

*Managing the Modern Farm Business*

**DESIGNING RISK  
MANAGEMENT STRATEGIES**

*Leonard Bauer*

*and*

*Don Bushe*

*Third Edition*

*2003*

Faculty of Extension  
University of Alberta

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# PREFACE

Why should managers be interested in this series of risk management modules? These self directed learning modules demonstrate the basic tools used in the business world today; they are the language and practice of modern business.

My biases on the importance of having a strong understanding of management concepts come from over a decade spent as a researcher and instructor at the University of Alberta blended more recently by several years as manager of a commodity production business.

I have worked with many excellent business managers and if there is a central theme it is this; they distinguish themselves by their knowledge and ability to apply the principles of economics and risk management. These modules outline the basic principles and give practical insights, through illustrations and exercises, on how the material can be applied in practical situations.

The following modules lay out the basic process of developing and implementing a risk management program. Although the discussion in the modules is restricted to a highly simplified case, the tools can be applied to any business enterprise. Even if a manager does not use the actual detailed methods in every situation, e.g. calculating that the probability of default will drop by five or ten percentage points, there is power in understanding the sources and relative magnitudes of risk associated with various events. It is impossible to build sound strategies without a solid foundation.

I have thoroughly reviewed these materials; I use the principles in my day to day operations. I strongly encourage managers and those who work with and advise managers, in any capacity, to make use of Dr. Len Bauer's work to ensure a clear grasp of the important concepts and tools. The instructional design provided by Don Bushe makes it easy for busy managers to assimilate the ideas efficiently.

In these modules you gain a lot of understanding about important management ideas by working with a simple set of examples; today's managers had better be able to master these methods. Remember, if you fail to apply sound management principles you are inviting the market place to solve your management problems for you.

Frank Novak, Managing Director  
Alberta Pig Company

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# FOREWORD

Farm business management is the art and science of making decisions about the use of available resources and acting on those decisions in an uncertain world so that the short- and long-term goals of the business owners are as fully satisfied as possible.

This definition is not new, but rather a distillation of the thoughts and philosophies of many writers on the topic. The definition contains several key words. Management is concerned with achieving goals. Decision-making and action are crucial. Resources are limited and the world is uncertain.

As the general manager of your business, you need to plan, organize, control, co-ordinate, and motivate your management team. You must see to it that the details of production, marketing, financing, and personnel management are carried out.

As production manager, you must decide what to produce, how to produce it, and how much of it to produce, and you must set the production process in motion. As marketing manager, you must form expectations of product prices, and you need to carry out the functions of buying inputs and selling the products. As financial manager, you need to decide which assets to acquire, how to raise the funds to acquire them, and also when to exercise financial control. As personnel manager, you need to find and keep the right staff and then make sure they are properly trained to do the job.

*‘Managing the Modern Farm Business’* is a series of modules designed to help in developing the necessary concepts and skills essential to effectively manage the production, marketing, financing, and human resource aspects of the farm business. If you are the owner-manager of a farm, these modules will improve your chances of operating a successful business. If you are a farm management advisor, or an instructor, these modules are useful in reviewing and enhancing your understanding of management principles. They also provide an excellent resource of study materials, examples, and exercises for your students and clients.

Management is a process of gathering information, making decisions, and taking action. This module will help you take part in this process.

Leonard Bauer, PAg

Technical Editor

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# ACKNOWLEDGEMENTS

The authors acknowledge the contributions of many groups and individuals. The ideas portrayed in these modules were first developed as a tool for teaching introductory farm management. One individual in particular stands out for recognition; Alf Petersen has offered substance and encouragement to the preparation for many of the modules in the ‘*Managing the Modern Farm Business*’ series. Many students at the University of Alberta have provided a worthwhile testing ground for the subject matter and its presentation. Their candid contributions have been invaluable.

Staff members of the British Columbia Ministry of Agriculture, Fisheries, and Food have participated at risk management workshops and have provided useful suggestions for improvement. Their contributions and those of Howard Joynt and Mike Cowley of the British Columbia Ministry have provided practical insights invaluable to this set of modules. The insights of these individuals were incorporated into the first edition in 1993. We acknowledge funding of the first edition by the Province of British Columbia, Ministry of Agriculture, Fisheries and Food in cooperation with Agriculture Canada and the University of Alberta. Furthermore we acknowledge the contributions of Lois Hameister as copy editor, Melanie Eastley as graphic designer and Lu Ziola for electronic page composition.

The second edition, published in 1994, benefited from staff in Alberta Agriculture, most notably Ted Ford, Paul Gervais and Garry Bradshaw. We are grateful for their input and the input of others at an Alberta Agriculture Risk Management Workshop. The second edition was made possible through special funding provided by the Canada – Alberta Farm Business Management Initiative. This important contribution is hereby acknowledged. We acknowledge too the role Lois Hameister played as copy editor.

Alberta Agriculture, Food and Rural Development provided special funding for the considerable revisions undertaken in the third edition. We gratefully acknowledge this valuable contribution as well as the editorial and substantive contributions of Ted Darling and Dale Kaliel of that organization.

Whilst care has been taken to ensure accuracy of the material the authors freely accept responsibility for any errors remaining.

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# INTRODUCTION

## *Risk Management Modules*

Discussing farm risk usually involves reference to poor yields, disastrous events, calamitous markets, and missed opportunities. There is no doubt that bad things happen on the farm. Good things can happen as well: high yields, bountiful markets, and avoided disasters are some examples. But even these good things can have a bad side for the operator who did not anticipate or plan for them and then was unable to seize on the opportunity.

A high price for barley coinciding with a bumper crop is a good thing for the grain farmer who planted barley. It would be a bad thing for the farmer who decided against planting barley. Similarly, a farmer who sprayed for insects would be protected in the case of an infestation; in a year of few insects, he will have spent money unnecessarily. Risk, then, has two major components: the probability of bad things happening, and the consequences of bad things that have happened.

Farm managers need to understand their attitude toward risk. They must develop methods to identify, measure, and control risk to reduce the losses that are a consequence of bad things happening. Effective management can help to improve the chances that good things happen, losses are avoided, and opportunities captured. These are the themes that are developed in each of the modules.

The first module, *Identifying Risk Attitudes*, examines the predisposition to risk of the manager. One must be able to recognize and allow for one's own risk attitude in selecting the "right" course of action. *Identifying Risk Sources* explores the compounding effect that financial risk has on business risk. *Measuring Degrees of Risk* presents methods that the manager can use to calculate risk exposure and make effective comparisons of alternate actions. *Designing Risk Management Strategies* outlines the ways that effective farm managers can reduce overall risk exposure.

### *Designing Risk Management Strategies*

Farming is a risky business, but there are management strategies to help farmers deal with the variety of uncertainties that plague them in their day-to-day operations and in their long term strategic planning. This module is a guide through the process of enumerating and evaluating the types of risks faced in the business and to assess how important they are in the survival of the business.

When you have completed this module, you will be able to:

- define the business including the product(s) being produced and the production process being followed
- list the risk sources being faced by the business
- evaluate and rank the risk sources
- analyze the extent of the risk and its impact and the efficiency of possible solutions
- develop strategies for coping with the risk

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# RISK AND FARM MANAGEMENT

## *Types of Risk*

There are two main kinds of risk facing the operation – business risk and financial risk. Business risk relates to how much income deviates from what is expected. Financial risk is related to the manner in which the business is financed.

### *Business Risk*

The deviation from what is planned or predicted is called Business Risk. This is regardless of whether the business is heavily leveraged or without debt. Error in predicting income derives from the variability in prices, production levels and costs. In turn, commodity prices depend on the forces of supply and demand and these on marketing arrangements, market concentration, relative bargaining power between the farmer and the commodity buyer, the stability of trade agreements, government policy, and things of this sort. Variability in yields of crops and livestock depends on climatic and environmental factors and upon the technologies of production employed. Costs vary unexpectedly because of supply and demand forces that determine production inputs prices. On top of this there is the possibility that the production technologies invested in by the farm business will become obsolete.

### *Financial Risk*

The consequence of income being below expectations is much more severe for a business heavily in debt than for one operating with a modest amount of borrowed money.

