

Managing the Modern Farm Business

IDENTIFYING RISK ATTITUDES

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

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

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

The 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 realize 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.

Risk Attitude and Decision Making

Why are some people ultra-security conscious? Why do others seek out risky situations, even to the point of addiction? The answers are to be found in psychology. Such attitudes develop early in life. Is it nature, nurture, or is it both? Even though we might not understand why one person develops an extreme aversion to risk while another embraces it, we can draw useful conclusions about the risk attitude of decision makers.

We do know, from the mathematics of probability and economics that serious investors do exhibit some degree of risk aversion. Those that don't usually don't survive in the long run. We might paraphrase the French mathematician Abraham de Moivre (1667 – 1754) who observed “no matter the size of your fortune, if you play against a stacked house you will be bankrupt if you play long enough.”

Over the past few decades there has been considerable research into the behaviour of decision makers concerning risk attitude. During the same time there have been many developments in decision-making tools to guide decision makers to make sound choices

in risky environments. These modules draw on these developments to provide guidance to farm managers and their advisors as they face the real world of risk and uncertainty.

Identifying Risk Attitudes

The manager's own risk attitude will determine the courses of action to be followed. Those who are cautious by nature may avoid risky situations and fail to capture opportunities as a consequence.

Those who are extreme risk seekers are blind to the danger presented by particular courses of action. As a consequence of their compulsion extreme risk takers usually disappear from the scene.

The vast majority of people lie between these extremes. Serious players in the game of business, farming included, are risk averse to varying degrees.

In this module, you will learn how to:

- identify risk averse managers
- identify risk-seeking managers
- complete a decision chart
- compare the decisions of risk-seeking and risk averse managers

A number of situations are used to demonstrate how the attitude of the manager affects the course of action taken. By knowing one's own risk attitudes prejudgments and predispositions can be accounted for in critical decision-making.

THE MANAGEMENT PROCESS

The first step in many farm management manuals is setting goals and objectives. But farm managers have many goals including such things as performing community service, providing a moral background for raising the family and so on. As business goals, however, farmers are interested in earning a profit while at the same time ensuring that the operation survives. These two, profit or return versus risk or survival, are the goals that we will concentrate on in this module. Managers must answer the question 'how much profit are we willing to trade off for reduced risk?' The manager's risk attitude provides this answer.

Performance is measured against goals so that problems might be detected and opportunities identified. Then the possible ways of solving the problem or realizing the opportunity are specified. Next a particular solution is chosen and implemented. The farmer and farm family as manager(s) of the business carries out these steps of problem definition, solution, decision, and action.

Risk exists because the future is unknown. Because there is uncertainty about the future, there is a chance of loss. Risk relates to the size of the potential loss (i.e. the severity of the loss) and to the likelihood that it will occur (i.e. the frequency of it occurring).

Loss can happen in two ways. There can be a direct loss. A house can burn down. A business can be burglarized. An investment can turn sour. These losses are both graphic and clear.

Less obvious losses are those represented by a lost opportunity. A decision to not invest in an activity that subsequently proves to be profitable is an example of a lost opportunity.

The Importance of Information

Information becomes important when the decision-maker has a number of ways of resolving a situation. Sometimes just identifying the problem clearly provides the manager with enough information so that the decision can be made with confidence. At other times, more information is needed before decisions can be made.

Collecting data and sorting them into useful information costs money and takes time. Time in assembling information means a delay, which may jeopardize the decision. Making a decision impulsively, on too little information, increases the chance of error. But gathering too much information might not improve accuracy enough to justify the extra cost. By taking too long to make a decision, choices may be limited and a decision forced.

A decision is made in the present but will have its results in the future. The result of the decision depends upon action taken. Action is something within the control of the decision-maker. The result of the decision also depends upon events. Events might happen without the decision-maker's control. At the time of the decision, the decision-maker does not know which of the possible events will occur. Because of this uncertainty, there is a risk that the decision will be wrong.

DETERMINING RISK ATTITUDE

Because all decisions have an element of uncertainty about them, all decision-makers are risk takers. The degree to which decision-makers enjoy taking risk depends upon individual attitudes. To illustrate the concept, consider this example.

It is autumn, the fall roundup is completed and 100 head of good quality beef feeder calves have been weaned. Should the calves be sold to another feeder to be finished, or should they be put into our own feedlot for finishing? What information would you want before deciding? You would probably want some idea of the price of weaned calves now and the price of finished cattle one year from now. You would likely be interested in how much it would cost in feed, etc. to keep them. Let's organize the elements into a simplified decision chart.

Decision-Making Elements

The problem of deciding whether to sell the calves now or to feed them out and sell them later contains four elements. They are:

- possible actions,
- possible events,
- result or payoff of each action for each event
- the likelihood that the event will occur

To choose the correct action we will construct a decision chart to simplify the comparison of the actions, events, payoffs and the likelihood of the event occurring. The start is the possible actions.

Actions

Actions are the things that managers do as a result of decisions. Outcomes are the result of decisions – are things that managers have control over. In this case, there are two possible actions:

1. sell the calves now, or
2. finish the weaned calves and sell them later.

Action	
Sell Now - Feed and Sell Later	
sell weaned calves now	sell finished cattle later

The first step in constructing a decision chart is listing the possible actions in order to compare possible outcomes.

Events

Events are things that might happen. Unlike actions, they are beyond the decision-maker's control, but they do affect the outcome or payoff.

In this case there are two possible events. There could be:

1. a strong price for finished cattle one year from now
2. a weak price for finished cattle one year from now

These events are added to the decision chart.

Event	Action	
	Sell Now - Feed and Sell Later	
Sale Price	Sell Weaned Calves Now	Sell Finished Cattle Later
Strong Prices In One Year		
Weak Prices In One Year		

Results or Payoffs

The result or payoff of the situation describes the return to the business as a result of actions that might be chosen and events that could occur. The amount of the return – the result or payoff - depends upon the interplay of actions and events. In this example, there are four possibilities that can be listed in the decision chart.

1. If the weaned calves are sold now and the finished cattle price one year from now is strong, the opportunity of making a profit is lost.

Event	Action	
	Sell Now - Feed and Sell Later	
Sale Price	Sell Weaned Calves Now	Sell Finished Cattle Later
Strong Prices In One Year	Lost Opportunity	
Weak Prices In One Year		

2. If the rancher decides to finish the calves and the finished cattle price one year from now is strong, a profit is realized.

Event	Action	
	Sell Now - Feed and Sell Later	
Sale Price	sell weaned calves now	sell finished cattle later
Strong Prices In One Year	Lost Opportunity	Profit Realized
Weak Prices In One Year		

3. If the weaned calves are sold now and the finished cattle price one year from now is weak, a loss is avoided

Event Sale Price	Action	
	Sell Now - Feed and Sell Later	
	Sell Weaned Calves Now	Sell Finished Cattle Later
Strong Prices In One Year	Lost Opportunity	Profit Realized
Weak Prices In One Year	Profit Realized	

4. If the calves are kept and the finished cattle price one year from now is weak, a loss occurs.

The decision chart shows how each of these payoffs relates to actions and events. There seems to be no 'right' answer. Selling now can be the 'right' action depending on

Event Sale Price	Action	
	Sell Now - Feed and Sell Later	
	Sell Weaned Calves Now	Sell Finished Cattle Later
Strong Prices In One Year	Lost Opportunity	Profit Realized
Weak Prices In One Year	Profit Realized	Loss Incurred

which event occurs. So why would one individual choose to sell now while another chooses to feed given the same information? To understand the differing choices made by farm managers, we need to examine their willingness to accept or tolerate risk.

