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INTRODUCTION TO AGRICULTURAL INSURANCE AND RISK MANAGEMENT

Manual 1

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INTRODUCTION TO AGRICULTURAL INSURANCE AND RISK MANAGEMENT

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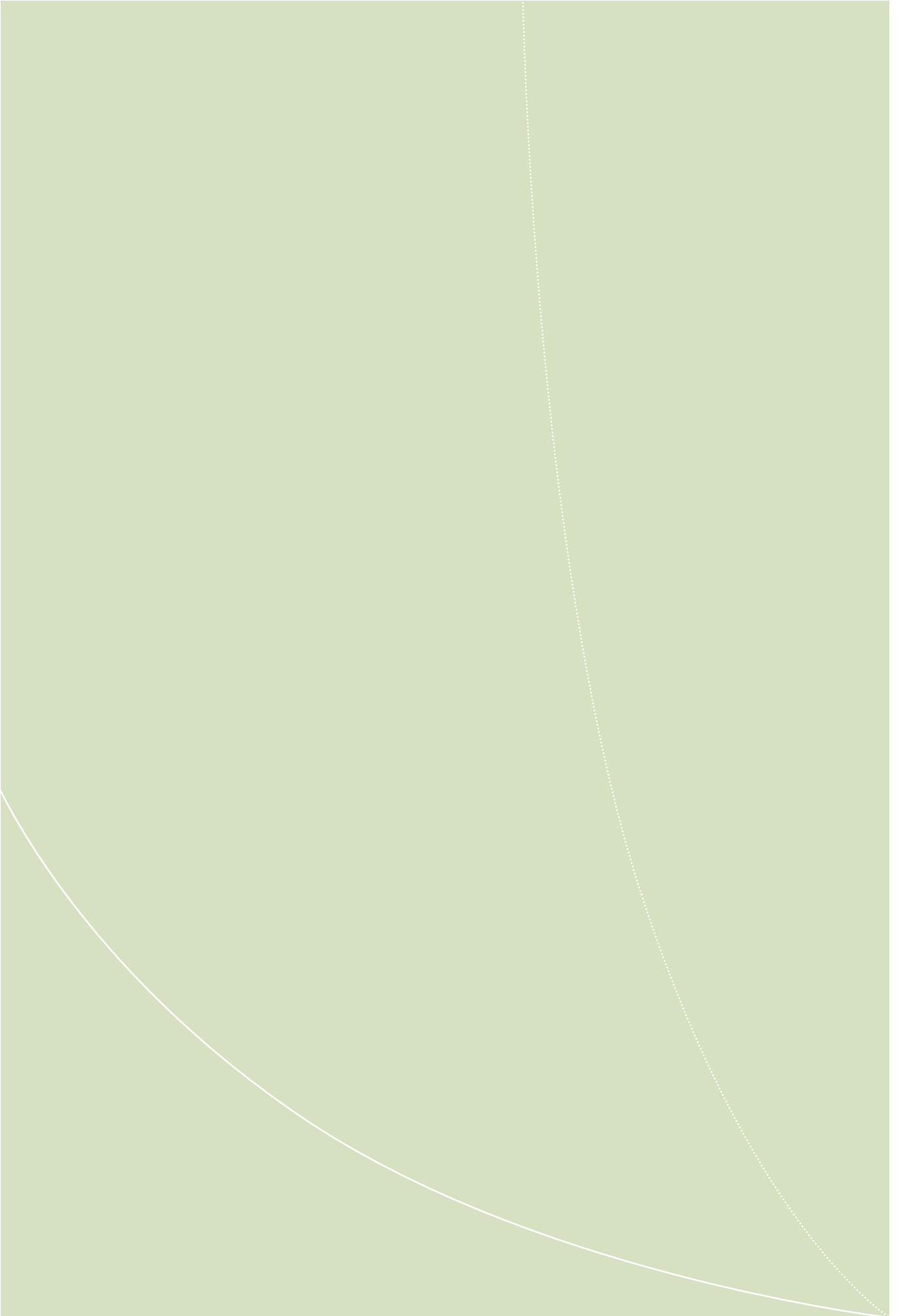


Table of Contents

Part 1: Introduction and Background	8
1.o. Introduction	8
2.o. Benefits of Crop Insurance	9
3.o. Introduction to Agricultural Risk	10
3.1. Sources of Risk	10
3.1.1. Production and Technical Risk	10
3.1.2. Output and Input Price Risk	10
3.1.3. Financial Risk	11
3.1.4. Political Risk	11
3.1.5. Legal Risk	11
3.1.6. Personal Risk	11
3.2. Risk Management Tools	11
3.2.1. Low Risk Investments	12
3.2.2. Enterprise Diversification	12
3.2.3. Excess Debt Capacity	12
3.2.4. Liquid Financial Reserves	12
3.2.5. Off-farm Income	12
3.2.6. Shared Ownership or Leasing	12
3.2.7. Risk Transfer	12
3.2.7.1. Insurance Products	12
3.2.7.2. Contracts	12
3.2.7.3. Hedging and Options Markets	12
4.o. Government Risk Management Programs	13
5.o. Agriculture Crop Insurance	14
5.1. Definitions	14
5.2. Issues Related to Product Development and Delivery	15
5.2.1. Product Delivery	15
5.2.2. Factors Affecting Participation	15
5.2.2.1. Premium Rates	15
5.2.2.2. Deductibles/Coverage	15
5.2.3. Potential Operating Structures	15
5.2.3.1. Government Agencies	15
5.2.3.2. Private Companies	16
5.2.3.3. Mixed Systems	16
5.3. Types of Insurance Products	16
5.3.1. Individual Insurance Products	16
5.3.1.1. Individual Yield-Based Insurance Products	16
5.3.1.2. Individual Revenue-Based Insurance Products	16
5.3.2. Proxy Index Products	16
5.3.2.1. Other Index Products	17
5.4. Stakeholders	17
5.4.1. Producers	17
5.4.2. Primary Insurers	17
5.4.3. Reinsurers	17
5.4.4. Government	17

5.5. Processes and Procedures	18
5.5.1. Sign-up	18
5.5.2. Premium Payments	19
5.5.3. Loss Adjustment	19
5.5.4. Indemnity Payment	20
5.5.5. Final Steps	20
5.6. Example	20

Part 2: Foundational Concepts22

6.o. Actuarial Methods22

6.1. Pure Risk Rate	22
6.2. Loads and Total Premium Rates	23
6.3. Rating Methods	24
6.3.1. Empirical Rating Methods	24
6.3.2. Parametric Rating Methods	24
6.3.3. Combined Approach	24
6.3.4. Rating Methods with Limited "On Site" Data	24

7.o. Data Management and Accounting25

7.1. Data Needs	25
7.1.1. Producers	25
7.1.2. Primary	25
7.1.3. Reinsurance	25
7.1.4. Government	26
7.1.5. Regulatory Agencies and Oversight Boards	26
7.1.6. Policy Makers	26
7.2. Collecting Data	26
7.2.1. Farm-Level	26
7.2.2. Primary Insurance Providers	26
7.2.3. Private and Public Third Parties	27
7.3. Storage	27
7.4. Access	27
7.5. Business Operations	27
7.5.1. Document Storage (Signed Policies)	27
7.5.2. Business Processes	27

8.o. Underwriting and Loss Adjustment28

8.1. Underwriting	28
8.2. Loss Adjustment	29
8.2.1. Procedures	29
8.2.1.1. Biological Versus Sample Harvest	30
8.2.2. Dispute Resolution Systems	30

9.o. Reinsurance31

9.1. Introduction to Reinsurance	31
9.2. Reinsurance Rating	32
9.2.1. Types	32
9.2.1.1. Co-payments, Coinsurance, or Percentage Participation. Co-payments (or Co-pays)	32
9.2.1.2. Stop-Loss	32
9.2.1.3. Layered, Stacked, or Tranched Reinsurance	32
9.2.2. Costs	33

- 9.3. Insurance Pooling 33
 - 9.3.1. Standardized Products..... 34
 - 9.3.2. Standardized Business Procedures..... 34
 - 9.3.3. Standardized Loss Adjusting 34
 - 9.3.4. Pool Risk Retention and Transfer 34
 - 9.3.5. Alternative Risk Transfer Mechanisms 34
- 10.o. Illicit Behavior..... 35**
 - 10.1. Moral Hazard..... 35
 - 10.2. Adverse Selection..... 36
 - 10.3. Participation Erosion..... 36
 - 10.4. Fraud 36
- 11.o. Government Responsibilities..... 37**
 - 11.1. Regulation 37
 - 11.2. Audit and Oversight 37
 - 11.3. Judicial and Legal..... 38
 - 11.4. Subsidies 38
 - 11.4.1. Premium and Servicing Subsidies..... 38
 - 11.4.2. Public Reinsurance..... 38
 - 11.4.2.1. Government Involvement 39
 - 11.4.2.2. Data Quality 39
 - 11.5. Trade and International Policies 39
- 12.o. Marketing and Program Management..... 40**
 - 12.1. Marketing 40
 - 12.1.1. Program Transparency 41
 - 12.1.2. Program Consistency 41
 - 12.2. Producer Participation 41
 - 12.2.1. Product Identification..... 41
 - 12.2.2. Educating Producers..... 42
 - 12.2.3. Sales and Enrollment 42
 - 12.2.4. Premium Collection 42
 - 12.2.5. Loss Adjustment..... 42
 - 12.2.6. Indemnity Payments..... 43
 - 12.2.7. Dispute Resolution 43
 - 12.3. Primary Insurance Pooling 44
 - 12.3.1. Crop 44
 - 12.3.2. Yield..... 44
 - 12.3.3. Spatial..... 44
 - 12.3.4. Production Practices..... 44
 - 12.3.5. Farm Size 44
 - 12.4. Business Management 45
 - 12.4.1. Operations..... 45
 - 12.4.2. Administration 45
 - 12.4.3. Accounting 45
 - 12.4.3.1. Information Technology (IT) Systems 46
 - 12.4.3.2. Business Systems 46
 - 12.4.3.3. Reporting Procedures 46
 - 12.4.3.4. Auditing..... 46
- 13.o. Summary Comments..... 47**

Preface and Acknowledgements

Five manuals were prepared by IFC for the development of agri-insurance markets where the public and private sectors work together in a partnership (PPP). The manuals are designed to strengthen the capacity of the government and market players to effectively design agri-insurance products, both traditional indemnity and index, introduce them to the market, and build sales. The manuals are designed to be succinct yet at the same time sufficient to create the technical and administrative foundation for a modern agri-insurance system, and to allow programs in early stages of development to properly plan the required system. Finally the manuals are designed to train practitioners, to build local capacity for skills that are required to start the program, and to enable the program to grow over time.

The principle author of the manuals is Professor Myles Watts, University Professor, Lead Actuary at Watts & Associates, Member of the Board at the Federal Agricultural Mortgage Corporation, and 5th Generation Montana Farmer. Watts and Associates designed and launched numerable agri-insurance products in North America, frequently consults for the major reinsurers, and supports insurance programs around the world. They have established their own index insurance company, eWeatherRisk. The manuals incorporate practical lessons learned over the past 40 years.

The development of the manuals was a joint activity of the Ukraine Agri-Insurance Project (2007-2015), IFC's Global Agri-Finance Team, and the Global Index Insurance Facility (GIIF) (2009 to present). Dr. Gary Reusche led the Ukrainian project, served as a technical specialist on the global agri-finance team, and as a member of the GIIF technical committee and core management team. Agri-insurance development is closely linked to agricultural finance and value chains and they are effectively developed in unison.

The manuals result from training workshops developed by the agri-insurance project in Ukraine and globally by GIIF technical experts. The entire agri-insurance team in Ukraine made practical contributions to the manuals, with special recognition due to Victoria Yakubovich for collecting, organizing and preparing the initial drafts and Andrey Zaripov a member of the GIIF team for helping to develop the reinsurance and cash flow models. The project team included experts from the Alberta (Canada) provincial agri-insurance program, in particular Richard McConnell, who contributed his experience and expertise to the training activities.

Peer review and Spanish language translations of the manual resulted from IBRD consultants in Central and South America, especially Pablo R. Valdivia Zelaya and Roberto Dario Bacchini.

The team is grateful to Professor Gary Brester for his practical contributions and editing of the manuals and Olesya Zhuchenko for coordinating the publication of the manuals, working with designers to plan the layout, and printing.

Finally support for the manuals was provided by the Canadian government, and the Global Index Insurance Facility (GIIF) lead by Gilles Jacques Galludec (Program Manager) funded by the European Union, Japan and the Netherlands.

Acronyms

IFC – International Finance Corporation

GIIF – Global Index Insurance Facility

DFATD – Foreign Affairs Trade and Development Canada

IIARM – International Institute for Agricultural Risk Management

EU – European Union

GATT – General Agreement on Tariffs and Trade

HA – Hectares

IT – Information Technology

USDA's RMA – United States Department of Agriculture, Risk Management Agency

WTO – World Trade Organization

UAH – Ukrainian Hryvnia, money unit of Ukraine

Part 1: Introduction and Background

1.0. Introduction

This manual introduces and discusses agricultural insurance and provides tools for the development, management, operation, and maintenance of such programs. Agricultural insurance includes a variety of product types, including property, causality, life, and health insurance. Throughout the manual, the term “agricultural insurance” refers to crop (and in some cases livestock) insurance programs.