As you build the risk profile think of adverse events that will have an impact on your business. Hail or other natural disasters might depress production levels for example. The bankruptcy of a major buyer that has a negative impact on prices would be another. Think of these events in terms of how vulnerable your business would be.

## *Risk Management Strategies*

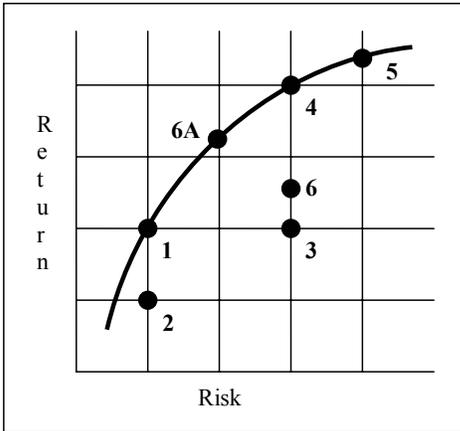
There are four categories of risk management strategies. Risk can be

- accepted,
- controlled,
- transferred, or
- avoided

When a farmer uses chemical or biological pesticides, he is controlling the risk of loss due to pest damage. Alternatively, the farmer who chooses to not use the pesticides is accepting the risk of crop damage. The farmer who locks in a price for finished cattle with a futures contract is transferring the risk of volatile prices to a professional risk taker. When an earlier maturing but lower yielding crop variety is planted in preference to a higher yielding one that requires a longer growing season the risk of crop loss due to frost is being avoided.

## Risk Efficiency

Options can be evaluated by comparing their standard deviations and expected returns. Investors use risk efficiency diagrams to enable such a comparison. Remember that these diagrams were used in the module where you identified risk attitudes. The risk efficient



position is an ideal, one you can move towards. While it's difficult to put into a strict numerical form it is a very powerful concept for analyzing different options.

If one axis is the expected or average return and the other the standard deviation (or level of risk) the options can be located and compared to the efficiency curve. The closer to the curve, the more efficient the option is said to be.

The purpose of risk management is to discover ways of increasing returns or reducing risk, or both. That is, the manager must decide on ways to move the business towards the risk efficiency

curve. A manager might search for ways to reduce risk for the same level of return. Alternatively, the manager may seek ways to increase the expected return for the same level of risk. Of course the manager might look for ways of increasing expected return while reducing risk. Sometimes management may be content to accept less return for correspondingly lowered risk. Such actions move the business from the current position towards a more risk efficient position.

## Risk Management Principles

There are four general rules to follow in selecting among risk management options.

- transfer the risk where the severity of loss is large but the frequency of the loss occurring is low
- avoid the risk where the severity of loss is large and the frequency of the loss occurring is high
- control the risk where the severity of loss is small but the frequency of the loss occurring is high
- accept the risk where the severity of loss is small and the frequency of the loss occurring is low

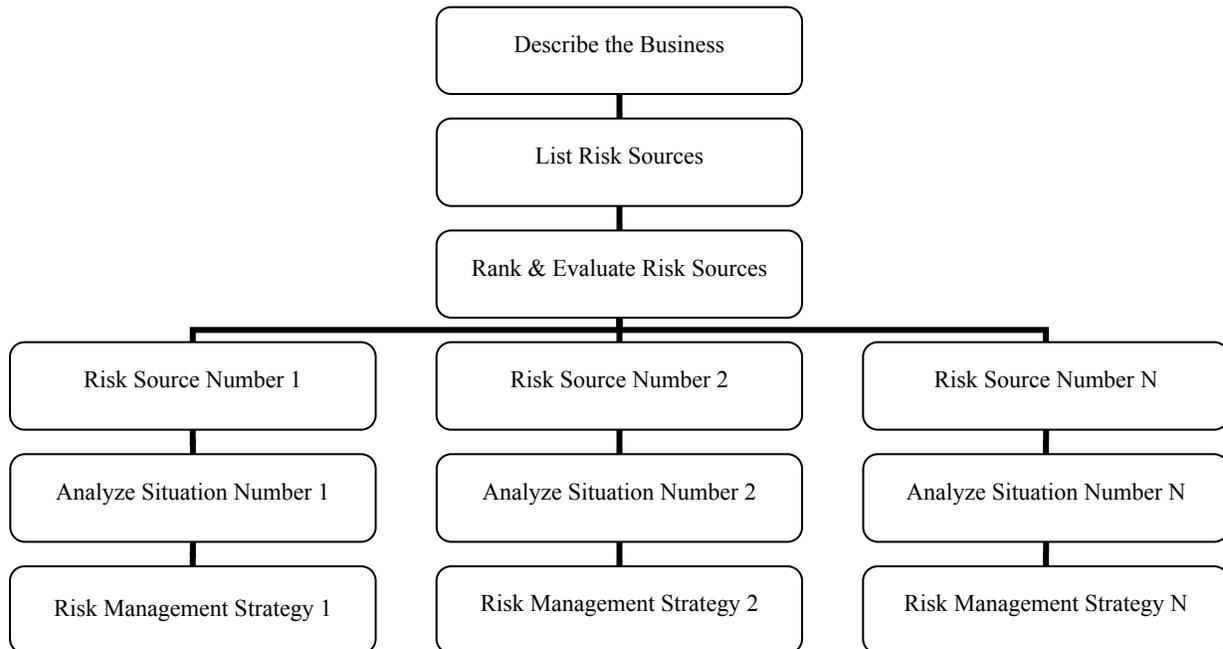
Severity of Loss	Frequency of Loss	
	Low	High
Small	Accept	Control
Large	Transfer	Avoid

These rules are general guidelines. They are not mutually exclusive; often two or more of the rules might be used simultaneously. For example, part of the risk may be assumed and part of it transferred. At other times it may be controlled to the extent possible and the remaining risk accepted. At other times, risk control measures might be used with risk transfer strategies. Sometimes it's wise to just walk away; just avoid the risk all together. The choices depend upon the objectives of the business, the nature of the problem, the efficiency of the solution, and the risk attitude of the operator.

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# THE RISK PROFILE

A risk profile is an organized process of describing specific risks being faced by the operation, analyzing the dangers that those risks impose on the business and then developing strategies to cope with them. There are a series of well defined steps to be followed. Each step is shown in the following diagram.



In order to illustrate the steps in the development of the risk profile, we will continue to follow the experiences of Kim and Lee as they prepare the risk profile for their grain farming operation.

## ***K&L Farms – A Case Study in Risk Management***

Kim and Lee have been operating K&L Farms for the past seven years while continuing their ‘in town’ occupations. Kim is an accountant and Lee a high school mathematics teacher. They have been able to refer to the experiences of the previous owner of their operation in building a twenty year history of yields and prices. As they have examined their operation and calculated the probabilities associated with good and bad things happening, they have learned that they are facing concerning levels of financial risk compounding their business risk situation. To explore and assess different risk management strategies that could be available to them they have called on their friend George who is a Farm Management Consultant. George is assisting them in the process of building a risk profile with the ultimate objective of designing strategies for the major risks facing them. George cautioned them to be concise and specific in the way they answered the questions associated with the various steps. The first step is to define the product they are producing and the production process being followed; in other words, to describe the business. Next they will identify the risks being faced and then finally they will analyze these to find solutions to the problems being faced.

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## ***Step 1 – Describing K&L Farms***

Step One  
Describe the Business

In order to build a meaningful risk profile it is necessary to describe the business that is exposed to the risk. Obviously it is important to know what product is being produced and under what production system. It is also important to know something about the marketing processes involved. The risk attitude of the business owners and manager are another important ingredient of the profile. Finally, knowing the risk bearing capacity of the business is essential to building a credible risk profile and ultimately a practical strategy.

### ***The Production Line***

The first step in the process is to define the product being produced. “That’s easy, we’re in grain production,” Kim was quick to offer.

“That’s true,” replied George, “but can you be more specific? In my experience it’s a good idea to be as specific as possible in defining the product or group of products. For some products this might require naming the particular type or variety ‘table potatoes’ for example. In other instances the production process may be important. ‘Table potatoes produced under irrigation’ would likely be more useful than simply ‘potatoes’. Simply stating ‘hog production’ would not elicit as appropriate a risk profile as would ‘farrow to finish hog production’ or ‘weaner pig production’.”