Individual Risk Attitude

Suppose there are two ranchers facing the same situation as in the example. Rancher A and Rancher B are deciding to sell the weaned calves now or to feed them for the next year and sell them as finished beef.

Rancher A chooses to sell the weaned calves. He is extremely risk averse. The prospect of loss, no matter how small the chance of that loss, is extremely unsettling to him. He might reason that selling in the fall, at weaning time gives the best result should the worst event occur. In his mind the

Event Sale Price	Action	
	Sell Now - Feed and Sell Later	
	Rancher A Sell Weaned Calves Now	Sell Finished Cattle Later
Strong Prices In One Year		
Weak Prices In One Year		

worst case would be a weak price. Rancher A's strategy, in the face of any risk, is to avoid it. The action that Rancher A takes can be placed in a decision table.

In contrast to Rancher A, Rancher B consistently chooses to keep the calves, finish them and sell them later. He enjoys the excitement of risky activities; no matter how small the chance, even the glimmer of a profit is worthwhile to him. Feeding the calves gives the best result in the case of a strong price. Rancher B is a risk seeker; his action is to accept any level of risk that is encountered.

Event Sale Price	Action	
	Sell Now - Feed and Sell Later Rancher A Sell Weaned Calves Now	Rancher B Sell Finished Cattle Later
Strong Prices In One Year		
Weak Prices In One Year		

The action that Rancher B takes can be added to the decision table.

Exercise 1 – Risk Attitude

Rate the action of Rancher A and Rancher B by choosing the statement in the square brackets. The first one is done for you as an example of the assignment.

Event Sale Price	Action	
	Sell Now - Feed and Sell Later Rancher A Sell Weaned Calves Now	Rancher B Sell Finished Cattle Later
Strong Prices In One Year	[Profit Realized / Lost Opportunity] [Correct/Incorrect] Choice	[Profit Realized / Loss Incurred] [Correct/Incorrect] Choice]
Weak Prices In One Year	[Profit Realized / Lost Opportunity] [Correct/Incorrect] Choice	[Profit Realized / Loss Incurred] Correct/Incorrect] Choice

Rancher A: In the case of a strong price, Rancher A’s decision to sell the calves will have been [~~correct~~ / incorrect]. Rancher A’s action will have resulted in [a lost opportunity / ~~a profit realized / a loss incurred~~]. In the case of a weak price, Rancher A’s decision to sell the calves will have been [correct / incorrect]. Rancher A’s action will have resulted in [a lost opportunity / a profit realized / a loss incurred].

Rancher B: If the price of finished beef one year from now is strong, Rancher B’s decision to keep the calves and feed them will have been [correct / incorrect]. The decision will have resulted in a [a lost opportunity / a profit realized / a loss incurred]. If the price of finished beef One Year from now is weak, Rancher B’s decision to keep the calves and feed them will have been [correct / incorrect]. The decision will have resulted in [a lost opportunity / a profit realized / a loss incurred].

Risk Attitude – Answer

Check your work and correct your responses. Give yourself one point for each answer that you had correct. Enter your score in the table.

Event Sale Price	Action Sell Now - Feed and Sell Later	
	Rancher A Avoid risk (sell now)	Rancher B Accept risk (sell later)
Strong Prices In One Year	[Profit Realized / Lost Opportunity] [Correct/Incorrect Choice	[Profit Realized / Loss Incurred] [Correct/ Incorrect] Choice
Weak Prices In One Year	[Profit Realized / Lost Opportunity] [Correct/ Incorrect Choice	[Profit Realized / Loss Incurred] [Correct/Incorrect] Choice)

Rancher A: In the case of a strong price, Rancher A’s decision to sell the calves will have been [~~correct / incorrect~~]. Rancher A’s action will have resulted in [a lost opportunity / a profit realized / a loss incurred]. In the case of a weak price, Rancher A’s decision to sell the calves will have been [correct / ~~incorrect~~]. Rancher A’s action will have resulted in [a lost opportunity / a profit realized / a loss incurred].

Rancher B: If the price of finished beef one year from now is strong, Rancher B’s decision to keep the calves and feed them will have been [correct / ~~incorrect~~]. The decision will have resulted in a [a lost opportunity / a profit realized / a loss incurred]. If the price of finished beef one year from now is weak, Rancher B’s decision to keep the calves and feed them will have been [~~correct / incorrect~~]. The decision will have resulted in [a lost opportunity / a profit realized / a loss incurred].

Exercise	Possible Score	Your Score
Chart	8 points	___ points
Statement	8 points	___ points
Total Score	16 points	___ points

If your score is less than 14 out of 16 (more than 2 wrong) you should re-read the section.

Rancher A and Rancher B are extreme examples of managers’ attitudes towards risk. Most decision-makers are found between these extreme positions; they require more information before deciding and acting to either accept or avoid risk.

The Probability of an Event

So far, the decision chart that we have constructed has three elements. These are actions, events and payoffs.

- Actions are the possible things the decision-maker (manager) can do.
- Events are those things that may occur but which are beyond the control of the manager.
- Payoffs are the results or outcomes of an action should a particular event occur.

The remaining element to consider is the likelihood of an event occurring. There are numerous methods by which the relative probability of an event occurring can be determined. Methods for assigning probabilities will be explained later in the module “*Measuring the Degrees of Risk*”.

Likelihood of an Event

The Cattle Feeder Decision situation will help to illustrate the importance of knowing the chances an event will occur. In the same situation faced by Rancher A and Rancher B (100 weaned calves to be sold or placed in a feedlot), a market forecast has predicted a high likelihood of a strong price for finished beef one year from now.



The study predicts that the likelihood of the good thing happening (a strong price for beef in one year) is high.



The likelihood of a bad thing happening (a weak price for finished beef in one year) is therefore low.

The market forecast provides information about the likelihood of the events. This information of the probability of the event occurring can be added to the decision chart.

Probability	Event	Action	
		Sell Now	Feed And Sell Later
High	Strong Finished Cattle Prices In One Year	Lost Opportunity	Profit Realized
Low	Weak Finished Cattle Prices One Year From Now	Profit Realized	Loss Incurred

Considering the probability of the event has no importance to Rancher A or Rancher B. Because of their extreme risk attitudes, they would choose to ignore the forecast information. They made their choices no matter what the probability of the events. The forecast information has no effect upon their decision.

Serious managers are risk averse to a varying degree. Rancher A is extremely averse to risk. He is so averse that he will avoid risky situations of any sort. Rancher B is not risk averse at all. In fact he shows signs of being a compulsive gambler. He will take on any risky situation just for the thrill of it. Most managers fall in between these two extremes. They will take risky actions as long as the potential payoff is worth it to them.

Another pair of ranchers is less extreme in their attitude towards risk. Rancher C needs a bigger payoff for a given level of risk than does Rancher D. Rancher C is therefore more risk averse than is Rancher D. For this reason, Rancher C would chose to sell the weaned calves. He is avoiding the risk.

Probability	Event	Action	
		Sell Now Rancher C Avoid Risk	Feed And Sell Later
High	Strong Finished Cattle Prices In One Year	Lost Opportunity	Profit Realized
Low	Weak Finished Cattle Prices One Year From Now	Profit Realized	Loss Incurred

With the forecast of a strong price for finished beef in one year, Rancher D would choose to accept the risk and feed the calves. The chance of profit from the action (feeding the weaned calves to finished beef) makes up for the risk that is involved.

Probability	Event	Action	
		Sell Now Rancher C Avoid Risk	Feed And Sell Later Rancher D Accept Risk
High	Strong Finished Cattle Prices In One Year	Lost Opportunity	Profit Realized
Low	Weak Finished Cattle Prices One Year From Now	Profit Realized	Loss Incurred

The extra profit possibility was not sufficient to overcome Rancher C's aversion to risk. Rancher D is accepting the risk presented.

