

Assessing Risk in Production Agriculture

A Self-Study Course for Finance Professionals

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Assessing Risk in Production Agriculture

Preface

Risk and uncertainty are givens in any business environment. Understanding the magnitude of those risks and how to manage them is critical to the long-term success of any business. The risks lender's face are complicated by the fact that he or she must assess the risk faced by the borrower as well as the effectiveness that the borrower exhibits in managing those risks.

Risks faced by farmers and agricultural lenders are the focus of this educational program, presented in three sections.

- Section I reviews some of the basic concepts of risk measurement and risk management by exploring the general principles of risk management and adapting them to the agricultural industry.
- Section II focuses on risk exposure and risk exposure management from a producer/borrower's perspective by describing the various sources of operational and strategic risk faced by agricultural production enterprises.
- Section III addresses managing and structuring the extension of agricultural credits and the management of the agricultural portfolio to minimize the credit risk and loss exposure in the portfolio.

The Setting

INTRODUCTION

Risk is a hot topic today in business, agriculture, and banking. Let's sit in as a banker and a producer consider the everyday realities of the risks they face.

OBJECTIVES

The objectives of this module are to:

1. Describe a typical scenario that illustrates the challenges lenders face in assessing borrower risk and managing credit risk.
2. Describe a typical scenario that illustrates the challenges farmers have in assessing and managing operating, financial, and strategic risk.

MADISON NATIONAL BANK

John Anton sat at his desk and thought about the task before him. He had just been hired by Madison National Bank to be the Senior Vice President for Agricultural and Commercial Loans. Madison National was a locally owned community bank located in a county seat town of approximately 50,000 people in a historically prosperous farming community in the Great Plains. John was part of a new management team brought into the bank when it was acquired by new owners from the bank founders' family. Previous management had not been particularly progressive in managing the loan portfolio, and John inherited the dual problems of lower-than-desirable credit quality as well as declining loan volume. His immediate challenge was to make a presentation to the Board of Directors to outline Madison National's strategy to expand loan volume. At the same time, improve credit quality by cleaning up the current portfolio and putting in place policies and procedures that would manage the risk of expanding their loan portfolio. The task would not be easy for a number of reasons.

The first challenge was that the loan market in which Madison National had historically participated was in major transition. The \$250 million bank was located in a rural community that historically had a strong agricultural base with traditional, independent family farmers as its prime agricultural customers. Agricultural loans were expected to continue to be a major part of the portfolio in the future, but the farming industry was changing dramatically from one of modest-sized family-based grain and livestock operations to more specialized grain or livestock businesses that were much larger in scale. Many livestock operations in the area required credit requests of \$1,500,00 or more, and grain operations with lines of \$1,000,000 or greater were rapidly becoming the norm. Many of the grain operations involved significant cash-rented land acreages, and the cash-rent market was very aggressive. The larger-scale operations needed more credit on the livestock side, but they were operating with higher leverage positions than

Risk Concepts and Terminology

INTRODUCTION

Risk and risk analysis and assessment are complex concepts and processes. The purpose of this module is to present some of the terminologies of risk analysis and assessment so that the discussion of analyzing producer's risk and credit risk in the agricultural portfolio can be accurately anchored and framed. This framework is essential to differentiate between a common perspective that risks are unexpected surprises that one can do nothing about and a more analytical perspective that risks can be measured, analyzed, and managed. Thus, this module's focus will be to develop the concepts essential to a more analytical perspective of risk and risk assessment.

OBJECTIVES

The objectives of this module are to:

1. Introduce various definitions and measurements of risk.
2. Introduce the concept of potential loss exposures as an important indication of financial and credit risk.
3. Categorize risks faced by farmers, including operational risk and strategic risk.
4. Identify the various strategies for managing risk.
5. Describe the importance of the concept of risk aversion and the trade-off between risk and return.

RISK DEFINITION

Everybody talks about it. Farmers and their lenders say it is increasing in agriculture. Lenders lose sleep over it. What is this phenomenon called risk?

Most lenders and farm and agribusiness managers think about potential losses when they think about risk. These losses can be in various forms, but the common denominator in most cases is a significant financial loss or setback. Some people define risk as a peril or a hazard, whereas others perceive a risk to be an outcome that is different than the one expected. Some distinguish between situations where probabilities are known (risk) and where they are not known (uncertainty); we will not worry about that distinction. Economists tend to worry about variability or variation when they think of risk, although variability as typically measured by economists includes potential gains as well as potential losses. Most businessmen and lenders focus their attention on the loss dimension of variability rather than the gain dimension.