“Well then,” Kim re-thought his response, “we’re in cereal grain production.”

George, still wanting more detail asked, “Can you be a bit more specific yet?”

“Well, we’ve been growing feed barley,” was Kim’s reply.

“That’s more like it,” George smiled, “K&L Farms is producing barley for feed.” He wrote that information down.

### ***Production Process***

“Can you describe the production process you follow in producing feed barley,” George wanted to know.

“We’ve tried to run a low cost operation,” Kim replied, “so we use a ‘zero-till’ approach with a single pass at seeding time. That means we use an ‘air-seeder’ to apply fertilizer and seed at the same time. Later on we spray for weeds. We harvest using a swather and combine. The barley is normally stored on the farm until sold. Sometimes we sell directly from the combine.”

### ***Marketing Process***

George suggested the next step would be to describe the marketing process. “How do you market the barley?” He inquired.

Lee does the marketing so she answered George’s question. “I try to keep up on prices as best I can by researching the papers and web-sites. Future’s markets are a good source of price information that I use. There are often ads in the paper from feedlots wanting barley so I strike deals over the phone and we use e-mail. Then we find the trucker to haul the

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grain to the feedlot. After a while you get to know the feeders and truckers quite well. I know just who's reliable and who's not ... that kind of stuff."

"Very good," replied George, writing all this down.

### ***Risk Attitudes***

"Can you talk a bit about how you view risky situations," George wanted to know.

"We don't like taking extreme risks, would you not agree, Lee?" Kim replied.

"That's pretty accurate," Lee agreed, "I sometimes think we've gotten in a bit deep on our debts. Generally speaking we're pretty conservative in our choice of investments both on the farm and off, wouldn't you say, Kim?"

"I agree with you, Lee," Kim replied, "especially on our financial risk exposure because of our leverage rate. We're both in our late thirties and we're both well established with stable careers besides farming. But you know, we'd both like to retire from our professions and have the farm support us within the next five to ten years," Kim added.

"I guess we'd like the farm business to be profitable, but we're also concerned about our survivability," Lee went on to say while George recorded the gist of their conversation.

### ***Risk Bearing Ability***

"Apart from your own predispositions to risk which seem reasonable," said George, "how do you rate your business's capacity to bear risk?"

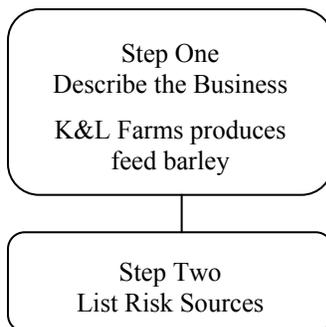
"The best way to answer that question is with our annual report," Kim and Lee responded.

Statement of Assets, Liabilities and Equity for K&L Farms as at December 31, 2xx6		
Cash	5,000	
Accounts Receivable	20,000	
Term Deposits	15,000	
Supply Inventory	10,000	
Product Inventory	50,000	
<b>Total Current Assets</b>		<b>100,000</b>
Land	400,000	
Buildings	50,000	
Machinery	175,000	
<b>Total Fixed Assets</b>		<b>625,000</b>
<b>Total Assets</b>		<b>725,000</b>
Operating Loans	0	
Accounts Payable	0	
<b>Total Current Liabilities</b>		<b>0</b>
Term Loans	500,000	
<b>Total Term Liabilities</b>		<b>500,000</b>
<b>Total Liabilities</b>		<b>500,000</b>
Equity		225,000
<b>Total Liabilities and Equity</b>		<b>725,000</b>

Income Statement for K&L Farms for Year Ending December 31, 2xx7		
Income:		
Crop Revenue	200,000	
<b>Gross Income</b>		<b>200,000</b>
Expenses:		
Crop Expenses	30,835	
Fuel and Repairs	20,000	
Term Interest	50,000	
Depreciation	34,000	
<b>Total Expenses</b>		<b>134,835</b>
<b>Net Income</b>		<b>65,165</b>

Lee offered her interpretation. “From our balance sheet you can see K&L Farms has a total value of assets \$725,000 in which we hold an equity of \$225,000. The mortgage company has a stake of \$500,000 in K&L Farms. Consequently K&L Farms has a debt to equity ratio, or leverage ratio of 2.2222. This rather high ratio means we operate under a rather significant exposure to financial risk.”

“Very good,” complimented Kim, the accountant. “You might have added that K&L Farms consists of 1280 acres of which 1143 acres (actually 1142.8571 acres) are in crop annually.”



George wrote down the information then said, “Good that finishes the first step. Now let’s look at specific risks.”

### ***Step 2 - Listing and Evaluating Risk Sources***

The next job in this process is to list as many of the risks affecting K&L Farms as is practical. After the list has been prepared these risks will need to be rated as to severity, frequency and overall importance. George had some suggestions for doing this.

“Here are some suggestions for listing and evaluating adverse events,” George said. “List the adverse events that are the source of risks and be specific as possible. For example, you will find it more useful to think in terms of diseases, drought or hail.”

“I see what you mean,” Kim replied, “simply saying ‘poor yields’ doesn’t tell much.”

“Right Kim,” George agreed. “Once you have prepared the list, rate each source of risk according to its severity, frequency and overall importance.”

“What does that mean?” Kim inquired.

“Severity refers to the size of the potential loss, should it occur. Frequency refers to the probability or likelihood that it will happen. In order to set priorities as to which source of risk to deal with first, rank each source with regard to its overall importance. A source that has severe consequences should it occur but a low frequency of occurrence would likely still be of greater importance than one with a high probability of happening but with only minor consequences when it does.”



### ***Step 3 – Order Risk Sources***

Kim and Lee proceeded to list and then order the risks facing K&L Farms and listed them in the risk profile.

1. **Low Barley Yields:** Once in four years K&K Farms experiences low barley yields due to drought, disease or hail. An analyses of their gross income figures revealed that a yield less than 30 to 35 bushels per acre, even with average prices, causes considerable financial hardship. As a matter of fact a 30 bushel yield per acre or less occurs with a probability of 13.84 %. While the frequency of such loss is relatively low the severity is significant as it affects the entire source of revenue. This event is of high importance.
2. **Low Barley Yields and Prices:** K&L Farms produces a single crop, feed barley. The joint events of poor prices and yields are of real concern to Kim and Lee. Their analysis showed that a gross income of \$125.00 per acre or less occurred about once every four years, (a probability of 23.39%). As with low yields occurring by themselves this also presents a potentially stressful situation. This event is of moderate to high importance.
3. **Bad Debts:** K&L Farms sells its production to a number of different feedlots. The potential loss is of low to moderate severity because Lee has a number of different buyers. No single buyer accounts for a large share of the total sales. Experience to present is that the frequency of default is quite low. In seven years of farming there have been no occurrences. Lee does a thorough background check on all of her customers. The importance of this event is of lower importance.
4. **Single Enterprise Risk Exposure:** Currently, all of K&L Farm’s eggs are in the ‘barley production’ basket and subject to risks imposed by fluctuating barley prices. Furthermore the size of business is limited to production from 1143 acres. The risk imposed by barley price fluctuations and relatively small business size is of moderate frequency and severity. The importance of this risk’s impact on the business is relatively low relative to the other risks identified.

### Step 4 - Risk Source 1

Risk Source Number 1  
Low Barley Yields

Analyze Low Barley Yields

A low barley yield due to drought, disease or hail occurs with relatively low frequency but has rather severe consequences when it does. “A suitable risk management strategy might be to transfer the risk to an insurance company,” George suggested.

