DATA AND INFORMATION MANAGEMENT

Manual 3

WORLD BANK GROUP

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IN PARTNERSHIP WITH DONORS

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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

IIARM – International Institute for Agricultural Risk Management

DFATD – Foreign Affairs, Trade and Development Canada

APX – Amsterdam Power Exchange

GHCND - Global History Climate Network – Daily

GSOD – Global Summary of Day

IT – Information Technology

NYSE – New York Stock Exchange

SAFEX – South African Futures Exchange

WMO – World Meteorological Organization

1.0. Introduction

Data and information management refers to the development, collection, use, and preservation of data and the methods needed to acquire, control, protect, deliver, and enhance its value to achieve the goals of agricultural insurance programs. Issues related to the collection, development, updating, and quality of data are often overlooked when developing agricultural insurance programs. However, such programs will likely fail without a concise, well-developed plan for data and information management.

Data are needed by those who develop, operate, and manage agricultural insurance programs. In addition, agricultural producers need access to high-quality data for making individual purchase decisions. Better data quality and larger data quantities improve decision-making, management, and product development. Successful agricultural insurance programs require accurate and comprehensive data collection, management, and security.

This manual presents a wide range of management issues related to agricultural insurance data. Specifically, issues related to data uses, needs, documentation, quality control, security, accessibility, storage, and public policy are discussed. In addition, data needs related to underwriting, loss adjustments, premium rating, and reinsurance are also presented. Because specific agricultural insurance products often have differing data requirements, similarities and differences among such products are delineated. Finally, this manual also considers computer hardware and software design issues and requirements and provides examples of necessary data files.

2.0. Data Uses

Accurate and comprehensive data are needed by those who develop, operate, manage, and regulate agricultural crop insurance programs. In general, the preferred approach to rating is the use of historical data for the perils of concern. If historical data are not available, other approaches are used to rate various crop insurance products. However, the results of such rating are usually inferior to those derived using comprehensive data. Agricultural producers and producer organizations need data to decide whether or not to purchase products and to develop crop insurance products. In addition, producers use data for making decisions regarding coverage levels and product purchases. In most cases, the performance of insurance products and their efficacy regarding risk management for agricultural producers is largely a function of data availability and maintenance.

Primary insurance providers need data to establish premium rates, service products, evaluate product performance, monitor individual producer activity, research and develop new products, and modify existing products. Furthermore, insurance providers require data to develop financial reviews and other information needed for internal and external auditing, reports to external organizations, and for evaluating reinsurance premiums. In many cases, primary insurance providers also receive premium subsidies from government agencies. Thus, data are needed to complete those transactions and also for dispute resolution proceedings.

Reinsurance companies also require comprehensive data to evaluate the riskiness of agricultural insurance portfolios, establish reinsurance premium rates, and service reinsurance contracts. In addition, government agencies require data to help manage, operate, and evaluate crop insurance programs. This is true regardless whether products are offered through the private sector or directly from government agencies. In all cases, government agencies are likely to be involved in the regulation and monitoring of crop insurance programs—especially when they provide premium or administrative subsidies and/or stop-loss coverages. Government agencies are also often involved in regulatory actions, audits, and dispute resolution procedures.

2.1 Program Development

The development of agricultural insurance programs often hinges upon the availability of high-quality data. For example, individual yield or revenue products cannot be designed without a sufficient amount of producer-level yield data. In the absence of such data, programs are often developed around area or group yield principles. In addition, revenue products require that an unbiased source of price discovery be available so that product rating can maintain its actuarial soundness.

Substantial quantities of data must also be available for developing programs affected by correlations among individual agricultural producers and regions. Consequently, program development is often the result of data availability.

2.1.1. Strategic Planning: Data development, accessibility, and management are critical to the success of agricultural insurance programs. Hence, it is essential that a strategic management plan regarding data issues be developed along with the other aspects of agricultural insurance programs. The tendency is to assume that data issues will resolve themselves if a solid program is first developed. However, solid programs cannot be developed in the absence of strategic data planning.

Strategic data plans must consider the interaction of data management and acquisition with respect to national agricultural risk management policies and agricultural programs. Agriculture insurance programs need to coincide with the goals of other government actions. If properly developed, such systems can generate substantial synergies with national policy in terms of data acquisition, evaluation, and growth.

Finally, strategic data plans should be constructed around stated objectives and should meet various performance measures. In this way, proper evaluations of such programs can be quantified with respect to stated goals.

2.1.2. System Governance: Equitable and transparent governance structures are essential for all aspects of an agricultural insurance program, but they are especially important for data management issues because of the personal and confidential nature of required data and document information. Governance issues are directly related to data availability and collection. For example, data governance must consider requirements for reporting contract details (e.g., legal entities, acreages, etc.), provide details for dispute resolution, and develop best management practices for information, business, agronomic, and insurance actions.

Governance structures must clearly describe rules and enforcement of contract details such as product eligibility, crops, perils, design, losses, deadlines, and repercussion for the misrepresentation of each. In each case, governance structures must clearly offer reasons for the need of such information. Data governance is also important for underwriting and developing loss adjusting standards.

Governance decisions must also include processes for providing all stakeholders with sufficient information for optimal decision-making. For example, the data needs of regulatory agencies include information on crop insurance companies. These data and information needs may be quite different from those of internal stakeholders and system personnel. External stakeholders and policy makers have different data needs, as do reinsurance companies.

2.1.3. Coordination of Business Functions: Current and accurate data are needed to manage and effectively coordinate agricultural insurance functions. These functions are a product of the need to communicate with participants and develop transparent business process reviews.

Strategic directions and rationale, team members, and performance assessments are examples of internal communications which require the use of business process and governance data and information. External communication efforts include rapid responses to information requests and educational materials that are readily available for distribution. Such materials must be kept current and systems need to be established to monitor version control of all external documents.

Effective communications with customers (producers), media representatives, and government officials require that tracking systems be developed to respond to requests. Efficient tracking systems ensure that all requests are answered within a reasonable timeframe. In addition, such systems should monitor return responses to improve quality.

Other business processes that require data and documentation include monitoring the performance of each aspect of the agricultural insurance system. For example, loss adjustment activities should be monitored in terms of claims responses, actions by loss adjusters, and indemnity delivery. Business process review systems also require substantial data for monitoring standard business activity such as accounts receivable and payable. In addition, discounts for early payment of receivables may be offered; these details must be carefully monitored.

2.1.4. Financial Reporting and Accountability: Agricultural insurance systems require substantial amounts of business management data for financial reporting and accountability purposes. Such reports are routinely submitted to government agencies, regulators, managers, and investors.

Regulatory agencies often require the reporting of performance measures relative to goals, portfolio risk, loss ratios, and information related to financial sustainability. Regulatory frameworks should be developed in conjunction with data management systems to reduce the costs of reporting.

Internal financial reports are often needed to assess portfolio risk, cash flow needs to meet indemnity claims, administrative costs, and overhead. In addition, government agencies frequently request specific reports on various insurance activities. Much of the data needed to respond to these requests are contained in files generated by insurance providers with respect to the sale of insurance products. It is essential that business management systems are able to seamlessly access these data to reduce costs and increase response times.

Data are also necessary for effective interactions between private companies that provide insurance, government agencies that monitor and may also provide insurance, and agribusinesses. Agricultural producers must be provided with meaningful, understandable data regarding product performance.

Accurate and reliable data often help to obviate competing objectives among agricultural insurance participants. Producers prefer low premium rates, high coverage levels, and flexible terms for loss adjusting. Insurers and reinsurers want to be compensated for the risk incurred by offering such programs. Program administrators often want management flexibility, oversight, and sufficient budgets to perform their roles. Many of the competing objectives can be met if data are used to illustrate stakeholder issues.

2.2. Product Design

The primary areas of product design for which data requirements are of the most concern involve underwriting, rating, and indemnification. Large quantities of high-quality data are needed when using empirical methods to develop actuarially sound premium rates and for determining indemnification policies.

Product design must occur in conjunction with the development of data collection and management systems. Products cannot be properly serviced if issues related to data quality, quantity, accuracy, and timeliness needed to meet operational requirements of the program are ignored.

2.2.1. Data Requirements for Empirical Rating: The need for large quantities of high-quality historical data are most acute for establishing premium rates. Empirical rating processes provide the most actuarially sound approach to rating and result in lower premium rates compared to other methods. However, empirical rating processes are highly data intensive. For example, an ideal data set for rating an individual yield insurance product would consist of more than 100 years of observations for each producer in any given region. Such data are seldom available, so other procedures are frequently used. For example, shorter periods of data are usually

used for empirical rating processes. Premium rates are then increased by various load factors to reflect unknown risks that cannot be determined because of insufficient data volumes.

2.2.1.1. Combining Data Using Bootstrapping Procedures: In some cases, regional yield data may be available for a relatively long period of time while individual farm level data are often not. In these cases, bootstrapping procedures can be used to combine the shorter term farm-level data with longer term regional data. Bootstrapping procedures combine longer term regional variations in yield with variations in multiple farm yield observations to increase the accuracy of individual farm yield variance estimates. These adjusted variances are then used for establishing premium rates.

