed in terms of a guaranteed yield which is between 50% and 70% of expected yield having regard to the nature of the crop and the region in which it is being grown. Payout under the policy is initiated where the yield of the producer falls short of the guaranteed yield in the policy. If the producer has an insurable interest, the payout will be the shortfall in yield at a value that is agreed in the policy. If the producer has financed the crop externally and the financier has an insurable interest, the payout accrues to the financier and will be the product of the short fall in the yield and the amount of the loan that was granted. Premium for this type of insurance ranges between 5% and 20% of the sum insured (depending on the type of the crop), the region in which it will be grown and the level of coverage being sought.

Crop revenue insurance

In guaranteeing the policy holder a certain level of revenue, the insurer protects the holder from declines in yield and also adverse movements in crop prices. The guaranteed yield is determined as a percentage of the producer's past production, and the guaranteed price can be either the future market price for the crop for the month of harvest or the strike price of a base price option. If the actual yield received by the producer, which is given by the product of the actual yield and the spot market price at the time of harvest, is less than the guaranteed amount, the insurer will pay the difference.

Area yield index insurance

The insurance contract defines an area referred to as the "insured unit". The insurer constructs an index based on a guaranteed yield for the

insured unit, normally in the range of 50% to 90% of the expected yield. The insurer pays out if the actual yield of the insured crop in the insured unit falls below the guaranteed yield, irrespective of the actual yield of the particular policyholder. The payout is determined as the product of the shortfall in production in the insured unit and the sum insured. Payment is normally made six months after the crop is harvested.

Weather index insurance products

The product is designed around the construction of an index that is highly correlated with loss experiences. The most common index in agriculture is rainfall. Typically, an insurer will offer a contract that will specify the index (for example, rainfall), over what period and where it will be measured, the threshold, the sum insured and any indemnity limits. If the rainfall is less than the index at the specified measurement point and over the period specified in the contract, the insurer will payout under the contract irrespective of the actual losses of the policyholder. The quantity of the payout is determined according to the provisions of the contract. A simple payout may be the total sum insured under the contract. More commonly, contracts are written so that the proportion of the sum insured that is paid out is determined by how far the actual production observed in the insured unit deviates from the index.

This product can be used at the micro, meso or macro levels. At the micro level, a producer will insure his/her production based on the measurement of rainfall at a weather station close to his/her farm. The meso level insurance may attract a financier who has provided crop finance to producers in a certain geographic area and wishes to mitigate his/her credit risk against the possibility of drought in the area. At the macro level, a country wishing to lessen the possibility of famine through the failure of a staple crop as a consequence of drought may be attracted to this insurance, where the index is based on the country and the weather observations are made at stations throughout the country.

Livestock insurance

Livestock insurance provides insurance products to cover horses, mares, colts, fillies and foals; bulls, cows and heifers; swine; sheep, goats and dogs and occasionally wild animals. It is a relatively small segment of the market accounting for 4% of the total agricultural insurance premium written worldwide in 2008.

The protection offered under livestock products includes against losses arising from death, injury and loss of function as a result of accidents, natural causes, fire, lightning, acts of God and acts of individuals other than the owner. Cover is extended to forced slaughter of livestock on humanitarian grounds. Additional coverage can generally be purchased for veterinary expenses, transport and non-epidemic diseases.

The sum insured is based on the market value of the animal and can be reduced based on the animal's age. Premium rates range from 1.5 percent to 10 percent of the sum insured based on the type of animal, its age, location and the functions it performs. Deductibles range from no deductible to ten percent.

Traditionally, epizootic1 diseases have been a standard exclusion under livestock policies although some companies have begun to offer cover on a very selective basis. Epizootic insurance coverage is offered to the governments of countries that can demonstrate superior sanitary conditions and effective controls to prevent particular diseases entering the country. Where it is offered, the insurance covers business interruption and the costs to government of slaughtering animals to curtail outbreaks of the relevant diseases.