Crop Insurance Corporation writes insurance policies for all

Twenty Year History of Barley Yields and Prices With and Without Insurance						
Year	Yield bu/acre	Price \$/bu	Shortfall bu/acre	Gross Revenue per Acre from		
				Insurance	Market	Total
1	42.5	4.11			174.68	174.68
2	63.0	2.94			185.22	185.22
3	23.0	3.43	12.0	36.00	78.89	114.89
4	15.5	3.75	19.5	58.50	58.13	116.63
5	51.5	2.85			146.78	146.78
6	63.5	3.22			204.47	204.47
7	80.5	3.25			261.63	261.63
8	37.5	4.18			156.75	156.75
9	46.5	3.12			145.08	145.08
10	63.0	3.96			249.48	249.48
11	57.5	3.43			197.23	197.23
12	69.5	3.68			255.76	255.76
13	42.0	3.44			144.48	144.48
14	32.0	2.96	3.0	9.00	94.72	103.72
15	46.5	3.78			175.77	175.77
16	41.5	3.20			132.80	132.80
17	75.0	4.13			309.75	309.75
18	20.5	3.49	14.5	43.50	71.55	115.05
19	68.5	3.56			243.86	243.86
20	60.5	3.52			212.96	212.96
Mean	50.0 bu/ac	\$3.50/bu			\$175.00	\$182.35
Standard Deviation					\$68.89	\$58.37
Insured Coverage	35.0 bu/ac	\$3.00/bu				
Premium						\$10.00/ac

risk crop insurance. For an annual premium of \$10.00 per acre the corporation will insure against crop yield shortfalls of 70 % of the long term yield. Since K&L Farms has a long term average of 50.0 bushels per acre this means the insurer will make up the deficit when ever the yield dips below 35.0 bushels per acre. Should the insurance company make up the

difference it will do so at a price of \$3.00 per bushel. For example, if the actual yield

were 15.5 bushels per acre, as it was in year 4, the insurance company makes up the shortfall of 19.5 bushels per acre at \$3.00 or \$58.50. Of course the farmer would sell his 15.5 bushels at whatever the market price is that year. Suppose that the price was \$3.75 per bushel as it was in year 4. In year 4 there would be revenue of \$58.13 per acre, (15.5 x 3.75 = 58.13) from the market place. The total revenue for this year would be \$116.63 per acre made up of \$58.50 from the insurance payout plus \$58.13 from the barley sold in the market place. In a year like year 5 there would have been no payout and the revenue of \$146.78 would have been entirely from the sale of 51.5 bushels at \$2.85 per bushel.

The actual yields and prices shown in the table are those that were obtained by K&L Farms over the seven years of Kim and Lee’s ownership and management (from year 14 through 20) plus the previous experience of the former owner.

Kim and Lee analyzed the insurance situation as it would have applied to their farm over the twenty-year history.

First they calculated the revenue that would have pertained in each year of the series of yields and prices.

Then they calculated the mean gross revenue and standard deviation per acre with insurance in place.

<b>Comparative Performance With and Without Insurance</b>		
	<b>Without Insurance</b>	<b>With Insurance</b>
Mean Crop Revenue per Acre	175.00	182.35
Total Gross Revenue	200,000	208,400
Insurance Premium	0	11,429
Net after Premium	200,000	196,971
Other Deductions	108,835	108,835
Return to Assets	91,165	88,136
Per Cent Return on Assets	12.57%	12.16%
Standard Deviation on Assets	78,728	66,709
Per Cent Standard Deviation	10.86%	9.20%
Cost of Debt	50,000	50,000
Return to Equity	41,165	38,136
Per Cent Return on Equity	18.30%	16.95%
Standard Deviation on Equity	78,728	66,709
Per Cent Standard Deviation	34.99%	29.65%

They had already calculated these statistics for the uninsured situation.

With this information they were able to calculate the per cent return on assets and the per cent standard deviation for the insured situation in order to compare it to the uninsured situation.

Exercise 1 - Insurance Comparison

Refer to the information in the table to complete the statement.

The per cent standard deviation with the all risk insurance option would [ fall to/rise to/stay at ] [ \_\_\_\_\_ ] from \$68.89. The per cent return on assets would [ fall to/go up to/stay at ] [ \_\_\_\_\_ ] from \$175.00 per acre.

Insurance Comparison - Answer

Compare your work to Kim and Lee’s. Correct any errors. If you had less than three correct (more than one error) you may wish to review the section.

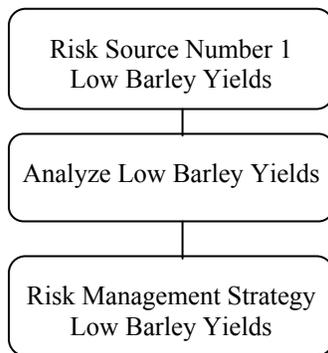
The standard deviation with the all risk insurance option would [ ~~fall to~~ **rise to** / ~~stay at~~ ] [ **\$58.37** ] per acre from \$68.89. The gross revenue will [ ~~fall to~~ **go up to** / ~~stay at~~ ] [ **\$182.35** ] from \$175.00 per acre.

“This looks pretty good Lee,” Kim exclaimed.

“That’s true, Lee interjected, “but why did our per cent return on assets drop?”

“You’re right. Then maybe it’s not such a good idea,” Kim said with sudden unease.

**Develop Risk Management Strategy**



“Let’s think about this a bit more,” George offered.  
 “Remember we would be transferring the risk of crop loss to the insurance company. They won’t do it unless they are compensated for the risk they assume. To K&L Farms a crop failure would be a disaster. To the insurance company it would be the normal course of its business. In effect it pools K&L Farms’ yields with many other farmers over a wide region. It is unlikely that all of the farms they insure would experience a crop failure in the same year. Even if they did they would probably re-insure with an even larger pool so that the risk is spread even wider. For the \$10.00 per acre premium the insurer is willing to take on the risk you are nervous about accepting yourselves.”

“I think I’m beginning to see,” said Kim, “but let’s check it out a bit more.”

George suggested a table that expressed the analysis on a total farm basis, not just per acre. After this was done he noted that, after paying the premium for insurance they

Cash Commitments With or Without Insurance				
Description	Without Insurance		With Insurance	
	Amount	Totals	Amount	Totals
Crop Expenses	30,835		30,835	
Fuel and Repairs	20,000		20,000	
Insurance Premium	0		11,429	
Level A		50,835		62,264
Debt Service	65,737		65,737	
Level B		116,572		128,000
Living Costs	24,000		24,000	
Level C		140,572		152,000
Depreciation	34,000		34,000	
Level D		174,572		186,000

would have just over \$3,000 less in net returns, (200,000 – 196,971 = 3,029). Their per cent return on assets would drop from 12.57 % to 12.16 %. Standard deviation would drop considerably from \$78,728 to \$66,709.

“By buying the insurance we appear to be moving in the right direction, toward the risk efficiency curve,” Lee concluded.

“Exactly,” George agreed.

“But,” Lee went on, “I’m still a bit leery as to how were going

to pay our bills. Remember we'll have all of our previous expenses plus an extra \$10.00 per acre crop insurance premium.”

“Well then why don't we look at the probability of covering critical levels of cash commitments?” Kim was quick to offer.

“That's a good idea,” George encouraged.

They began with a table containing the four levels of cash commitments for the two cases; with and without insurance.

Once they had completed the table showing the levels of their various cash commitments they were in a position to calculate the probabilities that they might default on their obligations.

“We can calculate the Z-Scores as we did before.” Lee offered to do the calculations.

“The expected gross revenue for the ‘without insurance’ case is \$200,000 and the standard deviation is \$78,728. In the ‘with insurance’ case the gross revenue is higher at \$208,400 while the standard deviation has dropped to \$66,709. We can then calculate the Z-Scores and look up the probabilities in the table.”

Exercise 2 - Probability of Default

Use the Z-Score tables that were attached to Module three to complete the missing calculations in the following. Then refer to the information in the table to complete the statement.

Probability of Default on Cash Commitments With and Without Insurance						
Commitment Category	Without Insurance			With Insurance		
	Amount	Z-Score	Probability	Amount	Z-Score	Probability
Level A	50,835	-1.89	2.92%	62,264	-2.19	1.42%
Level B	116,572	[_____]	[_____]	128,000	[_____]	[_____]
Level C	140,572	-0.75	22.66%	152,000	-0.85	20.06%
Level D	174,572	[_____]	[_____]	186,000	[_____]	[_____]

Comparing the probabilities for the two cases; with and without crop insurance, the probability of default is [ **reduced/increased/stays the same** ] at all levels. In fact on Level B the probability of default or rather of defaulting on the mortgage payment has [ **stayed the same at/risen to/gone down from** ] [ \_\_\_\_\_% ] to [ \_\_\_\_\_% ].