2.2.2. Data Requirements for Parametric Rating: Parametric rating procedures are often used when historical data are insufficient to provide reasonable empirically rated premiums. Historical data may simply not exist in the quantities needed, or the data may be of poor quality. Poorer quality data occur when observations include inaccuracies or missing values, are collected using inconsistent methods, or are affected by policy changes. In these cases, a variety of statistical distributions may be used to represent the underlying variation in yields that occur in actual observations. In some cases, limited historical data may help identify the appropriate statistical distribution for rating purposes. In other cases, a normal or uniform distribution may simply be assumed. These two distributions often provide conservative and liberal endpoints for premium rate ranges. Statistical distributions are used to establish expected indemnities which are then combined with liabilities to establish pure risk premium rates. These procedures, however, often require the addition of substantial premium rate loading factors to reflect uncertainty associated with actual yield outcomes.

2.3. Program Management

Reliable data that are easily accessible by program managers are essential for the success of agricultural insurance programs. Program administrators and managers use data to:

- Develop strategic plans;
- Interface with government agencies and private insurance companies;
- Evaluate rating outcomes;
- Develop and adjust products;
- Conduct internal audits;
- Prepare financial reports;
- Evaluate business processes in terms of efficacy and efficiency.

Effective communication among private insurance companies, reinsurers, government agencies, regulators, and agricultural producers are essential for the control of such programs. In addition, data are used in day-to-day operations:

- To support and record sales;
- In the application process for products;
- For underwriting process;
- For loss adjusting purposes;
- To support claims processing procedures;
- For dispute resolution processes.

2.4. Program Evaluation

Agricultural insurance programs generally have a public-sector component attached to them. Hence, program evaluation is necessary for deciding whether public goals are being met. In addition, internal evaluation of programs is an essential part of general business procedures. In both cases, data are needed for research and to evaluate the efficiency of agricultural insurance programs. In addition, policy makers often need information regarding the consequences of crop insurance programs on agricultural production, environmental issues, agribusiness industrial organization, food supplies, and public policy goals. Insurance companies use performance data to identify areas for product improvements, develop new products, and adjust program goals.

2.5. Documentation

Data must be accurately recorded and maintained. A good data management system will not only record data, but also document sources of all observations. Documentation of data and their sources allow for seamless continuity of programs as they develop, grow, and change. In addition, a variety of documents and their sources need to be maintained by agricultural insurance data management programs.

2.6. Public Policy

Public resources are frequently used to support agricultural insurance programs. The rationale for public sector involvement often centers on maintaining rural communities, reducing the need for disaster relief, stabilizing food supplies, and supporting farm incomes through risk mitigation. Thus, substantial data resources are needed to develop and evaluate public policy issues related to agricultural insurance programs.

Data are needed to evaluate whether or not public policy goals are being accomplished. Public accountability of such programs requires that companies submit themselves to independent third-party audits of products and business management performance. Producers, taxpayers, regulators, and government officials need to be assured that public resources are being used effectively.

Public policy accountability may extend beyond a single country. For example, agricultural insurance programs must be evaluated for compliance with international trade agreements—especially for programs that receive substantial government subsidies.

Insurance companies must also maintain sufficient data to demonstrate regulatory compliance various public agencies. Furthermore, these companies must comply with legal rules that govern contractual compliance issues. That is, data ownership, access, confidentiality, and use must follow legal guidelines.

3.0. Data Needs

The development, execution, and supervision of methods to acquire, control, protect, deliver, and enhance the value of data and information assets are important elements of a data management program. Data management in agricultural insurance programs extends beyond numbers and includes maintaining producers' personal information, policy documents, and business management practices.

A variety of initial data needs are required for the development of agricultural insurance programs. Although most products require at least some common data, each product also requires specific information.

Data are also required for operational needs. For example, data must be updated annually to improve rating processes and evaluate products and programs.

3.1. Initial Data Needs

Agricultural insurance products can be categorized into to two general types: (1) individual products and (2) proxy products. This taxonomy is an important element of data requirements. Indemnity payments for individual products are triggered by individual yields or revenues related to specific land parcels. Individual product liabilities are generally determined by a producer's actual yield or revenue outcome.

In contrast, proxy products are triggered by variables that are correlated with individual actual outcomes. Examples of proxy variables include per acre area yield/revenue, national prices, climate outcomes, and satellite imagery. Proxy product liabilities are usually determined by regional historical outcomes. Alternatively, proxy product liability may be based on individual producer outcomes. Consequently, data requirements are substantially different depending upon product type and design.

Individual products require farm-level historical data for rating and loss adjusting. Thus, individual products are data intensive because of the large number of farm producers, their length of time in agriculture, and changes in farm structures and size. When acquiring data for individual products, requests should be kept to a minimum and not be duplicative. Data series continuity needs to be maintained even if a producer changes primary insurance providers across years. Data requests need to be automated and consistent across years. Data accuracy and completeness are essential elements of individual insurance products.

Proxy products do not generally rely on information about an individual farm's specific performance. Rather, rating and indemnities are based on outcomes that occur within a region. This greatly reduces the amount of data that needs to be collected from producers and the amount of monitoring, data collection, and loss adjusting that needs to be done on an annual basis. However, the data that are collected need to be well-documented and transparent in the case of area yield and revenue insurance products. Because these products are based on regional yields or revenues rather than farm-level outcomes, producers are likely to question the data when outcomes on their operations differ from regional outcomes. In addition, while area-based weather or satellite imagery products do not require data from individual producers for indemnity calculations, they both produce voluminous amounts of data that need to be carefully managed and monitored for aberrations and pipeline interruptions.

Margin insurance products combine some elements of individual and proxy products. Hence, the data needs of this product are a hybrid of the other two.

Every insurance product, however, will require some common data and documentation. For example, the complete legal names of producers, mailing addresses, individual identifiers, telephone numbers, and e-mail addresses should be collected when a producer initially purchases an insurance contract. Thereafter, providers should be notified by producers if changes in those identifiers occur.

All products also require a physical description of farms and areas that are to be insured within those farms. Sizes and legal descriptions of property are needed as well.

For each insurance policy on each insured area, documentation should include the insurance provider name, product purchased, policy number, expected outcomes (e.g., yields, revenue, precipitation, etc.), coverage levels and deductibles, and indemnity triggers. In addition, prices used to calculate indemnities, total liability, premium rates, total premiums, total premiums paid by a producer, total premium subsidies (if any), and timing of indemnity payments should be documented.

3.1.1. Individual Insurance Data Needs: The two primary individual insurance products are yield and revenue based. In terms of yield insurance products, indemnities are paid when per acre actual yields do not meet a certain value. For revenue products, indemnities are paid when per acre revenues (i.e., yield/acre multiplied by price/unit) do not meet certain values.

3.1.1.1. Individual Yield Insurance Data: For individual yield insurance products, crop yield histories for each insured acre by growing season are required. At least four years of data should be included, but ten or more years are preferred. Consideration must be made for rotational crops or fallow years. If such data are not available, alternative values need to be established. For some crops, variety and quality outcomes are also needed. In addition, the per unit price at which yield losses will be indemnified must be clearly known.

Requirements for best management practices need to be documented including planting dates, potential required fertilizer herbicide and pesticide applications, irrigation activities (if applicable), and other required practices as needed.

Claims and loss-adjusting actions need to be documented at appropriate times. Descriptions of both covered and uncovered losses need to be developed as well as amounts and dates of indemnity payments. In addition, yields for each crop year need to be collected once a producer enters into an insurance contract whether or not a claim is initiated.

3.1.1.2. Individual Revenue Insurance Data: All of the data required for individual yield insurance products are also relevant for individual revenue insurance products. In addition, documentation of the prices that will be used to calculate revenues should be specified. These prices may differ from those used to calculate indemnities for yield products. Additional data requirements include expected harvest prices, expected revenue per unit, revenue coverage levels, and revenue deductibles. In addition, documentation should clearly indicate trigger revenues and total liabilities.

3.1.2. Proxy Insurance Data Needs: Proxy insurance products are designed to compensate producers for losses that are not directly measured. A variety of reasons exist for developing such products. In some cases, it is simply too expensive to measure certain outcomes. For example, forage is consumed by livestock and is not directly measurable. In addition, the moral hazard associated with some agricultural commodities and regional situations renders the use of individual insurance products infeasible or the operations costs are prohibitive.

In such cases, proxy insurance products rely on more easily measured outcomes to calculate indemnities. These proxies are generally related to regional rather than individual measurements. Because losses are not directly measured, however, the proxy measure used to trigger insurance indemnities may not be perfectly correlated with individual loss experiences in a given time period.

Several proxy metrics have been developed, including area yield, area revenue, price insurance, weather, and satellite imagery of vegetative growth. In some cases, yields of crops that are more easily measured and where yields are highly correlated with a different crop are sometimes used as a proxy. The costs of such products primarily depend upon existing infrastructure as it relates to gathering proxy measures.

Proxy insurance alternatives usually require that much less data be obtained from individual farms. However, total data requirements and management may be quite large as a result of voluminous measurements over time. In addition, proxy-based products do not require individual farm histories or in-person loss adjustments to settle claims. However, some monitoring must occur to ensure that crops being insured are actually being produced. This is especially important if government subsidies are being used to offset premium payments.