Analyzing Risky Decisions

INTRODUCTION

Making decisions in an environment of risk and uncertainty is difficult. Still, one way to reduce that difficulty is to use a structured decision process that organizes the components or elements of a decision problem and applies appropriate tools and techniques to solve that problem. This discussion aims to describe that decision structure and identify various tools and techniques that can be used within that decision structure to make the best decision. These tools include probability distribution techniques, control charts, risk scorecarding, decision trees, scenario analysis, stress testing, value at risk, preemption, and options procedures. Although the decision tools discussed here will not guarantee success in risky decision-making (that is, one of the characteristics of a risky decision—there are no guarantees), they improve the chances of capturing all the information available and making a sound decision.

Additionally, because many decisions that involve uncertainty also have a critical timing dimension (either time is of the essence, or a delay can be orchestrated before a choice is made), the critical issue of managing time in a risky decision environment needs to be considered. Understanding how individuals and businessmen perceive risk, and how perceptions influence decisions, and how those perceptions can be managed to improve decision-making in a risky decision environment is an important concept. Finally, we focus on the critical issue in agriculture: whether the farmers bear the risk of their production, marketing, and other business decisions, or whether the public through government policy is the major bearer of production agriculture risk.

OBJECTIVES

The objectives of this module are to:

1. Identify and describe the critical components of a risky decision problem.
2. Introduce the concepts of probability distribution techniques and illustrate their usefulness in risky decision-making.
3. Illustrate the use of control charts in separating uncontrollable from controllable risk or variability.
4. Describe the potential use of risk scorecarding as a tool for analyzing risk.
5. Illustrate the use of decision trees as a mechanism for structuring and analyzing a risky decision.
6. Describe the concept of value at risk and its use in analyzing potential loss exposures.

Sources of Risk Exposure

INTRODUCTION

The general categories of operational risk and strategic risk were introduced in Risk Concepts and Terminology, the second module of this notebook. The purpose of this module is to identify the specific sources of operational and strategic risk faced by agricultural producers. Although it would be impossible to identify all of the risks that might be faced by an individual farm business, the discussion here will first attempt to identify specific events that create various types of operational risks for a typical farm business. Following the identification and discussion of operational risk, various sources and forms of strategic risk will be identified. Examples are given to illustrate what events might cause those strategic risks. Finally, the risk factors that farmers face will be classified into fourteen categories that comprise the universe of risk.

OBJECTIVES

The objectives of this module are to:

1. Identify various categories of operational risk exposure faced by farmers and the specific events that create those risks.
2. Describe the various sources of strategic risk exposure farmers face and illustrate potential causes of those strategic risks.
3. Describe the universe of risk faced by farmers.

The operational risk exposures that producers face have various origins. We will discuss these sources using the taxonomy typically used by farm management specialists and the USDA Risk Management Agency (RMA). Table 1 provides specific examples of the different sources of operational risk that farmers face, although the list is certainly not exhaustive.

Agricultural Industry Overview

INTRODUCTION

Understanding the risks in any industry requires a fundamental appreciation for the operating characteristics, technology, market position and environment, and the regulatory climate faced by the firms in that industry. This discussion will provide an overview of U.S. crop and livestock production agriculture characteristics with an emphasis on first describing that sector or industry. Then assessing the major risk exposures that the sector faces in terms of production, prices/markets, human, legal/regulatory, relationships, technology, and casualty risks. For a more detailed discussion of the agricultural industry, see Overview of Agriculture in “Financial and Credit Analysis of Farm Businesses.”

OBJECTIVES

The objectives of this module are to:

1. Provide front-end guidance for major U.S. crop and livestock production enterprises in market size and volume, technology, operating characteristics, and future challenges and opportunities.
2. Identify and briefly assess the major sources of risk that producers of each of these livestock and crop products and their lenders face.

CROP PRODUCTION

There are hundreds of different crops produced in the U.S., generating around \$190 billion annually in cash receipts. For this discussion, we are only focusing on the primary crops produced in the U.S.

Corn/Soybeans

The U.S. is a major producer of corn and soybeans, producing approximately 33% of the world's corn and 31% of its soybeans in 2020/2021. In the U.S., corn and soybean production is geographically centered in the Midwest.