Probability of Default – Answer

Compare your work to Kim and Lee’s. Correct any errors. If you have less than 6 correct (more than 2 errors) you may wish to review this section.

Probability of Default on Cash Commitments With and Without Insurance						
Commitment Category	Without Insurance			With Insurance		
	Amount	Z-Score	Probability	Amount	Z-Score	Probability
Level A	50,835	-1.89	2.92%	62,264	-2.19	1.42%
Level B	116,572	<b>-1.06</b>	<b>14.48%</b>	128,000	<b>-1.21</b>	<b>11.33%</b>
Level C	140,572	-0.75	22.66%	152,000	-0.85	20.06%
Level D	174,572	<b>-0.32</b>	<b>37.44%</b>	186,000	<b>-0.34</b>	<b>36.68%</b>

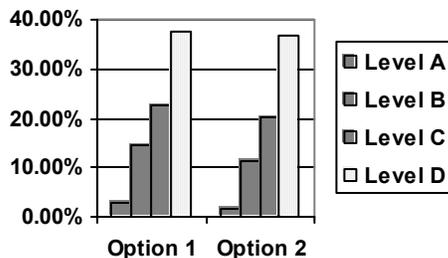
Comparing the probabilities for the two cases; with and without crop insurance, the probability of default is [ ~~reduced/increased/stays the same~~ ] at all levels. In fact on Level B the probability of default or rather of defaulting on the mortgage payment has [ ~~stayed the same at/risen to/~~ **gone down from** ] [ **14.48% to 11.33%** ].

Lee commented, “as you remember Kim, from our previous work, we were in danger of default once in about every seven years.”

“That’s right Lee,” Kim agreed, “actually it was  $1.0 / 0.1448 = 6.91$ . At this level, it’s once in about nine years or  $1.0 / 0.1133 = 8.83$ .”

“That appears to be quite an improvement,” George commented. “You know, many of my customers find it helpful to see a graph to make the changes more apparent.”

“We should construct a graph to aid in the interpretation of the figures,” Lee agreed.



George reentered the discussion at this point. “Before going further why don’t we label some of the options we are considering?”

“OK,” chimed in Lee, “let’s call our current operation, where we grow only feed barley and don’t insure it as ‘Option 1’.”

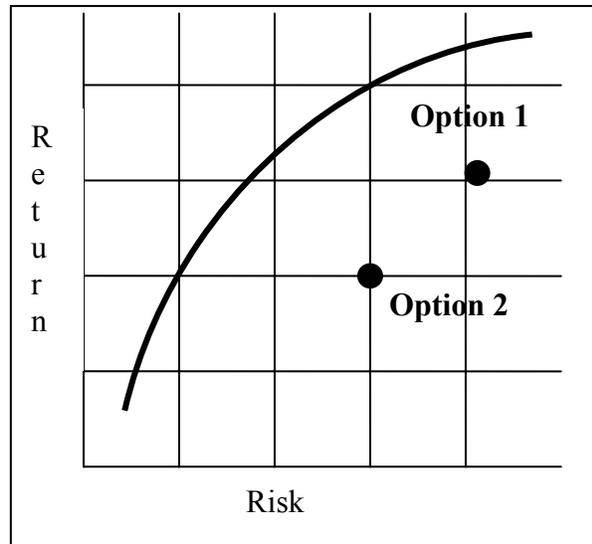
“Then,” Kim continued, “we would label the option we have just considered, grow only feed barley but under crop insurance as ‘Option 2’.”

“Good,” George agreed and prepared a summary table.

Name	Description
Option 1	grow only feed barley, without crop insurance
Option 2	grow only feed barley, with crop insurance

As George finished summarizing the options Lee was busy charting the risk efficiency curve and K&L Farms' relation to it.

George inspected Lee's graph and remarked, "OK Kim and Lee, you must decide, based on your risk attitudes, whether the reduction in per cent return on assets from 12.57% to 12.16% more than compensates you for the reduction in risk. There the standard deviation drops from 10.86% to 9.20%. Only the two of you can decide."



"I think crop insurance would be a good management strategy for dealing with our financial risk," Kim observed. What do you think, Lee?"

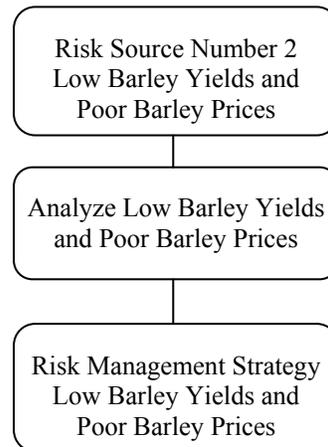
"I agree, let's call the agent," Lee said enthusiastically.

"Let's evaluate the other options first," cautioned Kim.

**Step 4 – Risk Source 2 Low Barley Yields and Prices**

"You're right Kim," Lee observed, "we do have all of our eggs in one basket. Should we consider another enterprise as well as feed barley?"

George referred to the risk profile notes he had taken. "The second risk faced by K&L Farms that you identified is the joint occurrence low prices and yields."



Their previous analysis on crop insurance (their review of Option 2) dealt with yield risk only.

"Let me guess," Kim smiled, that would be Option 3."

After some discussion Kim suggested they investigate devoting some of their acreage to growing Canola.

"The cost of production and the work requirements are about the same as for barley so Canola would be a likely candidate for spreading our risk," he stated.

Name	Description
Option 1	grow only feed barley, without crop insurance
Option 2	grow only feed barley, with crop insurance
Option 3	Grow feed barley and Canola with crop insurance.

It would cost \$10.00 per acre in premiums to cover K&L Farms for Canola at a 70% level of yield which comes to 18.2 bushels per acre. The price the company would pay out at is \$6.50 per bushel. With insurance considered the gross revenue increased to \$189.74 and, as one would expect, standard deviation dropped to \$64.61 per acre. After allowing for the premium the return would be \$179.74 but the standard deviation remains at \$64.61.

“Aren’t there some disease limits on the amount of Canola we can include in our crop program?” Lee questioned.

“As I understand it we could grow Canola one year out of three without any major

Twenty Year History of Canola Yields and Prices With and Without Insurance						
Year	Yield bu/acre	Price \$/bu	Shortfall bu/acre	Gross Revenue per Acre from		
				Insurance	Market	Total
1	31.5	5.88			185.22	185.22
2	31.5	7.92			249.48	249.48
3	21.5	7.12			153.08	153.08
4	42.5	7.58			322.15	322.15
5	36.0	7.36			264.96	264.96
6	19.0	8.09			153.71	153.71
7	21.0	6.88			144.48	144.48
8	26.0	5.87			152.62	152.62
9	23.5	7.56			177.66	177.66
10	40.0	8.12			324.80	324.80
11	32.0	5.78			184.96	184.96
12	9.0	8.67	9.2	59.80	78.03	137.83
13	12.5	6.88	5.7	37.05	86.00	123.05
14	35.0	6.86			240.10	240.10
15	16.0	5.92	2.2	14.30	94.72	109.02
16	35.0	7.12			249.20	249.20
17	31.0	6.56			203.36	203.36
18	24.5	6.24			152.88	152.88
19	21.0	6.98			146.58	146.58
20	11.5	6.61	6.7	43.55	76.02	119.57
Mean	26.0 bu/ac	\$7.00/bu			\$182.00	\$189.74
Standard Deviation					\$74.25	\$64.61
Insured Coverage	18.2 bu/ac	\$6.50/bu				
premium						\$10.00/ac

disease problems,” was Kim’s response.

Lee offered, “we could begin by collecting yield and price data just as we did for barley. I think we should consider crop insurance as part of the analysis.”

Kim and Lee themselves had no yield or price experience, but George had some data for the district. As a matter of fact he showed them this table which reveals an expected yield of 26.0 bushels per acre at an

average price \$7.00 per bushel. The result is gross revenue of \$182.00 per acre. The standard deviation of gross revenue is shown in the table as \$74.25 per acre.

Lee proposed, “Let’s prepare a table projecting the results of one-third of our acreage in Canola and the remaining two-thirds in barley. Let’s suppose the past twenty years is a reflection of the next twenty years so we can use George’s data.”

