Wolkite University
We Strive for Wisdom!

COLLEGE OF AGRICULTURE AND NATURAL RESOURCE
DEPARTMENT OF AGRIBUSINESS & VALUE CHAIN MANAGEMENT

Risk Management & Insurance in Agribusiness (5 ECTS)

Chapter One: General Overview of Risk Management and Insurance

Farming is risky. Farmers live with risk and make decisions every day that affect their farming operations. Many of the factors that affect the decisions that farmers make **cannot be predicted** with 100% accuracy: weather conditions change; prices at the time of harvest could drop; hired labour may not be available at peak times; machinery and equipment could break down when most needed; draught animals might die; and government policy can change overnight. All of these changes are examples of the risks that farmers face in managing their farm as a business. All of these risks affect their farm profitability. While farmers have always faced risk, farming has over the years, as a result of market liberalization and globalization, become increasingly risky. Smallholder farmers have become especially vulnerable. A casual approach to farming, even if it is for household food consumption, is no longer viable. Farmers need to acquire more professional skills, not only in basic production but also in farm business management. Among these are **risk management skills**. Skillful farmers and other business people generally do not become involved in risky situations unless there is a chance of making money. **Higher profits** are usually linked with **higher risks**. These risky but potentially profitable situations need to be managed as carefully as possible. Good risk management involves anticipating potential problems and planning to reduce their detrimental effects. Simply **reacting to unfavorable** events after they occur is **not good risk management**. In order to succeed, farmers need to generate more profit and become competitive. They must have a good understanding of the farming environment and be skilled at managing risk. By dealing with risk more effectively, better farming opportunities arise. Extension workers can help farmers improve their risk

management skills. They can help farmers recognize and understand their problems and assist them in making better farm management decisions

Hence, at the start of a season, farmers decide to grow different crops. They decide what to plant, how much to plant and when to plant. These decisions may appear simple, but for each decision there are many possible consequences. There will be only one outcome; only one result. But at the time the decision is made, the outcome is uncertain. When the chance or probability of an outcome is known in advance **this is called risk**. When the chance of an outcome is not known in advance this is called **uncertainty.**

"Risk management" can be defined as an organized approach to identify possible or probable financial harm and take steps to minimize the financial impact to acceptable levels. **Insurance** is one of the tools that farmers and other stakeholders can use to manage risks that are too large to manage on their own (risk layering). Part of that risk is transferred to another party, who takes it in return for a **fee (or premium**). Where available and affordable, agricult ural insurance (crop or livestock) can provide great benefits to farm households. Agricultural insurance protects against loss of or damage to crops and livestock. It has great potential to provide value to **low income** farmers and their communities, both by protecting farmers when shocks occur and by encouraging greater investment in agriculture. Agricultural insurance can indemnify policy holders for losses, though such indemnity products are relatively rare due to high costs of administration and the risk of fraud.

1.1. Concept and Meaning of risk

There is no single definition of risk. Economists, behavioral scientists, risk theorists, statisticians, and actuaries each have their own concept of risk.

The term "risk" is used by people in the insurance industry to mean something very different

♣The property is at "risk"—there could be a fire

♣A person is at "risk" or a "risk"—a young driver may be considered a "risky" insured to the insurance company. To further compound the problem, the term "risk" is used by people in the insurance business to mean a peril insured against, Fire, Earthquake, Flood , Crop loss, livestock loss. For purposes of this class the general meaning of the word "risk" will indicate a situation where an exposure to loss exists. **Risk** is a condition in which there is a possibility of an adverse deviation from a desired outcome that is expected or hoped for. Chance of harm from an activity

Risk is the potential for adverse outcomes to human health and safety, business activities and the environment from those dealings.

Risk is uncertainty regarding loss. The individual hopes that adiversity will not occur, and it is the possibility that this hope will not be met that constitutes risk. If you own a house, you hope that it will not catch fire.

RISK VS UNCERTAINTY

Uncertainty refers to a state of mind characterized by doubt, based on a lack of knowledge about what will or will not happen in the future. Uncertainty is simply a psychological reaction to the absence of knowledge about the future. The existence of risk creates uncertainty on the part of individuals when that risk is recognized. **Uncertainty** is the doubt a person has concerning his or her ability to predict which of the many possible outcomes will occur.

Uncertainty is imperfect ability to assign a character state to an entity or activity; a form or source of doubt. For this definition 'Imperfect' refers to qualities such as incomplete, inaccurate, imprecise, inexact, insufficient, error, vague, ambiguous, under-specified, changeable, contradictory or inconsistent; 'ability' refers to capacities such as knowledge, description or understanding; 'assign' refers to attributes such as truthfulness or correctness; 'character state' refers to properties such as time, number, occurrences, dimensions, scale, location, magnitude, quality, nature, or causality; 'entity' refers to things such person, object, property or system; 'activity' refers to actions and processes such as assessment, calculation, estimation, evaluation, judgment, or decision; 'a form or source of doubt' is an informal definition of uncertainty.

RISK VS PROBABILITY

Probability refers to the long-run chance of occurrence, or relative frequency of some event. Insurers are particularly interested in the probability or chance of loss, or accurately, the probability that a loss will occur to one of insured objects. Actually, probability has little meaning if applied to the chance of occurrence of a single event. It has meaning only when applied to the chance of occurrence among a large number of events.

Risk, as differentiated from probability, is a concept in relative variation. We are referring here particularly to objective risk, which is the relative variation of actual from probable or expected one. Objective risk can be measured meaningfully only in terms of a group large enough to analyze statistically. Probability has both objective and subjective aspects.

Objective Probability: Refers to the long-run relative frequency of an event based on the assumptions of an infinite number of observations and of no change in the underlying conditions. It can be determined in two ways. First, they can be determined by deductive

reasoning. These probabilities are called a priori probabilities. For example, the probability of getting a head from the toss of a perfectly balanced coin is ½ because there are two sides, and only one is a head. Second, objective probability can be determined by inductive reasoning. For example, the probability that a person age 21 will die before age 26 cannot be logically deductive. However, by a careful analysis of past mortality experience, life insurers can estimates the probability of death and sell a five year term insurance policy issued at age 21.

Subjective probability: It is the individual's personal estimate of the chance of loss. For example, people who buy a lottery ticket on their birthday may believe it is their lucky day and overestimate the small chance of winning.

RISK DISTINGUISHED FROM PERIL AND HAZARD

Peril: is defined as a cause of loss. It is a contingency that may cause a loss. Example, if your house is burns because of a fire, the peril, or cause of loss, is the fire. If your car is damaged in a collision with another car, collision is the peril, or the cause of the loss.