Livestock mortality index insurance is a relatively new form of livestock insurance that was introduced into Mongolia. It has potential in countries where livestock production is exposed to catastrophic losses.2

Bloodstock insurance

Bloodstock insurance provides cover for high value animals, mainly equines. It is also a minor business line accounting for 3 percent of the agricultural premium written worldwide in 2008. Animals are either insured on an individual basis or collectively such as where a stable of horses is insured. The insured events include mortality, disability, infertility, medical treatment and surgery.

The sum insured is based on the market value of the animal. The market value is determined by the prizes that the animal has won or the present value of the future prizes that it potentially will win. Any matter that adversely affects the animal's capacity to win prizes will affect its market value and can result in over insurance. To deal with the potential moral hazard, it is common practice amongst bloodstock insurers to insure high-value animals for only a portion of their market value.

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5 a disease or condition that occurs at about the same time in many individuals of the same species in a geographic area.

6 Refer to the case outlined in Annex three.

Premium rates vary in the range of 0.5 to 10 percent. Claims are normally subject to a deductible of 10 percent.

Aquaculture insurance

Aquaculture insurance provides cover for producers involved in breeding and raising aquatic fauna and growing aquatic flora. In addition to flatfish, aquaculture encompasses molluscs, crustaceans and commercial seaweed cultivation. Although it is a small segment of the market with 1 percent of written premiums for the worldwide agricultural insurance market in 2008, it is expected to develop rapidly as aquaculture becomes more important in the face of dwindling natural fish supplies.

Cover is offered on a named peril or all risks basis. Cover is for loss of stock. Covered perils include meteorological events, acts of God, diseases, pollution, predator attacks, collision, oxygen depletion, changes in pH and salinity, theft and escape. Both offshore cage systems and inshore pond cultures are covered.

The sum insured is defined by the value of the stocks insured and it is customary to set a maximum aggregate limit per site. Premium rates range between 3 percent and 10 percent of the sum insured and deductibles range between 15 percent and 30 percent each and every loss, both depending on the species, location and the conditions in which the stocks are kept.

Aquaculture insurance is a very specialized field with complex insurance contracts reflecting the complexities of the production processes. Underwriting which involves risk assessment and frequently underwater inspections requires specific expertise, as does loss assessment, which is frequently outsourced to firms that specialize in the activity.

Forestry insurance

Forestry insurance is also a small segment of the overall agricultural insurance market accounting for about 1 percent of the premiums written worldwide in 2008. It protects standing timber stocks against fire, lightning, explosion and aircraft impact. Coverage can be extended to damage caused by wind, windstorms, volcanic eruption, flood, hail, freezing and the weight of ice and snow. Fire fighting expenses and debris removal are also covered and are capped at an annual aggregate limit.

The sum insured is determined on a tiered basis with young plantations valued at establishment cost, medium aged plantations at the lower of establishment cost or commercial value and mature plantations at commercial value. Losses are frequently capped at an annual aggregate limit to avoid large exposures in high risk areas.

Premium rates range from 0.2 percent to 1 percent of the total sum insured, depending on the species, location and measures in place to prevent or suppress fires. Deductibles are common with a standard deductible of 10 percent of the loss subject to a minimum of between 0.3 percent and 1 percent of the sum insured.

The terms and conditions of forestry insurance contracts are comprehensive and complex. This reflects the nature of the risk being underwritten and the possible risk of moral hazard.

Greenhouse insurance

Greenhouse insurance contributed 1% to the total written premium in agricultural insurance in 2008.

Greenhouse production is a very capital-intensive activity and relies heavily on the serviceability of the infrastructure that the producer has put in place. In insuring the infrastructure, insurers typically provide comprehensive cover for material damage to structures, glass, equipment, stock and other contents. Infrastructure is insured against damage from storm (including hailstorm), water, fire, smoke, lightning, explosion, malicious acts, aircraft impact and earthquake. Cover may also be extended to business interruption, machinery breakdown, and electronic equipment.