They would have 762 acres (precisely 761.9048 acres) in Barley and 381 acres (precisely 380.9524 acres) in Canola. This crop rotation would insure that Canola would be grown in a particular field only once every three years fulfilling the requirement for disease control. Both crops are insured with the All Risk Crop Insurance Corporation.

The gross revenue from the total farm would average \$211,212 with a standard deviation of \$47,430. Option 3 compares favourably to Option 2, (growing only barley with insurance), where the gross revenue was \$208,400 with a standard deviation of \$66,709.

<b>A Twenty Year Projection of Gross Revenue of One-Third Canola Two-Thirds Barley Rotation with Insurance</b>					
Year	Barley		Canola		Total Farm
	Per Acre	Total	Per Acre	Total	
1	174.68	133,086	185.22	70,560	203,646
2	185.22	141,120	249.48	95,040	236,160
3	114.89	87,535	153.08	58,316	145,851
4	116.63	88,857	322.15	122,724	211,581
5	146.78	111,829	264.96	100,937	212,766
6	204.47	155,787	153.71	58,556	214,343
7	261.63	199,333	144.48	55,040	254,373
8	156.75	119,429	152.62	58,141	177,570
9	145.08	110,537	177.66	67,680	178,217
10	249.48	190,080	324.80	123,733	313,813
11	197.23	150,267	184.96	70,461	220,728
12	255.76	194,865	137.83	52,507	247,371
13	144.48	110,080	123.05	46,876	156,956
14	103.72	79,025	240.10	91,467	170,491
15	175.77	133,920	109.02	41,531	175,451
16	132.80	101,181	249.20	94,933	196,114
17	309.75	236,000	203.36	77,470	313,470
18	115.05	87,653	152.88	58,240	145,893
19	243.86	185,798	146.58	55,840	241,638
20	212.96	162,255	119.57	45,549	207,804
Acreage		762		381	1,143
Mean Gross Revenue		182.35		189.74	211,212
Standard Deviation		58.37		64.61	47,430

Kim and Lee could have taken their analysis a bit further by examining the relationship of gross revenue from barley to that of Canola. They could have done this by calculating another statistic called the co-variance, something judged to be beyond the scope of these modules. Briefly stated co-variance is calculated as the sum of the cross products of the deviations from the mean divided by the adjusted number of observations. If the co-variance is negative we would conclude that the two crops were good candidates for diversification. The underlying notion here is that in years when income from barley is down Canola income is likely up and vice versa. If the co-variance were found to be positive the two crops become less suitable for diversification.

Lee observed, “Adding Canola to our cropping program (Option 3) doesn’t reduce our expected returns appreciably from our original position (Option 1) where we were

Comparative Performance of Options			
	Option 1	Option 2	Option 3
Mean Crop Revenue per Acre	175.00	182.35	189.74
Total Gross Revenue	200,000	208,400	211,212
Insurance Premium	0	11,429	11,429
Net after Premium	200,000	196,971	199,783
Other Deductions	108,835	108,835	108,835
Return to Assets	91,165	88,136	90,948
Per Cent Return on Assets	12.57%	12.16%	12.54%
Standard Deviation on Assets	78728	66,709	47,430
Per Cent Standard Deviation	10.86%	9.20%	6.54%
Cost of Debt	50,000	50,000	50,000
Return to Equity	41,165	38,136	40,948
Per Cent Return on Equity	18.30%	16.95%	18.20%
Standard Deviation on Equity	78,728	66,709	47,430
Per Cent Standard Deviation	34.99%	29.65%	21.08%

growing barley without insurance. Our per cent return on assets went from 12.57% to 12.54%, hardly any decline at all.”

“But look at the dramatic decline in risk as expressed by standard deviation,” Kim added. “It dropped from 10.86% to 6.54% so this must really bring down our probability of defaulting on our obligations.”

“There’s only one way to find out,” said Lee. “Let’s calculate.”

### Exercise 3 - Option 3

Complete the missing calculations then refer to the data in the table to complete the statement.

Probabilities of Default for Option 3			
Commitment Category	Amount	Z-Score	Probability
Level A	62,264	-3.14	0.11%
Level B	128,000	[_____]	[_____]
Level C	152,000	-1.25	10.58%
Level D	186,000	-0.53	29.78%

The z-score for covering Level B cash commitments is [\_\_\_\_\_] there is a probability of [\_\_\_\_\_] or [\_\_\_\_\_%] of not having enough cash to meet this commitment. By comparison, for Option 1 there was a 14.48% probability of default.

Option 3 – Answer

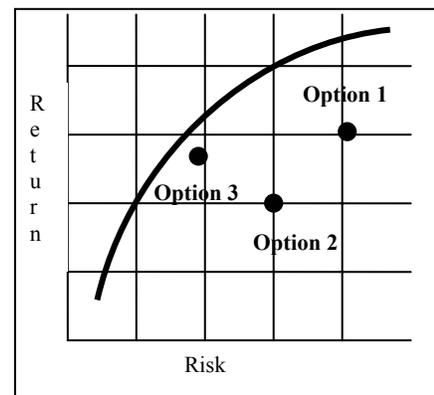
Compare your answers to Kim and Lee’s work. Correct any errors. If you had less than 4 correct (more than 1 error) you may wish to review this section.

Probabilities of Default for Option 3			
Commitment Category	Amount	Z-Score	Probability
Level A	62,264	-3.14	0.11%
Level B	128,000	<b>-1.75</b>	<b>3.98%</b>
Level C	152,000	-1.25	10.58%
Level D	186,000	-0.53	29.78%

The z-score for covering Level B cash commitments is [ **-1.75** ] there is a probability of [ **0.0398** ] or [ **3.98%** ] of not having enough cash to meet this commitment. By comparison, for Option 1 there was a 14.48% probability of default.

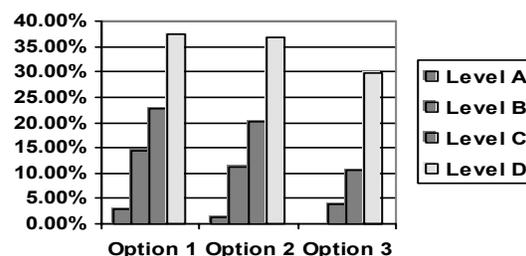
George suggested that they plot Option 3 on the risk efficiency graph, which Lee did.

Kim and Lee were pleased with the results of their calculations. If they were to adopt Option 3 the probability of default on their Level B cash commitments would be 3.98%. This is to say, if they adopted a one third canola two thirds barley cropping program they would be unable to make all of their mortgage payments once in twenty-five years. This is a marked improvement over their initial position. To make comparisons easier Lee suggested they compare the options on one table.



Lee observed that there is a constant progression in improvement from Option 1 to Option 2 through to Option 3. Kim and Lee both were beginning to make up their minds on the appropriate strategies, but there were two more situations to consider.

Comparative Probabilities of Default among Options			
Commitment Category	Option 1	Option 2	Option 3
Level A	2.92%	1.42%	0.11%
Level B	14.48%	11.33%	3.98%
Level C	22.66%	20.06%	10.58%
Level D	37.44%	36.68%	29.78%



Risk Source Number 3  
Potential Bad Debts

Analyze Potential  
Bad Debts

Risk Management Strategy  
Potential Bad Debts

### ***Step 4- Risk Source 3 Potential Bad Debts***

The third risk situation identified by Kim and Lee was that of the buyers of feed barley reneging on the payment for the product they purchased. Since Lee has the responsibility of negotiating sales to feedlots her view on the matter was most relevant.

“Since we sell to a number of different feedlots and that we demand payment within 30 days of delivery I don’t see this as a big risk,” she reasoned. “I’ve gotten to know the feedlot managers and the payment history has been excellent. We’ve never had a default in the past seven years and nothing leaves here without cash or a certified cheque. Besides” she

Name	Description
Option 1	grow only feed barley, without crop insurance
Option 2	grow only feed barley, with crop insurance
Option 3	grow feed barley and Canola with crop insurance
Option 4	grow feed barley and Canola with crop insurance and accept occasional bad debt

concluded “there are no practical ways of transferring the risk. My recommendation is to accept this risk of doing business.”