Hazard: is a condition that may create or increase the chance of a loss arising from a giver peril. A hazard is a condition that introduces or increases the probability of loss from a peril. For example, one of the perils that can cause loss to an auto is collision. A condition that makes the occurrence of collisions more likely is an icy street. The icy street is the hazard and the collision is the peril.

There are basic types of hazards

Physical hazard: is a condition stemming from the physical characteristics of an object that increases the probability and severity of loss from given perils. For example, the existence of dry forests (hazard for fire), earth faults (hazard for earthquakes), icy road (hazard for auto accident).

Moral hazard: is dishonesty or character defects in an individual that increase the frequency or severity of loss. Moral hazard refers to the increase in the probability of loss that result from dishonest tendencies in the character of the insured person. Example of moral hazard includes intentionally burning unsold merchandise that is insured.

Morale hazard: is carelessness or indifference to a loss because of the existence of insurance. Some insured are careless or indifferent to a loss because they have insurance. Examples of morale hazard include leaving car keys in the ignition of an unlocked car and thus increasing the chance of theft, leaving a door unlocked that allows a burglar, etc.

CLASSIFICATION OF RISK

1. Static and Dynamic Risks

Dynamic risks are those resulting from changes in the economy. Changes in the price level, consumer tastes, income and output, and technology may cause financial loss to members of the economy. These dynamic risks normally benefit society over the long run, since they are the result of adjustments to misallocation of resources. Although these dynamic risks may affect a large number of individuals, they are generally considered less predictable than static risks, since they do not occur with any precise degree of regularity.

Static risks involve those losses that would occur even if there were no changes in the economy. If we could hold consumer tastes, output and income, and the level of technology constant, some individuals would still suffer financial loss. These losses arise from causes other than the changes in the economy, such as the perils of nature and the dishonesty of other individuals. Unlike dynamic risk, static risks are not a source of gain to society. Examples of static risks include the uncertainties due to random events such as fire, windstorm, or death. Static losses involve either the destruction of the asset or a change in its possession as a result dishonesty or human failure. Static losses tend to occur with a degree of regularity overtime and, as a result, are generally predictable. Because they are predictable, static risks are more suited to treatment by insurance than are dynamic risks.

2. Fundamental and Particular Risks

The distinction between fundamental and particular risks is based on the difference in the origin and consequences of the losses.

A fundamental risk is a risk that affects the entire economy or large numbers of persons or groups within the economy. Fundamental risks involve losses that are impersonal in origin and consequence. They are group risks, caused for the most part by economic, social and political phenomena, although they may also result from physical occurrences. They affect large segments or even all of the population. Examples of fundamental risks include high inflation, war, drought, earthquakes, floods and other natural disasters.

A particular risk is a risk that affects only individuals and not the entire community. Particular risks involve losses that arise out of individual events and are felt by individuals rather than by the entire group. They may be static or dynamic. Examples of particular risks are the burning of a house, the robbery of a bank, and the damage of a car.

3. Objective and Subjective Risks

Objective risk is defined as the relative variation of actual from expected loss. Objective risk, or statistical risk, applicable mainly to groups of objects exposed to loss, refers to the variation that occurs when actual losses differ from expected losses. For example assume that a property insurer has 10.000 houses insured over a long period and, on average, 1 percent, or 100 houses, burn each year. However, it would be rare for exactly 100 houses to burn each year. In some years, as few as 90 houses may burn, while in other years, as many as 110 house my burn. Thus, there is a variation of 10 houses from the expected number of 100, or a variation of 10 percent. This relative variation of actual loss from expected loss is known as objective risk.

Subjective risk is defined as uncertainty based on a person's mental condition or state of mind. A subjective risk is a psychological uncertainty that stems from the individual's mental attitude or state of mind. Some writers have used the word "uncertainty" to be synonymous with subjective risk as defined here. Subjective risk has been measured by means of different psychological tests, but no widely accepted or uniform tests of proven reliability have been developed. Thus, although we recognize different degrees of risk-taking willingness in persons, it is difficult to measure these attitudes scientifically and to predict risk-taking behavior, such as insurance-buying behavior, from test of risk-taking attitudes.

Degree of Risk: is the range of variability around the expected losses, which are calculated using the chance of loss concept by means of the following formula:

Objective risk =$(Probable\ variation\ of\ actual\ from\ expected\ losses)/$
$(average\ losses)$

Consider the possibility of fire losses to buildings in towns A and B. There are 100,000 buildings in each town and, on average; each town has 100 fire losses per year. By looking at historical data from the towns, statisticians are able to estimate that in town A the actual number of fire losses during the next year will very likely range from 95 to 105. In town B, however, the range probably will be greater, with at least 80 fire losses expected and possibly as many as 120. The degree of risk for each town is computed as follows

$〚Risk〛_A = (105 - 95)/100 = 10\ percent$

$〚Risk〛_B = (120 - 80)/100 = 40\ percent$

As shown, the degree of risk for town B is four times that for town A, even though the chances of loss are the same. Chance of loss is expressed as the ratio of the number of losses that are likely to occur compared to the larger number of possible losses in a given group.

"0" The outcome will not occur (event is impossible)
"1" The outcome will occur (absolute certainty).

4. Pure and Speculative Risks

Pure risk is defined a situation in which there are only the possibilities of loss or no loss. The only possible outcomes are adverse (loss) and neutral (no loss). A pure risk exists when there is a chance of loss but not chance of gain. For example, the owner of an automobile faces the risk associated with a potential collision loss. If a collision occurs, the owner will suffer a financial loss. If there is no collision, the owner does not gain. The owner's position remains unchanged. Other examples of pure risks include premature death, job-related accidents, and damage to property from fire, lighting, flood, or earthquake.

Speculative Risk is defined as a situation in which either profit or loss is possible. A speculative risk exists when there is a chance of gain as well as a chance of loss. For instance, investment in a capital project might be profitable or it might prove to be a failure. If you purchase 100 shares of common stock, you would profit if the price of the stock increases but would lose if the price declines. Other examples of speculative risks are betting on a football match, investing in real estate, and going into business for yourself. In these situations, both profit and loss are possible.

Classifications of Pure Risk

The major types of pure risk that can create great financial insecurity include personal risks, property risks, liability risks, and risks arising from failure of others.

A. Personal Risks

Personal risks are risks that consist of the possibility of loss of income or assets as a result of the loss of the ability to earn income. Personal risks are risks that directly affect an individual; they involve the possibility of the complete loss or reduction of earned income, extra expenses, and the depletion of financial asset. There are four major personal risks:

- Risk of premature death
- Risk of insufficient income during retirement
- Risk of poor health
- Risk of unemployment

Risk of premature death

Premature death is defined as the death of a household head with unfulfilled financial obligations. These obligations can include dependents to support, a mortgage to be paid off, or children to educate. If the surviving family members receive an insufficient amount of replacement income from other sources, or have insufficient financial assets to replace the lost income, they may be financially insecure. **Premature death** can cause financial problems only if the deceased has dependents to support or dies with unsatisfied financial obligations. Thus, the death of a child age 10 is not "premature" in the economic sense.