Exercise 2 – Changed Probabilities

In the next year, the market forecast for the price of finished beef might be different. If, for example, the market forecast is for an even higher likelihood of strong prices for finished beef, this also means that there is therefore an even lower likelihood of a weak price. Rancher C might choose to feed the cattle. What will be the action of the other three ranchers, will they choose to sell now or to feed and sell later?

Probability	Event	Action	
		Sell Now (Rancher A B C D)	Feed And Sell Later (Rancher A B C D)
Higher	Strong Finished Cattle Prices In One Year	[Lost Opportunity / Loss Avoided]	[Profit Realized / Loss Incurred]
Lower	Weak Finished Cattle Prices One Year From Now	[Lost Opportunity / Profit Realized]	[Profit Realized / Loss Incurred]

Changed Probabilities – Answer and Explanation

Check your work and correct any errors. If you had more than two incorrect answers, you should re-read the information in this section of the module.

Probability	Event	Action	
		Sell Now (Rancher A B C D)	Feed And Sell Later (Rancher A B C D)
Higher	Strong Finished Cattle Prices In Another Year	[Lost Opportunity / Loss Avoided]	[Profit Realized / Loss Incurred]
Lower	Weak Finished Cattle Prices In Another Year	[Lost Opportunity / Profit Realized]	[Profit Realized / Loss Incurred]

- Rancher **A** will ignore the information and sell the weaned calves.
- Rancher **B** will ignore the information and finish the weaned calves.
- Rancher **C** will decide to feed the calves rather than sell them now because the higher chance of a strong price improves the chance of profit.
- Rancher **D** will assess the information and finish the calves.

Most people are like Rancher C or Rancher D. They are willing to accept risk in relation to the level of anticipated profit.

Summary

A new element has been added to the decision chart; the probability (or likelihood) of an event occurring.

The decision chart, then, has these four elements. They are actions, events, payoffs, and probabilities. They are defined as follows.

- Actions are possible things the decision-maker (manager) can do.
- Events are those things that may occur but which are beyond the control of the manager. One and only one of the events must occur.
- Payoffs are the results or outcome of an action should a particular event occur.
- Probabilities are the likelihood or chance of an event occurring.

Possible Errors

We have seen that the manager must decide upon an action in the face of events.

The decision and subsequent action that the manager takes can turn out be wrong in one of two ways. Errors or wrong decisions occur:

1. if the decision-maker decides to take an action and an unfavourable event happens. The result is usually an actual loss.
2. if the decision-maker decides to not take an action and a favourable event happens. In this case, an opportunity is lost.

Risk management attempts to minimize those errors. A Decision Chart helps to clarify the events, actions, probability, and the associated payoffs. Analyzing decisions after the fact is an important risk management activity in itself.

Probability*	Event	Action	
		Take action	Avoid action
Higher	Favourable	Profit Realized Correct Choice	Lost Opportunity Incorrect Choice
Lower	Unfavourable	Loss Incurred Incorrect Choice	Profit Realized Correct Choice

* Errors can be seen only after the fact, i.e. after the events have taken place. Consequently, probabilities do not enter into this analysis of subsequent error. Of course, probabilities are very important prior to making the decision in assessing the likelihood of error. The calculation of these probabilities will be detailed in another module.

MANAGING RISK

The risk averse decision-maker places greater emphasis upon the consequences of an unfavorable event.

The risk-seeking decision-maker places greater emphasis on the possibilities of a lost opportunity.

So far, we have considered only two possible ways of dealing with risk. We have shown that risk can be accepted or it can be avoided. There are other possible ways to manage risk. The following examples demonstrate some of these opportunities.

Controlling Risk

The farm manager who faces a decision involving risk can choose to accept it or to control it. Controlling risk requires a decision that mitigates the adverse effect of the event. Spraying a crop to ward off insects is an example.

A Crop Spraying Case

Mrs. Obst owns an orchard. Her decision whether or not to spray against an insect infestation can show how she can control risk. The Decision Chart allows her to compare.

There are two possible actions in this situation: Mrs. Obst can choose to control the risk of infestation by spraying the orchard, or accept the risk of infestation by not spraying.

Probability	Event	Action	
		Avoid risk Spray	Accept risk Do not spray
Low			
High			

There are two possible events. Either there will be an infestation of insects or no infestation of insects will occur.

Probability	Event	Action	
		Avoid risk Spray	Accept risk Do not Spray
Low	Insect Outbreak		
High	No Outbreak		

Exercise 3 – Crop Spraying Case

Four results or outcomes are possible.

1. If Mrs. Obst chooses to spray and there is an outbreak in the region, damage to the crops and financial loss are avoided.
2. If there is no insect outbreak and she has chosen to spray, Mrs. Obst will not suffer the crop damage. She will, however, have borne the cost of spraying. Overall net revenues will be reduced by that amount.
3. If she chooses not to spray and there is an outbreak, she will sustain crop damage and consequently financial loss.
4. If Mrs. Obst chooses not to spray and the infestation does not materialize, she will have an increased profit by having saved the cost of spraying.

Complete the Decision Chart and choose the appropriate responses.

Probability	Event	Action	
		Spray	Do not Spray
Low	Insect Outbreak	Loss Avoided [Correct/Incorrect] Choice Made	Loss Incurred [Correct/Incorrect] Choice Made
High	No Outbreak	Extra Cost Incurred [Correct/Incorrect] Choice Made	Extra Cost Saved [Correct/Incorrect] Choice Made

If Mrs. Obst is somewhat risk averse (like Rancher C) she **[would / would not]** spray the insecticide.

If she were less averse to risk (like Rancher D) Mrs. Obst **[would / would not]** choose to spray the insecticide.

Crop Spraying Case – Answer and Analysis

Check your work and correct any errors. If you made more than two errors, you should re-read the information in this section of the module.

Probability	Event	Action	
		Spray	Do not Spray
Low	Insect Outbreak	Loss Avoided [Correct/ Incorrect] Choice Made	Loss Incurred [Correct/ Incorrect] Choice Made
High	No Outbreak	Extra Cost Incurred [Correct/ Incorrect] Choice Made	Extra Cost Saved [Correct/ Incorrect] Choice Made

If the Mrs. Obst is somewhat risk averse (like Rancher C) she [~~would~~ / ~~would not~~] spray the insecticide.

If she were less averse to risk (like Rancher D) Mrs. Obst [~~would~~ / ~~would not~~] choose to spray the insecticide.

A person, who tends to be risk averse, like Rancher C, would choose to spray. The decision is to control the risk. If the owner's attitude to risk is more like Rancher D, however, he might accept the risk and not spray. The probability of an infestation not happening is high, and the less risk averse individual would be willing to accept the risk rather than reducing profit by incurring the cost of spraying.

So far, we have learned that one can accept risk, avoid risk, and now, we can see that it is possible to control risk. The particular choices made depend on risk attitude. There is another risk management method that can be employed. The farm manager can chose to transfer risk to others.

Transferring Risk

As well as accepting, avoiding and controlling risk it is possible to transfer some or all of the risk associated with an action to others. This method of managing risk is demonstrated in the following example.

A Crop Insurance Decision

A grain farmer must decide whether to insure the crop against hail. While the probability of hail is low, the consequences, should it occur are severe. The farmer could transfer the

risk of hail to the insurance company by purchasing hail insurance. The action is to insure or not insure the crop.