George added Option 4 “Any other possibilities to consider?” He asked.

“We’ve considered Value Added processing.” Kim said.

Risk Source Number 4  
Single Enterprise Exposure

Analyze Single Enterprise  
Exposure

Risk Management Strategy  
Single Enterprise Exposure

### ***Step 4 –Risk Source 4 Single Enterprise***

Currently K&L Farms is involved in one line of production, feed barley. Even if it adopts Option 3 to add Canola to the crop mix, it is still specialized in crop production. Production of ethanol, as an energy source, has been suggested.

After some initial exploration it was decided that it would take a sizeable outlay of capital to establish an ethanol manufacturing plant. Since they consider themselves already highly leveraged they have decided to avoid the financial risk of expanding into ethanol production at the present time.

Name	Description
Option 1	grow only feed barley, without crop insurance
Option 2	grow only feed barley, with crop insurance
Option 3	grow feed barley and Canola with crop insurance
Option 4	grow feed barley and Canola with crop insurance and accept occasional bad debt
Option 5	grow feed barley and Canola with crop insurance, accept occasional bad debt and avoid risks associated with major expansion into ethanol production

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## SUMMARY

Kim and Lee, with the assistance of George, their farm management counselor, have analyzed four potential risk management strategies. Option 1 is the ‘business as usual’ option where K&L Farms devotes its entire acreage to the production of feed barley. Although sound cultural practices are followed in the production process there are no specific risk management strategies in place. The result is an expected per cent return on assets of 12.57% with a standard deviation of 10.86%.

Option 2 is the option that includes crop insurance as a method of handling crop yield risk. The result was a minimal reduction in per cent return on assets to 12.16% accompanied by a more substantial reduction in standard deviation to 9.20%. Kim and Lee, the owners and managers of K&L farms decided to transfer their crop yield risk to the crop insurance company.

Option 3 seeks to reduce the incidence of price risk through diversification in the crop rotation. By introducing Canola into the crop rotation, such that one-third of the acreage is devoted to that crop, risk is further reduced. The result is a marginal reduction in per cent return to assets, from that Option 1, to 12.54%; the reduction of risk, as measured by standard deviation, dropped to 6.54%. Kim and Lee decided to adopt the crop rotation that includes Canola as part of the production of K&L Farms. In following this management strategy they have chosen to control the risk imposed by variable yields and prices.

Option 4 is essentially a measure to accept the risk of potential bad debts; there is a risk that buyers of feed barley from K&L Farms might default on payment. There is an element of control in their approach as Lee takes great care in screening the customers and insists, as much as is possible that payment is made by cash or certified cheque.

Option 5 considers the addition of another enterprise to K&L Farms to increase size of business. Kim and Lee considered doing some value added processing of their barley by establishing a small ethanol production plant. This option was dismissed as being uneconomical in their situation. The size of plant considered was of questionable profitability and would have entailed borrowing a sizeable amount of money taking K&L Farms further into the perils of financial risk. They decided to avoid the risk imposed by the value added option.

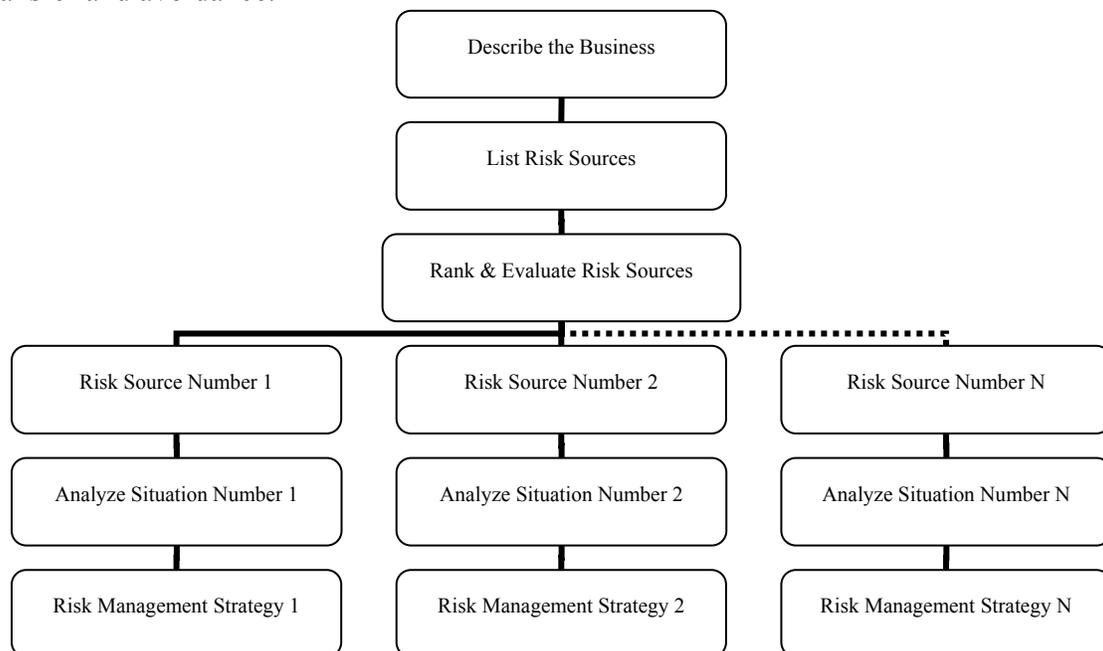
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## CONCLUSION

Kim and Lee have followed a number of well-defined steps in developing suitable strategies for managing the risks faced by K&L Farms.

They began by defining their business. Articulating their situation helped them place themselves into the proper context for dealing with risk. They described their line of production (feed barley) and the production and marketing processes followed. They examined their personal attitudes to risk and the risk bearing ability of their business, as revealed in the annual reports of K&L Farms.

They went on to list the various risks faced by the business so that they could evaluate the risks and set priorities. Once priorities were set it was possible for Kim and Lee to develop management strategies. The strategies included elements of acceptance, control, transfer and avoidance.



Now that Kim and Lee have gone through the risk profile building process they are able to approach their risk management function in greater confidence. As Lee remarked, “knowing more about our business and the risks it faces increases our comfort level about the future of K&L Farms.”

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## SELF-CHECK

When you have completed the module and feel confident in your understanding of the processes and procedures presented, go ahead to examine the following situation and then answer the questions.

Kim and Lee have purchased a new pickup truck costing \$35,000 and are re-examining their automobile insurance needs.

They are both responsible individuals with good driving records. The chances of them having a serious accident causing severe injury or property damage to others are less than the national average (one chance in 100,000). The chances of them having a less severe accident, but one in which their shiny new truck would nevertheless be destroyed is 500 chances in 100,000.

They live in a quiet farming community that has been relatively free of break-ins and vandalism. The chance of loss due to theft, vandalism or fire is much less than the 100 chances in 100,000 national average.

Their farm is served by a gravel road and they have been replacing broken windshields about once every 18 months. A new windshield costs \$200.00.

NOTE: These chances are cited for illustrative purposes only and do not reflect actual national figures for any particular year.

The policy options presented by their agent are as follows:

<b>Category of Coverage</b>	<b>Annual Premium</b>
Public liability and property damage insurance with \$1,000,000 coverage	100.00
Collision and upset with a \$500 deductible clause	400.00
Comprehensive insurance against fire, theft and vandalism (excluding windshield breakage) with a \$50 deductible clause	75.00
Insurance on windshield with a \$50 deductible clause	125.00
<b>Total Cost</b>	<b>600.00</b>

Which of the insurance strategies would be appropriate for Kim and Lee to adopt?

**Strategy 1: Public Liability and Property Damage Insurance**

Refer to the information above to complete each of the tables that follow. The first one is completed for you as an example.

Probability	Event	Possible Actions	
		Insure	Don't Insure
1/100,000	Accident	Paid cost of premium -\$100	Catastrophic loss -\$1,000,000
[ ]	Accident	Paid cost of premium [ ]	Catastrophic loss [ ]
[ ] / [ ]	No Accident	Paid cost of premium [ ]	Saved cost of premium

The probability of incurring serious public liability or property damage is [ ]. The potential loss would be catastrophic. Risks with low frequency but high severity are prime candidates for [ **transfer/acceptance/avoidance/control** ].