There are at least four costs that result from the premature death of a household head. First, the human life value of the family head is lost forever. The human life value is defined as the present value of the family's share of the deceased breadwinner's future earnings. Second, additional expenses may be incurred because of funeral expenses, uninsured medical bills and others. Third because of insufficient income, some families will experience a reduction in their standard of living. Finally, certain non-economic costs are also incurred, including emotional grief, loss of a role model, and counseling and guidance for the children.

Risk of insufficient income during retirement

Risk of insufficient income during the retirement is another major risk associated with old age. The majority of workers in America retire before age 65. When they retire, they lose their earned income. Unless they have sufficient financial assets, or have access to other sources of retirement, they will be exposed to financial insecurity during retirement

Risk of poor health

The risk of poor health includes both the payment of catastrophic medical bills and the loss of earned income. Unless a person has adequate health insurance, private saving and financial assets, or other sources of income to meet medical expenditures, he or she will be financially insecure.

The loss of earned income is another major cause of financial insecurity if the disability is severe. In cases of long-term disability, there is a substantial loss of earned income, medical bills are incurred, employee benefits may be lost, or reduced, savings are often depleted/exhausted sand someone must take care of the disabled person. The loss of earned income during an extended disability can be financially very painful.

Risk of Unemployment

The risk of unemployment is another major threat to financial security. Unemployment can cause financial insecurity in at least three ways. First, the worker loses his or her earned income. Unless there is adequate replacement income or past savings on which to draw, the unemployed

worker will be financially insecure. Second, because of economic conditions, the worker may be able to work only part-time. The reduced income may be insufficient in terms of the worker's needs. Finally, if the duration of unemployment is extended over a long period, past savings may be exhausted.

B. Property Risks

Anyone who owns property faces property risks simply because such possessions can be destroyed or stolen. There are two major types of loss associated with the destruction or theft of property: direct loss and indirect or consequential loss.

Direct Loss: is defined as a financial loss that results from the physical damage, destruction, or theft of the property. Direct loss is the simplest to understand; if a house is destroyed by fire, the owner loses the value of the house. This is a direct loss.

Indirect Loss: However, in addition to losing the value of the building itself, the property owner no longer has a place to live, and during the time required to rebuild the house, it is likely that the owner will incur additional expenses living somewhere else. This loss of use of the destroyed asset is an "indirect," or "consequential," loss. **An indirect loss** is a financial loss that results indirectly from the occurrence of a direct physical damage or theft loss. An even better example is the case of a business firm. When a firm's facilities are destroyed, it losses not only the value of those facilities but also the income that would have been earned through their use. Property risks, then, can involve two types of losses: (a) the loss of the property and (b) loss of use of the property resulting in lost income or additional expenses.

C. Liability Risks

The basic peril in the liability risk is the unintentional injury of other persons or damage to their property through negligence or carelessness; however, liability may also result from intentional injuries or damage. Under our legal system, you can be held legally liable if you do something that result in bodily injury or property damage to someone else. **Liability risks** therefore involve the possibility of loss of present assets or future income as a result of damages assessed or legal liability arising out of either intentional or unintentional torts, or invasion of the rights of others.

Liability risks are of great importance for several reasons. First, there is no maximum upper limit with respect to the amount of the loss. You can be sued for any amount. In contrast, if you own property, there is a maximum limit on the loss. Second, a lien can be placed on your income and financial assets to satisfy a legal judgment. For example, assume that you injure someone, and a court of law orders you to pay substantial damages to the injured party. If you

cannot pay the judgment, a lien may be placed on your income and financial assets to satisfy the judgment. Finally, legal defense costs can be enormous. If you have no liability insurance, the cost of hiring an attorney to defend you can be staggering.

D. Risks Arising from Failure of Others

When another person agrees to perform a service for you, he or she undertakes an obligation that you hope will be met. When the person's failure to meet this obligation would result in your financial loss, risk exists. Examples of risks in this category would include failure of a contractor to complete a construction project as scheduled, or failure of debtors to make payments as expected.

1.2. Producers' Attitude towards Risk

Farmers may be divided into three types: risk-neutral; risk-takers and risk-averse. The risk-averse farmers try to avoid taking risks. They tend to be more cautious individuals with preferences for less risky sources of income. In general, they will sacrifice some amount of income to reduce the chance of low income and losses. A risk averter does not refuse to accept any risk at all. However, the risk averse farmer would seek to be compensated for the risk taken by receiving a higher return than would normally be obtained if there were no risk.

Risk-takers are people who are open to more risky business options. The risk-takers prefer to take a chance to make more profit. Unlike the risk-averse, risk takers choose the alternative that gives some chance of a higher outcome, even though they may have to accept a lower outcome. When faced with the choice, risk-taking farmers tend to prefer to take the chance to make gains rather than protecting themselves from potential losses. Even so, risk-taking farmers are still influenced by the return they could receive. Risk-neutral lies between the risk-averse and risk-taking positions. It is useful for the farmers and those who provide support services to know their attitudes towards risk. In this way, they are more conscious of the motivation behind the risk management decisions made. While most farmers tend to be risk averse, attitude concerning risk is not fixed. Many factors influence it. Thus in one situation a farmer may be risk averse, and in another situation the same farmer may be a risk-taker.

The following are some of the factors that may influence a farmer's attitude towards risk

- Farmers who operate under subsistence conditions tend to be the most risk-averse. The provision of food for their dependent is an overriding priority for many of them. Activities

with a monetary reward are frequently sacrificed in favor of meeting the objective of producing their own food.

- Market-oriented farmers who are not willing or able to withstand the possible financial losses associated with a risk also tend to be more risk-averse. This is often true for smallholder farmers. In effect the relationship between the input costs and the value of output from the farm influences the farmer's attitude toward risk.
- Family commitments and responsibilities can also play a role in attitudes toward risk. A person without family commitments may be more willing to take risks. Similarly, older people are likely to take less risk.
- Past experience may also influence a farmer's decisions. The effects of particularly good or bad years in the past influence decisions to be made today. Again, this may be related to age; a younger person may not yet have had many experiences on which to base decisions.

An example of decision-making in risk management A farmer needs to decide how to cope with a possible infestation of pests. Should he spray early as an "insurance" against the infestation occurring? Or should he wait for indications of infestation before deciding when to spray? When market prices are low and the cost of pesticides is high, the net benefit from using pesticides in years when there is high pest infestation will be lower. In this case the farmer will be reluctant to buy expensive inputs.