Tables 1 and 2 show the five leading corn and soybean producing states that accounted for 61.2% and 51.2% of the U.S. production. These percentages are averages over the past three years to smooth out year-to-year production variability.

Government Policy in Agriculture

INTRODUCTION

Producers of agricultural commodities face numerous risks, as outlined in Sources of Risk Exposure. Both state and federal policies and programs have been implemented to help producers reduce or offset these risks. Because state policies and programs to modify or offset agricultural risks vary widely. Because they tend to have less impact than federal programs, our focus here will be on federal programs.

While there are a multitude of federal policies and programs that directly or indirectly affect agriculture, we will concentrate on the following:

- Federal Farm Programs
- Crop Insurance
- Environmental Regulations
- Food Safety
- International Trade and Global Market Access
- Worker Safety
- Monetary Policy and Interest Rates

OBJECTIVES

The objectives of this module are to:

1. Understand the key federal programs that impact agriculture.
2. Recognize how these programs shift, reduce, or eliminate risks for agricultural producers.
3. Illustrate how federal programs alter the risks faced by agricultural lenders.

FEDERAL FARM PROGRAMS

Federal farm program payments to agricultural producers date back to 1933 and have continued in some form through the present time. While the nature of the programs has changed over time, the objective has always been to stabilize and/or improve farm income, thereby lowering agricultural producers' risks. Often the programs required producers to take land out of production to qualify for program payments. The programs were often criticized because the program's benefits were capitalized into land values, therefore benefiting landowners (many of which no longer farmed) and not the intended recipient, the agricultural producer.

Marketing Alternatives

INTRODUCTION

Agricultural producers, particularly crop producers, continue to identify price and income risk as one of their greatest management challenges. Managing crop price risk is complicated by the fact that while crops are harvested one time per year, the window of pricing opportunities for that crop spans at least two years. Prices can and do vary considerably during that window of pricing opportunity. It is typical, for example, for corn prices to vary by \$0.75 to \$1.25 per bushel and soybean prices to vary by \$1.00 to \$2.25 during the marketing window. Price changes are influenced by a large number of factors and are not easily predictable.

Beyond the pricing decision, both crop and livestock producers are seeing significant structural changes in the relationship with buyers of agricultural commodities. These changes include a wide array of production and marketing contractual opportunities and opportunities to form production and marketing alliances. The challenges associated with marketing are now extended beyond the pricing decision to include concerns about maintaining market access.

OBJECTIVES

This module includes an overview of the traditional price risk management issues and tools available for producers and a look at some of the more recent contracting and producer alliances developments. The emphasis for crops is on the corn and soybean markets since these crops are most widely grown in the U.S. However, the contents are relevant for other crops that have actively traded futures and options markets—wheat, rice, and cotton. The discussion is not generally applicable to fruit and vegetable crops, which have very different, market structures and different price discovery mechanisms.

The objectives of this module are to:

1. Describe pre-harvest price risk management tools, such as hedging, cash contracts, and put and call options.
2. Identify and discuss storage pricing alternatives such as basis contracts and delayed pricing contracts.
3. Discuss alternative selective hedging and calendar-based marketing strategies.
4. Describe the concept and importance of the material hedge.
5. Discuss contracting, qualified supplier and producer alliance programs, and other non-traditional arrangements to market agricultural products.

Crop Insurance

INTRODUCTION

Crop insurance provides a means for farmers to protect themselves against low gross revenues resulting from crop production. Traditionally, crop insurance reduced risks by protecting against low yields. Since 1995, crop revenue products have become available that provide protection against yield losses and protection against downward price movements. The goal of this module is to show how crop insurance products impact production and price risks faced by farmers. Lowering these risks will typically increase the probability that farmers will repay loans.

OBJECTIVES

The objectives of this module are to:

1. Describe crop insurance products available to farmers.
2. Show how specific products reduce risks.
3. List general guidelines for making crop insurance decisions.

BASIC TERMS OF CROP INSURANCE

Crop insurance is a contractual agreement between a farmer and an insurance company. The farmer pays the insurance company a premium. In exchange, the insurance company bears risks associated with yield losses and, in some cases, downward movements in market prices. In some form or another, all crop insurance policies will deal with the following:

- Premiums
- Guarantees
- Payments
- Insurable units
- Actual production history yield
- Perils covered

Premiums

A premium is an amount a farmer pays to the crop insurer in exchange for protection against potential losses. Insurers set per acre premiums using rating procedures that consider the risks of insuring the crop. Premiums are higher for policies that have more risks.