3.1.2.1. Area Yield Insurance Data: In addition to data needed for all insurance products, area yield products also require data regarding the area or regional yield history of the crop being insured. This history should be as extensive as possible for rating purposes. In addition, actual area or regional yields need to be calculated in a timely manner following harvests. This can be a difficult task as most regional yield estimates depend upon producer surveys. Delays in obtaining these data can marginalize the initial reason for purchasing insurance (i.e., the timely indemnification of a loss).

After the growing season or harvest, region yield data that are used to calculate indemnity triggers must be published. Trigger yields for each level of coverage must be announced. As is the case for all claims, indemnity payments and dates must be documented.

Area yield products usually rely on third-party data collections. Hence, the methods used to collect these data must be well-understood. In addition, it is critical that such data are gathered using consistent methods over time.

3.1.2.2. Area Revenue Insurance Data: In addition to data required for area yield insurance, area revenue insurance requires data on area or regional revenue per unit insured. That is, average commodity prices for a region must be established in order to calculate expected area revenues and to provide indemnity triggers. The same third-party data issues that affect the collection of yield data are also relevant for the establishment of price data used in revenue insurance products.

3.1.2.3. Price Insurance Data: Price insurance is generally a livestock-related (e.g., cattle, sheep, and hogs) product. Such products are usually based on the number of animals marketed by an individual. However, expected prices and indemnity triggers are based on national or regional market price outcomes. Consequently, these products have both individual and group or area components attached to them.

In addition to data required for all insurance products, additional data needed include:

- Numbers of livestock to be insured;
- Physical description of livestock (e.g., quality, expected weight at time of sale);
- Livestock price when insurance is purchased;
- Expected livestock price at date of sale;
- Actual livestock price at date of sale;
- Price coverage level/deductible selection farmer;
- Premium rate;
- Premium subsidy (if any);
- Indemnity amounts (if relevant).

3.1.2.4. Weather Index Product Data: Weather index products may address single or multiple metrics. Single-weather products may have "all or nothing" indemnity payments and may be based on rainfall indices, temperature (heat or cold), or transpiration (a combination of rainfall and heat). That is, if a measured value is below a trigger value, then indemnities are paid in their entirety. Data required for such products are typically temperature measurements at specific times within a region or close proximity to the insured property. Weather stations often provide these data.

Dual-trigger single-weather index products may provide prorated indemnities depending upon outcomes that occur between two different triggers. For example, a dual trigger of high and low rainfall could be used to calculate an indemnity that could be prorated depending upon the closeness of the observation to the high or low trigger levels.

Multiple-weather index products can be developed to insure against both temperature and precipitation outcomes with single or dual triggers. These could be "all or nothing" products or they may provide prorated indemnities. Once again, data are usually obtained from weather stations.

These products require particular attention to timing issues related to weather measurements. That is, temperature and precipitation triggers may be established based upon available reporting measurements within the context of a single point in time, over a single day, throughout growing seasons, or on an annual basis.

3.1.2.5. Satellite Imagery Data: Satellite imagery is generally used for measuring vegetative growth. This proxy insurance product is based on correlations between vegetative measurements and yield outcomes. The use of satellite imagery involves substantial costs and generates huge amounts of data that must be carefully managed. In addition, satellite imagery can be interrupted for extended periods of time and influenced by cloud cover and other atmospheric phenomena. Furthermore satellite imagery data must be calibrated to accurately reflect crop yield losses.

3.1.3. Margin Insurance Data Needs: Similar to price insurance, margin insurance can have individual and group elements included in terms of data requirements. However, because margin insurance is designed to mitigate the risk that differences between livestock revenues and livestock production costs may narrow, a variety of additional data are needed, including:

- Historical average input requirements;
- Expected input prices;
- Estimated input expenditures during the current growing season;
- Selected margin coverage level/deductible.

3.2. Operational Data Needs

The operational aspects of agricultural insurance programs require accurate and timely data to perform business functions and provide information for the evaluation of business effectiveness. Program management and transparency are greatly enhanced by appropriate business management information systems.

3.2.1. Functional Needs: The operational functions of agricultural insurance programs include sales and application processes, underwriting, field audits and loss adjustments, claims processing, and dispute resolution.

Sales and application processes require a structure for recording sales, contract responsibilities, producer information, insured crops, and product details. Operational management requires that such information be readily accessible by managers.

Underwriting activities are highly data dependent. Data and information regarding agronomic practices, contractual obligations, and production histories are critical for appropriate underwriting. In addition, underwriting activities meet specific data processing premium rates, coverage levels, and indemnity triggers. Many aspects of underwriting are regionally specific. Hence, information and data are often needed throughout a region where coverage is being offered.

Field audits and loss adjusting represent substantial functions of business operations in agricultural insurance systems. Loss claims need to be quickly recorded and addressed by loss adjusters. Field audits are needed to ensure that crops are planted and best management agronomic practices are followed need to be carefully organized and monitored. In addition, loss adjusters must verify losses and their causes. This operational process requires access to data and information related to specific insurance contracts and accurate land descriptions.

After losses and their causes have been verified, claims processing becomes the most visible aspect of agricultural insurance systems from the perspective of a producer. Indemnity payments must be consistent and transparent with respect to contracts that have been sold. Producers need to understand the reasons for and size of indemnity payments, as well as the timing of those payments. This operational aspect is likely to be the most important element for establishing trust in agricultural insurance programs.

Finally, the business operations of agricultural insurance programs must provide a clear and transparent process for dispute resolution. Disputes often occur over ambiguous underwriting rules and inconsistent or inaccurate data and information management. Data systems must be developed to minimize discrepancies and errors created during sales and loss adjustment processes. Random secondary field audits should be included as a standard management practice. Producers should have clear and concise instructions for appealing decisions, and underwriting rules should clearly identify a formal review process. Resolution outcomes should be communicated quickly and completely between both parties in a dispute.

3.2.2. Informational Needs: A variety of information needs to be collected and managed for the effective operational control of agricultural insurance programs. Informational needs include the identification of best management practices regarding various agronomic activities, legal contractual obligations, and underwriting procedures. Personal information regarding the identification of agricultural producers and land parcels are critical informational needs. The ability to link or combine data sets seamlessly is an important aspect of data management.

In addition, the storage, backup, and movement of information must be part of operational planning processes. Forms and applications may be stored in paper or electronic formats (or both). The identification of producers must be clearly established and the legality of signatures and ownership claims must be verified.

3.3. Reinsurance Data Requirements

Reinsurance is the process of transferring risk to another entity. Most agricultural insurance programs need to have at least part of their book of business reinsured by other companies because most private agricultural insurance issuers lack the financial resources to accept the risk of crop insurance liabilities. In addition, agricultural insurance products do not represent sufficient diversification opportunities to reduce risk exposure. Weather-related events often affect broad regions and are not usually specific to certain crops. Hence, indemnities are often highly correlated across regions.

Other types of insurance (e.g., casualty, life, health) have risks that are not highly correlated with agricultural insurance. Reinsurance companies build risk portfolios that have low correlations among adverse outcomes across products, regions, and time. Thus, companies with such portfolios can often add agricultural insurance risks without greatly increasing their overall risk exposure.

Agricultural insurance providers will likely need to develop reinsurance submissions to cede risk to more diversified and larger companies. Data are needed to quantify the amount of risk and the quality of the program so that reinsurers are willing to accept this risk. The quality of data and program control can result in faster acceptance and lower costs for ceding risk.

3.3.1. Reinsurance Submission

Reinsurance submission processes are highly confidential and specific to each reinsurer. The goal of a reinsurer is to keep the costs of acquiring risk low while charging rates that compensate them for these costs and added risk acceptance.

In general, reinsurance submissions contain descriptions of each product along with competitive issues, usefulness, and viability. The market size, needs, uses, and design of each product are usually detailed as well.

In terms of data needs, the bulk of reinsurance submissions will present actuarial documentation, product administration, underwriting, and loss adjustment information. Each of these factors is critically related to accurate and comprehensive data collection and security.

3.3.1.1 Actuarial Documentation: This component of a reinsurance submission consists of descriptions and documentation of data, rating methods, assumptions, and often a rating example. A major component of this section involves a discussion of data used for rating, including a description of methods used to establish premium rates.

Actuarial documentation often involves a discussion of risks associated with both rates and premiums. Once again, this is a product of historical data. Historical data are generally used to simulate a book of business based upon actual or simulated loss histories. The efficacy of this particular section is greatly enhanced by accurate data descriptions and documentation.

3.3.1.2. Product Administration: Product administration is also highly data intensive. Not only would this section of a reinsurance submission include issues related to data management, but also to record keeping, confidentiality, and accounting systems. The timing of sales, processing, and indemnity payments would also be included in this section. Performance reviews of personnel who monitor and manage this product also involve proper documentation and data management.

Financial documents—including income statements, balance sheets, and cash flow statements of the primary insurer—would be included in this section and also require accurate data management. To a great extent, the competency of firms involved in agriculture insurance sales is reflected in the accuracy and completeness of product administration.

3.3.1.3. Underwriting: A reinsurance submission would include a section that describes underwriting processes. Specifically, the policy provisions of each product would be outlined in this section. Such provisions include issues related to required best management practices by those purchasing insurance products, a schedule of deadlines including sign-up and premium dates, and other important events such as rules for early and late planting dates and harvest windows. Any legal or policy issues that currently exist with respect to products should also be documented in this section.