Risk-taking choices: Risk management refers to actions farmers take to increase the chances of success of the farm business. Farmers can do this by influencing events in the future and by limiting the negative effect of those events. Many farmers try to do both. A good risk management strategy will try to act on both events and their consequences. Farmers are often willing to accept higher risks to obtain higher incomes.

The main aspects of risk management are:

1. Anticipating that an unfavorable event may occur and acting (where possible) to reduce the chances of it happening;

2. Taking actions that will reduce the adverse consequences should the unfavorable event occur. An important aspect of risk management is that all responses to risk involve a cost. This cost is expressed by the amount of resources tied up in order for the farmer to manage his risks more effectively. In some cases the cost is easy to identify, in other cases the cost is less obvious.

Examples of risk management costs: A farmer may keep a stock of spare parts for the farm machinery to minimize risks of breakdowns. The spare parts are tied-up resources. The cost is the value of the spare parts. Insurance is a common way to manage risk. In this case the cost is obvious and easily identified: the insurance premium. A farmer may decide to grow a drought-resistant crop instead of one that is more drought prone. But the market price of the drought-resistant crop may be lower than the market price of the drought-prone crop. The cost to the farmer is the possible higher price that is given up by growing the drought-resistant crop. A farmer may decide to use a more complex production system. In this case, the cost is in the form of additional time required in management. Whatever its form, the cost of a response to risk will also influence a farmer's choice of strategies to manage risk.

An example of reducing adverse consequences: A cassava farmer in West Africa has heard on the radio that there is blight in his area. What should be done about the risk that his crop might be attacked by the blight?

• First he needs to know how likely it is that his farm will be affected.

• He knows that one way to avoid the potential problem is to harvest his crop early. But to do this means he will have a smaller crop that will possibly attract a lower price. There is a risk in taking this action.

• He does not like taking risks. He is risk averse.

• The cost of this action is the potential loss of income. But failure to do it may lead to a total crop failure. So a lower income may be better than the risk of no income. He decides to harvest his crop early. This way he knows he will have some income, which is better to him than the possibility of no income at all. He decides to harvest his crop early. This way he knows he will have some income, which is better to him than the possibility of no income at all.

When risk is viewed as the chance either of gains or losses, the decision changes from seeking to remove all risk to trying to find the balance between the potential incomes that the farmer is willing to accept and the amount the farmer is willing to pay to reduce the risk. That balance depends on: the riskiness of the action itself; the farmer's attitude towards risk; the resources tied up; the gains that must be given up to cover the risk.

The decision is complex and related to the farmer's ability to take risk. In order to assess the cost of risk and the effect on potential income, the farmer will need to have at least a basic understanding of farm economics.

An example of avoiding potential problems: At the beginning of every season a farmer worries that his old tractor could break down. To reduce the likelihood of this happening he may: overhaul the tractor before he starts using it; keep some spare parts for the tractor ready; service the tractor regularly in an attempt to avoid the risk completely. While these actions may not prevent a breakdown, the farmer reduces the chances of one happening.

1.3. Quantifying Risk

Quantifying risk is a process to evaluate identified risks to produce data that can be used in deciding a response to corresponding risks.

The objective of risk quantification is to prepare contingencies in terms of costs, time, or human resources and prioritize them in terms of their severity and likelihood, so that appropriate action can be taken accordingly. In order to quantify risk, it needs to be identified first. Once risk is identified then it is analyzed in terms of probability of occurrence and impact that it could print on the outcome. The probability is assigned either based on intuition or the previous data of failure rates available for similar events in datasheets. Once probabilities of all events are calculated, a criterion for the likelihood of all the events is defined. For example, if a specific event may occur in exceptional circumstances, like for example less than 3% chance of occurrence, then its likelihood can be assigned as **"Rare".** In a similar way, severity or consequence of the events on a project is also classified. For example, if an event may result in abandonment of project then it can be classified as **"Catastrophic"** or if it may result in a delay of 50% of schedule or 50% of additional cost then it may be classified as **"Major".** The risk(R) is calculated by multiplying probability (P) with the impact (I) or severity.

Farmers' risk-taking abilities are determined by their financial obligations. Some key indicators of risk taking ability are:

Gross margin: is the difference between the income of an enterprise or farm and the variable costs. The higher the gross margin, the more income the farmer can generate and the greater the risk-taking ability.

Cash flow: All farmers need cash to meet family living expenses, loan repayments and other expenses requiring cash payment. The farm is expected to generate an income to cover expenses. Cash flow is the expected sales minus expenses. The smaller the cash flow, the lower the cash reserve and the risk-taking ability of the farmer. In the event of a shock occurring, such as a sudden increase in costs, or an outbreak of disease leading to a high mortality of

livestock, or drought and a failed crop, the farmers with a “cash cushion” are better able to absorb these risks.

An example of cash flow

Assume there are three farmers each operating 20-ha farms with the same type of machinery. All three farmers have outstanding debt from a purchase of improved seed and fertilizer. Farmer 3 borrowed $100 to cover the cost of hired labor when the farmer was in hospital. A comparison of the three respective financial situations is outlined below.

	Farmer 1	Farmer 2	Farmer 3
Gross income	$220	$180	$210
Variable costs	80	60	80
Gross Margin	140	120	130
Inflow			
Loan	—	—	100
Income	220	180	210
Total inflow	220	180	310
Outflow			
Debt repayment	10	10	80
Rent	—	100	100
Expenses	80	60	80
Total outflow	90	170	260
Net cash flow	130	10	50

Here we see that Farmer 1 has the highest gross margin and the largest cash flow. Farmer 1 can assume more risk than either Farmers 2 or 3 and has higher risk-taking ability. A quick demonstration of this can be seen if the gross income is reduced by $60. In this situation, Farmer 1 would still have a positive cash flow, but Farmers 2 and 3 would have negative cash flows. This again shows that Farmer 1 is able to absorb greater risk.

2. Chapter Two : Risk Analysis

Risk analysis is the overall process of risk assessment, risk management and risk communication. Risk assessment identifies risks from plausible sets of circumstances that may result in harm to people or to the environment and estimating the level of risk on the basis of the seriousness and chance of harm. Risk management evaluates, selects and implements plans or actions to ensure that risks are appropriately managed. Risk communication is the exchange of

information, ideas and views between the stakeholders. Risk communication also conveys the rationale for decisions made by the stakeholders.