Successful agricultural insurance programs must be thoughtfully constructed before their introduction and tailored to the unique circumstances of individual countries and regions; poorly designed insurance programs will fail and generate losses for invested parties while creating distrust among producers and the public. Successful programs must inspire a high degree of confidence among all stakeholders.

Transparency is of particular importance to developing and maintaining confidence in agricultural insurance programs. Achieving this transparency is only possible when all stakeholders participate in open debate and understand the insurance process. Clear communication allows stakeholders to develop programs that meet the needs of their users and help prevent long-term complications. Throughout this document, emphasis is placed on transparency at all levels, from farmers through private insurers and government agencies that support and regulate programs.

Using examples from the United States and Canada, this document addresses a wide range of issues, including program structure, participation incentives, the role of insurance and reinsurance companies, and the role of government agencies in the provision and support of crop insurance programs and subsidies.



2.0. Benefits of Crop Insurance

The provision of credit to agriculture producers differs substantially from other types of business lending. The most notable difference occurs in the seasonality of cash inflows into many agricultural operations. Although cash outflows generally occur throughout a year on most agricultural operations, cash inflows may appear only a few times (and often, only once) in any given year. The usual intermittent cash inflows that occur in production agriculture create the need for operating lines of credit. Consequently, crop insurance may be an important component of obtaining and accessing credit. In addition, because many assets require large initial outlays that are expected to yield benefits over many years, the need for intermediate-term financing for breeding livestock, machinery, and buildings is often high. Given that cash inflows often occur only sporadically within a given year, a crop failure can result in an immediate risk of default. A common commercial lending practice is to “classify” loans that have not fully made payments in the past 90 days as contractually specified. In agriculture, however, a single missed loan payment results in the loan being “classified”. In most other business lending situations, however, cash inflows are more regular and so failure to receive a single cash inflow does not as dramatically affect the loan payment. Although an agricultural production operation might be profitable over the long run, a single year in which extreme weather or low market prices occur can cause credit default. Consequently, agricultural production often represents a high short-term credit risk because of the combination of high fixed costs, weather and disease variability, and variations in cash receipts.

Governments are often involved in many aspects of providing agricultural insurance. In addition to reducing the variability of farm incomes, other social issues are often cited as reasons for government involvement. For example, social unrest in many developing countries is often associated with low production and incomes – especially for subsistence farmers. Many developing countries depend on a healthy farm economy as a means for generating revenues through agricultural exports. Furthermore, many social issues are exacerbated by emigration from rural areas into urban regions. This migration increases in years of low farm production. Many rural areas would benefit from the adoption of modern technologies. However, it takes time and financial resources to adopt and learn new technologies. In the absence of income levels that are guaranteed by crop insurance, risky new technologies are seldom adopted even if these technologies would improve producer well-being. Finally, many countries encourage high participation in agriculture insurance to reduce the need for *ad hoc* disaster programs which tend to be expensive, ineffective, and inefficient.



3.0. Introduction to Agricultural Risk

Agricultural producers face a variety of risks and considerable uncertainty. This section identifies and defines sources and types of agricultural risks as well as tools available to manage those risks.

3.1. Sources of Risk

Agricultural producers face a variety of risks including production (yield), output price, and input price risk. Some of these risks are managed through production and financial decision-making while others are simply accepted as costs of doing business. Some risks can be managed through a variety of contractual and insurance-related products. In many cases, however, some risks are difficult to ameliorate such as those associated with interpersonal relationships that can generate personal physical, emotional, and financial stress among farm families and their employees. This section discusses sources of agricultural risk.

3.1.1. Production and Technical Risk are primarily caused by disease and extreme climate conditions including drought or low precipitation, excessive rainfall or flooding at planting time (prevented planting), precipitation or frost at or just before harvest (delayed harvest, sprouting), wind, insects, or hail. Unlike many other production situations, the use of specific quantities and qualities of inputs in an agricultural production process can result in different outcomes depending upon weather, insects, weeds, and a wide variety of interactions among these and other factors. Changes in technology represent another aspect of technical risk. The adoption of a new technology itself is inherently risky, but failing to adopt emerging and successful technologies also generates the risk of not being competitive in a global economy.

3.1.2. Output and Input Price Risk is substantial in agricultural markets because of worldwide supply and demand factors. Prices of agricultural commodities that are widely traded among countries are particularly subject to world market conditions. Changes in transportation, storage, and input costs also add to local price variability.

Example: In the last eight years, fluctuations in world wheat production levels has caused the price of wheat to vary between \$100 per ton and \$300 per ton.

Input Price Risk occurs because the prices of agricultural inputs often vary substantially over time. Fuel, fertilizer, and agricultural chemical prices fluctuate as a result of changes in demand for use in both agricultural and non-agricultural uses and because of variations in exchange rates and world production.

Example: The price of diesel fuel doubled over twelve months (October 2007 – October 2008) in the United States. Over the same period, the price of fertilizer increased by 250%. The price of crude oil influences diesel fuel prices while the price of natural gas influences nitrogen fertilizer prices. Price increases for these primary inputs influences profitability among agricultural producers.



3.1.3. Financial Risk generally refers to the variability of net farm revenue over a specific period of time (often one year or a production cycle) and is a major concern for agricultural producers, suppliers, and agribusinesses. On average, annual net farm revenues may be sufficient for agricultural producers to realize profits, but revenue variability may cause some agricultural producers to fail. If net farm revenue is small or negative in a given year, a producer will likely face financial difficulties. Volatile net farm revenue is particularly difficult for farmers. Financial risk management is especially important for agricultural producers who acquire either short-term or long-term financing that requires scheduled interest and principal payments.

3.1.4. Political Risk stems from changing regulatory and government actions as they relate to environmental concerns, business practices, financial issues, international trade relationships, and government support programs. Such issues are relevant even within stable, well-established political systems.

3.1.5. Legal Risk is relevant to multiple aspects of agricultural production. For example, agricultural production firms may be subject to various liabilities resulting from environmental degradation, noise and air pollution, wrongful termination, injury, contract fulfillment, and property rights.

3.1.6. Personal Risk includes the threat of injury, illness, or death among managers or employees. Production agriculture is an inherently dangerous and hazardous occupation. Divorce and other personal relationship deteriorations can also cause financial distress.

3.2. Risk Management Tools

Agricultural producers use a variety of techniques to manage the variability of net farm revenues. In general, agricultural input costs and usage are much more stable from year to year than commodity prices and yields. Attempts to reduce net income variability, therefore, tend to focus on production (yield) and output price risk.

Agricultural producers employ a variety of strategies to manage financial risks including investments in lower risk enterprises, enterprise diversification, maintaining relatively low debt-to-asset ratios and adequate financial reserves, and developing off-farm income sources.



3.2.1. Low Risk Investments represent an approach to managing risk. That is, risk can be mitigated by avoiding high risk endeavors. Investments in low risk activities, however, are usually correlated with relatively low average returns compared to higher risk investments.

3.2.2. Enterprise Diversification is a risk management technique that involves investing in a variety of less than perfectly correlated investments within a portfolio. Combining less-than-perfectly correlated investments reduces variability of returns and may allow mean returns to be maintained. Many farmers produce a variety of crop and livestock products as a means of diversification; many of these diversification techniques also produce added benefits through improving soil characteristics, reducing weeds, and limiting insect infestations. The prices of many agricultural commodities are often positively correlated, which limits diversification benefits from producing multiple crops. In addition, yields tend to be positively correlated across crops which limit the value of crop diversification. For these reasons, many agricultural producers diversify across both livestock and crop commodities.

3.2.3. Excess Debt Capacity. Agricultural producers generally maintain relatively low debt-to-asset ratios as a means of mitigating financial risk; the average farmer in the United States maintains a debt-to-asset ratio of approximately 10% which is a much lower ratio than other agribusinesses. Low debt-to-asset ratios are necessary because of high fixed costs (costs that do not vary with output) and revenue seasonality. Much of the financial risk involved in production agriculture is a result of the seasonal nature of production and, hence, revenue generation.

3.2.4. Liquid Financial Reserves. Many agricultural producers maintain substantial financial reserves or liquid assets to help mitigate seasonality effects and reduce financial risk including the risk of crop failures.

3.2.5. Off-farm Income. Agricultural producers and their family members are often employed in off-farm jobs. Nine of every ten farm families in the United States have some off-farm employment income that provides a more stable and, potentially, non-seasonal source of income. These employment opportunities can provide additional benefits including access to group health and life insurance.

3.2.6. Shared Ownership or Leasing of productive assets occurs in several ways. In general, someone other than the farm/ranch manager may own all or a percentage of a farm's productive assets. Land, buildings, livestock, and machinery may be partly or wholly owned by someone other than the farm/ranch manager. In many cases, these assets are leased to a farm operator which reduces that operator's financial risk because of decreased capital investment and lower debt needs.

3.2.7. Risk Transfer can shift some of the risk associated with agricultural production away from producers, but is not without its own costs. Agricultural producers transfer risk to other parties in a variety of ways including the use of formal insurance markets, futures and options markets, and contracts.

3.2.7.1. Insurance Products help reduce risk. For example, formal property insurance markets transfer risk from producers to others with respect to fire, wind, theft, and other perils on buildings, machinery, and livestock. Furthermore, health and life insurance products are used to manage personal risk. Premiums paid to insurance companies for the transfer of this risk represent the costs of risk transfer. In addition, yield insurance can offset production risk and revenue insurance can offset combinations of yield and price risk.

3.2.7.2. Contracts. Some producers forward contract the delivery of their crops and livestock to various agribusiness entities. In most cases, forward contracts stipulate specific prices to be paid upon delivery of the commodity. Contracts often include a variety of quality specifications and are legally enforceable. In addition, producers may forward contract for agricultural inputs.

3.2.7.3. Hedging and Options Markets. Formal commodity futures markets provide input and output price risk management opportunities. Much like forward contracting, commodity futures markets can be used to establish selling prices. Unlike forward contracting, basis risk (the difference between prices at a commodity futures market and local prices) can alter net sales prices, but basis variability is generally much less than commodity price variability.

In the case of Put Options, commodity options markets provide another type of price insurance by establishing a price floor (in exchange for a premium payment) without placing a limit on potential price increases. Call Options establish a price ceiling for input prices without limiting gains that can be obtained by price declines. Put and Call Options are generally traded for commodities for which futures markets exist.

4.0. Government Risk Management Programs

In many developed countries, a variety of government programs provide financial risk protection for agricultural producers. In some countries, such as Japan, programs establish minimum prices for agricultural commodities. In the United States, countercyclical program payments are available to producers to offset periods of low prices. Given recent high commodity prices worldwide, countercyclical programs have not been implemented in the past several years (except for cotton).

Agricultural **Price and Income Support Programs** affect producers' incentives to participate in agricultural insurance. These programs provide minimum price guarantees and a variety of farm income support for producers of some commodities. Programs that provide minimum price supports or countercyclical payments for specific commodities reduce financial risk by reducing price variability and provide direct payments that increase producers' financial reserves. At the margin, these risk reduction programs reduce incentives for producers to purchase crop insurance. To maintain participation rates, some governments require that producers purchase crop insurance as a prerequisite to obtaining income support benefits. In addition, participation in agricultural insurance programs may increase access to credit because of related decreases in default risk.

Many countries provide *ad hoc* **Disaster Aid** programs that offset losses caused by catastrophic weather events. Government emergency or disaster relief programs provide assistance to agricultural producers in response to catastrophic events such as widespread flooding, drought, hurricanes, or tornados. Considerable research has been conducted on the effect of disaster programs on farmers' willingness to purchase crop insurance. In general, agricultural producers who are relatively certain that their government will provide financial aid after a natural disaster tend to be more reluctant to purchase crop insurance. *Ad hoc* programs often incur substantial administrative costs because each new disaster may require the building of administrative and operation structures.



5.0. Agriculture Crop Insurance

The primary difference between crop insurance and other types of property insurance involves monitoring and rating. Because of weather and biological effects, crop losses are much more costly to monitor than most other forms of property insurance. Furthermore, prices that are used to indemnify losses are subject to significant temporal and spatial variability. Substantial amounts of high-quality data are needed to set actuarially sound premium rates. The wide variety of crop insurance products, triggering mechanisms, and public policy issues complicates crop insurance programs.

5.1. Definitions

Several crop insurance terms must be defined in order to understand issues related to the provision of crop insurance programs. An **Insurance Provider** is an entity that is willing to provide insurance coverage in exchange for a fee (or premium). Insurance providers include both issuing agencies and reinsurers. **Issuing agencies**, sometimes referred to as primary insurers, market and manage insurance contracts to the insured. **Reinsurers** are usually very large insurance companies (or in some cases, governments) that are well-diversified across space, sector, and types of insurance and that have substantial financial reserves that provide capacity to pay indemnities.