**Strategy 2: Collision and Upset Insurance with a \$500 Deductible Clause**

Probability	Event	Possible Actions	
		Insure	Don't Insure
[ ]	Accident	Paid cost of premium and deductible [ ]	Loss of vehicle [ ]
[ ]/[ ]	No Accident	Paid cost of premium [ ]	Saved cost of premium

The probability of severe damage due to collision or upset is approximately [ ]. The potential loss, while not catastrophic, would nevertheless be substantial. A total write-off would be \$35,000. This might be a risk with [ **low/high** ] frequency and [ **low/high** ] severity. It would be a candidate [ **transfer/acceptance/avoidance/control** ].

**Strategy 3: Comprehensive Insurance against Fire, Theft and Vandalism**

Probability	Event	Possible Actions	
		Insure	Don't Insure
[ ]	Accident	Paid cost of premium and deductible [ ]	Loss of vehicle [ ]
[ ]/[ ]	No Accident	Paid cost of premium [ ]	Saved cost of premium

The probability of loss due to fire theft or vandalism is also small, approximately [ ]. The potential loss, while not catastrophic, would nevertheless be substantial. A total loss of the pickup would be \$35,000. This might be considered a risk with [ **low/high** ] frequency and [ **low/high** ] severity. It would be a good candidate for [ **transfer/acceptance/avoidance/control** ].

**Strategy 4: Insurance on Windshield with a \$50 Deductible Clause**

Probability	Event	Possible Actions	
		Insure	Don't Insure
[ ]	Windshield breakage	Paid cost of premium and deductible [ ]	Loss of windshield [ ]
[ ]/[ ]	No windshield breakage	Paid cost of premium [ ]	Saved cost of premium

The probability of windshield breakage is once every 18 months or [ ]. If the windshield is broken, it will cost \$200 to replace it. The insurance company will cover \$150 of the amount. This would be considered a risk with [ **low/high** ] frequency and [ **low/high** ] severity. It would be a good candidate for [ **transfer/acceptance/avoidance/control** ].

# ANSWERS TO SELF-CHECK

## *Strategy 1: Public Liability and Property Damage Insurance*

		Possible Actions	
Probability	Event	Insure	Don't Insure
<b>1/100,000</b>	Accident	Paid cost of premium <b>-\$100</b>	Catastrophic loss <b>-\$1,000,000</b>
<b>99,999/100,000</b>	No Accident	Paid cost of premium <b>-\$100</b>	Saved cost of premium

The probability of incurring serious public liability or property damage is [one chance in 100,000]. The potential loss would be catastrophic. Risks with low frequency but high severity are prime candidates for [**transfer/acceptance/avoidance/control**].

## *Strategy 2: Collision and Upset Insurance with a \$500 Deductible Clause*

		Possible Actions	
Probability	Event	Insure	Don't Insure
<b>500/100,000</b>	Accident	Paid cost of premium and deductible <b>-\$900</b>	Loss of vehicle <b>-\$35,000</b>
<b>99,500/100,000</b>	No Accident	Paid cost of premium <b>-\$400</b>	Saved cost of premium

The probability of severe damage due to collision or upset is approximately [**500 chances in 100,000**]. The potential loss, while not catastrophic, would nevertheless be substantial. A total write-off would be \$35,000. This might be a risk with [**low/high**] frequency and [**low/high**] severity. It would be a candidate for [**transfer/acceptance/avoidance/control**].

## *Strategy 3: Comprehensive Insurance against Fire, Theft and Vandalism*

		Possible Actions	
Probability	Event	Insure	Don't Insure
<b>100/100,000</b>	Accident	Paid cost of premium and deductible <b>-\$125</b>	Loss of vehicle <b>-\$35,000</b>
<b>99,900/100,000</b>	No Accident	Paid cost of premium <b>-\$75</b>	Saved cost of premium

The probability of loss due to fire theft or vandalism is approximately [**100 chances in 100,000**]. The potential loss, while not catastrophic, would be substantial. A total loss of the pickup would be \$35,000. This might be a risk with [**low/high**] frequency and [**low/high**] severity. It would be a candidate for [**transfer/acceptance/avoidance/control**].

***Strategy 4: Insurance on Windshield with a \$50 Deductible Clause***

		Possible Actions	
Probability	Event	Insure	Don't Insure
2/3	Windshield breakage	Paid cost of premium and deductible <b>-\$175</b>	Loss of windshield <b>-\$200</b>
1/3	No windshield breakage	Paid cost of premium <b>-\$125</b>	Saved cost of premium

The probability of windshield breakage is once every 18 months or [**12 chances in 18 which are two chances in three**]. If the windshield is broken, it will cost \$200 to replace it. The insurance company will cover \$150 of the amount. This would be considered a risk with [~~low~~/**high**] frequency and [~~low~~/**high**] severity. It would be a good candidate for [~~transfer/acceptance/avoidance/control~~].

There is a two-thirds probability of losing a windshield which will be reimbursed at \$150 should it occur hence the expected value of the insurance is \$100 [i.e. 150 x 2/3]. In the long run Kim and Lee would pay more for the insurance than they would get back. Should they lose a windshield without insurance they would not sustain a significant financial loss. Compare this situation to the liability insurance situation. The expected value of the liability insurance was \$10.00 [i.e. \$1,000,000 x 1/100,000 = \$10.00] for a premium cost of \$100.00. It is true that in the long run Kim and Lee might pay more in premiums than they will receive in liability claims, however a \$1,000,000 lawsuit would cripple them financially. In fact, like all of us they hope they will never be faced with such a situation. They can afford to accept the small risk imposed by a broken windshield. They cannot afford to accept the risk imposed by a third party liability claim. Consequently they must choose to transfer that risk to the insurance company. This is exactly the same principle as was involved with crop insurance.

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## About the Authors

### ***Leonard Bauer***

Len Bauer is Professor Emeritus of Agricultural Business Management in the Department of Rural Economy at the University of Alberta. He joined the faculty in 1977 to assume research and teaching duties in agricultural business management, finance, and production economics. He has served as advisor and consultant to provincial and federal government departments and institutions and to private agencies on matters concerning production, finance, and risk management in agriculture.

He was instrumental in creating the Agricultural Business Management Program at the University and was its first director. Prior to joining the University, he was employed by the Province of Alberta as an extension officer and by the Government of Canada as project leader in the design and implementation of the CANFARM information systems for farm businesses.

He was guest professor at the University of Hohenheim in West Germany and guest lecturer at FINAFRICA in Milan, Italy, and at Curtin University of Technology in Perth, Australia. In 1995 he was workshop leader for agricultural instructors in Ukraine.

Although retired since 1996 Len, together with Don Bushe, continues to develop instructional materials in Agricultural Business Management.

### ***Don Bushe***

Don is a consultant, writer, teacher, and designer of interactive instructional materials. His products and publications have received national and international recognition from the European Broadcasting Union, Ohio State Awards of Excellence, National Educational Broadcasters' Association, and the Japan Prize Competitions. His more than 200 broadcast and non-broadcast radio and television productions range from 'The Parent Puzzle' series on parenting skills to 'Listen to the Prairies,' a radio series for elementary school science.

Don's experiences developing interactive learning materials have ranged from the preparation of video-disc based paramedical emergency services training to CD-ROM and computer delivered training systems for liquids and gas pipeline operators in Argentina, Brazil, Colombia, as well as individual companies in the USA and Canada.

The interactive DVD productions and systems he designed are featured in museums and information systems from the Royal Tyrrell Museum in Alberta to the Visitor Interpretive Center in Arviat (formerly Eskimo Point) in Nunavut. He brought an innovative and unique approach when assisting college instructors and university faculty in Ukraine as they struggled to re-define their economics curriculum in the post-soviet era.

Don and Len have collaborated to develop a number of self-instruction modules in farm management modules for the University of Alberta, Faculty of Extension and the British Columbia, Ministry of Agriculture, Fisheries and Food. Together, they prepared what has become the basis for the standard textbook for agricultural economics in Ukraine.