3.3.1.4. Loss Adjustment: The purpose of loss adjusting is to assess claims (i.e., monitoring, field management, gathering and verifying data, involvement in the underwriting process, and producer education). Procedures and personnel used for loss adjusting are important components to a reinsurance submission. For example, loss adjusters may be provided by government entities or by insurance companies. Alternatively, loss adjusters may be certified independent contractors. Loss adjustment procedures and documentation need to be clearly identified. Continued education of loss adjusters needs to be specified. In addition, compliance issues with other government programs may be a component of loss adjustment processes and procedures for validating loss adjustment decisions and must be clearly identified.

3.3.2. Data Reporting and Auditing Requirements

Reinsurance agreements specify various data reporting and auditing requirements. These requirements ensure accurate payment of reinsurance premiums and reinsurance indemnity obligations. In many cases, a reinsurer's gross liability may be limited by reinsurance agreements.

Reinsurance agreements also stipulate liability and indemnity reporting schedules. For example, the expected total liability prior to the reinsurance attachment is usually specified. In addition, total liabilities incurred as a result of product sales need to be reported immediately after sales closing dates. If preliminary indemnity payments are due, forecasts for ending indemnity payments should also be made. Regular crop and growing condition reports and indemnity forecasts need to be made throughout growing seasons. The final report should be received shortly after harvest and prior to the reinsurance payment notification.

Data and business systems need to be developed that allow for reinsurers to audit transactions, verify liabilities, and provide indemnity payments. In most cases, reinsurers prefer the opportunity to monitor these accounts online and in real-time. However, these requirements vary by reinsurer and by government regulators.

4.0. Data Sources

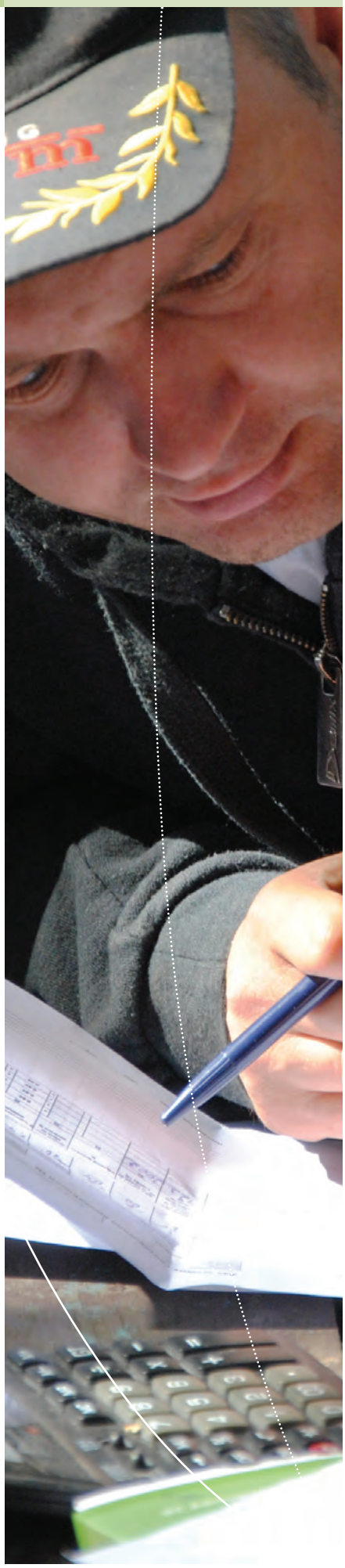
Data used in designing, operating, and maintaining agricultural insurance programs are obtained from three sources: (1) individual farms, (2) agricultural insurance systems, and (3) third parties. Each of these sources provides unique value and complications.

Accuracy, confidentiality, and consistency are critical components for data collection. Data must be carefully evaluated and cross-checked with related observations to ensure accuracy. Confidentiality of farm-level data must be assured. In addition, the data collection methods and activities of third-party sources must be understood by those who depend on that data for rating and underwriting.

Another critical element involves transparency. Although confidentiality must be maintained for individual producers, summary data must be reported so that participants and other stakeholders are confident that insurance decisions are based on data outcomes. Furthermore, data management systems must be able to document changes in farm ownership, production practices, new producers, and land use.

Program integrity is also important. The accuracy and consistency of data collection is paramount for the integrity and viability of agricultural insurance programs. Both factors affect the amount of trust that stakeholders have in such programs. Data must be gathered and reported in a timely manner. The accuracy of data must be carefully evaluated, and data adjustments or procedural changes must be transparent and credible. Data revisions must always be considered within the context of their influence on indemnity payments and rating. This is especially relevant for area yield and revenue insurance products for which data revisions frequently occur. The purpose for those revisions must be clear and their impacts on proposed or actual indemnities must be evaluated.

Finally, the storage format (i.e., paper or electronic) along with the length of time that information should be stored need to be carefully considered when establishing agricultural insurance programs.



4.1. Farm Data

Farm-level data provide important information for crop insurance programs but are also hampered by accuracy, continuity, and short time periods. Farm-level data are needed to develop individual insurance products and for rating purposes. These data are equally necessary for updating and evaluating actuarial soundness over time. Necessary farm-level data include producer identification and product choices, liability determination, management practices, annual production, and claim initiation.

4.1.1. Producer Descriptions and Insurance Choices: Information must be obtained regarding a producer's or entity's name, identification number, correspondence address, and age. Other documentation may be needed to establish compliance with environmental regulations and participation in other government agricultural programs. Total acreages of each crop are also needed if a producer is required to insure all acreages within a specific program.

In addition, descriptions of insurance products selected for each covered crop, coverage and deductible selections, co-payment selection, and other special provisions must be recorded.

4.1.2. Liability Determination: It is necessary to obtain information regarding the total liability associated with each contract that a producer has purchased. Total liability can only be determined if the following factors are identified:

- A description of each area planted to each crop;
- Historical yield data for each specific area and for each crop for all growing seasons. Such data should include yields for consecutive years for annually planted crops. For rotational crops, yields are needed for consecutive growing seasons. And, in cases that involve more than one crop within a growing season, yield data for consecutive growing seasons are also needed;
- Whole farm historical income and input expenditure data if whole farm income of margin products are being offered;
- Management practices implemented on the farm including timing of field activities.

4.1.3. Best Management Practices: A variety of management practices must be documented as part of data collection activities. For example, documentation is needed for:

- Irrigation practices, including evidence that appropriate irrigation timing and application occurred;
- Planting dates, which may include documentation that a crop was not planted too early during a growing season (which could cause frost damage) nor too late (which could result in too few days for crop maturity);
- Completion data for required practices such as fertilizer and herbicide applications, when this is a required production practice;
- Crop harvest date.

4.1.4. Claim Initiation: For an agricultural insurance program to remain viable, producers must report yields for each growing season regardless of whether they initiate a claim for loss. This practice is necessary so that a producer's yield history can be updated. If an indemnity claim is initiated, then producers must report yields at that time; these need to be verified during the loss adjustment process. If an indemnity claim is not initiated, yields can either be reported after harvest by a producer or when the next insurance contract is signed. However, producers must be able to document yields, and processes need to be developed to verify that documentation.

It is also important to have a system that cross-checks reported yields with other unbiased information. For example, some agricultural insurance programs spot check yields from a sample of farms whether or not indemnity claims have been initiated. Loss adjusters then visit those farms during harvest seasons to assess actual yields. Reported yields are then compared to those assessed by the loss adjuster. These approaches help provide incentives for accurate reporting.

4.2. Agricultural Insurance System Data

A variety of data need to be recorded and developed within agricultural insurance systems, including:

- Eligibility requirements to determine whether or not a farmer is eligible to purchase a product. These eligibility requirements are defined by the insurance provider and/or the regulatory agency that oversees the provision of insurance;
- Premiums and coverage options established by the insurance company and/or the government agency that develops the product;
- Field monitoring and annual production data verification provided by the crop insurance system through the use of loss adjusters and crop inspectors;
- Indemnification amounts and premium co-charges or discounts, which need to be clearly described by insurance providers;
- Uninsured causes of loss. Such information can be provided by loss adjusters and crop inspectors and are critical for accurately updating yield histories or determining whether changes in program or product design are needed.

4.3. Third-Party Data

Third-party data are particularly necessary for evaluating crop values and, in cases of margin or proxy insurance products, identifying input costs or quantities. That is, the costs of compensating a yield loss by replacing the physical commodity are prohibitive. Rather, yield losses are more efficiently "replaced" using monetary equivalents. However, moral hazard issues related to individual crop pricing are too severe for the development of affordable crop insurance products. Hence, yield losses need to be valued through the use of price data that cannot be altered by any individual, but which reflect reasonable values across each product and region. Therefore, third-party data are frequently used to establish commodity and input prices.

In many cases, third-party data are not always available for a given region or country. In these cases, data are often obtained from other countries. However, this practice introduces exchange rate variability into indemnity calculations. Furthermore, substantial basis risk exists between countries, and such risk can be quite variable throughout any given year.