Premiums represent the price that an insurance purchaser pays to an issuing agency to obtain an insurance policy. The market transaction in which an insurance provider is willing to accept risk through the provision of an insurance contract (in exchange for a fee) is a **risk transfer** mechanism. **Rating** refers to the process of establishing actuarially sound insurance premiums. **Actuarial soundness** implies that, over time, the collection of premiums is sufficient to offset the provision of indemnities along with allowances for risk acceptance and insurance provider costs.

Coverage is one minus the deductible.

Deductibles are a proportion of a loss that is not covered by an insurance contract. In general, deductibles are established to reduce moral hazard behaviour. **Moral hazard** occurs when insurance purchasers increase risky behaviour simply because they have purchased insurance against losses. **Indemnities** are payments made by an insurance provider to an insurance purchaser to offset losses in excess of pre-determined deductibles due to insured perils.

These concepts are relevant for most property insurance situations, but agricultural insurance requires additional definitions. For example, **single-peril** crop insurance products refer to insurance purchased against a specific peril. The provision of hail insurance is an example of a single-peril product. The purchaser of hail insurance will receive an indemnity if hail causes a crop loss in excess of an established deductible. However, if a crop loss were caused by a non-hail event such as drought, then an indemnity is not paid. **Multiple-peril products**, however, provide indemnities for losses caused by virtually any peril other than specifically-excluded perils.



Insurable perils are those that allow insurers to develop actuarial assessments, obtain sufficient volume of insurance activity, and monitor outcomes. Non-insurable perils usually include:

- Yield and revenue reductions resulting from poor production practices (e.g., failure to irrigate or harvest);
- Fraud (e.g., under-reporting of actual yield);
- Changes in public policy or government regulations.

5.2. Issues Related to Product Development and Delivery

Private agricultural insurance companies have generally offered only specific-peril products because the costs of determining losses and indemnity payments are much smaller than for multiple perils. Single-peril insurance coverage tends to limit fraudulent activity by producers.

More recently, private companies have begun to develop insurance products that are based on proxies for growing conditions such as temperature and rainfall measurements. Such measurements are somewhat attractive to private companies because producers are unable to manipulate the thresholds used to trigger indemnities.

Multiple-peril insurance products involve larger costs for monitoring production practices and fraudulent activities. Governments desiring to provide safety nets for agricultural producers in the form of crop insurance usually provide premium or other subsidies for multiple-peril insurance products.

A wide variety of subsidized multiple-peril products have been developed and implemented worldwide. These products provide different levels of risk management, premiums, and program costs depending on the mechanisms used to determine expected yields, trigger levels, and valuation of losses.

5.2.1. Product Delivery. Successful delivery of crop insurance products depends on program integrity, accurate rating and underwriting procedures, loss verification, efficient business operation, data

5.2.2. Factors Affecting Participation. Several factors influence producer participation in crop insurance programs including product design, transparency, applicability, premium rates, deductibles, and integrity of insurance providers.

5.2.2.1. Premium Rates affect participation because insurance premiums represent the price of purchasing an insurance product. Consequently, lower premiums encourage producers to purchase more insurance.

***Example:** Prior to 2000, approximately 30% of crop insurance premiums were subsidized by the U.S. government; at that time, about 40% of corn and wheat acreage was insured.² After 2000, U.S. subsidies increased to 60% and approximately 80% of corn and wheat acreage was insured.*

5.2.2.2. Deductibles/Coverage. Like most insurance products, crop insurance requires participants to select a deductible. Crop insurance deductibles represent the difference between an expected yield or revenue and an indemnity trigger yield or revenue. Deductibles are an important element of insurance products because they reduce moral hazard which is the decision by an individual to increase risky behaviour simply because they have purchased insurance against losses. Higher deductibles reduce risk and lower costs for insurance providers because of moral hazard reductions and lower likelihoods of indemnities.

5.2.3. Potential Operating Structures. Crop insurance programs operate within various organizational structures including government agencies, private insurance providers, and combinations of the two.

5.2.3.1. Government Agencies. In some cases, government agencies manage all aspects of agricultural insurance programs in that they establish premium rates, sell and service products, market products, conduct loss adjustments, and issue indemnities. They collect and maintain all data necessary to manage and improve crop insurance programs in addition to subsidizing premiums.

¹ In the United States, participation is measured as the area of insured land relative to the total land area planted with a crop.

5.2.3.2. Private Companies. Some systems allow the private sector to provide most agricultural insurance products. In such cases, private companies establish premium rates, sell and service products, market products, conduct loss adjustments, and issue indemnities. They collect and maintain all data necessary to manage and improve crop insurance programs. This is especially the case for single-peril products.

5.2.3.3. Mixed Systems are those in which government agencies and private companies share operational elements of the program. These elements may include shared data management functions (e.g., the collection and storage of data) or issuance of indemnity checks.

Private companies are responsible for product delivery, receive premiums, pay indemnities and have most of the producer contact.

For multiple-peril offerings, however, governments are often involved in the provision of crop insurance. Premiums may be government subsidized through compensation to private companies or delivered to agricultural producers. Even within such systems, however, government agencies often provide oversight and reviews of private company operations, product offerings, efficiency, participant equity, financial viability, fraud prevention, and dispute resolution. The United States has a mixed system.

Relationships among government agencies and private companies in providing crop insurance services may be complex. Regardless of the nature of these relationships, the responsibilities and obligations of each party must be clearly defined. In addition, all systems must be transparent in terms of flow of funds and dispute resolution. Decision-making and accountability must be clearly delineated.

5.3. Types of Insurance Products

A wide array of crop insurance products have been developed and implemented. In general, insurance products can be divided into individual, area-based, and proxy products.

5.3.1. Individual Insurance Products are those for which indemnity triggers and premiums are specific to yield histories and production outcomes for each individual farm operation.

5.3.1.1. Individual Yield-Based Insurance Products rely on historical production data from individual farms to determine expected yields. Indemnities are triggered when individual farm yields decline below a trigger point which is based on individual producers' coverage selections. Indemnities are based on the difference between actual yields and indemnity triggers and valued at a predetermined price for the commodity as specified when the insurance contract was established.

5.3.1.2. Individual Revenue-Based Insurance Products are similar to yield-based products in that they use individual historical farm production data to determine expected yields. In addition, expected harvest prices are established when an insurance contract is purchased. Producers select a coverage level based on expected per-acre revenues (i.e., the product of expected yield and expected harvest price). An indemnity is paid at harvest if per-hectare revenues fall below the indemnity trigger regardless if the cause of loss is a lower price, lower yield, or a combination of the two. In some cases, options exist that allow the indemnity trigger revenue level to be adjusted upwards if commodity prices increase between the establishment of the insurance contract and harvest.

5.3.2. Proxy Index Products. Unlike individual products, proxy index product indemnity triggers and premiums are determined by area or regional histories and production outcomes.

Area-Based Yield Insurance products are a variation on individual yield insurance products. The primary difference is the mechanism used to determine expected yields and actual yields. Area-based yield insurance products use data from a region (e.g., a county or province) to establish expected yields and indemnity triggers. Producers who have established insurance contracts are indemnified whenever regional yields fall below a producer's coverage selection of expected regional yields. One advantage of this product type is that it does not require data on a specific farm's historical or actual production, but information regarding acreages, legal descriptions, and crops insured is necessary.

One disadvantage of this insurance type is that an individual farm's production may be only weakly correlated with regional production. A producer could have above average yields in a year in which regional yields were low (or vice versa), allowing that producer to receive an indemnity. Conversely, a single producer could harvest below average yields in a year for which regional yields were above average; this producer would not receive an indemnity even though their production was below average. For this reason, area-based yield insurance generally offers less protection than individual yield insurance products. However, rating and monitoring costs are much lower relative to individual yield-based insurance products.

Area-Based Revenue Insurance products are a variant of individual revenue-based insurance products. Area-based revenue insurance products combine the process used to establish expected yields in area-based yield insurance products with those used to determine expected harvest prices in individual revenue-based insurance products. Indemnities are based on area-wide revenue outcomes.

5.3.2.1. Other Index Products use various proxy indicators for growing conditions to trigger indemnity payments. Two **weather** index products have been developed to date. The first uses precipitation and/or temperature as a proxy for growing conditions within a region. The second product bases indemnity payments on measures of vegetative growth. This product uses satellite imagery to trigger indemnity payments.

Proxy index products have advantages over area-based products because regions can be more narrowly defined. These products also have advantages over individual-based products in that individual producers do not have incentives to influence actual yields or the ability to manipulate indemnity triggers.

5.4. Stakeholders

Producers, insurance providers, government agencies, and reinsurers are all stakeholders in the provision of crop insurance products. Each group of stakeholders has different objectives and building confidence in a program requires that all participants understand these competing goals.

5.4.1. Producers. Producers are interested in reducing risk, increasing profits, and improving credit access. Because of the complexity and multiple details associated with crop insurance products, the primary purpose of crop insurance—to provide agricultural producers with insurance products that help them manage risk—is often overlooked. Failure to focus on consumer needs often results in poor participation rates which can exacerbate adverse selection, increase premium rates, and reduce profitability.

5.4.2. Primary Insurers. The issuing agency (or primary insurer) is the entity that actually sells insurance contracts to producers and, in many systems, does most of the contract servicing. An issuing agency can be either a private company or a government entity. Issuing agencies provide sales, premium collection, loss adjustment, and indemnity payment services as well as necessary support services. Interestingly, issuing agencies tend to retain the smallest amount of risk of the overall insurance program. Most issuing agencies do not have enough financial reserves to accept more than a minimal amount of insurance risk; the remainder of the risk is generally shared with reinsurers or governments.

5.4.3. Reinsurers. Unless governments provide all insurance services, reinsurers are a critical element in developing successful crop insurance programs. Reinsurers accept most of the risk initially incurred by issuing agencies. Consequently, reinsurers provide the majority of indemnity payments. Crop insurance designers need to be cognizant of reinsurance needs, goals, and procedures.

5.4.4. Government. Governments play a variety of roles in crop insurance programs. They may develop and provide crop insurance products, reinsurance, stop-losses, or serve as regulators. In terms of regulation, government agencies often monitor the financial integrity of issuing agencies and reinsurers. Regulatory activity is particularly important to confirm that issuing agencies have sufficient cash reserves to cover their share of liability and that remaining liability is the responsibility of reinsurers with ample financial reserves.

Government agencies also enforce government subsidy policies and audit issuing agencies. Government agencies often transfer funds to private insurance companies to offset administrative expenses or provide subsidy payments. Governments often confirm that issuing agencies are charging producers actuarially sound premium rates net of subsidies. Government agencies are involved in contract enforcement through judicial systems or mediation, including assuring that indemnity payments are made consistent with the insurance contract.

5.5. Processes and Procedures

Successful crop insurance programs require several processes and procedures including sign-up, verification, premium payments, loss adjustment, indemnity payments, and notifications among reinsurers and government regulators.

5.5.1. Sign-up. Crop insurance programs involve multiple steps. Although many appear obvious, each is important for developing a successful crop insurance program.

Prior to producers signing (purchasing) crop insurance contracts, it is necessary to review previous program performance and concerns. Mechanisms must be developed to allow producer concerns and requirements to be recorded and categorized. If those concerns are legitimate and appropriate, then the program should be modified accordingly. Before sign up:

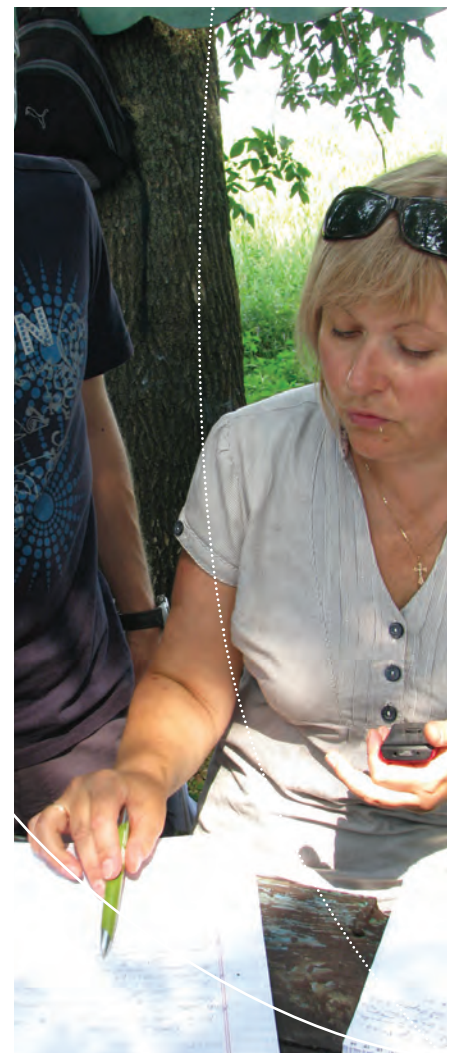
- Modify program details, including premium rates if necessary;
- Review data and other operations systems;
- Train sales personnel;
- Develop program support and collect informational materials. Prescribed procedures must be in place for managing common situations and information must be made available to producers. Producers must understand the services that are provided to them in exchange for their premium payments;
- Review risk bearing strategy and agreements including risk distribution and responsibilities of primary insurance companies, reinsurers, and governments;
- Finalize insurance policy details prior to the sign-up period.