Other Operational Risk Management Topics

INTRODUCTION

The production organization of any business, including a farm business, will have important impacts on the risk that business faces. Production organization issues in farming include a number of farm activities, off-farm employment, and production practices used on the farm. Moreover, recent advances in information technologies may impact the operational risks faced by farmers. This module describes how production organization impacts operational risk.

OBJECTIVES

The objectives of this module are to understand:

1. Diversification impacts on risk.
2. Off-farm employment impacts on risk.
3. Production practice impacts on risk.

This module also includes a case study that illustrates the impacts that diversification has on risk.

NUMBER OF ACTIVITIES AND DIVERSIFICATION

Farms typically engage in more than one income-producing activity. Engaging in more than one activity diversifies a farm's income sources, potentially leading to risk reductions in total income for a farm. Diversification works as a risk management strategy when below-average income from one activity is offset by above-average income from other activities. For example, income from one activity may be low, but this activity's low income may be totally or partially offset by high income from another activity, thereby leading to a more stable total income for the entire operation.

The effectiveness of diversification depends on three factors. The first is the profitability of the various activities. Generally, combining an unprofitable activity with a profitable activity does not lead to a superior risk position. Hence, all activities of the farm must be profitable before diversification works as a strategy. The second factor is the income variability from the activities. An activity with high-income variability tends to increase total farm income variability even if the high variability activity is combined with activities with lower variability.

The third factor is the correlation between activity incomes. Correlation can range between two extremes: perfect positive correlation and perfect negative correlation. A perfect positive correlation means that the incomes from two activities move up

Lending Practices and Approaches

INTRODUCTION

A thorough understanding of the borrower's risks and the techniques that can be used to manage those risks are critical for the lender to assess the debt servicing and credit risks of individual customers and for the agricultural portfolio. This module focuses on the lender's practices and procedures to manage the risks in extending credit to agricultural borrowers. This discussion will emphasize sound lending practices, including the essential components of loan documentation, proper procedures for loan review and credit risk detection, alternative problem loan resolution strategies, and standard lending practices and procedures for different types of loans and enterprises. Note that adequate financial analysis of risk-bearing ability and income-generating and debt servicing capacity should have been completed to verify that the borrower is creditworthy.

For a review of loan structuring issues, see Loan Structuring Issues in "Financial and Credit Analysis of Farm Businesses."

OBJECTIVES

The objectives of this module are to:

1. Describe the critical components of credit analysis and loan documentation.
2. Identify the elements of a properly structured credit arrangement.
3. Describe the proper procedures for loan review and credit risk detection.
4. Identify specific problem loan resolution strategies.
5. Describe standard lending practices and procedures for different types of loans and enterprises.
6. Identify various procedures to manage portfolio risk and monitor borrowers' risk management strategies.

MANAGING DEBT SERVICING/CREDIT RISK

Managing debt servicing and credit risk involves a number of tasks. The first task is proper credit analysis and loan documentation. The second task is the proper structuring of credit terms. Third is periodic reviews combined with policies and procedures for credit risk detection. Finally, specific problem loan resolution strategies should be identified prior to encountering a specific debt servicing problem.

Loan Guarantees and Securitization

INTRODUCTION

Lenders have the opportunity to reduce and/or shift credit and default risk through loan guarantees or through securitization of loan receivables. Normally, these measures to modify risk are negotiated when the loan is being put in place. However, there may also be opportunities to strengthen the lender's risk position even after the loan is made.

Loan guarantees are also referred to as "third-party enhancements." This means a third party has undertaken a contingent obligation to strengthen the credit or reduce the risk of loss for the lender. The third-party obligation is normally a "contingent" claim meaning it is only enforceable if the primary borrower fails to perform according to the terms of the loan agreement. The most common circumstances for third-party enhancements are:

1. A beginning farmer with limited net worth and a large loan request relative to collateral available to secure the loan.
2. An established farmer whose net worth has been eroded by adverse financial events beyond his/her control.
3. A farmer is making large capital investments in specialized agricultural buildings such as hog facilities, feedlots, milking parlors, etc. Upon completion, the market value of such facilities may be much lower than the cost of construction.
4. Loans to corporations or limited liability companies. Lenders often ask for personal guarantees when lending to such business entities. In these situations, the purpose of the guarantee is to increase the security for the loan and prevent the business owner from shifting business assets to personal assets, which would then shield them from the obligations incurred by the business.