Third-party data are often obtained from satellites and weather stations. Observations regarding rainfall, temperature, and vegetative growth are often used as proxies for yields. However, the value of these observations not only depends on their correlations with actual yields, but also on an uninterrupted pipeline of data. Satellites and weather stations may experience mechanical or electronic failures. This can inhibit data updating and completeness. In addition, these interruptions can result in delayed indemnity calculations and payments. Finally, relying on single-source third parties for critical data is risky, as catastrophic failures of programs can occur if public policy changes or corruption within the management of those sources restricts data access.

4.3.1. Commodity Prices: A variety of third-party sources exist for determining commodity prices, including:

- National Government Sources (e.g., Ministry of Agriculture, National Statistical Service, Census Bureau, Bureau of Economic Analysis, Customs and Excise Office, Internal Revenue Service, etc.);
- Commodity Market Exchanges (e.g., Winnipeg Commodity Exchange, Chicago Mercantile Exchange, Minneapolis Grain Exchange, Kansas City Board of Trade, SAFEX, Africa Mercantile Exchange, Brazilian Mercantile and Futures Exchange, NYSE Liffe, Australian Securities Exchange, Tokyo Grain Exchange);
- Local market surveys;
- Farm organizations.

However, prices must be relevant or highly correlated with insured product prices. For example, the Minneapolis Grain Exchange provides futures market data for 13.5% protein spring wheat. However, many other wheat classes are produced, and prices for those need to be assessed. In addition, futures market prices for any given month change minute-to-minute, and monthly contracts expire throughout a year. Additionally, futures markets prices for the delivery of a commodity at harvest can vary greatly between the time in which an agricultural insurance contract is signed and harvest actually occurs. Consequently, it is important to establish the precise methods that are to be followed when using third-party data.

4.3.2. Input Prices: Margin products require information about the price of inputs such as energy, fertilizer, machinery and equipment, feed, hired labor, contract services, etc. Not only are these prices highly variable across years, regions, and input quality, but a consistent source of these prices are often difficult to obtain. Depending upon the input price of interest, sources include:

- National governments (e.g., Ministry of Agriculture, National Statistical Service, Census Bureau of Economic Analysis, Customs and Excise Office, Department of Labor, etc.);
- Commodity Market Exchanges (e.g., New York Mercantile Exchange, Africa Mercantile Exchange, APX-ENDEX, European Energy Exchange, Australian Securities Exchange);
- Local market surveys.

4.3.3. Proxy Index Data: Proxy index products do not measure yield losses directly. Rather, indemnities are triggered when certain proxies for yield do not meet specific targets. For example, proxy index products may insure against precipitation, temperature, and remote-sensed vegetative growth outcomes that either exceed or do not meet certain levels.

Such measurements are often obtained from weather stations or satellite imagery. Nonetheless, problems exist when using such data. That is, weather station data may not be consistently reported or may be subject to interruption. In addition, the correlation of these data with actual micro-climate outcomes can vary over time. Finally, a number of problems can occur with the use of satellite imagery, including cloud cover and other atmospheric conditions that can influence the accuracy of measurements.

Satellite hardware and digital signals are subject to depreciation and degradation. In addition, satellites have finite lengths of service and plans may not exist for physical replacement or software updating. Furthermore, satellite readings must be initially mapped with actual yields. These mappings may need change over time because of variances in mechanical functions and satellite orbits. Calibration and orbital variations can influence the consistency and usefulness of satellite-sourced data. Hence, data systems based on these third-party providers need to accommodate these variations. Finally, the pipeline must also be dependable so that transfer is not interrupted by mechanical, political or corruption transfer issues.

Weather data may be obtained from the Global Summary of Day (GSOD) system or the Global History Climate Network – Daily (GHCND) program. GSOD data are free of charge to non-commercial users and are derived from global integrated surface data. Information from over 9,000 weather stations is currently available. Some of these stations have been reporting data since 1929. These stations include many airport and city locations worldwide. Various daily summary observations such as temperature, dew point, wind speed, air pressure, visibility, and precipitation are gathered by the GDOD system. The data are updated daily within one to two days after the date of observation.

The GHCND database provides historical daily weather data over global land areas. It reports a composite of climate records from numerous sources that are merged before being subjected to quality assurance reviews. Data archives include daily maximum temperatures, daily minimum temperatures, temperature at time of observation, precipitation (rainfall and snow water equivalents), snowfall, and snow depth. Some GHCND data are exchanged under the World Meteorological Organization (WMO) World Weather Watch Program as stipulated by WMO Resolution 40. WMO member countries can restrict the use of that data for commercial purposes outside of the receiving country.

Historical weather data often contain unrealistic observations, missing observations, and other errors. This requires that weather data be carefully screened before being used for rating and underwriting purposes. Missing observations must be appropriately adjusted and unrealistic outliers must be altered to avoid rating errors.

Weather datasets contain huge numbers of observations. For example, if fifty years of daily data are available, then 18,000 observations for each measured variable are available for an individual weather site. Consequently, automated computer processes must manage, update, and process these large numbers of observations.

5.0. Data and Information Files

In addition to accessing large quantities of high-quality data for rating and indemnification purposes, successful agricultural insurance programs must manage information on individual producers. Management information systems must not only be developed to record yield information efficiently, but a plethora of documentation is also necessary for verification and administrative purposes. Although a variety of methods can be used, it is instructive to consider the details of a specific example to illustrate the scope and scale of documentation needs. Management information systems must be designed to account for operational realities, provide for the needs of the crop insurance system and be consistent with product design and underwriting.

5.1. An Example from the United States

The U.S. agricultural insurance program uses multiple data collection processes. Insurance issuing agencies construct a data file and transmit it to government agencies at specified time periods. Depending upon participation, multiple files may be constructed for an individual producer. These files are confidential and submitted for each year that insurance is purchased. Given the scale of the endeavor, it is important that management information systems are thoroughly evaluated so that data are organized efficiently from the beginning of the program.

There are nine primary and several other minor data files used by the U.S. system. In total, each contract contains 435 potential primary data field although some fields are duplicative. Table 5.1 presents the nine file types used in the United States and the accompanying number of data fields for each. The table also indexes the file name attached to each type and a brief description of the file type contents.

Table 5.1. U.S. File Types

File Type	File Name	Description	Number of Producer Obtained Data Fields
10	Policy Record	Producer Details	46
11	Acreage Record	Policy Details	93
12	Payment Record	Policy Premium Payment Details	12
15	Yield Record	Insured Historical Data	93
20	Loss Total Record	Loss or Indemnity Payment History	35
21	Loss Line	Loss Details and Cause	82
25	Settlement/ Arbitration	Appeals Record	17
55	Agent Data	Agent Description	40
56	Loss Adjustor Data	Loss Adjustment Description	25

Most of these file types are used for administrative, rating, or actuarial purposes, and do not change within a given year for specific products. However, a recording of this documentation is essential for avoiding and resolving disputes. The most relevant file type for this manual is file type 10. An example of file type 10 is presented in Table 5.2. File type 10 contains forty-six fields, some of which are simply blanks to maintain file integrity. A total of thirty-eight fields contain usable data.

The following provides a description of each field:

- *Field 1*: Record Type. This field must be completed with a "10" for this File Type.
- *Field 2*: Approved Insurance Provider. A two-digit code number that represents the name of the insurance provider.
- *Field 3*: Location State. A two-digit code for each of the fifty U.S. states.
- *Field 4*: Policy Issuing Company. In some cases, an approved insurance provider will subcontract with another company for the purposes of issuing policies. This field allows that information to be recorded.
- *Field 5*: Policy Number. A 7-digit policy number must be assigned for each separate policy. Hence, a single producer may have several policy numbers and, therefore, several Type 10 files for any given year.
- *Field 6*: Crop Year. Crop years usually coincide with the year that an insurance contract is issued. The exception occurs with winter crops in which a crop is planted in one year, but not harvested until the following year.
- *Field 7*: Type 10 Key Reserve. Field 7 is currently reserved for future use.
- *Field 8*: Record Number. A value of "001" is entered when an individual has a "substantial business interest" in the crop, define as at least 10% business interest in the crop. If a 1/3-2/3 landlord/tenant crop share lease were involved, then the producer would have 66% business interest in the crop. In these cases, landlords and tenants would have separate File Type 10s.
- *Field 9*: Branch Office. Many agricultural insurance companies have branch offices. This field indicates the branch location where the policy was sold.
- *Field 10*: ID Type. This field indicates the type of personal identification number being used the purchaser. In the United States, this number is usually a social security number, but other identification numbers may also be used.
- *Field 11*: ID Number. This field is populated with an identification number for the person purchasing the contract.
- *Field 12*: Entity Type. Indicates the type of ownership that exists on the property for which the contract is being purchased. Examples in include "corporation," C, and "individual," I.
- *Field 13*: Producer Last Name. The purchaser's last name.
- *Field 14*: Producer's First Name. The purchaser's first name.
- *Field 15*: Producer's Middle Name. The purchaser's middle name.
- *Field 16*: Producer Name Suffix. The purchaser's suffix (if any).
- *Field 17*: Producer Title. The purchaser's title (if any).
- *Field 18*: Business Name. The purchaser's business name (if different from the purchaser's name).
- *Field 19*: Address Line 1. The purchaser's primary address.