Risk assessment identifies substantive risks and estimates the level of risk based on a combination of the likelihood and consequences of potential harm. The purpose of risk assessment is to identify and characterize risks to the health and safety of people or to the env ironment from dealings as the result of farming activities. The risk assessment identifies risk by considering what could go wrong and how harm might occur. Risks are then characterized by considering how serious the harm could be and how likely it is that harm may occur in the farming activities. The risk assessment initially considers a wide range of possible risks, but puts greatest emphasis on more substantive risks, which receive more detailed characterization. Risks that are estimated to be greater than negligible are then considered by risk management for control or mitigation.

Risk management is evaluating the risks that may warrant control measures and determines the appropriate conditions to manage farming risk. The purpose of risk management is to protect the health and safety of people and the environment by controlling or mitigating the farming risks. Risk management may be described as answering the questions: does anything need to be done about the risks? What can be done about it? And what should be done about it? Risk management involves prudent judgments about which risks require management (risk evaluation).

Risk management includes preparation of a risk management plan by evaluating and treating risk, applying general risk management measures, and proposing conditions to give effect to management measures. In addition, risk management includes monitoring and reviewing to provide feedback on all steps in risk analysis and ensure the outcomes remain valid for future findings or changes in the circumstances of farming activities.

The risk assessment and risk management plan forms the basis upon which the Regulator decides whether to issue a license or not. To issue a license the Regulator must be satisfied that risks can be managed the farming activities to protect human health and safety and the environment.

Risk communication- establishes an interactive dialogue between the regulator and stakeholders to provide open, transparent and consultative risk-based regulation of farming business.

Risk communication is integral to the processes of risk assessment and risk management and involves development of an interactive dialogue between the Regulator and stakeholders of farming business. The Regulator undertakes extensive consultation with a diverse range of expert groups and authorities and key stakeholders, including the public, before deciding whether to issue a license or not. In many instances differing perceptions of risk can influence the approach of stakeholders to particular issues. The Regulator endeavors to provide accessible information to interested parties on applications, licenses, and dealings with farming business. The Risk Analysis Framework is part of the Regulator's commitment to clarity, transparency and accountability of decision-making processes and is supported by a risk communication charter.

The Risk Analysis Framework is a key document for informing applicants, stakeholders and the public about the Regulator's approach to applying risk analysis of farming business. The purpose of this Risk Analysis Framework is to:

- Provide a guide to the rationale and approach to risk analysis used by the farming activities
- Enable a consistent and rigorous risk analysis approach to evaluating the farming business
- Ensure that the use of risk analysis in the decision-making process is transparent to the farming businessmen and other stakeholders.

This version of the *Risk Analysis Framework* incorporates recent advances in risk analysis methodology and increased scientific knowledge, as well as regulatory experience gained from farming activities.

2.1. Sources of Risk

The most common sources of risk in farming can be divided into five areas:

A. **Production and technical risk: -** Crop and livestock performance depend on biological processes that are affected by the weather, and by pests and diseases. Low rainfall or drought may lead to low yields. Hail or heavy rains could damage or even wipe out crops. Outbreaks of pests or diseases could also cause major yield losses in crops and livestock. It include low rainfall, drought, hail or heavy rains, pests and disease, breakdown or unavailability of equipment and spare parts. When farmers plant seeds and fertilize their land they do not know for certain how much rain will fall, or whether there will be a hail storm. They do not know if there will be a problem with pests or diseases. But still they must decide whether they are going to plant their crops or raise their livestock. The resources they spend to plough, plant and fertilize their crops or to care for their livestock

may not be recovered. This is why there is risk. Farmers produce without complete certainty about what will happen to their production. Another source of production risk is equipment. A farmer's tractor may break down during the production season resulting in an inability to harvest in time, thus affecting yields. Similarly, if the farmer uses shared or hired traction or other equipment, will it be available when needed? If the farmer is using a new technology, will it perform as expected? Will it actually reduce costs and/ or increase yields? If seeds do not germinate and day old chicks die what will be the impact on production and farm family income? The farmer can never be completely certain.

Production risk stems from the uncertainty regarding the factors that affect the quantity and quality of farm produce (e.g. weather, disease, pests). It also arises with the introduction of new technologies. Several strategies can be used to **reduce production risk.**

Risk-reducing inputs:- are production inputs that improve the chances of better quantity or quality of farm products. Fertilizers and compost are used to reduce the risk of low yields. Pesticides and Integrated Pest Management (IPM) practices are used to reduce the risk of crop damage. Irrigation is used to reduce the risk of low rainfall. Not all inputs necessarily reduce risk. For example, even if fertilizer is used, the crop still depends on rainfall, which may or may not be favorable. When soil moisture levels are low, using fertilizer can still result in low yields.

Farmers, however, do not experience only one kind of production risk at a time. They often experience the risk of unfavorable weather, pests and weeds at the same time. Using a single risk-reducing input, such as drought-resistant seed will not prevent low yields caused by pest and insect damage. To determine whether an input will reduce the risk of low yields, farmers must look at a number of factors at the same time. They should think about the effect the input is most likely to have on their crop, given other factors that also affect production. For example, hybrid seeds may increase yields in years of good rainfall but produce poorer yields than traditional varieties in years when the rain is poor. Farmers must ask themselves whether the income expected by using the input is high enough to compensate. For the increased risk involved. Essentially, farmers must weigh up the costs and benefits of using an input as a risk reducing strategy.

Risk-reducing technologies:- Farmers can reduce risk by learning about and applying new technologies and practices designed to address specific risks common to their area of production. For example, new varieties of seed are being developed and livestock are being bred with certain characteristics, including the following:

- ✓ Drought-resistant seed for maize;
- ✓ Bird-resistant seed for sorghum;
- ✓ Disease- and pest-resistant seed species;
- ✓ Decease -resistant livestock species;
- ✓ Livestock breed to provide better productivity;
- ✓ Irrigation for high-value crops;
- ✓ Crops and livestock bred specifically to improve marketability

Risk-reducing technologies may be difficult to implement but could be beneficial if successful. In many countries there are examples of how genetic technology has created an economically viable opportunity to address some of the risks in livestock production. For example, programs have been developed to provide higher quality cattle to local farmers to make it possible for them to access markets that offer higher prices. **An example of introducing new technologies:** A farmer in Swaziland received imported milk cows from a technical assistance project. The cows faced production risks as they could not easily adapt to the environmental conditions of Swaziland. To reduce these production risks the farmer decided to cross-breed the imported animals with local breeds, as a way to improve their disease resistance.

Risk is a way of describing the chance a farmer takes when making decisions. Risk can often encourage positive change. Risk can lead to gains or losses. The greater the risk, the greater t he potential for loss or gain.