The sum insured is determined on either an agreed value or production cost basis. Indemnities are calculated as a percentage of damage to both the structures and the contents. A deductible of 10% of the loss subject to a minimum of 1% of the sum insured is usually applied. Rates for greenhouse insurance vary from 0.3% to 0.7% of the total sum insured depending on the construction of the greenhouse.

Agricultural Reinsurance

An earlier section noted the complexities of agricultural insurance that arise from the characteristics of the risks covered; the asymmetries of information and potential moral hazard. The section noted that these complexities have promoted the development of specialized underwriters and loss adjusters who have the skills and expertise to practise in

this market. The design of suitable agricultural reinsurance programs is subject to the same complexities and requires skill and expertise. Only a selected group of not more than twenty reinsurance companies worldwide are currently providing reinsurance capacity for agricultural risks. An even more limited group of reinsurance companies are able to provide terms and conditions for reinsurance treaties.

The public sector plays a role in agricultural reinsurance through public private partnerships. Governments play a part where the private sector cannot offer reinsurance at affordable rates. The private sector has proven more cost effective than the public sector in providing reinsurance for other than catastrophe cover, while the government, through the establishment and administration of catastrophe funds, can offer catastrophe cover effectively.

The role of reinsurers in agricultural reinsurance is not limited to providing reinsurance capacity for insurance companies. The agricultural insurance industry requires services that go beyond the provision of financial capacity. Reinsurers that are involved in agricultural reinsurance assist insurance companies in providing advisory services in risk assessment, risk modelling, pricing, and risk structuring; as well as in the design of loss adjustment and operational manuals, risk rating and risk accumulation control software, and the wording of insurance contracts.

Several forms of reinsurance cession are used by the insurance industry to cede agricultural risks. Quota share reinsurance cessions and stop loss reinsurance protections are the most common forms. For aquaculture and forestry reinsurance it is also common to find surplus share cessions and catastrophic excess of loss protections in use.

Overview of the role of public sector in agricultural insurance

While agricultural insurance is essentially a commercial activity, it is, nevertheless, common to see governments playing a role in the industry. Governments have an interest from the perspective of maintaining productivity for the economy and safeguarding the wellbeing of the rural community. Government presence in the market fills a void left by the private sector which is sometimes reluctant to enter this market segment due to high start up costs, high distribution and administrative costs and a lack of capacity caused by difficulties in obtaining reinsurance. Where the private sector is in the market, it often offers cover at premiums that are beyond the financial capacity of small producers.

Where governments choose to intervene in agricultural insurance markets, they may adopt different approaches. According to a recent World Bank survey on public intervention in agricultural insurance performed in 65 countries[3], the most common mechanisms for public sector involvement in agricultural insurance markets are:

- Premium subsidies - the survey revealed that the most common type of public sector support to agricultural insurance is through premium subsidies; 63 percent of the surveyed countries use this mechanism to support crop insurance and 35 percent to support livestock insurance.
- Investment in product research and development (R&D), training and information gathering—41 percent and 37 percent of the countries in the survey reported public sector investment in R & D, training and information gathering for crop insurance and livestock insurance, respectively
- Agricultural insurance legislation—the study showed that the development of specific agricultural insurance legislation is also an important form of support to agricultural insurance, special legislation for crop and livestock insurance was evident in 51 percent and 33 percent of the surveyed countries respectively.
- Public sector reinsurance - 32 percent and 26 percent of the countries in the survey reported public sector reinsurance programs for crop insurance and livestock insurance respectively. .
- Administration cost subsidies -the study also revealed that public sector support through crop and livestock insurance administration cost subsidies is a less common practice, with only 16 percent and 11 percent of the surveyed countries providing administration cost subsidies for crop insurance and livestock insurance respectively.