During the contract sign-up period, it is necessary to:

- Confirm that producers understand the program including premium calculations;
- Record producer choices;
- Calculate premiums;
- Record producer information (e.g., name, address);
- Record production information (e.g., crops, acreage, location);
- Sign insurance agreements and provide both parties with copies;
- Collect producer comments, concerns, and recommendations.

After the contract sign-up period, it is necessary to:

- Enter sign-up information into a database. There should be an electronic method for entering this information while contracts are being signed. One approach is to remotely enter information directly into an electronic database, but this approach is problematic if there are electronic transmission problems. Therefore, it is sometimes preferable to enter such data after the sign-up period to allow for corrections to be made if transmission is interrupted;
- Provide other risk-bearers with information (how many acres were insured, liability, which crops);
- Fulfil regulatory requirements, particularly on reporting;
- Store signed agreements in a filing system;
- Record producers' comments and recommendations;
- Ensure that data are stored redundantly in several backup locations;
- Notify producers of final date for contract modification (contract modifications may include acreage adjustment just prior to planting, but after the insurance contract is signed);



- Enter producer modifications into a database;
- Notify other risk bearers of required information;
- Fulfill regulatory requirements;
- Perform and record any required field inspections.

5.5.2. Premium Payments. In most cases, producers pay insurance premiums when a contract is purchased. The United States allows producers to delay premium payments until later in the year. However, the United States has cross compliance for premium payment with many other government programs, which minimizes payment default. To receive premium payments it is necessary to:

- Confirm the accuracy of premiums quoted at sign-up. Contracts should specify the procedures to be followed if producers do not provide sufficient premium payments;
- Notify producers of premium amounts and provide invoices;
- Receive premium payments;
- Record payment or non-payment;
- Notify producers of payment receipt;
- Notify producers of a policy cancellation if premium payments are not received;
- Notify regulators and other risk bearers as required.

5.5.3. Loss Adjustment refers to the process of verifying that actual harvest yields are below indemnity trigger yields. This is one of the most critical factors in developing a successful crop insurance program. Stakeholders must:

- Review loss adjustment procedures, operations, infrastructure, and personnel;
- Inform producers of loss notification procedures;
- Provide a mechanism to receive producer requests for loss adjustment;
- Delineate and implement field inspections if required;
- Adjust, document, and record losses;
- Inform producers of preliminary estimates of indemnity payment.



5.5.4. Indemnity Payment. When actual harvest yields (or revenues) are below the indemnity triggers, an indemnity payment is owed. Indemnity payment amounts are determined by the difference between actual yields (or revenues) and the indemnity trigger multiplied by the price at which the commodity is valued. Several procedures for distributing indemnity payments must be followed:

- Review, document, and record indemnity calculations based on loss adjustments;
- Pay indemnity to producers;
- Notify and invoice risk-bearing partners;
- Receive payment from risk-bearing partners;
- Record payment from risk-bearing partners in database;
- Record producer indemnity payment in database

5.5.5. Final Steps. A variety of procedures need to be followed annually for the successful completion of a crop insurance cycle.

- Fulfill regulatory requirements;
- Analyze program performance;
- Prepare appropriate reports;
- Prepare for next year.

5.6. Example

The following terms are used to illustrate a simple crop insurance example:

- **Expected Yield:** A producer's average historical yield;
- **Price:** Price per unit of output used to calculate premiums and indemnity payment;
- **Deductible:** A percentage of loss absorbed by a producer prior to qualifying for an indemnity payment.
- **Coverage:** The portion of the crop that is insured:

$$\text{Coverage} = 1 - \text{Deductible}$$

- **Indemnity Trigger:** The yield level that triggers an indemnity payment:

$$\text{Trigger Yield} = \text{Expected Yield} \times \text{Coverage}$$

- **Liability:** The maximum indemnity payment:

$$\text{Liability} = \text{Trigger Yield} \times \text{Price}$$

- **Pure Risk Premium Rate:** Expected indemnity payments as a fraction of liability.
- **Load Rate:** The cost of providing insurance in excess of the pure risk premium rate.
- **Total Premium Rate:**

$$\text{Total Premium Rate} = \text{Load Rate} + \text{Pure Risk Premium Rate}$$

- **Total Premium:** The total cost of insurance:

$$\text{Total Premium} = \text{Liability} \times \text{Total Premium Rate}$$

- **Producer Premium:** The producer's cost of insurance:

$$\text{Producer Premium} = (1 - \text{Subsidy Rate}) \times (\text{Total Premium})$$

- **Subsidy Rate:** The fraction of total premium paid by the government;
- **Indemnity:** Compensation for yield before indemnity trigger.

Example: Assume a producer buys an individual yield-based insurance product with the following attributes:

Deductible = 40%

Pure Risk Premium Rate = 0.87%

Load Rate = 3%

Subsidy Rate = 25%

Price of Output (wheat) = 1.0

1 hectare is insured

Liability is based on expected yields. Suppose that the producer has the following production history:

Year	Historical Yield (tons per hectare)
1	2.7
2	3.6
3	2.4
4	3.3

In this case, Expected (or average) yield = 3.0 tons/ha

Expected yields are sensitive to sample size. Many countries use as little as four years of data, while others use as many as ten or more years to calculate expected yields. Fewer years of data are subject to outlier (extreme) observations. When longer samples are used, it may be important to account for yield trends resulting from technological change. In our example:

$$\text{Liability} = (\text{Expected Yield}) \times (\text{Coverage}) \times (\text{Price}) \times (\text{Area}) = (3 \text{ tons / ha}) \times (1 - 0.4) \times (\$1 / \text{ton}) \times (1.0 \text{ ha}) = \$1.80$$

$$\text{Total Premium Rate} = (\text{Load Rate} + \text{Pure Risk Premium Rate}) = (3\% + 6\%) = 9\%$$

$$\text{Total Premium} = (\text{Liability} \times \text{Total Premium Rate}) = (\$1.80) \times (0.09) = \$0.162$$

$$\text{Subsidy} = (\text{Subsidy Rate}) \times (\text{Total Premium}) = (0.25) \times (\$0.162) = \$0.0405$$

$$\text{Producer Premium} = (1 - \text{Subsidy Rate}) \times (\text{Total Premium}) = (0.75) \times (\$0.162) = \$0.1215$$

$$\text{Trigger Yield} = (\text{Coverage}) \times (\text{Expected Yield}) = (1 - 0.4) \times (3 \text{ tons/ha}) = 1.8 \text{ tons/ha}$$

If actual yield is greater than the indemnity trigger, no indemnity will be paid. In our example, if the actual yield is 2.0 tons/ha, then an indemnity is not generated. If actual yield is less than the indemnity trigger, however, then an indemnity is due. Suppose that the actual harvest yield total 1 ton per hectare. Then, the indemnity payment would be calculated as:

$$\text{Indemnity} = (\text{Trigger Yield} - \text{Yield Outcome}) \times (\text{Price}) \times (\text{Area}) = (1.8 \text{ tons/ha} - 1 \text{ tons/ha}) \times (\$1/\text{ton}) \times (1.0 \text{ ha}) = \$0.80$$

Part 2: Foundational Concepts

6.0. Actuarial Methods

Actuarial Methods refer to processes by which insurance premiums or rates are established. These premiums must be sufficient to compensate insurers and reinsurers for expected indemnities, costs of providing insurance services, business risk, and profit.

Assume a producer is interesting in purchasing a yield insurance product with the following characteristics:

Acreage = 1 hectare

Price = 1 UAH per ton

Deductible = 40%

In addition, the producer has the following yield history, for which the indemnity trigger and payments are:

Table 1. Simple Rating Example for Yield Insurance

Year	Yield Outcome	Indemnity Trigger	Indemnity Payment
1	2.70	1.8	0.00
2	1.72	1.8	0.08
3	3.24	1.8	0.00
4	4.28	1.8	0.00
5	4.20	1.8	0.00
6	4.73	1.8	0.00
7	0.32	1.8	1.48
8	2.77	1.8	0.00
9	4.10	1.8	0.00
10	1.92	1.8	0.00

This results in:

Expected Yield = *Mean Yield* = 3

and

Coverage = $(1 - deductible) = 60\%$

6.1. Pure Risk Rate

Liability represents the maximum possible indemnity payment in any given year. In this case, the liability is calculated as:

Liability = *Indemnity Trigger* x *Price*

Given that *Price* = 1.0,

Liability = 1.8 x 1.0

The **Pure Risk Rate** is calculated as the quotient of the expected indemnity payment and the liability:



$$\text{Pure Risk Rate} = \frac{\text{Expected Indemnity Payment}}{\text{Liability}} = \frac{0.156}{1.8} = 0.087$$

It should be noted that this example is presented only for illustrative purposes. Ten observations is an insufficient sample size for calculating pure risk rates. In cases of small samples, other methods must be used to determine pure risk rates, including expert judgments, experimental data, and comparisons to other crops and regions.

6.2. Loads and Total Premium Rates

Loads are additions to pure risk rates that compensate insurers for additional costs and risks. Consequently, loads are product-specific because more risk may be associated with different crops or even different producers. Commodities that are highly seasonal, possess small market shares, have little historical data, or are thinly traded often require high loads. Loads are commonly included in premiums to offset:

- **Rating confidence.** Loads are increased for insurance products that have been rated using low-quality data or questionable methodologies;
- **Insurance servicing.** Loads are larger for products requiring high monitoring costs, frequent review, audits, and smaller insurance markets;
- **Political, judicial, and other risks.** Loads are larger in regions in which clear and enforceable property rights are problematic;
- **Structural change.** Loads are larger for products and commodities subject to policy or technological changes.



Loads are sometimes a function of cost estimates that are based on contract servicing and historical performance of other insurance products. However, loads often result in subjective judgements of those involved in actuarial rating.

Loads can be applied to premium rates either as a proportion of a premium rate or as a fixed addition to a premium rate:

Proportional loads are added to a pure risk rate as:

$$\text{Total Rate} = (\text{Pure Risk Rate}) \times (1 + \text{Load})$$

Fixed addition loads are calculated as:

$$\text{Total Rate} = (\text{Pure Risk Rate}) + (\text{Load Rate})$$

6.3. Rating Methods

Several formal methods are used to rate crop insurance products including empirical, parametric, combined, and spatial smoothing approaches. In general, the quantity and quality of historical data dictate the choice of rating method.

6.3.1. Empirical Rating Methods use historical data to calculate premiums. The preceding example used an empirical rating method.

6.3.2. Parametric Rating Methods use specific probability distributions rather than empirical distributions (actual data) to establish premium rates. Parametric rating methods are often used in cases where historical data are not of sufficient quantity or quality to allow the use of empirical rating methods. The most common probability distributions used to rate insurance products include normal distributions, uniform distributions, and extreme value distributions.

6.3.3. Combined Approach. Empirical and parametric rating methods are often combined to develop premium rates when data are available. After using each method, the two rate outcomes are compared. If both methods generate similar results, then insurers can be reasonably comfortable with the rating procedures. The uniform distribution may be used to develop an upper bound on premium rates.

6.3.4. Rating Methods with Limited "On Site" Data. Historical data are often limited, so a variety of other methods may be used to establish premium rates. These rates usually include relatively high loads. These methods include special smoothing, rates from biologically similar crops, rates from regions with similar growing conditions, use of conservative parametric approaches, and subjective opinion of crop insurance experts.

In general, it becomes difficult and expensive to reinsure risks if high-quality data are unavailable.



7.0. Data Management and Accounting

Data collection, analysis, and management are central to the success of any insurance program. Data are used to evaluate and rate products, reinsure risk, detect fraudulent activities, adjust public policies, and measure success. Moral hazard and adverse selection in multiple peril crop insurance products make data management even more important.

7.1. Data Needs

Data and educational efforts are required by:

- Farmers and farm organizations;
- Private primary insurance providers;
- Reinsurance companies;
- Government agencies managing and/or operating crop insurance programs;
- Regulatory agencies and/or oversight boards;
- Policy makers.

7.1.1. Producers. Farmers and farm organizations need data and information to:

- Decide whether they want or need agricultural insurance products;
- Select which products to use, coverage levels, and deductibles;
- Determine eligibility and size of indemnity payments;
- Meet sign-up deadlines and respond to loss adjustment requests;
- Evaluate the performance of insurance products over time and assess whether they provide sufficient risk protection.

7.1.2. Primary Insurance Providers need data to:

- Service products;
- Establish premium rates;
- Pay indemnities;
- Establish performance benchmarks and monitor performance;
- Monitor individual farm losses to identify fraud and high risk producers;
- Conduct research, develop new products, and modify existing products;
- Provide product and financial information for internal and external audits;
- Receive government reimbursements for service costs and premium subsidies;
- Meet the information and performance benchmark requirements of reinsurance companies;
- Resolve disputes.

7.1.3. Reinsurance Companies need data to:

- Evaluate risk of agricultural insurance portfolios;
- Establish reinsurance premium rates;
- Service reinsurance contracts.



7.1.4. Government Agencies need data to:

- Service and operate programs;
- Regulate issuing agencies and reinsurers;
- Research, develop, and improve products;
- Establish product performance benchmarks;
- Evaluate product performance against benchmarks;
- Meet data requirements for internal and external audits;
- Calculate and disburse premium and service subsidies;
- Resolve disputes and manage dispute resolution procedures.