Selecting low-risk activities: One way to reduce production risk is to choose a farm enterprise that has a lower risk. In these situations farmers choose reliability over potential profitability. A farmer may forego an enterprise that has a high potential for income but also carries a high risk for loss, and choose instead an enterprise which is less profitable but also less risky. For example, some smallholder farmers may prefer a drought-resistant variety of sorghum or millet to high yielding varieties that could fail in a drought. **Farmers** often prefer to continue with familiar crops and production activities with low risk. Risk is often associated with a lack of familiarity with a variety. Although the yield of an improved variety may be more stable than those of local varieties, farmers may not have the knowledge and experience of growing the improved variety. This lack of experience could lead the farmer to assess the risk of cultivating the new variety as being too high. Farmers are usually aware of the differences in the yield variability of crops associated with the different soils, husbandry practices and other factors on

their farm. Because of the many differences, one farmer may consider a particular activity high-risk while another may consider it a low-risk activity.

System flexibility: Farming system flexibility is an important strategy for risk management. A flexible farming system makes it possible for the farmer to make quick or short-term changes in production and sales. Farmers who sell cash crops may also reduce risk by using available funds to enable them to change to another enterprise if the price of the main cash crop falls. By keeping their farm systems flexible, farmers are able to make decisions in response to changing circumstances. While working with general production plans, they should keep their options as open as possible in order to respond to opportunities and risks as they occur.

EXAMPLES OF FLEXIBLITY Vary area of land under cultivation and/or the number of livestock kept, as a response to market changes. Keep land fallow (unplanted) in times of low rainfall in order not to risk unnecessary expenditure on inputs. Intensify the farming system by increasing an already existing enterprise (e.g. small stock such as pigs, sheep, poultry) if future prices are likely to be good. Utilize labor rather than purchasing or hiring farm machinery. Spread the time of planting and increase the area under cultivation. If an early planted food crop fails the farmer may replant with a more drought-resistant variety. If farmers feel that neither will be successful they may decide to increase the area under another staple crop for food security purposes. It should be noted, however, that flexibility is not possible with all enterprises. For example, tree crops are generally inflexible. The enterprise cannot be changed easily and quickly. However, coffee farmers, for example, can respond to low prices by heavy pruning – hoping that yields will be good when prices are again high.

Production diversification: Diversification spreads risk and is a successful risk management strategy because not all farm enterprises and operations are likely to be affected in the same way by changing situations. Some techniques include managing multiple farm enterprises together at any one time (or in the same season); engaging in the same farm enterprise in different physical locations; engaging in the same farm enterprise over successive periods of time (or seasons); generating income from off-farm activities.

Managing multiple enterprises together at any one time (or in the same season). There are many forms of this kind of risk management strategy. For example, farmers concerned that their normal crop may fail because of pests may decide to produce more than one crop (i.e.

multiple enterprises) over the same season. They will choose crops that are more resistant to pests and diseases. Another example is intercropping, which is a common form of crop diversification. Crops that are more resistant to drought may be planted together with food crops to ensure that some return is obtained from the effort put into land preparation. In many countries, sorghum and maize are grown together; sorghum is drought resistant but susceptible to bird damage, whereas maize is liable to fail in a drought but is more resistant to bird damage. Mixed broadcast farming, which is a traditional practice in low rainfall areas of Southern Africa, is an example of intercropping. In this case, the farmer literally mixes the seeds of three or four different crops (e.g. maize, sorghum, pumpkin) in a single bag and plants them simultaneously in the same field. This was designed specifically to protect the household food supply in case of drought. Even if two crops fail, there are at least one or two other crops that will provide food for the family.

Essentially, diversification is a practical application of the saying "Don't put all your eggs in one basket"

Many farmers around the world – particularly smallholder farmers – integrate crops and livestock to reduce risk and improve their efficiency in resource use and sustainability of the natural resource base.

Engaging in the same enterprise in different physical locations. This risk management strategy works on the understanding that the same crops grown in different areas will not meet the same fate. Perhaps a crop grown in the area surrounding the house is more likely to be infested by rodents than the same crop grown elsewhere. One piece of land may have marginally better protection against frost than another. Also, by planting crops on different soil types the farmer diversifies to avoid risk: in a dry year the crop on sandy, upland soils may fail; in a wet year the crop on wet, river-valley land may fail. Land close to a river can possibly be irrigated. By taking advantage of these differences, farmers can spread their risks and can be more assured that at least one of their production sites will succeed.

Engaging in the same enterprise over successive periods of time (or seasons). Farmers also diversify over time. Staggered planting can be used to manage household food supply and also to reduce the risk of water stress. If an early-planted crop does not receive sufficient rain at the flowering stage, the crop planted later may not be affected in the same way. For example, the table below shows staggered planting dates for maize in parts of Africa to reduce the risk from uncertain rainfall. An example of phased livestock production A farmer in the Manica province of Mozambique, decided to develop a commercial broiler enterprise of 1 000 units. Owing to

limited capital for housing and a concern over the market, he decided to spread production and rear his broilers in batches of 250 units. By so doing he was able to spread sales and sell his chickens at competitive prices. As part of his business strategy, the farmer increased production towards one of the festival days to meet the increased demand for poultry at that time.

Generating income from off-farm activities. It is difficult to separate the risks of farming from the risks of the household, particularly among smallholder farmers. In many cases, the farm and the household are a single unit. Therefore, although it is not a farming strategy, many farmers sustain their income with earnings from activities off their farm. Farmers may take part-time work in towns or on commercial farms or one of their family members may have a full-time job.

Many farm families sustain their income with earnings from activities off their farm

General considerations. Diversification of production can be used to manage price, yield, and income risk. Unlike risk-reducing inputs, the effects of which are shown on a field-by-field or enterprise-by-enterprise basis, the effects of production diversification are seen only by observing the farm as a whole. But by diversifying production practices or engaging in alternative farm enterprises, the farmer no longer uses the optimum combination of resources that gives the highest possible yield. Using different production practices on different fields may require more management time and possibly different types of farm equipment. In this way production diversification, while minimizing risk, often reduces potential farm income. **Risk-averse** farmers will more likely be prepared to accept the lower income because their primary concern is to avoid risk. It is unlikely that risk-neutral or risk-taking farmers will accept the lower income because they will go for a production plan that will probably deliver the highest expected net income (over one or several seasons) regardless of risks involved. Indeed, the risk-taker might seek out more risky enterprises to gain a higher income. **An example of enterprise mix.** A farmer has been debating the most appropriate mix of enterprises on his farm. In particular he is considering switching 0.5 ha from maize to beans. In adding this new crop he is not worried about the risk of a lower income, because in his area income from beans varies less than income from maize. Also, the pattern of price changes for produce sold is not the same. When the price of maize falls, the price of beans often stays the same. One thing he has realized though is that he has to consider this risk reduction against the expected income from beans.