- *Field 20*: Address Line 2. Additional address information (if any).
- *Field 21*: City. The purchaser's city address.
- *Field 22*: State. The purchaser's State address.
- *Field 23*: Zip Code. The purchaser's ZIP code.
- *Field 24*: Zip Extension. The purchaser's ZIP code extension.
- *Field 25*: Phone Number. The purchaser's phone number.
- *Field 27*: Ineligible SBI Flag. If a "Y" is entered in this field, then the applicant is not eligible to purchase a policy. A person may be ineligible because of previous insurance fraud convictions.
- *Field 28*: Filler. Must be blank .
- *Field 29*: Ineligible SBI Share. Percentage ineligible if "Y" is entered in Field 27.
- *Field 30*: USDA Common Customer ID. Reserved for internal uses related to eligibility.
- *Field 31*: Uninsurable SBI Flag. Used in cases where a valid ID number has not been provided.
- *Field 32*: Filler. Must be blank.
- *Field 33*: Successor-In-Interest. Indicates the successor of interest to whom the check for indemnity payment will be sent if a purchaser dies during the year.
- *Field 34*. Previous Policy Number. Used for cases in which a Sucessor-In-Interest was relevant in previous years.
- *Field 35*. Filler. Must be blank.
- *Field 36*. SSN Validation Flag. Used for internal social security number editing.
- *Field 37*. Measurement Service Flag. An indicator of whether or not the acreage was actually measured or whether a producer's estimate of acreage is being used.
- *Field 38*. Filler. Must be blank.
- *Field 39*. FCIC Control Time. Internal use.
- *Field 40*. FCIC Control Date. Internal use.
- *Field 41*. Reinsurance Year. Internal use.
- *Field 42*. Batch Number. Internal use.
- *Field 43*. Transaction Sequence. Internal use.
- *Field 44*. Transaction Rejected Flag. Internal use.
- *Field 45*. Transaction Source Flag. Internal use.
- *Field 46*. Filler. Must be blank.

Type 10 files document and identify the purchaser of a specific contract. The Type 11 file records acreage information, including identifying land parcels. The Type 12 file documents premium payments, while Type 15 files record yield histories. Type 20 files document losses and indemnity payments and Type 21 files document losses and their causes. Type 25 files are used for settling disputes, and type 55 and 56 files provide data on the issuing insurance agent and loss adjuster, respectively. The documentation regarding these files can be found at: http://www.rma.usda.gov/data/m13/.

The above discussion and examples illustrate several points. First, all crop insurance programs must manage a plethora of data and documentation. Second, a great deal of planning is needed to operationalize such programs. Third, successful crop insurance programs grow and change. Data management systems must adapt to change. Fourth, the U.S. system is relatively clumsy as a result of growth and technological change since program initiation. When the system was first launched, computer usage was in its infancy and most recordkeeping involved paper copies. As data needs grew and technology changed, the system had to adapt to the use of electronic databases. Better systems can be developed using current technology, but flexibility must be built into such systems.

Table 5.2. FCIC Policy Record – Type 10 File

Field Number	Field Name	Beginning Position	Size	Picture	Field Edits
1	Record Type	1	2	9(02)	Required. Must be 10.
2*	Approved Insurance Provide	3	2	X(02)	Required. Edit with AIP/Company table.
3*	Location State	5	2	9(02)	Required. Edit with FIPS State table.
4	Policy Issuing Company	7	3	9(03)	Required. Edit with company table. Must be valid PIC code for reinsurance year.
5*	Policy Number	10	7	9(07)	Required. Must be > zeros.
6*	Crop Year	17	4	9(04)	Required. Must be the crop year of the crops reported under the policy. This will equal the Reinsurance Year or Reinsurance Year +/- 1 for the applicable crop code.
7	Type 10 Key Reserve	21	55	X(55)	Space reserved for additional key data required in the future or for other record types.
8	Record Number	76	3	9(03)	Required. Must be > zero. Only one record number "001" is permitted. Record numbers 002-999 are used to report SBI entities.
9	Branch Office	79	2	X(02)	Required. Reinsured organization branch office for record 001. Record 002 or greater must be spaces.
10*	ID Type	81	1	9(01)	Required. Must be one of the following: 1 = SSN, 2 = EIN, 3 = RMA Assigned, 5 = BIA Number. (See Exhibit 10-1 for valid combinations)
11*	ID Number	82	9	X(09)	Required. Must be one of the following: 1 = SSN (numeric), 2 = EIN (Numeric, > zero), 3 = RMA Assigned (MGR-05-008), 5 = BIA Number (may be alpha-numeric). (See Exhibit 10-1 for valid combinations) See note at end regarding Non-Citizen SSN Reporting.
12	Entity Type	91	1	X(01)	Required. Must be one of the following: A = Public Schools, B = Bureau of Indian Affairs C = Corporation, D = Estates E = Associations, Clubs, Private Schools, and/or Tax Exempt Organizations (religious) F = Transfer of Right to Indemnity (SBI only) G = Receiver or Liquidator, H = Public Agency – State I = Individual J= Joint Operators/Co-Owners/Joint Venture L = Landlord/Tenant (SBI only), P = Partnership R = Revocable Trusts, S = Spousal – Married T = Irrevocable Trusts U = Undivided Interests Valid for Cat Coverage Only V = Public Agency – County, W = Public Agency X = Individual Operating as a Company Y = Limited Liability Company (LLC) (See Exhibit 10-1 for valid combinations)
13	Producer Last Name	92	20	X(20)	Required if field 18 (Business Name) is blank. Left justify. Use for personal names only. Entries require a minimum of 2 characters. Only one name per field. Alpha including (-), (.), ( ), ('), (,).
14	Producer First Name	112	10	X(10)	Required if field 13 is not blank. Left justify. Use for personal names only. Only one name per field. For entity type 'J' there can be two first names. Alpha including (-), (.), ( ), ('), (,).
15	Producer Middle Name	122	10	X(10)	Optional. Left justify if reported. Alpha including (-), (.), ( ), ('), (,). Leave blank if not reported.

16	Producer Name Suffix	132	5	X(05)	Optional. Left justify if reported. The name suffix of the producer (e.g., SR, JR, II, etc.). Alpha including (-), (.), ( ), ('), (,). Otherwise, spaces.
17	Producer Title	137	4	X(04)	Optional. Left justify if reported. The title of the producer (e.g., MR, MRS, DR, etc.). Alpha including (-), (.), ( ), ('), (,). Otherwise, spaces.
18	Business Name	141	35	X(35)	Required if field 13 is blank. Left hustify. Use for all Entity Types except individual persons. Alphanumeric including (-), (,), (.), ( ), ('), (&), (%), (*), (+), (#).
19	Address Line 1	176	35	X(35)	Required. Left justify. Alphanumeric including (-), (,), (.), ( ), (&), (%), (#), (/).
20	Address Line 2	211	35	X(35)	Optional. Left justify. Alphanumeric including (-), (,), (.), ( ), (&), (%), (#), (/). Otherwise. spaces.
21	City	246	35	X(35)	Required. If state code = ZZ enter foreign city and country. Left justify.
22	Address State	281	2	X(02)	Required. Enter alpha state abbreviation. If a foreign country, enter ZZ.
23	Zip Code	283	5	9(05)	Required if State NE ZZ. Must be a valid U.S. ZIP code.
24	Zip Extension	288	4	9(04)	Optional. Otherwise, zero fill.
25	Phone Number	292	10	9(10)	Required. If no phone number, enter all fives.
27	Ineligible SBI Flag	303	1	X(01)	For SBI records only. Record number must be equal to or greater than 002. Enter Y if SBI Entity is ineligible and share has been reduced. Otherwise, blank.
28	Filler	304	2	X(02)	Must be spaces.
29	Ineligible SBI Share	306	4	9(01) v9(03)	Required: For SBI records only with an Ineligible SBI Flag of Y. Must be > 0% and ≤ 1.000. Record number must be ≥ 002. Must be zeros if not applicable.
30	USDA Common Customer ID	310	6	X(06)	Reserved.
31	Uninsurable SBI Flag	316	1	X(01)	Enter 'Y' on Primary Entity Record, record 001, if an SBI Entity does not have, or does not provide, a valid ID Number and share has been reduced. Otherwise, spaces.
32	Filler	317	1	X(01)	Must be a space.
33	Successor-In-Interest (SII) Application Data	318	8	9(08)	Application date of successor-in-interest MMDDCCYY format, else zeros. For current year only.
34	SII Previous Policy Number	326	7	9(07)	Previous policy number (unchanged or new) before successor-in-interest. Must be > zero if applicable, else zeros.
35	Filler	333	14	X(14)	Must be spaces.
36	SSN Validation Flag	347	2	X(02)	Internal use. Will be populated during SSN edit.
37	Measurement Service Flag	349	1	X(01)	N = Acreage measurement not provided, else space.
38	Filler	350	201	X(201)	Must be spaces.
39	FCIC Control Time	551	4	9(04)	Internal use. Time the transaction batch file was received. (From when transmission started) HHMM Format.
40	FCIC Control Date	555	8	9(08)	Internal use. Date the transaction batch file was received. (From when transmission started) MMDDCCYY Format.
41	Reinsurance Year	563	4	9(04)	Internal use. Reinsurance year. CCYY format.
42	Batch Number	567	4	9(04)	Internal use. Sequential number identifying the file that was submitted by the AIP to FCIC/RMA.
43	Transaction Sequence Number	571	8	9(08)	Internal Use. Sequential number assigned to each transaction number processed by DAS after it has been sorted.
44	Transaction Rejected Flag	579	1	X(01)	Internal. Reserved.
45	Transaction Source Flag	580	1	X(01)	Internal. Reserved.
46	Filler	581	20	X(20)	Internal.