7.1.5. Regulatory Agencies and Oversight Boards need information to:

- Establish benchmarks for program and product performance;
- Evaluate program and product performance;
- Evaluate dispute resolution procedures;
- Evaluate proposed new products and changes to existing products;
- Provide policy makers with information on program performance.

7.1.6. Policy Makers need data and information to:

- Establish performance benchmarks for program participation among farmers and for budgetary expenditures;
- Evaluate program performance;
- Determine and monitor subsidy funding levels and related budgetary expenditures.

7.2. Collecting Data

Data need to be collected from several entities including farms, primary insurance providers, and private and public third parties.

7.2.1. Farm-Level. Individual yield and revenue insurance products require a great deal of data including:

- Crops produced, areas planted to specific crops, crop production practices, field locations, and yield histories;
- Farm locations, names of insured farmers or landowners, and farm or farmer identification codes;
- Insurance product choices, including coverage levels, price elections, deductibles, co-payment choices, reseeding options, quality riders, and prevented planting selections.

7.2.2. Primary Insurance Providers must collect and manage data on:

- Program and product participation (e.g., numbers of contracts by product, program, region, total area covered, total liability, coverage levels and price election selections);
- Premium rates and revenues;
- Current year yields by farm, program, product, and region;
- Indemnity payments by product and region;
- Retained risk and reinsured risk;
- Retained earnings;
- Surplus position of accounts;
- Product and program service costs.

7.2.3. Private and Public Third Parties. Government agencies, international organizations, universities, research institutes, and other private companies gather data. Producers and insurance providers often access third-party data that may have been collected for non-crop insurance reasons. In the United States, Canada, and the United Kingdom, government agencies collect data on:

- Historical production data by county and region (often needed to establish premium rates and for other actuarial purposes);
- Weather and other proxy index data (needed for area-based insurance products);
- Historical and current crop and livestock prices (by county, state, region, and country);
- Plant pathology and other biological data;
- Experimental plot data for crops.

7.3. Storage

Agricultural insurance programs are data-intensive, so data storage is important for maintaining program integrity. Ideally, all insurance information should be stored and managed at a central location trusted by all stakeholders. Farm-level, product performance, and company performance data should be collected and maintained for all years. Storage issues that must be addressed include:

- Where will data be stored?
- Where will multiple data backups be stored?
- How will data security be managed?
- How will data be formatted for storage and accessibility?
- What security measures need to be implemented?
- Who will have access to data?
- What quality control measures will be used when entering data?

7.4. Access

Data confidentiality must be strictly maintained and access limited to relevant parties. Storage redundancy is essential to prevent data loss resulting from accident or malfeasance.² If trust between government, private insurance companies, farms, and farm organizations is at issue, then storage must be provided by a trusted third party.

If data are stored at a central location, then all program participants should be granted access to summary data and to their own confidential data, but not to other participants' confidential data. Oversight boards and regulatory agencies should have access to such confidential data as has been agreed to by all parties. Confidentiality rules must be strictly adhered to under penalty of law.

7.5. Business Operations

7.5.1. Document Storage (Signed Policies) and management are important aspects of insurance programs. Details to be considered include:

- Who is going to store signed insurance contracts?
- Will insurance contracts include references to other documents or will they be self-contained agreements?

Documents must be signed and stored, and duplicates should be maintained in a separate secure place.

7.5.2. Business Processes. Building confidence in crop insurance programs requires the development and adoption of solid business processes. Businesses must:

- Educate producers so that they understand products prior to purchase;
- Recognize and minimize hidden costs to farmers, auditors, and managers.
- Reduce unnecessary costs.

² Data redundancy means keeping data in multiple places and retaining the original paper file, not relying solely on electronic data.

8.0. Underwriting and Loss Adjustment

Underwriting and loss adjustment are cornerstones of successful agricultural insurance programs. Underwriting refers to the details involved in preparing crop insurance contracts including definitions, processes, rating, and dispute resolution issues. Loss adjustment refers to the processes used to report, verify, quantify, and document losses resulting from insured perils.

8.1. Underwriting

Underwriting represents the processes used to quantify and qualify insurance portfolio risks. **Quantifying** risk involves developing risk measures for sub-populations or individuals. This value is then translated into premium rates for individual producers. **Qualifying** risk refers to identifying reasons for risk differences and assessing the accuracy of assigned risks. Differences in production practices among individual producers may provide important actuarial differences but, in other cases, these differences may be unimportant for assessing risk.

Agricultural insurance underwriting is used to identify individual producer risk within a region and insurance portfolio. Underwriting is also necessary for transferring risk to the reinsurers.

Underwriting is a critical element of crop insurance programs. The following issues must be addressed by underwriting activities:

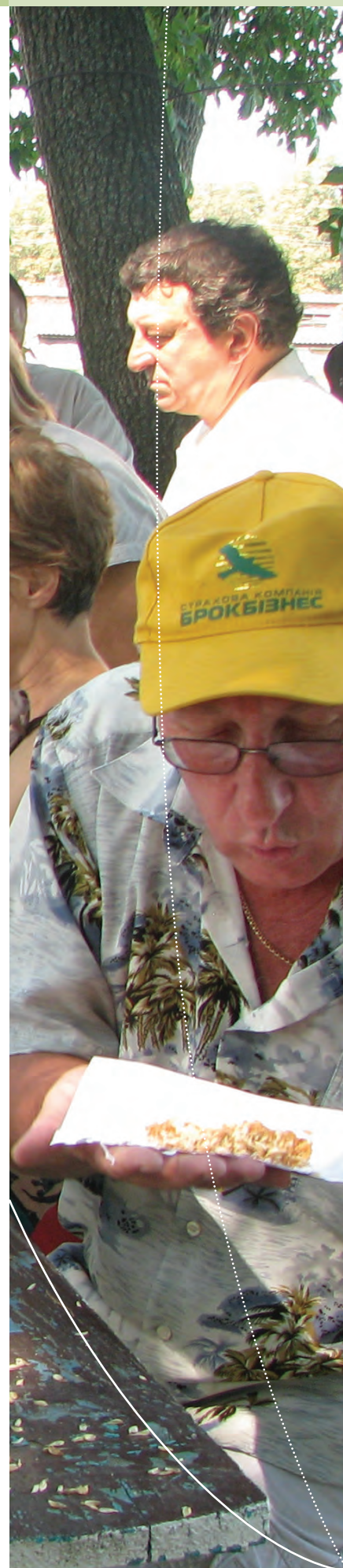
- Are underwriting activities conducive to responsible business practices?
- Should all products be underwritten using identical procedures?
- Are underwriting activities producing products that can be supported by existing institutional structures?

Underwriting requires that farmers be categorized into subpopulations or pools within an overall insurance portfolio. This process must be accomplished before insurance products are offered.

Program and product design often determine the focus of underwriting. Substantially different underwriting processes are needed for developing individual producer-based products versus proxy index products.

Developing and writing policies with a high degree of accuracy is a complex and time-consuming process. Policies are binding contractual agreements. Therefore, they must necessarily be written in technical terms to reduce ambiguity. Supplemental materials must be available to producers and insurance agents that explain policy details. Developing these materials must be done by individuals familiar with educating agricultural producers. The legal ramifications of selected wording are critical to maintaining policy integrity and minimizing disputes. Input from competent individuals including legal professionals, actuaries, insurance professionals, business managers, and others with agricultural expertise is frequently required during the underwriting process.

For individual-based products, underwriting must define the actual crop being insured. For example, one cannot insure a general crop called "wheat" because of differences in spring wheat, winter wheat, and durum wheat yields and prices. In addition, differences exist among wheat varieties in terms of production practices and yields.



Insured acreage must also be defined. For example, will all of a producer's acreage be insured by a single contract, or will producers be allowed to divide acreages based upon various insurable units? Minimum farm sizes may be stipulated for crop insurance eligibility.

Finally, underwriting must identify those who are eligible to purchase insurance (e.g., landowners, producers, trusts, etc.). If a product is designed to allow landowners to buy insurance, there must be some way of underwriting different risks and tracking rental agreements between farmers and landowners. There may also be different sub-contracts on the same farm if, for example, two individuals in the same family unit own different portions of the farm and manage them independently.

Underwriting index-based products is relatively easier than individual yield-based products. However, even with index-based programs, underwriters must determine crop ownership (eligible farmer), whether the crop is actually grown (eligible farmer), liability limits, proxy index descriptions, and product design and rating as well as consider regulatory and subsidy rules.

8.2. Loss Adjustment

Loss adjustment refers to the process of reporting, measuring, and validating losses that are covered by an insurance contract.

8.2.1. Procedures. In agricultural insurance, loss adjustment is required to assess claims, monitor field management, gather and verify data, perform underwriting activities, educate farmers, and conduct field research.

Loss adjusters verify yield outcomes provided by producers in both claim and non-claim years. Since non-claim year yields are used to update expected yields and indemnity triggers, these yields must also be verified annually. Producer involvement in the loss adjustment process limits appeals and improves dispute resolution outcomes.

Most crop insurance programs require pre-harvest adjustment.

During pre-harvest inspections, loss adjustors should:

- Determine crop type, location, and size (mapping);
- Review farm management practices;
- Identify cropping practice anomalies;
- Identify the stage of a crop relative to insurance policy specifications;



- Establish locations of plot samples for estimating production (including mapping locations and results of plant counts);
- Identify insurable and not insurable causes of loss;
- Collect field data;
- Verify/quantify loss prior to harvest;
- Fill out, record, and submit required forms.

Loss adjustment procedures are often tailored to specific product features. This is especially the case for products that include reseeding compensation, prevented planting (unseeded acres) benefits, or winter kill benefits.

8.2.1.1. Biological Versus Sample Harvest. The usual approach to loss adjusting involves a biological assessment. In these cases, a loss adjuster evaluates small portions of damaged fields to assess yield losses. Adjusters generally count the number of plants and amount of production remaining in each plant. These data are used along with row spacing to determine the potential yield of a field. Finally, adjusters often look for signs of damage such as kernels of small grains lying on the ground which cannot be profitably harvested. The process is designed to ascertain the potential and actual yield of a crop.

Although used less often, some insurance programs allow loss adjusters to conduct sample harvests to determine actual yields. In this case, adjusters actually harvest a portion of a field and measure the output to determine harvest yields. Of course, if adjusters have to use their own harvesting equipment to make this determination, the process can be very costly. On the other hand, the use of a farmer's harvest equipment presents additional challenges. That is, an adjuster would need to be knowledgeable about the operation and calibration of a wide variety of harvesting equipment to obtain accurate yields.

Measuring the amount of output in storage represents a combination of these two approaches. That is, a loss adjuster may measure the amount of output in storage to determine yields. However, this approach assumes that an accurate measure of previously stored crops can be obtained. But, it is often difficult to identify the source of stored commodities. Furthermore the adjuster needs to verify that all of the production was stored.

8.2.2. Dispute Resolution Systems are similar in Canada and the United States. After a loss adjuster determines the extent of a loss, a producer who disagrees with the decision can request that a second, more senior, loss adjuster provide an opinion. The producer can either accept the second judgment or submit an appeal to an arbitration committee. These committees are usually formed within the region of the dispute and consist of one person from the board of directors and several farmers trained in dispute resolution. Both the farmer and insurer present evidence supporting their positions and the committee renders a decision. Although producers can submit the dispute to the court system, courts often side with the decision made by the committee unless procedural errors were made.

Canadian loss adjusters are employees of the government agency that provides crop insurance services. Therefore, they do not need to insure themselves against professional liability. In the United States, however, loss adjusters are independent contractors. However, they are considered similar to government employees because they act on behalf of the government. Adjustors are generally protected from civil liability involving simple mistakes. However, adjusters who commit fraud are subject to criminal prosecution.



9.0. Reinsurance

Reinsurance is a major component of a well-functioning crop insurance program. In the U.S. program, total liabilities are distributed across several entities. Ignoring the government's assigned risk pool, primary insurers carry between 0-5% of crop insurance risks, reinsurers hold between 20-25%, and the government assumes 70-75%. In terms of historical indemnity payments, primary insurers pay 4-8% of all indemnities, reinsurers pay 92-96%, and in recent years, the U.S. government has paid 0%.

If the 14% of all policies assigned to the U.S. government's risk pool (a pool of the highest risk contracts) are included, then primary insurers pay 3-7% of all indemnities, reinsurers pay 86-90%, and the U.S. government has paid 6-7% in recent years.

For well-developed insurance programs in which there is broad participation across many agricultural sectors, it would be highly unlikely that total indemnity payments in a given year would exceed three times total annual premiums.

9.1. Introduction to Reinsurance

Reinsurance refers to the transfer of risk from one company (e.g., an issuing agency or primary insurer) to another insurance company (e.g., a reinsurer) or a government. Crop insurance products would not be viable without an effective reinsurance market.

Reinsurers are usually large insurance companies that are well-diversified across space, sector, and types of insurance. Diversification by space means that these companies operate in many countries and regions around the world. Diversification by sector means that these companies insure a variety of economic sectors including housing, commercial property, and real estate. Diversification by insurance type occurs through reinsuring agricultural production, property, casualty, health, and life insurance products. Reinsurance companies must be sufficiently large to bear multiple major risks and manage diverse portfolios.