OBJECTIVES

The objectives of this module are to:

1. Identify the types and sources of guarantees.
2. Describe the main features of the Farm Service Agency (FSA) guarantee program.
3. Identify the Small Business Administration (SBA) key features and state-level agricultural loan and guarantee programs.
4. Discuss participation and consortium lending and the use of asset securitization in agriculture.

Documenting and Monitoring Strategic Risks

INTRODUCTION

It is harder to manage and monitor strategic risk compared to operational risk, but it is no less important. One of the most significant strategic risks in agriculture is an environmental risk, so we will begin this discussion with a review of the environmental audit and managing environmental risk. We will then discuss regulatory compliance risk and provide a checklist to monitor regulatory compliance. Finally, our attention will turn to the challenge of assessing strategic and operational risk by introducing a graphical representation of risk assessment linked to the earlier discussion in Sources of Risk Exposure, the fifth module in this notebook, on the universe of risk.

OBJECTIVES

The objectives of this module are to:

1. Understand the importance of environmental risk and the components of an environmental audit to reduce that risk.
2. Identify and describe the regulatory risk and provide a checklist to evaluate regulatory compliance.
3. Introduce a visual technique to evaluate the total risk exposure of a farm business and how well those risks are being managed.

ENVIRONMENTAL RISKS

Environmental rules and regulations have a significant impact on agricultural lending. For many agricultural lenders, the environmental risk may be a larger potential source of cost and losses in their agricultural loan portfolio than traditional sources of credit risk. Most environmental regulations do not enhance revenue. They typically increase cost and reduce the cash flow generating capacity of the business. Furthermore, environmental compliance investments will typically not be financially self-sustaining and will drain revenues from other sources. Thus, investments and loans for environmental compliance must typically be subsidized from revenues generated elsewhere in the farming operation. And even if funds are not borrowed, compliance investments will typically reduce cash flow and income to service currently outstanding debt. Consequently, investments to comply with environmental regulations will almost invariably reduce the business's cash flow and debt servicing capacity and may, thus, increase credit risk.

In addition to the credit risk, the second risk of environmental regulation is that of environmental liability. It should be recognized that environmental liability can occur in all types of agricultural lending, not just in loans made for environmental compliance. A

Credit Scoring and Portfolio Stress Testing

INTRODUCTION

Lenders are increasingly using more comprehensive and formal methods to evaluate agricultural producers. A major evolution in credit evaluation methods has been the assessment of risk through credit scoring models. Credit scoring is a numerical method of evaluating the credit risk of loan applications based on a borrower's repayment history, financial condition, management ability, and other applicant characteristics. The numerical credit score ranks the applicant's likelihood of delinquency or default. Credit scoring provides a quick risk assessment tool and permits applicants' rank ordering by the relative amount of credit risk they represent. Analyzing risk at the portfolio level is important to assess capital adequacy, loan loss reserve allocations, and the financial institution's long-run viability. The use of stress testing models built on credit scoring systems to evaluate portfolio risk will also be discussed in this module.

OBJECTIVES

The objectives of this module are to:

1. Introduce and improve the understanding and limitations of credit scoring applied to agricultural borrowers.
2. Describe methods for evaluating credit risk impacts on the agricultural portfolio through stress testing.

CREDIT SCORING

History

Bill Fair, an engineer, and Earl Isaac, a mathematician, first implemented credit scoring as a tool to evaluate consumer credit in the 1950s. Fair, Isaac, and Co., Inc., a northern California company, is now the leading developer of credit scoring models for the consumer, residential mortgage, and small business credit. The growing role of technology and the current level of consumer credit in the U.S., over \$2.4 trillion, have led to expanded use of automated credit scoring systems in the credit card application process in addition to the automobile loan and home-equity lending markets. Credit scoring systems have the advantage of being able to handle a large volume of credit applications quickly.

Since the early 1990s, credit scoring has also been incorporated in the mainstream of residential mortgage underwriting. Both the Federal Home Loan Mortgage Corporation (Freddie Mac) and the Federal National Mortgage Corporation (Fannie Mae) have encouraged originators to use credit scoring models to evaluate mortgage applicants.