There appears to be a correlation between the level of public sector support and the penetration of agricultural insurance. Public sector support is high in the United States and Canada and these countries account for 70 percent of the written premium in the market. The governments of many European countries provide support and Europe writes 17 percent of the premium. In Africa and countries such as Australia and New Zealand where there is little or no public sector involvement, the levels of written premiums are very low.

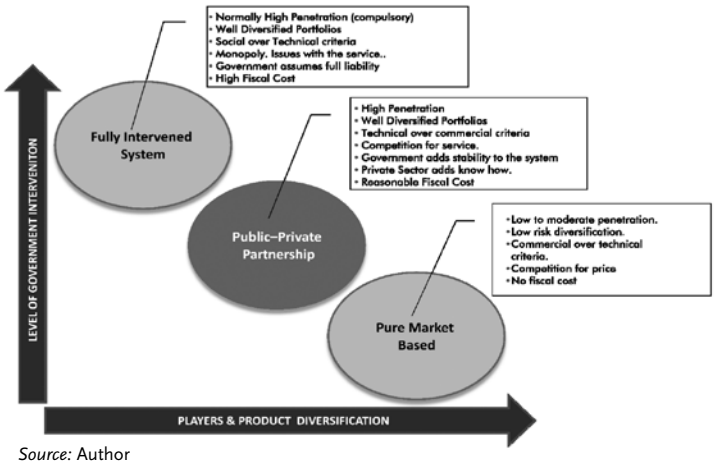
Three models for the delivery of agricultural insurance can be identified: *State controlled* systems (often referred to as fully intervened

7 Public Intervention for Agricultural Insurance, The World Bank (2009)

systems), *public-private partnerships* and *pure market* systems. Fully intervened systems are characterized by a high level of Government support and the existence of one single insurance product which is usually commercialized by a state owned insurance monopoly. Pure market systems are characterized by low or nonexistent government support for agricultural insurance and several insurance companies commercializing different types of products. Public-Private Partnership systems are the most balanced systems, both in terms of government support and product availability. The main features, as well as the advantages and disadvantages of each of these agricultural insurance delivery models, are summarized in Figure 9 shown below.

Public-private partnerships are the preferred model for a successful agricultural insurance market. The current high administration and transaction costs translate into high premium levels which makes insurance unaffordable for many small providers. Public sector participation in supporting agricultural insurance is a key to developing and scaling up agricultural insurance programs, while the participation of the private sector brings skills, expertise, and innovation into the market.

Figure 9: Models of Government Intervention in Agricultural Insurance



Source: Author

Concluding remarks

The primer presents only a brief introduction to the market, the types of products that are available and the parties for which the products have been designed.

Agricultural insurance is an important component of risk management in agriculture, but does not replace good risk management techniques, sound production methods and investments in up to date technology. When coupled with these factors, agricultural insurance enhances the wellbeing of the rural community and enhances the security of production.

Agricultural insurance is an area of insurance that is technically demanding. One of the many challenges to the insurance industry is maintaining the skills and expertise at the underwriter, loss adjuster, and reinsurer levels—not only to provide adequate levels of insurance, but also to assist the agriculture industry improve its risk management practices to enhance production.

There is no one single universal insurance product that meets all the demands of producers. Each agricultural insurance product is suitable for a certain set of conditions. The assessment of the suitability of any agricultural insurance product has to consider the production system, the type of asset to be covered, the key peril to which the insured is exposed, the risk location, data availability, farmer size, distribution channels, and delivery and loss adjustment needs.

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Annex I—Community Run Livestock Insurance Scheme in India

Livestock is susceptible to different types of risks, both idiosyncratic and covariant. The death of animals in accidents is not uncommon. Mortality of livestock is one of the principal causes of loan defaults by the poor. In the absence of comprehensive insurance for livestock, many of the poor are exposed to the loss of their livelihood after the death of livestock. This is the background against which loan protection schemes for dairy cows and buffalo were implemented.