By their very nature, crop insurance products attempt to insure producers against both individual (e.g., hail) and region-wide events (e.g., drought). Region-wide adverse weather events result in many large indemnity payments in one year and few indemnities paid in other years. Issuing agencies usually do not have sufficient financial reserves to absorb years of high indemnity payouts. Issuing agencies have an undiversified insurance portfolio because of the specialized nature of crop insurance and regional events. Therefore, reinsurance is particularly important for crop insurance programs because a region-wide event would likely deplete the cash reserves of issuing companies. In addition, most issuing companies are not diversified to the point where they can manage these substantial risks. Reinsurance companies have sufficient cash reserves and portfolio diversification to underwrite region-wide events because they operate across many regions.



9.2. Reinsurance Rating

Reinsurers must determine the price at which they are willing to accept risk from issuing agencies. Similar to the provision of crop insurance, reinsurers must also rate the risks that they are accepting. Reinsurance rating is a function of the underlying probability distribution of indemnity payments, types of insurance being considered, costs of providing reinsurance services, and public policies surrounding insurance programs.

Reinsurance companies rely on brokers to obtain business opportunities. Brokers are enlisted because they often have better understanding of issues, interests, and opportunities in specific areas. Brokers organize reinsurance business proposals for reinsurance companies.

9.2.1. Types. There are several types of reinsurance and relationships between reinsurers. It is rare for a primary insurance company to be owned by a reinsurer.

9.2.1.1. Co-payments, Coinsurance, or Percentage Participation. Co-payments (or Co-pays) refer to the proportional sharing of losses between a primary insurance company and reinsurers.

If one reinsurance company accepts 40% of indemnity payment risk and another accepts 60%, then the two companies will share indemnity payments on a 40/60 basis.

Even in a system with co-payments, the primary insurance company may be required to pay a deductible -- often as little as 5% of the liability. The deductible represent the amount of loss the primary insurance provider sustains prior to loss responsibility transfer to reinsurer. If the primary insurer has no deductible or co-pay responsibility, reinsurance rates are disproportionately large and reflected in reinsurance premiums.

9.2.1.2. Stop-Loss is an amount at which remaining indemnity payments are transferred to another entity. In general, only governments (with their vast resources and public policy mandates) are willing and able to accept large indemnity risks. Without stop-loss agreements, reinsurance companies would generally not be willing to reinsure agricultural insurance risks. In many cases, stop-loss levels are set at three to five times total annual premiums.

9.2.1.3. Layered, Stacked, or Tranched Reinsurance refers to situations in which the first component of risk is accepted by one entity before a second entity accepts any risk. Layered reinsurance may be defined in either percentage terms or fixed amounts. Each entity is responsible for a certain amount of loss based on a hierarchical structure.



Example: Proportionally Layered Reinsurance: \$1,000,000,000 liability.

Entity	Loss Responsibility	
	Percentage	Amount (million dollars)
Primary Insurer	5%	50
Lead Reinsurer	15%	150
Secondary Reinsurer	20%	200
Government	60%	600

This example provides an illustration of proportionally stacked reinsurance. The primary insurance provider accepts the initial 5% indemnity risk (i.e., indemnity payments), the lead reinsurer accepts the next 15%, a secondary reinsurer accepts the next 20%, and the government accepts the last 60%. Total liability is \$1 billion. In this case, if indemnity claims in any given year total 5% or less of total liability, only the primary insurer would pay indemnity claims (up to a total of \$50,000,000). However, if claims exceed \$50,000,000 but are less than \$200,000,000 (less than 20% of total liability), then the primary insurer's total indemnity liability would be limited to \$50,000,000, and the lead reinsurer would be responsible for the remaining \$150,000,000. The second reinsurer would be responsible for the next \$200,000,000 of liability, and the final \$600,000,000 would be the responsibility of the government.

Example: Fixed Layered Reinsurance: \$1,000,000,000 liability.

Situation	Total Indemnities Paid	Loss Payment (in millions of dollars)			
		Primary Insurer	Lead Reinsurer	Secondary Reinsurer	Government
A	50	50	0	0	0
B	125	50	75	0	0
C	300	50	150	100	0
D	500	50	150	200	100

This example illustrates a situation in which indemnities are distributed based upon fixed amounts. Situation A represents a case in which total indemnity payments would equal \$50,000,000. A primary insurer may be responsible for the entire amount. However, situation B requires total indemnity payments of \$125,000,000. In this case, the primary insurer's responsibility would be limited to \$50,000,000 and the lead reinsurer would pay the remaining \$75,000,000. For situations C and D, total indemnities paid are \$300,000,000 and \$500,000,000, respectively.

9.2.2. Costs. Primary insurers negotiate with reinsurers over the cost and terms of reinsurance. Primary insurers want to pay the lowest possible price for reinsurance while transferring the largest amount of risk possible. Negotiations focus on many factors including pure risk premiums, loads, servicing costs, program design, program integrity, transparency and auditing, political, judicial, and legal issues, personnel competency, fraud detection and control, and the reputations of involved parties.

9.3. Insurance Pooling

Primary insurers pay reinsurers to accept much of the risk incurred through the sale of insurance contracts. The price that primary insurers pay to transfer this risk depends on several factors, including the degree to which their product sales, business procedures, and loss adjusting activities are standardized across products, regions, and companies. In addition, the price of reinsurance depends upon the amount of risk the primary insurer is willing to retain and whether the issuing company decides to retain or transfer servicing activities and data management.

9.3.1. Standardized Products. Crop insurance programs often offer a variety of products including multiple-peril yield and revenue products, individualized products, area-wide products, and proxy insurance products. In many cases, different products are offered for similar crops in different regions. This is certainly the case for companies that operate on a global scale. The degree to which similar products can be bundled for sale to a reinsurer greatly affects the price of risk transfer. Standardization reduces reinsurers' technical, monitoring, and management costs. Hence, the transfer of risk from homogeneous products is less costly for a primary insurer relative to that arising from the servicing of heterogeneous products.

9.3.2. Standardized Business Procedures. Reinsurers are also willing to accept risk from primary insurers at lower costs if the latter's business procedures are relatively standardized across products. Similarity among accounting and reporting procedures, sales strategies, auditing, cash flow management, premium collections, and indemnity payments contribute to lower reinsurer costs. Thus, primary insurers need to develop and deliver products within pre-established, standard business practices. Such activity also contributes to developing transparency and confidence in business systems.

9.3.3. Standardized Loss Adjusting. Similarly, standardized and well-documented loss adjusting is important for reducing reinsurance costs. Of course, loss adjustment approaches will differ across products (e.g., multiple-peril yield insurance versus proxy insurance products). However, similar loss adjustment procedures certainly need to be promoted within classes of products, and when possible, across crops.

9.3.4. Pool Risk Retention and Transfer. Reinsurers often require that at least the first 5% of crop insurance liability remain with the primary insurer. In essence, this acts as a deductible for the reinsurer and helps reduce moral hazard and adverse selection issues related to primary insurers. In addition, the provision of co-payments, co-insurance, or percentage participation helps reduce concerns of moral hazard behaviour and reduces the risks incurred by reinsurers. Such reductions reduce fees charged by reinsurers to accept risk.

9.3.5. Alternative Risk Transfer Mechanisms. Insurance pooling also involves various approaches to transferring risk. In some cases, insurance providers facilitate stop-loss and risk sharing with governments. In other cases, primary insurance providers agree to continue servicing contracts, even though most of the risk associated with those contracts has been transferred to a reinsurer.



10.0 Illicit Behaviour

Unfortunately, crop insurance often provides an opportunity for illicit behaviour. Strong underwriting, product management, and appropriate management can minimize the undesirable behaviour.

Various potential sources for illicit behaviour including moral hazard, adverse selection, and fraud exist within all insurance programs. Some of this behaviour is especially relevant for crop insurance products.

10.1 Moral Hazard

Moral Hazard occurs when producers act in ways that increase the possibility of receiving indemnities. Specifically, moral hazard refers to actions taken by producers that would not occur in the absence of crop insurance. In general, moral hazard does not refer to fraudulent activities.

Example: Producers often have options regarding the quality of seeds used to produce a crop. Higher quality seed produces better yields but is more expensive. Lower quality and lower priced seed often results in lower yields. If a producer has purchased a yield-based insurance contract, the incentive to use lower cost and lower yielding seed is increased because resulting low yields would be somewhat offset by indemnity payments. Additionally, producers who have purchased crop insurance may be less diligent in monitoring weed and insect infestations or may be less attentive to irrigation timing or harvesting efforts.

The degree of moral hazard varies with program design. Potential for moral hazard is higher in individual-yield insurance products that are based on small areas of a farmer's land. Almost no moral hazard occurs with area yield, area revenue, or proxy index insurance products.

Moral hazard is usually the result of asymmetric information. Asymmetric information refers to cases in which one party (usually a producer) takes advantages of having more information regarding yield variability than another party (usually an insurance company). If such asymmetries exist, then insurance contracts must be carefully written to reduce moral hazard effects.

Moral hazard impacts can be reduced in a variety of ways. The first and most obvious solution is through careful monitoring, but intensive monitoring is expensive and adds to the costs of providing insurance products. These costs must either be covered through higher premiums or increased subsidies.

Another possible solution is to use indemnity triggers that cannot be altered by the insured. Area yield, revenue, and proxy index products reduce moral hazard for this reason. Finally, the use of high deductibles or co-payments reduces the effect of moral hazard. Moral hazard activities typically occur when actual harvest yields are close to indemnity triggers. Increases in deductibles or co-payments reduce the likelihood that a producer is near trigger levels.



10.2 Adverse Selection

Adverse Selection occurs when different parties have access to different information. In general, asymmetries occur when the insured has more information regarding yield potential and distributions than an insurer.

Producers of identical crops may face different risks but often share similar premium schedules. Insurance providers are often not able to distinguish between high-risk and low-risk producers, but high-risk producers are more willing to buy insurance than low-risk producers. Hence, insurance providers often find themselves with a large pool of high-risk producers who are paying premiums that were calculated based on both high- and low-risk participants.

Adverse selection may be reduced if pools can be formed so that the risk within each pool is more homogeneous and rated accordingly. Often, pools are formed by region, by crop, and by different yields.

Compulsory insurance participation almost completely eliminates adverse selection. Cross-compliance requirements often generate similar results. Proxy index products also reduce adverse selection outcomes. However, other selection issues can occur if certain individual producers' yield outcomes are relatively uncorrelated with the proxy trigger process. A producer's risk aversion level will encourage participation if indemnity payments are highly correlated with losses.

10.3 Participation Erosion

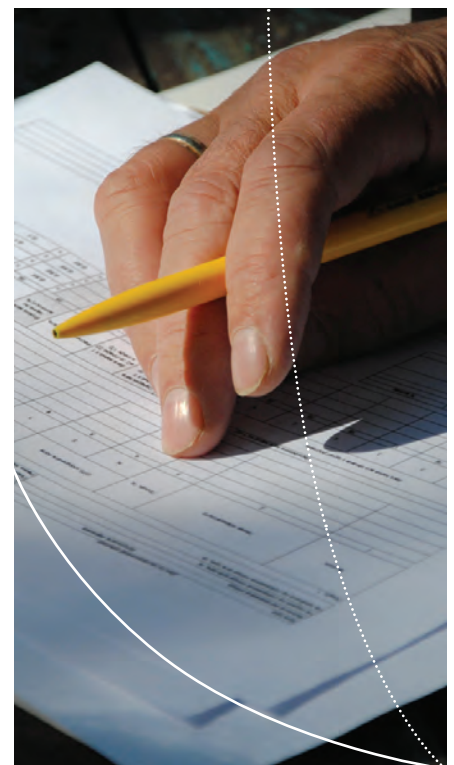
Participation Erosion occurs when insurance providers respond to moral hazard or adverse selection issues by increasing premium rates. However, higher premiums provide incentives for the lowest risk producers to exit the insurance pool, resulting in a pool with a relatively higher proportion of high-risk producers. As the process repeats, insurance premium rates must be raised to the point where only the highest-risk producers will purchase insurance. Participation erosion can eventually make providing insurance impossible.

There are several ways to reduce participation erosion. Separating producers into different risk pools can help. For example, if one can identify high- versus low-risk producers, these groups can be segregated which allows premiums to be calculated commensurate with actual risk incurred. Historical yield variability is one way to segregate producers by risk profile. Additionally, governments can subsidize premiums so that insurance is desirable to all producers. Another option is to assume varying levels of risk aversion based upon socioeconomic characteristics. For example, subsistence farmers are often highly risk averse because a single poor yield can result in starvation.

10.4 Fraud

Fraud occurs when producers attempt to increase indemnity payments by violating their insurance contracts. Crop insurance fraud most frequently occurs when producers underreport yields, manipulate yield histories, or bribe loss adjusters. A variety of methods have been developed to detect fraud, including:

- Actively monitoring crop progress and harvest yields;
- Scrutinizing data for anomalies in yield reports, indemnity payments, and location yield correlations;
- Designing products that reduce potential for fraudulent activities (e.g., proxy index and area-based products);
- Strictly enforcing rules and regulations and assigning high penalties for fraud. Effective and well-publicized fraud detection programs must be developed in conjunction with insurance program designs.