Reserves of inputs and produce: The most common reserves are stores of farming inputs and farm products. As a risk-reducing strategy, these goods are set aside to reduce the impact of unfavorable events. Reserves of inputs such as feed for livestock, fertilizer and other chemicals can protect farmers from the risk of short-term input price changes. Food storage on the farm can also provide security against the risk of crop failure, although losses of stored grain due to pests can be considerable. As is the case with all risk management strategies input and product reserves come at a cost. One obvious cost of holding reserves is their actual value. Resources held in reserve are tied up and do not earn a return. This can affect both the net income and cash flow negatively. Grain storage provides security against the risk of crop failure for both family needs and future market sales.

Share leases: In some countries where land tenure arrangements permit (e.g. among small-scale farmers in Latin America), share leases for crop and livestock production are a common risk management strategy. Under such schemes the landowners usually pay part of the operating expenses and, in return, receive a portion of the crop or livestock produced instead of a cash rental payment. In this way the risks of low production, low selling prices, or high input costs are shared between the tenant and the owner. Under share-lease arrangements tenants require less working capital for farm operations and credit may consequently be more readily available.

With share lease agreements production and sales risks are borne by both tenant and owner

Custom farming: Custom farming involves a farmer entering into an agreement with a custom operator to carry out various farm operations. It is also sometimes referred to as "contractor" farming. The advantage (or risk saving value) of this strategy is that operational costs can be fixed. Instead of facing the risk of high equipment costs, the farmer contracts someone else to do this work. Custom farming can also be applied to livestock feeding. Under such arrangements livestock producers feed cattle or small stock owned by other farmers on their own plots for a fixed price. In either case, some farmers may undertake only part of a production activity as a means of reducing risk. Farmers can either contract operators to work their land or be contracted as an operator to work the land of other farmers. Contracting an operator can reduce the risk of high equipment costs. A farmer with equipment, contracted as an operator, receives alternative income and makes more efficient use of equipment. Custom cattle feeding and custom farming allow farmers to focus on production.

The advantage of custom farming is that operating costs can be fixed in advance

B. Marketing risk – prices and costs Changes in prices are beyond the control of any individual farmer. The price of farm products is affected by the supply of a product, demand for the product, and the cost of production.

Supply of a product is affected by a combination of production decisions made by farmers as a group and by the weather and other factors that influence yields.

Demand for a product is affected by consumer preference, consumers' level of income, the strength of the general economy, and the supply and price of competing products.

Cost of production of a unit of product depends on both input costs and yield. This makes it highly variable. Although input costs tend to be less variable than output prices, when combined with yield variations the cost of production becomes a serious source of risk. Sometimes price movements follow seasonal or cyclical trends that can be predicted. Many times, however, supply or demand will change unexpectedly and, in turn, affect the market price. When farmers plant crops or commit resources to raising livestock, they do not know for certain what prices they will obtain for their products. In situations of low rainfall, production of crops is often reduced and, as a result, prices rise.

Factors affecting marketing risk include supply, demand and cost of production

Marketing risk exists because of the variability of product prices and the uncertainty of future market prices that the farmer faces when making the decision to produce a commodity. Several methods can be used to reduce price variability or to set a satisfactory price before the crops or livestock are ready for sale. These are discussed below.

Spreading sales: If the farmer is producing a crop that can be easily stored after harvest, parts of the crop can be sold at different times during the year. The farmer can watch for changes in the market and sell when prices are most favorable. This particularly applies to food grains and for seasonal produce that can be stored (e.g. apples, potatoes and onions). However, storing produce has risks, entails high costs and sometimes loss. Livestock sales can also be spread throughout the year if managed properly in terms of feeding, calving and other livestock husbandry operations. This strategy may or may not increase income for the farmer but it reduces risk and provides the added benefit of ensuring a regular cash flow throughout the year. Again, in all cases farmers need to balance the costs and benefits.

It is important that farmers realize both costs and benefits of storage and on-farm primary processing and ensure that income generated covers the costs involved. Produce that can be stored, can be sold later on in the season.

An example of adding value by drying: A farmer decided to process vegetables by solar drying and to selling them at times of short supply. By so doing he avoided having to sell his produce at times where the market was flooded and prices were low. This marketing strategy increased his farm income. Primary processing can be a way of avoiding losses in storage or low market prices.

Direct sales: For some farmers, selling directly to final consumers may be a way to enhance profitability and reduce risk. Small scale farmers near population centers may especially benefit from direct sales to final consumers. However, the farmers need to be sure that they can sell everything taken to market. Otherwise they may end up worse off than selling to traders. They also need to be sure that the higher prices they will get from retail sales will cover the extra costs they will incur.

Contractual agreements to sell produce and buy inputs: Price uncertainty could be greatly reduced if farmers could make advance contracts with buyers of products. Contractual agreements can be made with a private individual or company. The farmer often knows in advance the prices that will be received. For example, a livestock feed-mill may contract to buy a farmer's grain at an agreed price or a tobacco company may do the same for the tobacco crop. Some companies that buy produce from farmers at harvest time also sell inputs to farmers.

An example of a contract agreement

A farmer runs a small-scale commercial chicken broiler operation. He is considering whether to enter into a production contract with an integrated broiler company. The company would supply the farmer with chicks and technical advice on feeds, health and housing throughout the production cycle. In return for handing over management decisions, his income risk is greatly reduced, market access is guaranteed and access to capital ensured. The farmer has to weigh up these potential benefits against his reduced managerial freedom and the risk that the contract might be terminated after he has made considerable investment in broiler facilities. Marketing contracts can be either verbal or written agreements between farmers and buyers. The contracts often set the price for produce sold and the quality of the produce expected.

Forward pricing: Forward pricing is a practice where the buyer and producer agree on a price for the sale of crops or livestock in advance of delivery. An agreement is reached to deliver the crop at an agreed price, quantity, quality and time. This practice enables farmers to reduce the risk that the price they receive for their output might not cover production costs.

An example of forward pricing for vegetables

In the case of vegetable production, it is sometimes possible for a farmer to negotiate a predetermined price with a buyer. The price is often set at a level below the expected market price at harvest time. The farmer has to guarantee that supplies are delivered to the buyer according to the agreement; at the volume, quality and time set. This provides the farmer with a guarantee of the price to be received. In this way the risk of low prices is reduced. However, such agreements do not allow farmers to enjoy the advantages of possible price increase that may occur over the harvest period. **Forward pricing** is particularly relevant for highly specialized or perishable products, and is also common for "niche" products although it is not widely used by small-scale farmers at present. The box on the following page shows some forms of pricing arrangements used by larger commercial farmers in more developed countries.