6.0. Quality Control

Agricultural insurance programs are heavily dependent upon large quantities of accurate data and information. However, much of the required data is likely to contain a variety of errors. Therefore, quality control processes in terms of data input and security must be developed to minimize data errors. The goal of quality control procedures is to ensure that products, services, or processes meet specified requirements and are dependable, satisfactory, transparent, and fiscally sound.

A variety of data management concerns are associated with quality control issues in agricultural insurance programs. Automated error notifications during data entry provide one example. In addition, issues related to data transfer, missing data, outliers or aberrations, and procedures for updating and revising data must be considered when establishing management information systems.

Finally, it should be noted that incorrect observations often have worse impacts on the success of a product than having no observations. Thus, quality control processes must be able to identify errors. All data should be scrutinized and aberrant or missing data should be identified. In many cases, data quality issues can be addressed in appropriate ways that maintain the usefulness of information for insurance programs. However, the failure to recognize these problems can result in poor underwriting and premium rates as well as inconsistent communication with stakeholders.

6.1. Data Management Concerns

Management information systems must be developed to automatically incorporate quality controls and also allow for human checks on data issues. Automated processes can, for example, alert data personnel to entries that are outside of reasonable ranges. Frequent presentation of data in graphical or tabular form can also identify outliers and aberrations. Graphical and statistical processes can also be used to identify data that are trending over time and/or whether variations in observations are increasing or decreasing over time.

Processes must be developed for the secure, safe, and accurate transmission of data among authorized stakeholders. In addition, appropriate and clear version controls must be instituted so that incorrect additions to data files can be removed easily. Software and hardware updates must be scheduled so that operations are not interrupted and that data integrity is maintained. Furthermore, systems need to be developed so that they are not dependent on a specific person as all businesses must be prepared for human resource turnover.

Procedures must be developed for the automated updating of a variety of data and to accommodate periodic revisions of third-party data. Furthermore, methodological changes in third-party data collection procedures must be monitored and their potential impacts on product design and performance must be evaluated.

The effects of technological change on yields must be continually considered. Technological change occurs through the development of new genetic varieties, new machinery, and advanced production practices. The impacts of climate change, government regulations, trade agreements, and land use has important implications for agricultural insurance programs as well. Additionally, changing relative input prices can affect yields and yield variability.

6.2. Data Transfer

Data sharing is fundamental to agricultural insurance programs because of the wide variety of stakeholders involved in these programs. However, not every stakeholder needs access to all data and information. Hence, security and confidentiality are important features of data transfer operations.

Data and information transfers occur between:

- Farmers and insurance providers;
- Insurance providers and regulatory or government agencies;
- Organizational units within insurance companies;
- Insurance companies and reinsurers.

The mechanisms for such transfers are varied and include:

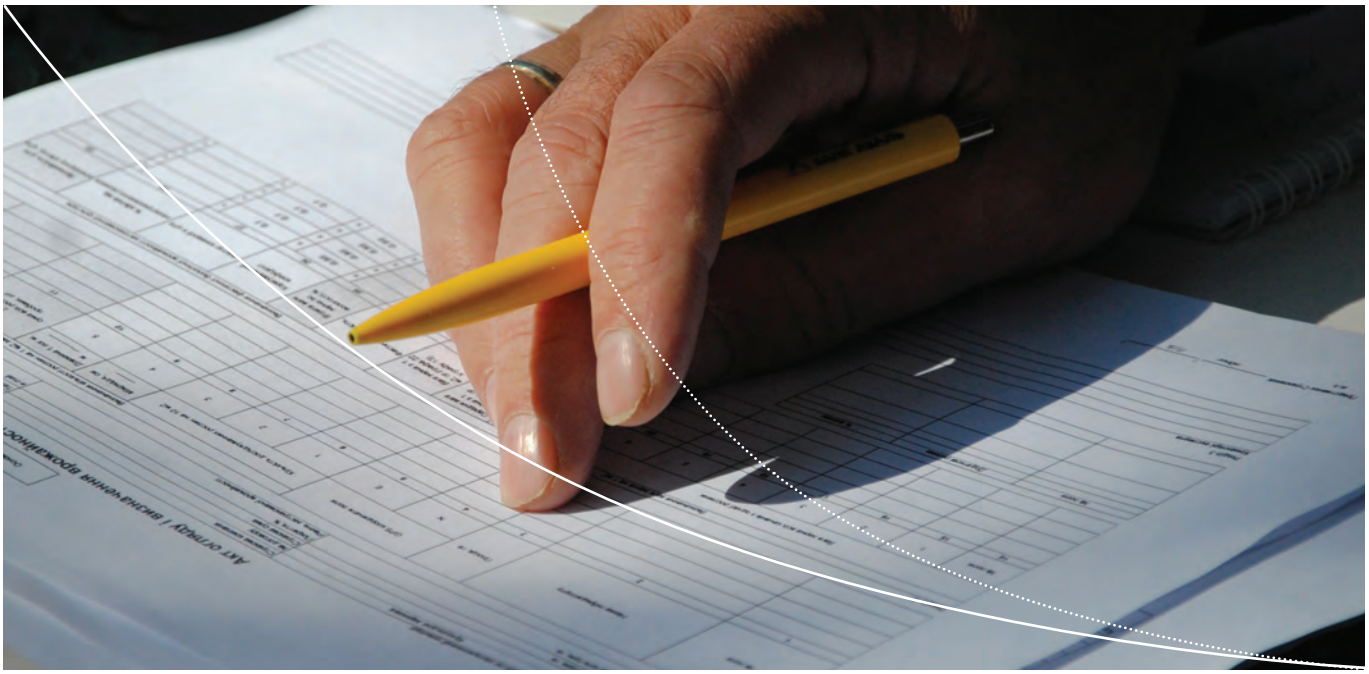
- Physical transfers through mail or courier;
- Protected or unprotected transfers of digital data through physical devices;
- Electronic transfers of digital data through encrypted or unencrypted processes;
- Telephone and fax technologies;
- Local intranets.

In addition, consideration must be given to which stakeholders have "read only" rights to data versus the ability to change data files.

6.3. Missing Data

The nature of crop insurance data often results in missing observations. Missing observations occur because producers may have lost or not documented yields in a given year, weather stations may have failed to record information for several days, or third-party price reporting may not have occurred consistently.

Within modern electronic databases, such missing data generally should not be coded with an entry of "0". For example, a yield observation may be missing, but yields were not actually zero. Conversely, it is certainly possible that a zero is legitimate entry for a yield observation. In addition, the systematic occurrence of missing data may be a signal that stakeholders are attempting to hide important information. Consequently, procedures must be developed to account for missing observations. In some cases, missing observations are simply ignored. In others, a value is entered for the missing entry. This value could be obtained through interpolation of surrounding data, or it may an average of other observations which were in a similar region at a similar time.



6.4. Outliers

Data outliers (aberrations) occur for a number of reasons in crop insurance data, including entry errors, mistakes, miscommunication, and poor measurement procedures. Depending upon the volume of data, graphs can often reveal outliers. When data volume is large, descriptive statistics can be used to identify outliers. In addition, consideration of intertemporal variability and comparisons to related data series can be used to identify aberrations.

Procedures must be developed to account for outliers. In some cases, coding outliers as "missing" may be a reasonable approach. In other cases, nearby observations, correlations with related variables, alternative data sources, or interpolation can be used to replace outliers with reasonable values.

6.5. Trending Data

Technological or other structural changes are often embedded in agricultural data. Such changes are often manifested as linear or non-linear trends. In addition, short term changes in government agricultural or trade policy can cause short term changes in the levels of agricultural prices or, occasionally, yields. Trends can be identified either through graphing or statistical procedures.

Trends should be accounted for when setting premium rates. If trends are ignored, then premium rates are likely to be set too high and/or coverage levels will be less than expected. In addition, trend recognition can help identify changing variability of yields or prices.

6.6. Updating and Data Revisions

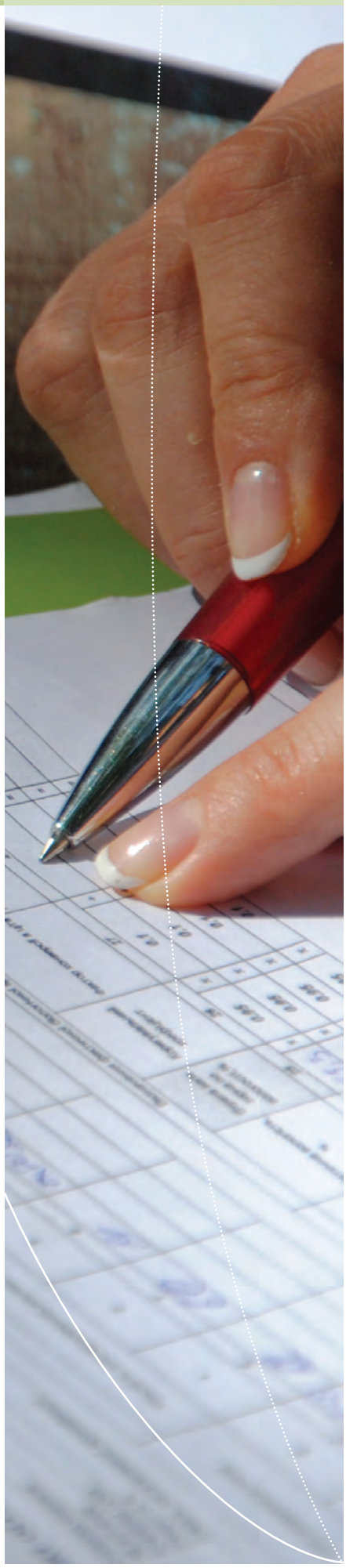
Data and information required by agricultural insurance programs need to be continually updated as new information becomes available. Updating information is not only necessary for operational efficiencies, but also for evaluating the efficacy of programs and for underwriting revisions. Hence, systems must be developed to allow for data to be updated seamlessly and accurately.