11.0 Government Responsibilities

Government provides a variety of insurance services even if the program is largely implemented by the private sector.

11.1 Regulation

A major component of public policy with respect to crop insurance involves regulation. Public policy must enhance and guarantee contract enforcement among insurance providers, reinsurers, and the insured. Insurance contracts must be consistently adjudicated. The adherence to contract law provides necessary transparency and confidence in agricultural insurance programs.

The financial integrity of primary insurers is critical to a successful agricultural insurance program. Insurers must maintain accurate records of policy contracts, premium collections, subsidy transfers, and loss adjustments. In addition, firms must have adequate financial reserves to conduct business and provide indemnity payments promptly. Government agencies or third parties must monitor the financial business practices of primary insurers.

11.2 Audit and Oversight

Public policy is directly involved in auditing and oversight functions. A major auditing function is to guarantee that primary insurers and reinsurers will meet their accepted responsibilities. In addition, public policy must also be sufficient to meet government commitments regarding stop-loss, reinsurance, or subsidy provisions.

Subsidy payments represent a transfer of resources from taxpayers to agricultural producers and/or insurance companies. Therefore, the flow and use of these funds must be monitored to guarantee the integrity of the process. The process must be transparent so that taxpayers can see that funds are used as intended. Public policy must provide oversight with respect to both the delivery and use of subsidies. Because government resources are limited in terms of financial and personnel resources, it is important to identify essential government roles and activities. If not performed by governments, these roles must be performed by private or third-party entities.

If a variety of insurance and reinsurance companies are involved in product design and administration, it is likely that premium rates will differ—even for identical or similar products—as a result of unique rating rules, profit goals, risk preferences, and financial resources. Consequently, it may be necessary to rationalize these differences across companies, products, and regions. In addition, primary insurers have incentives to overstate premium rates on products that receive government subsidies.

Government agencies generally perform many of the above functions, but third-party groups may perform some tasks which lessen the burden on government agencies and provide access to additional expertise. The use of third parties may also be more cost-effective.

In some countries, insurance companies are reviewed and monitored by third-party auditors during normal business operations. If conflicts of interest can be avoided, these auditors can also help monitor issues related to crop insurance accounting. Check-off dollars from each policy may be deposited into an account that helps pay for third-party monitoring. A reserve pool can also be used as insurance against default by any single insurance company.



Equitable agricultural insurance programs treat all participants fairly and impartially. Equity cannot be achieved unless decisions are made and implemented consistently. Transparency and consistency are necessary for fairness, which is only achieved if all participants clearly understand the tradeoffs and details of crop insurance products.

In addition, programs must be monitored to guarantee consistent application and enforcement of rules. Monitoring must include:

- Internal audits of loss-adjusting standards;
- Processes that prevent “profit” from affecting loss adjusting results;
- The use of independent loss adjusters;
- Third-party external auditing.

11.3 Judicial and Legal

Country-specific judicial and legal systems must fairly enforce contract and property right law. Contracts must be consistently enforced regardless of insurance provider or the insured. Enforcement must be equitable for all parties and individuals.

Government agencies need to be involved in enforcing contractual agreements. In addition, government involvement in arbitration may be desired.

11.4 Subsidies

Public policy must define the role and scope of agricultural insurance subsidies. For example, it is possible to provide subsidies directly to producers or indirectly through insurance or reinsurance providers. Policy makers must decide whether goals are best met through subsidizing insurance premiums and/or through the provision of administration and operating resources directly to insurers. Reinsurance companies are generally interested in accepting risk for portfolios that have a minimum starting liability value of \$200 million with potential for increases to \$1 billion. Subsidies encourage agricultural insurance participation and may be required to develop sufficient volumes needed for reinsurance.

11.4.1. Premium and Servicing Subsidies. Governments often play important roles in subsidizing agricultural insurance programs. Subsidies can be in the form of reductions in premiums, contributions to insurers’ administrative and operating expenses, reinsurance and stop-loss activities, regulatory and auditing oversight, and impacts on trade and international policies.

Governments use a variety of approaches to providing premium subsidies including subsidizing premiums by a fixed amount per hectare for a given crop in a given region. Amounts often vary by crop and region, and subsidies may be paid either directly to producers or to insurance companies.

Governments can also subsidize premiums by a percentage amount. Percentage subsidies are often larger for higher deductibles and smaller for lower deductibles. This provides farmers with incentives to choose lower coverage levels and reduces primary insurers’ total liability and opportunities for producer moral hazard activities. The costs of providing (i.e., servicing) subsidies are generally a constant percentage of pure risk premiums for similar insurance products. However, costs vary among insurance products. For example, area insurance products are less expensive to administer than individual farm insurance products.

In many countries—including the United States—low levels of insurance coverage (Catastrophic Crop Insurance) are provided to producers free of charge.

11.4.2. Public Reinsurance. Public policy is an important dimension for reinsurance. In many cases, governments serve as reinsurers. Public policy often dictates the collection and storage of data and many program features. Finally, public policy can influence portfolio volumes.

Governments may also provide stop-loss services. Stop-loss activities refer to situations in which (usually) a government accepts insurance losses beyond a certain level. In many cases, insurance providers and reinsurers will not offer insurance products in the absence of stop-loss agreements. Stop-loss levels are commonly about three to five times total premium levels. In the absence of stop-loss agreements, premium rates would be higher because of added risk.

11.4.2.1. Government Involvement. Insurance companies use pools to group policies into similar risk categories. One way that governments support agricultural insurance is by reinsuring high-risk products or producers. Governments often establish a high-risk pool into which primary insurance companies are allowed to place a limited number of policies. In general, high-risk pools are limited to less than 15% of total liability. All indemnities stemming from policies assigned to the government high-risk pool are paid by the government.

Insurance companies often use government high-risk pools as a way to reinsure new products and programs which are often difficult to rate without historical performance, data, participation, and moral hazard controls. Well-developed agricultural insurance programs often assign fewer than 10% of total liabilities to government high-risk pools. New products are less likely to be developed if high-risk pools are not reinsured by governments.

Unless governments reinsure all policies, crop insurance programs must be actuarially sound if the risk is to be accepted by a private reinsurer. Thus, policies must contain strong underwriting to avoid moral hazard, adverse selection, and fraud. Some perils may need to be excluded and premium rates must be actuarially sound.

11.4.2.2. Data Quality. To attract reinsurance companies, primary insurers must clearly identify the frequency of yield losses and their causes. These measures must be quantifiable if a reinsurer is going to be interested in accepting additional risk. Governments are often the source of much of the agricultural data necessary for underwriting purposes. If high quality data are not available, reinsurers may increase rate loads.

11.5 Trade and International Policies

Agricultural programs are scrutinized for compliance with international trade agreements including WTO/GATT (World Trade Organization/General Agreement on Tariffs and Trade) obligations. WTO trade agreements limit the amount of agricultural support by country. In general, safety net programs such as crop insurance or disaster programs are not trade-distorting and does not count toward support limits, but these programs must follow certain rules. Crucially, such programs must support farm incomes across all enterprises and can only be implemented when farm income falls below 70% of a farm's five-year moving average. Most agricultural support programs do not meet this requirement, primarily because they are product specific. However, if those subsidies represent less than 5% of crop values on a national basis, then they are considered *de minimis* subsidies and are not counted as part of a country's domestic agricultural support program. Although large, expenditures by the United States and Canada on crop insurance subsidies do not exceed the *de minimus* target. Current WTO negotiations include a proposal to lower the *de minimus* target to 2.5%.

Some European Union countries support crop insurance programs (e.g., Italy and Spain). Since 2001, the European Commission has been exploring EU-wide options for agricultural insurance including premium subsidies.



12.0 Marketing and Program Management

The primary issues regarding program management include producer participation, insurance pooling, and general business management decision-making. Standardizing these processes is an important element for effective management, transparency, and reinsurance.

12.1 Marketing

Marketing efforts must be designed so that the benefits from purchasing crop insurance are clear and well defined. Consequently, the details of each crop insurance product must be carefully explained and highlighted. In addition, marketing campaigns must provide for current and future product education. Marketing must clearly outline the transparency of insurance products to inspire confidence in agricultural insurance programs. To this end, loss adjusting policies must be carefully described. The process of premium collection, acreage updates, and planting deadlines must be clearly understood by producers. In addition, regulatory rules, program management issues, and dispute resolution procedures must be apparent in all marketing literature. A marketing program should encompass a variety of delivery media including personal contact, written materials, and Internet-based resources.

Processes for selling insurance contracts must consider a variety of questions including:

- Should selling agents be certified to indicate that they understand the products they are selling?
- Should all selling agents offer every product including those favoured or developed by competing companies?

Building confidence in crop insurance programs requires:

- Adhering to a fixed set of principles;
- Meeting the objectives of stakeholders;
- Providing transparency, consistency, equity, and fair dispute resolution;
- Streamlining business processes to improve cost effectiveness.

Developing and adhering to principles or goals is an important element to building confidence in crop insurance systems. The Canadian and U.S. systems emphasize similar principles:

- Clear purpose or program objectives;
- Transparency and Consistency;
- Equity and Fairness;
- Stakeholder Representation;
- Professionalism and Competency.



12.1.1. Program Transparency refers to making processes and products understandable and as uncomplicated as possible. Because agricultural insurance is complex by its very nature, efforts must be made to simplify and clearly explain procedures, objectives, processes, and products.

Example: When new Canadian products are introduced, printed materials are developed that describe every aspect of the new product. In the process, pros and cons of the product are discussed as are appropriate and inappropriate applications. In addition, insurance agents are supplied with documents, information, and training. Agents make appointments with their customers to discuss the new product and distribute informational materials. Finally, producers and agents can contact the agency that is introducing the new product if questions arise. These efforts provide participants with the knowledge necessary for making good decisions and reducing disputes.

12.1.2. Program Consistency requires that programs and products be compatible, harmonious, and consistent with adopted principles, objectives, and goals.

Consistency of product design implies that:

- Product designs are standardized across insurance firms;
- Insurance contracts, application processes, and underwriting are standardized;
- Data collection is coordinated and standardized;
- Loss adjusting and dispute resolution processes are standardized;
- Accurate methods are presented in educational efforts;
- Written material are designed to improve interactions between sales agents and producers;
- Call centres exist for farmers and sales agents;
- Insurance personnel training is coordinated;
- Formal processes are developed to document continuous improvements in education, knowledge, and efficacy.

12.2 Producer Participation

Farmers are the consumers of crop insurance products. For an agricultural insurance program to be successful, it must satisfy these consumers. Farmer satisfaction will largely depend upon the degree to which the program addresses several factors.

12.2.1. Product Identification. Producers must be offered products that help them manage risk. Identifying producer needs can occur in a variety of ways.

Farm organizations play a role in transmitting producer needs to the insurance industry. For example, prior to 1990, insurance was not available for blueberry production in the United States. Congressional delegations representing blueberry producers in Wisconsin and Massachusetts asked the USDA's Risk Management Agency (RMA) develop a product to help manage yield risk associated with blueberries.

Another example is provided by U.S. malting barley producers who wanted a product to help manage quality risks. Although individual insurance products were available for feed barley, existing yield insurance did not mitigate quality risks. Producers could harvest above-average crop yields that were unsuitable for malting purposes because of weather conditions. As a result, producers incurred price discounts when they were forced to sell malting barley into the feed barley market. National producer groups successfully lobbied for a quality rider on barley yield insurance products.

Government crop insurance agencies rely on farmer focus groups to help direct new product development. For example, the USDA RMA has periodically organized farm focus groups to discuss insurance products and new product development. These focus groups have had substantial influence on program design and helped develop desirable products.

Additionally, government and farm organizations frequently contract with consultants who have substantial expertise in plant physiology, economics, and statistics to develop new products.

12.2.2. Educating Producers. Another important criterion for success involves educating producers about crop insurance products. This process often involves government support and collaboration with university faculty, agricultural extension services, and private contractors to develop and deliver crop insurance education. These educational opportunities include in-person producer workshops that explain product design, implementation, and decision-tool computer software that enables producers to assess the value of crop insurance products for their operations. Additionally, farmers are provided with fact sheets describing products, sign-up deadlines, and other important administrative and compliance requirements or web- and CD-based self-directed educational curricula.

The U.S. government allocates \$20 to \$50 million annually for crop insurance education. The United States and Canada target limited-resource and underrepresented populations in much of their educational efforts. These groups generally consist of relatively small farm producers.

Private insurance companies also provide educational materials for insurance agents, and those agents educate producers. However, the potential for conflicts of interest certainly exists in these arrangements. Farm organizations often receive funding from government agencies to educate their members.

12.2.3. Sales and Enrollment. An agricultural insurance program can only be successful if farmers purchase products and enrol in insurance programs. Major stakeholders in this process often include private primary insurance providers and government agencies (especially if the crop insurance program is operated and managed by the government).

In the United States, every crop insurance issuing agency must offer the entire breadth of products to customers. Some farm organizations are also crop insurance issuing agencies. All Canadian insurance product sales are managed by a government agency.