Probability	Event	Action	
		Insure	Do not insure
Low	Hail	If there is no hail, then the profit is reduced by the amount of the insurance premium. If there is hail, the profitability of the operation is protected by the amount of the insurance claim payout. If the farmer chose to accept the risk, the hail insurance would not be purchased. If there is hail, crop revenue is lost. With no hail, the farmer who accepts the risk would save the cost of the insurance premium.	
High	No Hail		

Exercise 4 – Hail Insurance Decision Chart

Complete the decision chart and select the appropriate responses.

Probability	Event	Action	
		Insure	Do not insure
Low	Hail	Receive Insurance Payout [Correct / Incorrect] Choice Made	Lost Crop Revenue [Correct / Incorrect] Choice Made
High	No Hail	Extra Cost Of Premium [Correct / Incorrect] Choice Made	Save Cost Of Premium [Correct / Incorrect] Choice Made

The grain farmer who was risk averse (like Rancher C) would likely **[transfer / not transfer]** the risk by **[buying / not buying]** hail insurance. A less risk averse grain farmer (like Rancher D) would probably **[transfer / not transfer]** the risk by **[buying / not buying]** hail insurance.

Hail Insurance Decision Chart – Answer and Analysis

Check your work and correct any errors. If you made more than two errors in the chart or in the statement, you should re-read the information in this section of the module.

Probability	Event	Action	
		Insure	Do not insure
Low	Hail	Receive Insurance Payout [Correct / Incorrect Choice Made	Lost Crop Revenue [Correct / Incorrect] Choice Made
High	No Hail	Extra Cost Of Premium [Correct / Incorrect] Choice Made	Save Cost Of Premium [Correct / Incorrect Choice Made

The grain farmer who was risk averse (like Rancher C) would likely [transfer / ~~not transfer~~] the risk by [buying / ~~not buying~~] hail insurance. A less risk averse grain farmer, like Rancher D, would probably [~~transfer~~ / not transfer] the risk by [~~buying~~ / not buying] hail insurance.

Four Risk Management Strategies

There are basically four strategies in managing risk. It is possible to:

- avoid risk as Rancher A habitually does
- control risk as we observed in the Orchard example
- accept risk as is the practice of Rancher B
- transfer risk as we observed in the Hail Insurance example

Knowing when to avoid, control, accept, or transfer the risk is the key to managing a successful operation. The decision involves examining alternative actions in light of your own attitude toward risk. You will learn more about this topic in the module *Designing Risk Management Strategies*.

RISK RETURN TRADE OFF

The decision to accept, transfer, control, or avoid risk is affected by one's attitude. Our four ranchers cover the range of risk attitudes. Those at the extremes accept or avoid all risk. Those like Rancher A are extremely risk averse. They choose to avoid as much risk as possible. Rancher B, who prefers risky situations, represents the other extreme.

Managers make better decisions when they recognize their own attitudes towards risk and take them into account when choosing actions. These attitudes, expressed as business goals, involve increasing returns and reducing risk.

Comparing Risk and Return

Managers need a framework in which to compare risk and return for alternate courses of action. In addition to the decision chart you have learned about, they need to compare the profitability and riskiness of various alternatives. The principles of comparing alternatives can be illustrated by examining investments in the stock market. Once the methods are understood, they can be applied to a farming situation.

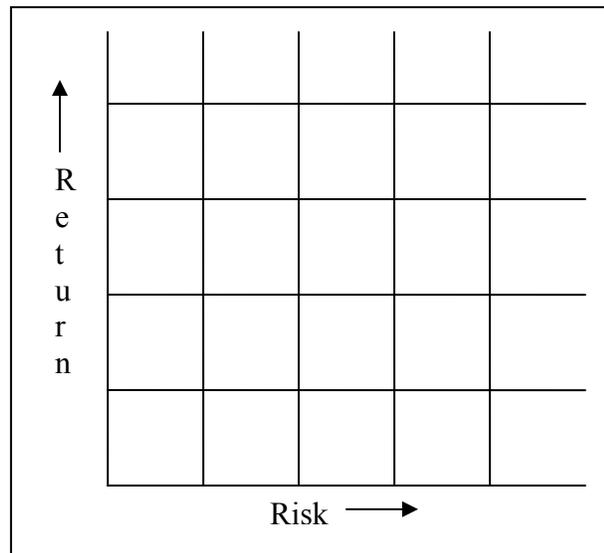
The Risk Return Graph

The choices that investors make in the stock market reflect their risk attitudes, just like the farm managers' selections were based on their risk attitudes. Because the risk involved can be directly measured by the return obtained by the investment, a chart showing rate of return compared to level of risk can be constructed.

Because it is a measure of the amount of return for each level of risk, it can be called a risk efficiency chart.

The level of risk involved in an investment is shown on the horizontal axis. You will learn in the module *Measuring Degrees of Risk*, that risk can be quantified by calculating the standard deviation. As an investment increases in risk, it would be placed further to the right on the risk axis.

Return on investment is shown on the vertical axis. Return in the stock market normally consists of two components, earnings such as dividends and change in stock value. Usually returns are expressed in percentage terms. As an investment increases in return, it would be placed higher up on the return axis.



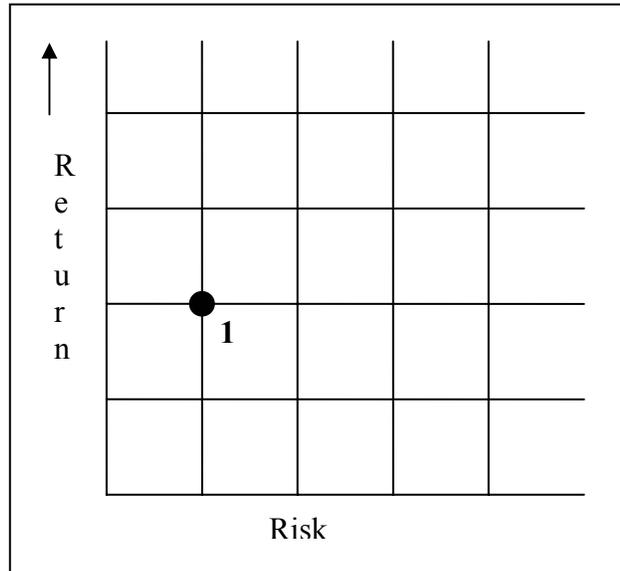
The risk and return, for any investment can be plotted on the graph and thereby compared to any other investment.

To illustrate the relationship of risk and return, we will compare the performance of five different companies. The risk attitude of the investor plays a vital role in selecting the most attractive investment.

Company One

Company One is a manufacturing company that has moderate expected return with low risk. It is a “blue chip” investment. The level of risk is shown on the horizontal axis and the level of return on the vertical axis.

As a secure investment, Company One has relatively low risk of loss to the investor. This is shown on the chart by its location close to zero on the “risk” axis. The moderate return to the investor in either direct dividends and indirectly through change in stock price is shown on the vertical axis.

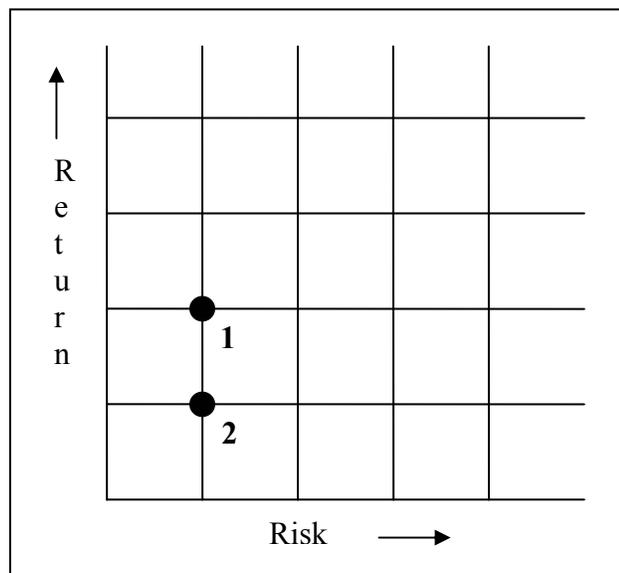


Company Two

Company Two is also a manufacturing company in a similar business as Company One. It is larger and has been established for many years. Company Two has an excellent reputation and represents the same level of risk as Company One. At the present time, however, the rate of return on investment is approximately one-half that of Company One.