Agricultural insurance programs often use substantial amounts of third-party data. Third-party data may be in the form of regional yield or price information, weather observations, or satellite imagery. In addition to updating data as it becomes available, third-party data are frequently subject to revisions. Methodologies must be established to incorporate data revisions obtained from third-party interests. The impacts of data revisions on rating, underwriting, and product servicing need to be carefully considered.

7.0. Data Access and Security

A critical element of successful agricultural insurance programs relates to data access, security, and confidentiality. Initially, these issues are related to public policy decisions regarding access. That is, in addition to insurance providers, reinsurance companies, product designers, and program evaluators need access to some, but perhaps not all, system data. However, each of these groups has different needs and, in many cases, should be blocked from certain confidential information that is not necessary for their purposes.

In terms of implementation, computer hardware and software decisions must facilitate appropriate access by different groups. In addition, the selection of hardware and software systems must consider costs, ease of use, quality control, expansion, and updating actions. Finally, information backup and security must be assured in such programs.



7.1. Information Security

Information security refers to the protection of information and information systems from unauthorized use, access, disclosure, disruption, modification, or destruction. These issues cross the areas of confidentiality, integrity, availability, authenticity, and non-repudiation.

7.1.1. Confidentiality: Protecting information confidentiality is a standard business practice. The lack of such protection causes businesses and strategies to fail if customers lose trust and confidence in business accountability. In addition, confidentiality is an ethical and legal requirement in many regions of the world. The privacy of such information is a fundamental right and requirement in many societies.

Information security must, therefore, protect the privacy of individuals. Maintaining confidentiality necessarily requires preventing disclosure of information to unauthorized individuals or systems. In addition, the privacy of personal information must be maintained.

7.1.2. Integrity: Another aspect of such systems is that they must ensure that data cannot be corrupted by others. Information systems need to be designed to ensure that data integrity is maintained. Data integrity can be breeched in two ways: (1) the theft of data and (2) the corruption of data.

Data integrity requires that systems be developed to keep data from being modified without authorization. Data integrity can be violated in a number of ways:

- An employee may accidentally delete important data files;
- Computer viruses can infect computer programs;
- An unauthorized user can vandalize a web site by corrupting or deleting important files.

7.1.3. Availability: Management information systems must make information available to those who need it in a timely manner. In some cases, individuals need access to only a limited amount of the complete data set. In addition, it is sometimes sufficient for users to simply view data rather than modify it. In other cases, individuals should be allowed to view only limited amounts of data.

Finally, data must be available on demand. That is, computing systems must be maintained and security systems established so that appropriate access is available at all times. Systems must not only function correctly but also be protected from disruptions due to power outages, hardware failures, and system upgrades.

7.1.4. Authenticity: As the electronic sale of agricultural insurance products becomes more common, it is essential that purchases, requests, and access are deemed to be genuine rather than forged or the result of unauthorized impersonations. Hence, systems must be designed to ensure the authenticity of participants.

7.1.5. Non-Repudiation: Non-repudiation refers to ensuring that policy purchasers and insurance companies fulfill their contractual obligations. This requires that each party be unable to deny receiving or ordering a transaction. Hence, most electronic commerce uses digital signatures and encryption processes to establish authenticity and minimize non-repudiation.

7.2. Access, Control, and Transparency

Access to protected information must be restricted only to those who are authorized to view or download selected data. Mechanisms must be established to control the access to protected information. The sophistication of control mechanisms should be matched to the value of information being protected. More sensitive or valuable information requires stronger control mechanisms. Access and control mechanisms must also recognize transparency issues. A lack of transparency in the interest of restricting access and improving control also reduces credibility and confidence in agricultural insurance programs. Tradeoffs between controlling access and transparency are important considerations in designing data systems.

The foundations on which access control mechanisms are built include issues related to identification, authentication, and authorization.

7.2.1. Identification: Data procedures that positively assure the identity of those who try to access data systems must be developed. Data access should only be granted upon the verification of a person's identity and rights to view, download, or alter data.

7.2.2. Authentication: A variety of information can be used to authenticate a person's identity including: (1) information a person knows, (2) something a person has, or (3) unique physical characteristics (often called biometric data).

For example, information that a person knows would include such things as a Personal Identification Number (PIN), a password, or a pre-established answer to a specific question. Things that a person has include driver's licenses or magnetic swipe card. Unique physical characteristics include biometric items such as fingerprints, voice prints, and retinal (eye) scans.

7.2.3. Authorization: Agricultural insurance programs must develop consistent process for determining a person's authority to access information. Clear requirements for access and the actions that can be taken by individuals (e.g., download, view, create, delete, or change data) should be carefully developed and widely advertised.

Authorization to access information and other computing services necessarily involves decisions regarding administrative policies and procedures. To be effective, policies and other security controls must be enforceable and consistently applied.

8.0. Computer Hardware, Software, and Backup

The quantity and use of data in agricultural insurance programs necessitates the use of high-speed, reliable computer management information systems. Three elements must be considered when designing such systems: (1) computer hardware, (2) computer software, and (3) backup storage and operations systems. Hardware systems must be reliable and easy to maintain and redundant backups of data are essential. In addition, data must be available during times when systems are not functional because of interruptions in electrical power or during system upgrades.

8.1. Hardware and Software Requirements

Decisions regarding hardware and software systems are important elements of any agricultural insurance program. The selection of such systems should be carefully considered before launching such programs, as systems are costly to alter once programs have begun. A variety of criteria must be considered in making these decisions, including system performance, cost, storage capacity, dependability, and back-up and disaster recovery.

8.1.1. Performance: Hardware and software must be jointly considered in terms of their ability to perform tasks necessary throughout the life of the project. Systems must be designed so that data can be easily and quickly entered, updated, sorted, and retrieved. Software systems need to meet the requirements of the insurance program, including data and documentation entry, evaluation, sorting, management, and quality control. In addition, security measures need to be a central component of management information systems. Hardware and software systems should anticipate of future growth and alterations. Hardware and software elements of the program will need to allow for such changes as new products and procedures develop.

8.1.2. Cost: Most of the costs of hardware and software systems are fixed in nature. Hence, decisions regarding performance need to be compared to initial capital expenditures. However, it is important to choose systems that can be expanded with minimal expenditures in anticipation of program growth. In addition, the costs of modifying software for new products are often underestimated. Consequently, it is critical that selected software programs be flexible in anticipation of future changes.

8.1.3. Storage Capacity: Storage capacity needs are ultimately a function of the amount of data to be processed and stored. It is critical to select systems that not only meet current needs but are also seamlessly expandable to meet future needs. It may be difficult to upgrade storage capacities if systems are not properly configured initially.

The selection of storage capacity features, including storage space and internal memory, is also influenced by the complexity of required features and the amount of activity associated with data input and access.

8.1.4. Dependability: Hardware and software systems must be dependable and have adequate manufacturer support. Systems should have a strong history of performance without the need for frequent interruptions caused by updates and modifications. Mistakes that are made during data entry or access should be identified by the software and should not cause a system to stop functioning. The capacities and capabilities of hardware and software should be thoroughly investigated before purchase. The ability to obtain continued manufacturer support and extended warranties can reduce future operational costs.

8.1.5. Backup and Disaster Recovery: Hardware and software systems should be seamlessly and continually backed up at both on-site and off-site locations. Backup systems should have consistent and obvious version control identifiers. On-site backups are important for correcting or restoring minor data entry problems and are critical for version control. Off-site backup mechanisms are especially important for disaster recovery that could be caused by damage to local hardware or security breaches.

Data access should not be disrupted during hardware and software maintenance or while data are being updated.

9.0 Summary

Agricultural insurance programs are complex business systems that require coordination among many entities. Much of this coordination involves the management of information and data. Although program design, management, and product development are highly data intensive, strategic evaluation of data management often receives low priority. However, the viability and success of agricultural insurance programs is critically dependent upon the collection and management of data for rating, underwriting, sales, indemnities, subsidies, and reinsurance. Because data requirements for product development and program operations are not only voluminous but also frequently shared among stakeholders, it is critical that computer-based hardware, software, and backup systems be developed to keep data management costs low, remain expandable, provide for flexibility, be redundantly backed up, and secure. Agricultural insurance programs should not be developed without a thorough strategic plan that addresses data needs, availability, and management.

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