Loan Protection Scheme for Dairy Cows and Buffalo

The scheme provides relief to the members and family members of the self-help group (SHG) who own the milk cattle, in the case of death of an animal. This is a premium based scheme under which every individual animal (Buffalo / Cow) is covered in consideration of an annual premium of 4% of the value of the animal (plus a small entry fee). The value of the animal is estimated by a veterinary. The value decreases with the age of the animal and progressively over the currency of the policy:

- up to three months from the date of insurance: 90% of value of animal
- three to six months: 85%
- six to nine months: 82%
- nine months to one year: 80%.

Policies are for one year and can be renewed. On renewal, the value of the animal for insurance purposes is reduced by 20% from the previous year.

The scheme is totally self-managed by the community. Accounting, monitoring and documentation systems are designed and implemented in house.

Claim procedure

Upon the death of an insured animal, the claim form is sent to the Village Organization (VO). A member of the sub-committee verifies the claim by visiting the village. After discussing the issue with the sub-committee, the claim is either settled or rejected. The settled claim is given to the VO by way of cheque. The VO pays the claim amount to the beneficiary.

Performance

The community based animal insurance scheme is among the first of its kind in India. The scheme is community-based and relies on peer monitoring.

The number of animal insured increased from 3,500 in 2005 to 25,500 in 2008. Premium collected increased from US$3.7 million in 2005 to US$8 million in 2008. The claims ratio has been stable, at around 2.6%. This makes this scheme financially viable. Operating costs represent 12% of the premium income. It is essential to keep the operating costs (e.g., underwriting cost, loss assessment costs and claims processing costs) at a minimum to ensure the sustainability of the scheme. Peer monitoring is critical to the success of the scheme in preventing false claims being paid. The community supervision and vigilance has been very effective.

Annex II—Small farmer mutual crop and livestock insurance. The case of "Fondos de Aseguramiento" (Self Insurance Funds, SIFs) in Mexico.

Mexico has 18 years of experience with the operation of small farmer mutual crop and livestock insurance through the "Fondos de Aseguramiento" (Self Insurance Funds, SIFs) program which is reinsured by Agroasemex, the national Agricultural Reinsurance Company. The SIFs are legally registered small-scale crop and livestock producer mutual companies the primary function of which is to access group crop and livestock credit. The "Fondos" program was originally conceived as a vehicle to provide small and marginal farmers access to credit on the basis that individually they were too small to be eligible for credit, but collectively they could access credit.

Since 1990 Agroasemex has provided advisory support and training to SIF members to form and register SIFs. Agroasemex also assists the SIFs to access short-term and medium-term production and investment credit, and provides technical assistance and training on crop and livestock insurance policy design and rating and in loss assessment procedures.

In 2005, there were 176 functioning SIFs in 24 Mexican states, of which 159 were crop producer SIFs and 17 livestock SIFs. In 2007, the SIFs insured more than 1 million hectares of crops and more than 4 million head of livestock (mainly cattle and pigs), generating MXN 647 million of premium (US$ 60 million)[4]. For crops, the basis cover is an individual grower MPCI cover which either insures against the producer's investment in the crop or against loss of yield: for livestock the policy is a herd-based catastrophe mortality and disease cover

8 Agroasemex 2008: Sistema Nacional de Aseguramiento al Medio Rural: Informe Final de Operaciones al cierre del ejercicio 2007.

which carries very low average rates. The crop and livestock products underwritten by the SIFs are eligible for federal government premium subsidies which average about 33% of the full premium. Today after 18 years of operation, the Mexican SIF program is a major agricultural insurance program for small and marginal farmers.

A key feature of the Mexican SIFs is the Stop Loss Reinsurance protection provided by Agroasemex to each SIF. Under the agreement between Agroasemex and the SIFs, Agroasemex is responsible for setting the premium rates for each crop and livestock program and then for the provision of Stop Loss Reinsurance protection. The SIF is entitled to deduct 25% of original premium to cover its administration and operating expenses. The SIF retains an average 70% of the premium net of these expenses, equivalent to 52.5% of gross premium to settle retained claims. The remaining average 22.5% of gross premium is paid to Agroasemex as stop loss reinsurance premium.