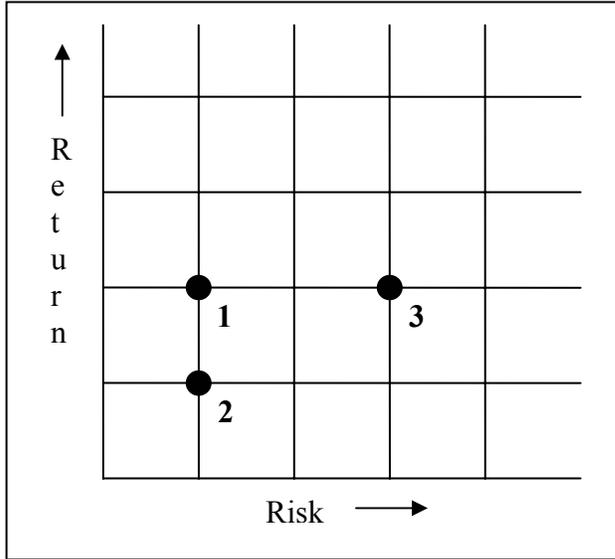
Because Company Two poses the same risk for the investor, as does Company One, it is located at the same level on the risk axis. Since its rate of return is about half that of Company One, it is located lower on the return axis.

Since the level of risk for the two investments is the same, investors would choose Company One over Company Two because of the higher return. All investors, when given a choice between two stocks of equal risk, would be expected to choose the one with the higher rate of return.



Company Three

Company Three is also a manufacturing firm in the same industry as Company One and Company Two. The rate of return for Company Three is the same as that for Company One; approximately double that of Company Two. However, Company Three is riskier than either Company One or Company Two. It has expanded rapidly recently and



analysts are concerned about the increased debt load and unproven management under the larger business size.

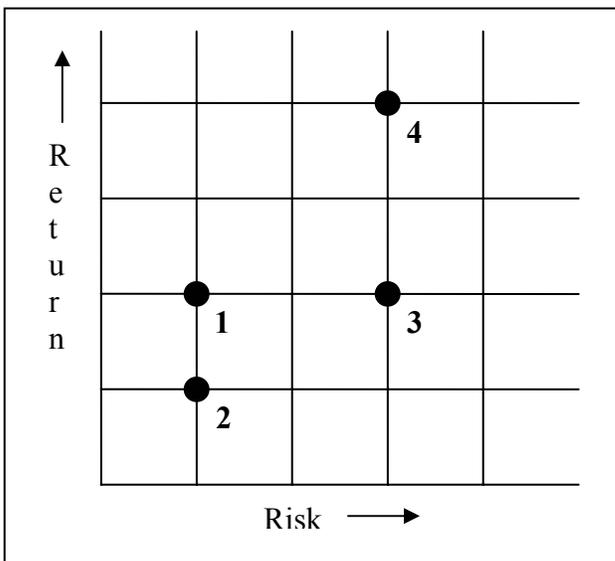
Company Three, then, is located at the same level of return as Company One on the return axis but further to the right on the risk axis. For the same level of return as in Company One, the investor in Company Three is exposed to a greater chance of loss.

Because the rate of return for Company Three is the same as that for Company One but at greater risk, no reasonable investor would purchase stock in the company. Without change

in the level of return for the given risk, Company Three would have difficulty in attracting investors.

Company Four

A fourth business is representative of a different industry; Company Four is an established business that has become a “high tech” operation in a new and developing field. Because the business is established but the approach to the operation is new, there



is slightly more risk of loss to the investor than in the case of Company One or Two. In fact, the risk is assessed to be the same as for Company Three.

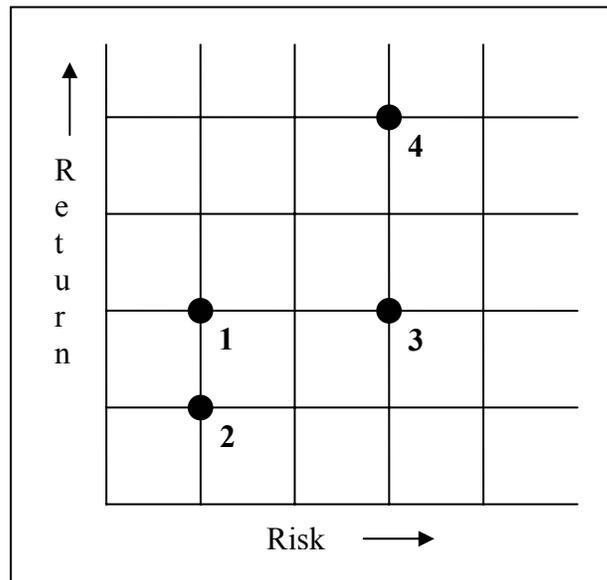
The opportunity for return on the investment is greatly enhanced by the “high tech” aspects of the operation. Consequently Company Four is located above Company Three on return axis on the Risk Efficiency Chart. Company Four promises a higher return than Companies One, Two or Three, but at the same risk level as Company Three.

Of the companies discussed so far, only Company One and Company Four are said to be Risk Efficient. Company Two is unattractive to investors because its return is too low for the level of risk. Company Three is unattractive because its risk is too great for the level of return promised. Hence, there are only two reasonable investment opportunities available for selection by potential investors. The choice is between Company One and Company Four. Which is chosen depends on the risk attitude of the individual investor.

Exercise5 – Risk Attitude and Choice

Remembering the risk attitude that was demonstrated by each of the four different ranchers that ranged from extremely risk averse to risk seeking, complete the statements to identify which decision would be made by each one. The table provides a summary of the attitude that each displayed.

Rancher A	Extremely Risk Averse
Rancher B	Risk Seeker
Rancher C	Somewhat More Risk Averse
Rancher D	Somewhat Less Risk Averse



Rancher A would choose to invest in Company **[One / Four]** because he or she is extremely risk **[seeking / averse]**. Rancher B would choose to invest in Company **[One / Four]** because he or she is extremely risk **[seeking / averse]**. Rancher C, because he or she is somewhat **[more / less]** risk averse would tend to pick Company **[One / Four]**. Finally, Rancher D as a somewhat **[more / less]** risk averse investor would likely choose Company **[One / Four]**.

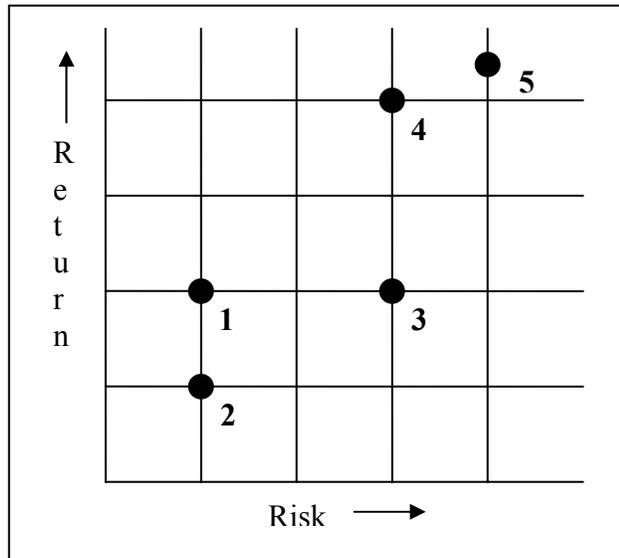
Risk Attitude and Choice Answer

Check your work and correct any errors. If you made more than two errors you should re-read the information in this section of the module.