12.2.4. Premium Collection. Another important point of contact with customers involves premium collection. Premium collection procedures must be clearly defined and operational. The complication of government premium subsidy payments must be politically acceptable, transparent, and cost effective.

Collections actually occur in a variety of ways. Private primary insurance providers or government agencies collect premiums (usually net of subsidies which are usually paid by the government directly to insurance providers). These premiums may be collected at purchase or after harvest (premiums are deducted from forthcoming indemnities). If the purchase occurs at harvest, rules must be established to guarantee that premium payments will be made.

In some countries, such as Ukraine, producers pay the entire premium to a private primary insurance provider and then receive a subsidy in the form of a rebate, either from the government or from the private company at a later date.

12.2.5. Loss Adjustment is central to successful insurance programs. The interaction between producers and loss adjusters is often fraught with emotion resulting from producers' concerns about recent losses. At these times producers do not want to argue with adjusters over loss adjustment details and outcomes. Historically, a variety of approaches have been used for loss adjusting. Private primary insurance providers can randomly select loss adjusters from a pool of individuals certified by a government agency. The government may contract with independent loss adjusters (ideally with no local ties) or uses government employees. Additionally, private primary insurance providers hire loss adjusters while random audits of performance are conducted by a government agency.



12.2.6. Indemnity Payments. Another point of contact between insurance programs and customers occurs when indemnity payments are issued. The timing, accuracy, and efficacy of indemnity payments are crucial elements of established insurance programs. Many different approaches are used to manage indemnity payments.

Loss adjusters sometimes pay small claims immediately (almost literally in the field). Large claims are often paid at a later date after review. Private primary insurance providers can pay all indemnities after a review, or a government agency can pay all indemnities. This usually occurs when a government agency is the sole provider of insurance (as in Canada, for example). It is also possible to allow only certified insurance companies to offer crop insurance services. The threat of losing certification can provide an incentive for companies to provide accurate, fair, and timely indemnity servicing.

12.2.7. Dispute Resolution. Successful businesses must have reasonable and credible dispute resolution processes. Dispute resolution procedures must be transparent, accessible, inexpensive, and equitable; these procedures are key to developing successful agricultural insurance programs. Effective dispute resolution systems should be easily accessible, understood, and well-defined. The processes that producers must follow to obtain review of initial claim assessments have to be clear.

Successful programs should employ an independent review panel that incorporates other producers trained in nuances of agriculture insurance including specific contract provisions and rationales for loss adjusting and encourage local or “informal” professional representation rather than legal representation. Review committees must be educated so they understand agriculture insurance programs, contracts, production management issues. These committees must be void of conflicts of interest and understand spatially diverse situations.

Producers must be given opportunities to appeal cases in a non-threatening environment. Appeal procedures for appeals and decision-making must be well-documented, affordable, and timely. Decisions must include clear reasons for a given outcome and must be promptly provided. Finally, records of reviews and disputes must be maintained.



For example, in the United States, dispute resolutions involving loss adjustments follow these steps:

- Initially, a producer must appeal the loss adjustment to the private primary insurance provider who sold and serviced the contract. Producers may request a second loss adjustment opinion by a different adjuster. Most disputes are resolved at this level;
- If a producer is still dissatisfied, he or she files paperwork with a Dispute Resolution Panel;
- Dispute Resolution Panel members are drawn from a broad base (representatives from farms and farm organizations, loss adjusters, etc.). Members are appointed by the Director of USDA's Risk Management Agency;
- If a producer is still dissatisfied with the outcome, he or she can use the judicial system to resolve the dispute. However, the judicial system generally sides with decisions of the Dispute Resolution Panel providing that there were no procedural errors.

Although loss adjustment disputes are a reality, the issue is likely to be more common during the early stages of development as underwriting oversights are revealed and producers learn about procedures, processes, and products. Consequently, it is imperative that dispute resolution processes be fully developed before offering crop insurance products.

12.3 Primary Insurance Pooling

Insurance providers pay reinsurers to accept much of the risk they incur through the sale of insurance contracts. Reinsurance costs are lower if insurance providers can pool similar contracts across multiple dimensions. Furthermore, appropriate pooling is necessary to avoid participation erosion. Hence, programs need to facilitate pooling across crops, yield determinations, regions, and production practices. Rating must recognize risk difference in these pools.

12.3.1. Crop. Every crop has unique properties for purposes of crop insurance. Differences in yield variability cause premium rates to differ markedly across crops and crop sub-classes. In addition, many crops have quality dimensions that must be considered when establishing value for indemnity and sales purposes. Variations in normal planting dates and other cultural practices also need to be considered. For example, prevented and delayed planting dates must be established.

12.3.2. Yield. The establishment of expected yields for each crop also affects insurance pooling. Historical data are often lacking or incomplete. Regional data may not be highly correlated with specific farming operations. The measurement of actual yields and loss adjusting procedures differ across crops and insurance providers. Often, yields can be measured on either a "wet" or a "dry" basis which affects the weight of a crop and, ultimately, yield calculations. In cases of quality considerations, there are differences in insurance contracts regarding whether quality adjustments are to be made on yield or price factors.

12.3.3. Spatial. There are substantial regional differences in crop production. Normal production practices differ by region, as do expected yields. Different varieties of the same crop are often planted in across different regions to take advantage of local weather conditions. The establishment of prices used for indemnifying yield contracts and calculating value in revenue contracts vary spatially. Even within a region, substantial basis differences exist. Climate differences also cause variation in end-use quality factors in terms of food and feed processors. Thus, spatial issues complicate insurance pooling activities.

12.3.4. Production Practices. Heterogeneous production practices also provide challenges for insurance pooling. Even within a region, several types of wheat (e.g., spring, winter, and durum) may be produced. Each may be produced under either dry land or irrigated production systems. Tillage practices for each can range from conventional tillage to limited tillage, minimum tillage, or no tillage. Each of these tillage systems may be used in conjunction with every-other year fallow, flex-cropping, or continuous cropping practices.

12.3.5. Farm Size. Larger farms usually have less yield volatility and lower servicing costs than small farms. Therefore, actuarially sound insurance rates are less for larger farms. However, providing lower rates to larger farms is often politically controversial.

12.4 Business Management

A wide range of business functions including management, monitoring, and governance are important elements of the agricultural insurance industry. The purpose of management is to coordinate the business functions of an agricultural insurance company. Management is supposed to be “the face” of the system to producers and the public. They represent the integrity of the system and organize communication and strategic planning.

Monitoring functions include contract enforcement, identification of the entities of the transaction, products offerings, coverage limits, insurance eligibility, risk capacity of insurance firms and the system, public reporting, consumer protection, certification of agents and insurance firms, and data management.

Governance involves decision-making about the structure and culture of a business entity. Specifically, governance involves strategic planning and setting priorities, regulatory compliance, establishing accuracy and clarity of insurance contracts, operating processes, and communications, financial management and public disclosures, and auditing and performance management. Together these functions facilitate the operations, administration, and accounting activities of a business firm.

12.4.1. Operations. Operating philosophy, program evaluation, reporting, monitoring, and oversight are essential elements of a successful agricultural insurance program.

Operating philosophies must allow managers to embody and communicate vision and philosophy, embed operations functions throughout system, assess and train successors, plan and manage knowledge, and develop processes that create and maintain integrity across operating functions (e.g., sales and loss adjusting).

Evaluating the success of a crop insurance program requires creating measurable targets that compare outcomes with original goals and gathering data that supports targets. Evaluations must include regular monitoring of key operating functions (e.g., loss adjusting, surplus premium investment performance, and dispute resolution) and conduct cost/benefit analyses of “best practice” improvement strategies.

Reporting and third-party audits refer to public accountability (if government funding is involved), transparent annual performance accounting, on-going open and effective communication with primary stakeholders and the public, third-party audits, sufficient financial reserves, and premium subsidy flows within system.

Monitoring business functions involves performing “system” assessments (business process review, producer participation, timing of claims and premium paying, response to production disaster, claims paid vs. claims reported); assessing loss adjustments (accuracy, consistency with standards, timing); and evaluating the performance of individuals within firms (management and other personnel).

Oversight committees or boards of directors should represent the interests of all stakeholders, insurance companies, government, and customers. The committee or board collectively decides on governance responsibilities, monitors management activities, and communicates with government, producers, and insurance firms. The committee should provide integrity, competency, and transparency to the system.

12.4.2. Administration. Management must have the authority to take action in the interest of meeting goals and fulfilling fiduciary responsibilities. For crop insurance system it is necessary to have sufficient resources to pursue business strategies, the authority to assign competent personnel with appropriate training and skills to complete tasks, structured performance assessments with rewards, guidance, and training for improvement, and processes for internal audit and monitoring to create and maintain integrity.

Additional administrative tasks include coordination and business strategy development through designing consistent products and developing operating standards (e.g., loss adjusting, underwriting), organizing data management and information technology systems, and setting priorities. Administration must coordinate research and product development, provide clear expectations regarding product delivery, and offer non-confrontational monitoring for the purpose of business improvements (education/training focus).

12.4.3. Accounting. Accurate, reliable, and efficient accounting systems are critical to the successful management and control of an agricultural insurance program. Such systems must have well-designed and functioning information technology systems, business systems, reporting, and auditing procedures.

12.4.3.1. Information Technology (IT) Systems. Agricultural insurance programs must have accurate, secure, accessible, redundant, and expandable IT systems. As is the case with many businesses, IT activities are essential for agricultural insurance programs. Most IT systems used by agricultural insurance programs employ “Relational Databases” because of the huge amounts of information being processed. Relational databases are characterized by key identifiers of individual producers (contracts) that can be linked across data sets. Agricultural insurance programs often require that variables be adjusted to reflect current conditions. Given the number of records that must be managed, a relational database allows for a change in one element of the database to be reflected across all records.

IT systems must provide easy access to data. One data access method uses “Query Tools”—automated systems that allow clients to access those data most relevant to current tasks.

Data management involves the use of numbers that represent, for example, yield data, price information, and loss adjustments. However, data must also be managed with respect to “Knowledge and Records” which refer to recording and tracking decisions made by insurance providers. Knowledge created over time must be transferred to others.

IT systems must also consider the delivery modes used to transfer information to others. That is, IT systems must include specific design elements if information is to be accessible through the Internet, in-person, or in print.

12.4.3.2. Business Systems are necessary for providing agricultural insurance, and include operating procedures that allow for the management of:

- Sales, applications, underwriting, and contracting;
- Accounts receivable – billing and collection systems (producer, government, reinsurance);
- Accounts payable – claims assessment (loss adjusting, processing, dispute resolution, documentation);
- Reporting – financial and performance indicators.

12.4.3.3. Reporting Procedures must not be arbitrary. They should be clear, consistent, well-defined, accurate, objective, and scheduled.

Reporting systems are often the responsibility of an oversight committee or board of directors that includes representation from major stakeholders, including representatives of insurance firms, government, farmers, and the public. Reporting should include issues related to business development, program delivery, policy, cost sharing, and regulatory compliance.

12.4.3.4. Auditing functions include internal and external audits. Internal audits are performed by insurance providers and external audits are conducted by qualified third parties. Audits evaluate the operational aspects of business systems as a check of impartiality, accuracy, and integrity.

Internal auditing is a management tool that reviews business functions such as governance, operating processes, policy documentation, contract application, billing accuracy, premium rating results, and claims processing. Additionally, audits can identify issues with and make improvements to system processes and determine problems that may emerge during third-party external audits.

Third-party external audits are conducted by unbiased external observers and are designed to provide an independent review of business practices and financial stability and evaluate premium collection process, data management systems, record keeping, accuracy, and consistent application of rules and procedures. Third-party audits provide recommendations to management and regulators and review progress in addressing concerns from previous audits. Third-party audit processes should be organized so that multiple audits are unnecessary.

Third-party audits, which are often required by regulatory agencies, frequently require substantial participation from management because external auditors usually do not understand crop insurance. Therefore, additional efforts have to be made to provide training. Well-developed agricultural insurance systems should conduct annual third-party audits that result in publicly-available annual reports that develop and maintain system integrity.

13.0. Summary Comments

The development, implementation, and success of agricultural insurance programs require much coordination, cooperation, and shared visions. Financial sustainability depends upon offering products desired by producers. In addition, appropriate premiums must be charged and transparent business management systems must be employed. In many cases, government involvement is necessary in terms of providing regulatory services and/or financial reserves or subsidies. In addition, human resources with specific expertise must be developed before implementing an insurance program. Substantial human capacities are required in government ministries, insurance regulators, private insurance companies, and producer organizations. Many of these skills are specific to the agricultural insurance sector.

Agricultural insurance systems involve multiple elements that must be carefully coordinated. To attract the interest of reinsurers, a pool of agri-insurance companies must often agree to market similar insurance products. Banks and other input suppliers are often involved in the sale of agri-insurance because it minimizes credit risk and improves producers' access to finance. Enforceable contract legal systems must exist for such programs to thrive. Also, the cooperation among disparate groups must center on a common vision and outcome. Finally, training and system development must be the product of substantial efforts to develop and introduce agri-insurance products into a market.



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