In the event of a claim, the individual SIF is responsible for settling claims up to a loss ratio of 52.5% plus any claims reserves held over from previous years. Any claim excess of this level is reinsured by Agroasemex. The reinsurer, Agrosemex, in turn, purchases Stop Loss Retrocession protection on the Fondos program from international reinsurers.

In any underwriting year, if the SIF generates an underwriting surplus (profit), 30% of the surplus must be added to a Special Claims Reserve for Catastrophe events and the remaining 70% is allocated to a Social Fund which may be divided among the SIF members to invest in income generating activities or to contribute towards crop and livestock insurance premiums.

Annex III—Index-Based Livestock Insurance in Mongolia

In 2005, the Government of Mongolia made a request to the World Bank for technical assistance in the design and implementation of pilot program on Index-Based Livestock Insurance (IBLI), in order to protect herders against major livestock losses caused by harsh winters, and recognizing that smaller, individual livestock mortality risks are better addressed through appropriate household-level risk mitigation strategies.

The IBLI pilot program is based on a combination of a commercial insurance product - the Base Insurance Product (BIP) - and a social product -Disaster Response Product (DRP). The BIP pays when soum livestock mortality rates exceed 6%, while losses beyond 30% are managed by the DRP. Payments are based on estimates of livestock mortality rates in local administrative areas (soums) from January through May, as estimated by the annual livestock census and, in the future, by a mid-year livestock survey. Traditional indemnity-based livestock insurance proved to be unsustainable in Mongolia given the extensive herding practices. This is the first time an index insurance product has been used in Mongolia. The first sales season started in 2006 and, as of 2009, the IBLI program is being piloted in four provinces: Bayankhongor, Khentii, Uvs, and Sukhbaatar.

The IBLI program is offered through the Livestock Indemnity Insurance Pool (LIIP). The LIIP is a public-private risk pooling arrangement among insurance companies, in which participating insurers share underwriting gains and losses based upon the share of herder premium they bring into the pool. The LIIP is protected with a stop loss reinsurance treaty, currently underwritten by the government

backed by a World Bank credit. The LIIP has several major advantages: (i) it fully insulates this line of business from other lines of insurance, as the insurance industry in Mongolia is still in its infancy, with limited capital; (ii) it fully secures the payment of indemnities, thus eliminating any risk of default on payments; (iii) it allows the insurance companies to pool their livestock insurance portfolio in different regions, thus taking advantage of the risk diversification benefits; and (iv) it facilitates the capacity building of the participating insurers. The risk financing structure of the LIIP follows best practices. Insurance companies retain some portion of the risk, pool risk with other companies, and access public reinsurance for excess losses. It is expected that international reinsurers will provide capacity for the mezzanine reinsurance layers, while the government would only cover catastrophic risk layers.

Two insurance cycles have been completed; the third is ongoing, and the sales season for the fourth has been launched and 4 insurance companies are currently participating. In the 2006 sales year, 2400 policies were sold; over 3700 policies were sold in 2007; and 4100 policies sold in 2008, representing 14% of herders in the pilot provinces. In mid-August 2008, following high livestock losses, MNT 389 million (USD340,000) was paid out to 1783 herders. All financing systems worked as planned; a small amount was drawn from the contingent debt facility.

Linking the products to herder loans will be an important next step to reduce the delivery cost. Lenders have already started offering lower interest rates and better terms for loans to insured herders.

Source: Mahul and Skees (2007)

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   by Rodney Lester
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5. **Asset Structures for Insurers**
   by Michael Hafeman based on Ray Willing
6. **Insurance Accrual Accounting**
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7. **Consumer Protection Insurance**
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8. **The Role of the Underwriter in Insurance**
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