Rancher A would choose to invest in Company **[One / Four]** because he or she is extremely risk **[seeking / averse]**. Rancher B would choose to invest in Company **[One / Four]** because he or she is extremely risk **[seeking / averse]**. Rancher C, because he or she is somewhat **[more / less]** risk averse would tend to pick Company **[One / Four]**. Finally, Rancher D as a somewhat **[more / less]** risk averse investor would likely choose Company **[One / Four]**.

Company Five

There is one more company to consider. Company Five has recently acquired a patent on a new revolutionary product. Independent business analysts have reported that extensive testing of the product reveals considerable potential; they predict that the return for Company Five is expected to be somewhat better than that of Company Four. As a result Company Five lies slightly higher on the return axis in comparison to Company Four. Even though test results look good and Company Five has done extensive market research there is always a risk in new products, caution the analysts. Consequently the risk associated with Company Five is greater than that of Company Four. Company Five then lies to the right of Company Four on the risk axis.



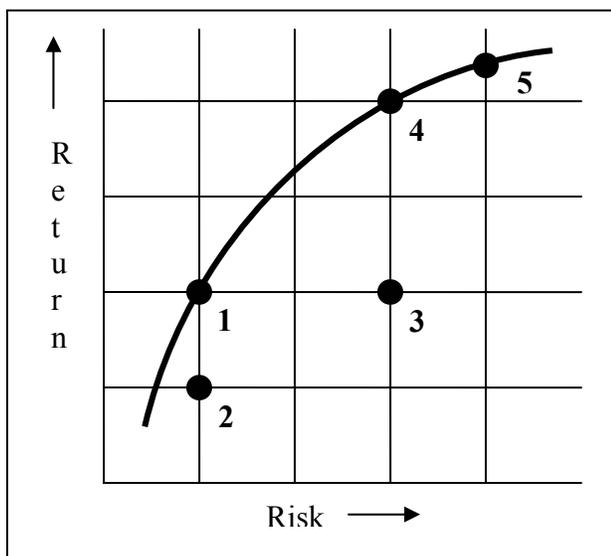
Rancher D, a less risk averse investor, might find the increase in return over Company Four enough to compensate for the extra risk. A more risk averse investor, like Rancher C, would remain with Company Four. Rancher B definitely goes with Company Five whilst Rancher A remains with Company One.

Extremely Risk Averse	Rancher A	Company One
Risk Seeker	Rancher B	Company Five
Somewhat More Risk Averse	Rancher C	Company Four
Somewhat Less Risk Averse	Rancher D	Company Five

Determining Risk Efficiency

The risk-return chart was developed to compare the five different investment opportunities. In reality there is a large list of investment opportunities. If all the possibilities were placed on the chart, we would have a smooth line on a graph.

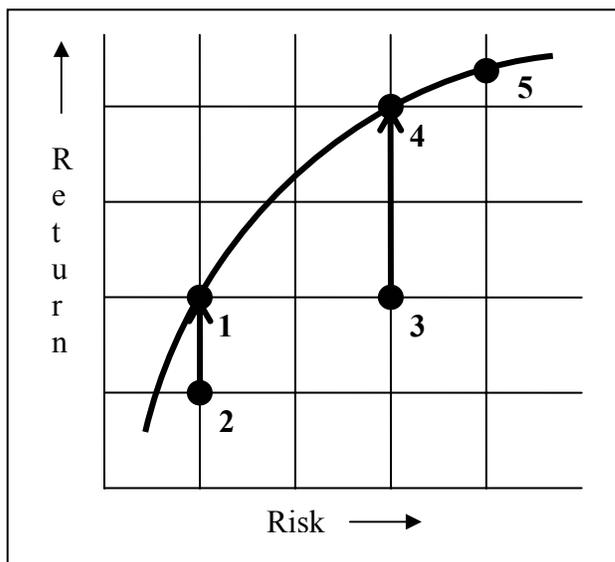
The curve represents risk-efficient investments. These are opportunities that represent a maximum rate of return for the level of risk incurred. Any location on this Risk Efficiency Curve is a place where reasonable (that is risk averse) investors would choose to invest. The only criterion for selecting one investment over another is the risk attitude of the investor.



Opportunities below the curved line (like Company Two or Company Three) are not attractive. The expected return for anticipated risk places them far below the Risk-Efficient Curve. But, the world is not static; adjustments will occur. Let us see what happens when change is introduced.

Increasing the Rate of Return

Both Company Two and Company Three promise insufficient return to make them attractive to investors. Company One is clearly better than Company Two because it returns more for the same level of risk and similarly Company Four dominates Company Three.

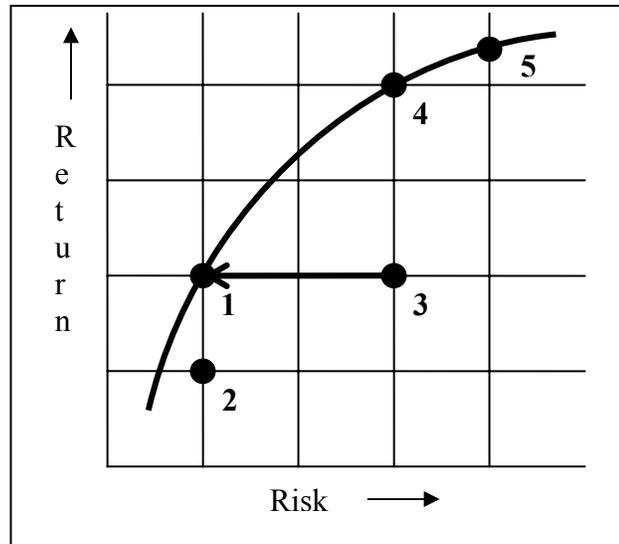


Investors would soon conclude that Company Two is overvalued in the market and discount the share price. At the lower share price the return would move up more in line with the return offered by Company One. Similarly, if the share price for Company Three dropped, its expected rate of return would increase to the level achieved by Company Four.

The same result could occur if implementing production efficiencies increased the profitability of the company. By producing more at the same cost and without changing the level of risk, Company Two and Company Three would thus approach the risk-efficiency curve. They become viable options for investors (depending upon their individual risk attitudes) to guide selection.

Reducing Risk

If the management of Company Three is able to find ways to reduce risk without changing the overall earning position, the position of Company Three would move to the left on the Risk and Return Chart to a position closer to the efficiency curve. Without an increase in return, then, it would fall on the same location as that held by Company One.

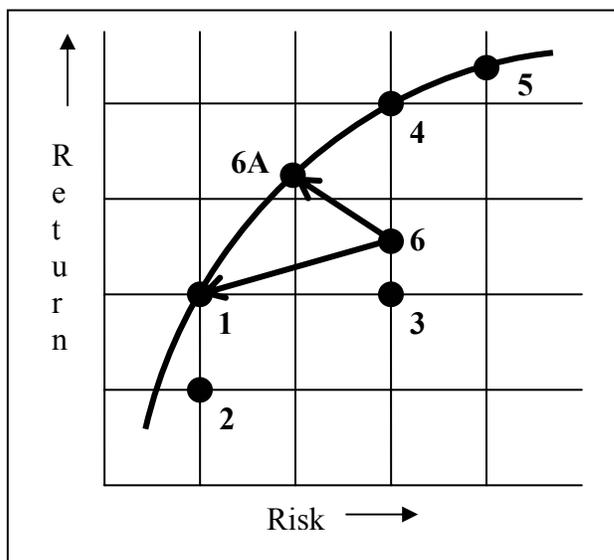


Risk Efficiency on Your Farm

The risk-return efficiency curve works well in comparing one stock in the market place to another. Making similar calculations directly for your farm is difficult, maybe impossible. However, an understanding of the concept provides you with a framework for analyzing situations. The question is: are you moving closer to or farther away from the efficiency curve?

Your job as manager is to move your business into a risk efficient position. Once you've done that find the correct place on the curve, the point that suits your risk attitude.

Suppose, conceptually, that your farm is located at position 6 on the Risk Efficiency



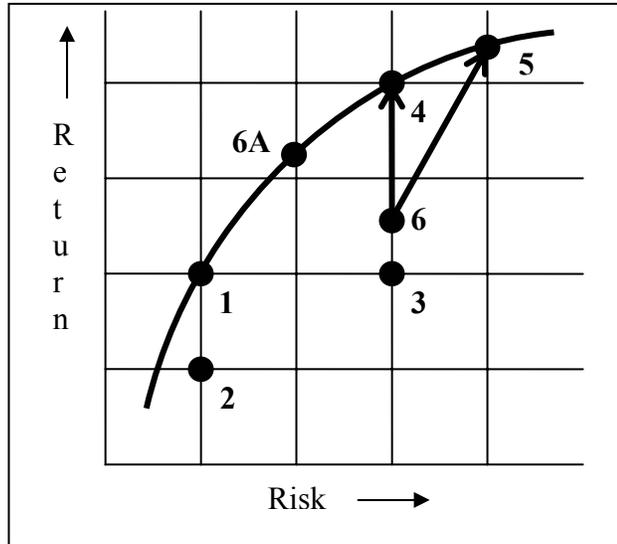
Chart, at the same risk and slightly greater return than Company Three. Accepting the risk as it is would leave the operation where it is at a position removed from the risk efficient position on the curve.

In exploring ways to move towards the curve, you could seek to transfer some risk to an insurance company, for example? If you did, risk would decline. But, because of the premium, so would your return. This option could move your business to position 1 on the efficiency curve.

Or, you may be able to control risk with a modest increase in return to

move the operation to position 6A.

It may be possible to accept additional risk along with an increase in return therefore moving the business to position 4, perhaps even to position 5.



As you improve return on your investment your goal is to minimize risk thereby move toward the Risk-Efficiency curve. The position that you choose on the efficiency curve depends on your attitude to risk. Only you can decide where are you most comfortable? Is it at 1? 6A? 4? Or is at 5? The correct position is your personal choice. It is a matter of risk attitude.

CONCLUSION

Dealing with risk is an integral part of the manager's job. Change brings about uncertainty. Uncertainty causes exposure to the risk of making errors. But not all uncertainty is bad because change is not necessarily bad. Uncertainty is a fundamental part of life and managers must manage risk so that the consequences of bad things happening are reduced. The manager is continually involved in making choices from among alternative courses of action. High payoffs usually have a higher risk associated with them. In making choices, managers must take into account the goals and objectives of the business. These goals involve a trade-off between risk and return.

The goal that you choose can be located anywhere along the line of the efficient balance between amount of risk and expected return. The next module in this topic, *Identifying Risk Sources*, will help you to establish the difference between business and financial risks. In *Measuring Degrees of Risk* you will be introduced to the numerical dimensions of managing risk in your operation. Finally, the module *Designing Risk Management Strategies* will show you ways to manage your risk situation.

The particular strategy you select, however, will be in large measure dependent on your own attitude to risk. Before proceeding with further study in the science of risk management, you should test your knowledge of risk attitudes by completing the Self-Check that follows.

SELF – CHECK

1. The Decision Chart

Farmer White and Farmer Brown are neighbours in a typical farming community who are trying to decide on the purchase of a new harvesting system. There are two harvesting systems available to them. One system has enough capacity to harvest the crop under the usual situation. The second system is more costly but is large enough to complete the harvest even under the worst conditions. Usually there is clear dry weather at harvest time. Unfortunately they sometimes have cold, wet weather and a short harvest season. White and Brown agree that there is a high likelihood of a normal harvest season and a low likelihood of a poor one.

The two neighbours agree on the facts. Mr. Brown has decided to purchase the normal capacity system while Mr. White has chosen the high capacity system. Select the correct information on the decision chart and the statement.

Probability	Event	Action Purchase new harvest system	
		System with normal capacity farmer [White / Brown] choice	System with high capacity farmer [White / Brown] choice
High	[Short Wet / Normal Dry] Harvest Season	Crop Harvested [Extra / No Extra] Cost	Crop Harvested [Extra / No Extra] Cost
Low	[Short Wet / Normal Dry] Harvest Season	Crop Harvested With [Partial / No] Crop Loss	Crop Harvested With [Partial / No] Crop Loss

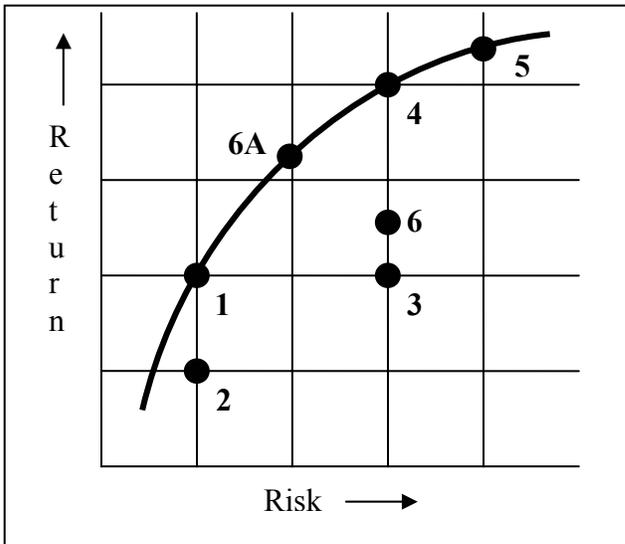
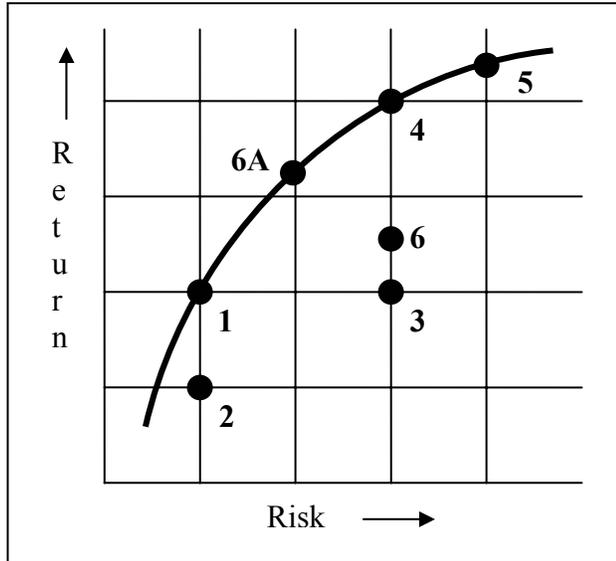
If the harvest season is normal, farmer White's decision will have been [**correct / incorrect**] because the crop would be harvested at [**extra / no extra**] cost. The risk management strategy is to [**control / accept**] the risk by having greater capacity than would be needed in a normal harvest season.

If the harvest season is short and wet, however, farmer Brown's decision will have been [**correct / incorrect**] because the crop would be harvested with [**partial / no**] crop loss. The risk management strategy is to [**control / accept**] the risk of an occasional crop loss.

For these reasons, we conclude that farmer White is [**more / less**] risk averse than farmer Brown because he or she chose to purchase the [**low / high**] capacity harvest system.

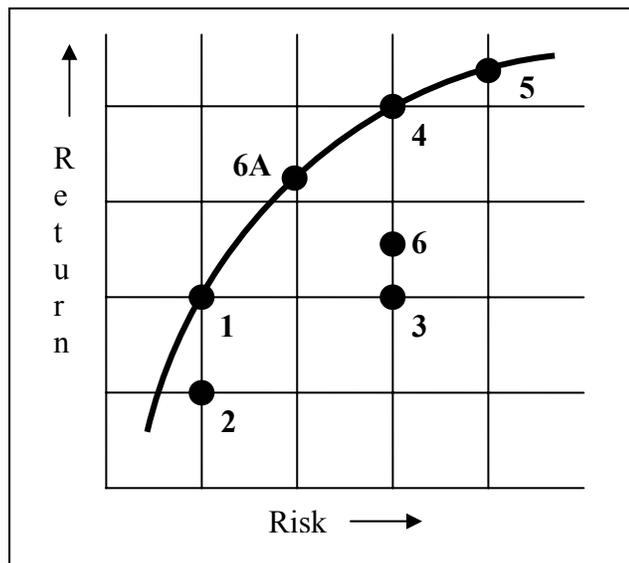
2. The Risk Efficiency Chart

(a) Suppose your farm is operating in position 6 on the Risk Return Graph. You've been attending a seminar where a new all perils crop insurance program as a way of transferring risk was suggested. The program looks promising as a risk-reducing tool but there is a premium to consider. Draw an arrow on from point 6 on the risk return graph, to the point (1 / 2 / 3 / 6A / 4 or 5) you are likely to end up at should you decide to use the program.



(b) Suppose your veterinarian has prescribed a new pre-conditioning procedure for feeder cattle entering your feedlot. There is a cost to the procedure but the result is less disease in the cattle as well as improved feed efficiency. That is, the cattle take less feed to gain weight. Draw an arrow from point 6 on the risk return graph, to the point (1 / 2 / 3 / 6A / 4 or 5) you are likely to end up at should you decide on using the pre-conditioning procedure.

(c) You have been investigating ways of improving your farm income, but you are conscious of risk exposure. You have been offered an opportunity to produce a new product under franchise. You will have to make a substantial investment in a building and in acquiring new equipment. As well, there is a licensing fee to be paid. The profit outlook looks promising but risk is involved. Draw an arrow from point 6 on the risk return graph to the point (1 / 2 / 3 / 6A / 4 or 5) you are likely to end up at should you decide on investing in the new product.



ANSWERS TO SELF – CHECK

1. The Decision Chart

Probability	Event	Action	
		System with normal capacity farmer [White / Brown] choice	System with high capacity farmer [White / Brown] choice
High	[Short Wet / Normal Dry] Harvest Season	Crop Harvested [Extra / No Extra] Cost	Crop Harvested [Extra / No Extra] Cost
Low	[Short Wet / Normal Dry] Harvest Season	Crop Harvested With [Partial / No] Crop Loss	Crop Harvested With [Partial / No] Crop Loss

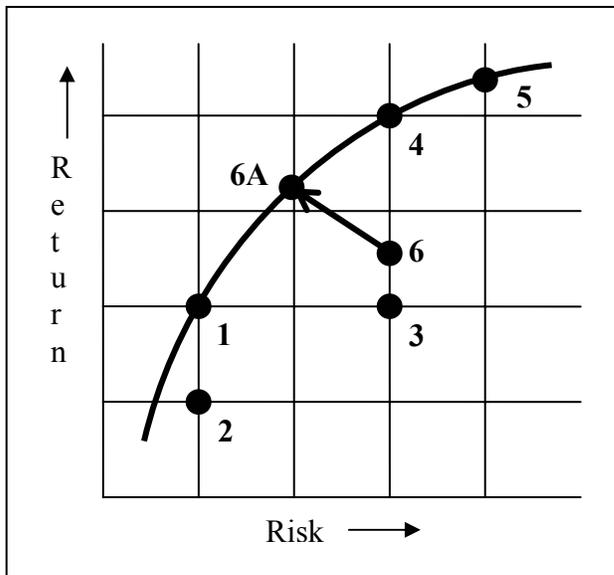
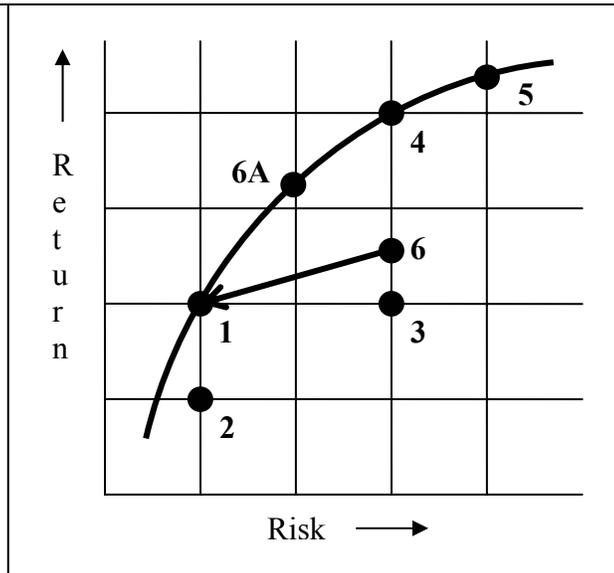
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If the harvest season is short and wet, however, farmer Brown's decision will have been [correct / **incorrect**] because the crop would be harvested with [partial / **no**] crop loss. The risk management strategy is to [control / **accept**] the risk of an occasional crop loss.

For these reasons, we conclude that farmer White is [more / **less**] risk averse than farmer Brown because he or she chose to purchase the [low / **high**] capacity harvest system.

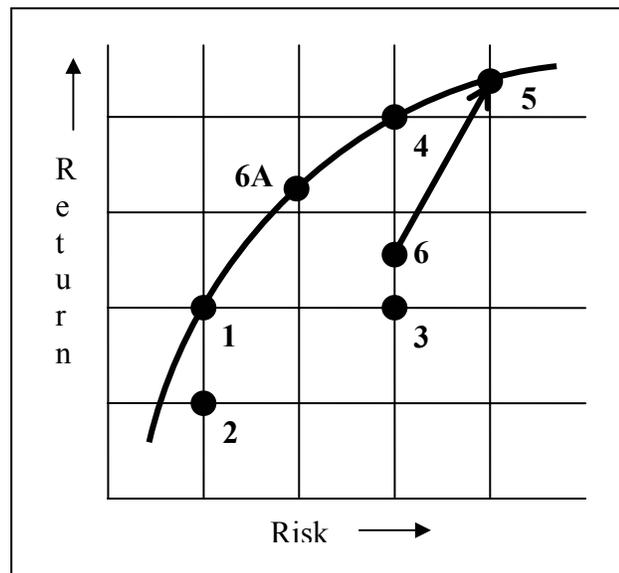
2. The Risk Efficiency Chart

(a) The all peril insurance program will reduce your risk by transferring it to the insurance company; however, the premium will increase expenses. In the end your risk is less, and so is your return. But it is now risk efficient at position 1.



(b) While the procedure will add to your expenses your revenue should more than offset this so that your returns should be greater than before adoption. Because the risk of disease is reduced, you would experience an overall reduction in risk. You would likely end up at point 6A a risk efficient point.

(c) Careful budgeting should show that your revenue would increase by more than the added costs. However this is a new product. While the franchiser has done his or her market homework, there is still an increased risk. You would likely end up at point 5 which is still risk efficient.



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.