ADVANCED PRICING ARRANGMENTS

Cash forward contracts: Agreements that are based on an exchange of produce at a specified future time. They allow farmers to establish a price for later delivery. The contract specifies the price, quantity and quality of produce to be delivered at an agreed post-harvest date. The contract also indicates the penalty to be paid if the farmer fails to deliver.

Deferred pricing contracts: Contracts where the price is determined later at some specified date. Ownership is transferred before the price is set.

Deferred payment contracts: Contracts where the current price and delivery of the produce is set but there is delay in the receipt of payment. It transfers ownership to the buyer at delivery but allows the seller to set the price later.

Minimum price contracts: Provide farmers with a floor price for duration of the contract. They offer the farmer protection against a drop in price below a minimum level, while still leaving the final pricing until a later date.

Futures contracts: Agreements that are made for a specified future time. The risks are transferred to another business that is more willing to accept them. Here the contract is sold and bought instead of the actual produce.

Building trust: For farmers involved in contractual relationships the most critical issue is agreeing on the price with the buyer and developing trust. The nature of the business relationship is that both buyers and sellers try to obtain the best deal. Farmers aim at negotiating the highest possible price to maximize their profits and buyers try to ensure that low prices are paid so that they can also maximize their profits. Farmers need skills in negotiating contracts in order to arrive at an acceptable agreement. Even though agreement can be reached there are

still risks involved for both the farmer and buyer. Problems are often related to: agreement on the weight of the crop; agreement on the quality of the produce; calculating the money owed to farmers; failure of buyers to buy agreed quantities; failure of farmers to supply agreed qualities.

Both parties need to build trust and realize that the long-term advantages of a fair relationship should outweigh any short-term benefits of failing to honor the agreement. Although there are likely to be periods when products are sold at a loss, a sustainable productionmarketing relationship is one in which both parties involved make a profit. For arrangements to continue for a long time they need to be financially sustainable. Both parties must benefit. The long-term success of such an arrangement depends on the capacity of farmers to negotiate with buyers and to ensure that they work well together. The position of farmers during negotiations with buyers can be improved by extension staff by: informing the farmers of the range of buyers available; encouraging the farmers to grow crops for which there is a strong demand; ensuring that farmers are aware of prevailing market prices and the conditions of purchase; advising farmers to calculate the break-even cost of production and marketing.

Market price information: A key element in managing price risk is market information, especially price information. Farmers should track price information relevant to their products. They should try to establish if there are seasonal, annual or other cyclical price trends for those products. Sound knowledge of market prices alone is not a risk management strategy. However, having such information strengthens a farmer's position to be able to forecast more accurately future price events. It will help farmers make basic decisions about their farm, including decisions about the level of inputs, production and choice of market. It will help farmers to better assess the risk of various products, production programs, and market options. Market information can be divided into short- and long- term (see below).

Short-term market information helps farmers make instant marketing decisions on selling their products. This includes: up-to-date price information; up-to-date information on supply and demand. **Longer-term market information** can be used to make planting decisions and plan marketing strategies. This includes: quarterly or annual price reports from market Information services; contacts of companies providing services (e.g. transport, storage), and inputs (e.g. seeds, fertilizers and packaging); descriptions of the marketing chain.

c. **Financial Risk:** Financial risk occurs when money is borrowed to finance the operation of the farm business. This risk is caused by uncertainty about future interest rates and repayment schedules, changes in the loan collateral, and the ability of the farm to generate the cash flow necessary for credit repayments. In some countries small farmers have become bankrupt as a result of indebtedness. Farmers may purchase expensive inputs on credit, but with the failure of rainfall and consequent low yields may be unable to repay their loans. The failure to assess the financial risks associated with lending has a direct impact on their livelihoods. In some cases, farmers have even committed suicide. This emphasizes the risk of farming and the need for extension workers and farmers to be aware of the need for appropriate financial risk management. **The three aspects** that need to be considered in managing financial risk are listed here. The availability and cost of credit and the repayment schedule, the farmer's liquidity or ability to generate cash flow and the farmer's ability to maintain and increase capital.

In the face of this, there are a number of strategies to manage financial risk.

Credit: Many factors influence a farmer's decision to borrow money, including: attitude toward risk; the size and type of farm operation; the farmer's relationship with input suppliers and output purchasers; the willingness of lenders to provide loans at conditions acceptable to the farmer. Increasing the capital available to farmers through lending enables them to expand their farm businesses but this, in turn, obliges them to repay outstanding debts and creates the risk of loan default. Increased debt raises the likelihood that farmers would be unable to meet their financial obligations in a year of low returns. Highly indebted farmers operate in an environment of greater financial risk.

Savings with high liquidity are most easily converted to cash assets that are easily converted should be sold first.

Liquidity: is the ability of the farmer to raise cash. What can a farmer do if an unfavorable event happens? Does the farmer have ready cash or other assets that can be easily converted to cash to cover his or her financial obligations? Assets tied up in land and machinery are the most difficult to convert to cash, while stored inputs or products are easier to convert. Cash held at home or in a bank provides the best protection. In the case of non-cash assets, conversion to cash is generally done by selling the asset. High liquidity means that the farmer can fairly easily convert assets to cash without the assets losing much value in the transaction. It is often very useful to maintain high levels of liquidity to provide a financial cushion against the risk of low

income or increased debt. However, if all farmers in an area have to sell stored crops at the same time, the price will fall and the liquid assets will be less valuable. As a risk management strategy, the farmer should start by selling assets that are most easily converted to cash. Less liquid assets should be sold only if and when additional cash is needed.

Leasing assets: Assets are hired or rented out to another farmer for a specified period and at a specified price. The asset Savings with high liquidity are most easily converted to cash assets that are easily converted should be sold first. The asset remains the legal property of the owner. Farmers can lease land, machinery, equipment or livestock. Leasing assets generates additional income and spreads the cost of paying for and maintaining the asset. It also allows farmers to use equipment that might otherwise not be profitable to buy.

Managing the phasing of investments: This refers to decisions made by some farmers about the timing of the purchase of assets. Rather than buying all the necessary equipment at one time, the farmer may spread the purchases out over time – over the year or even over several years. In this way, farmers can limit (or perhaps even avoid) debt and at the same time build equity.

Contingencies: are often included in farm enterprise budgets as a way of building risk into the business decisions of the farmer. They are a deliberate overestimation of costs to account for the risk of unexpected increases in the cost of inputs, materials and capital items. Contingencies can generally be used in three ways when drawing up an enterprise budget: to cover cost increases; to cover costs (often a variety of small items) that have not been specifically identified but which the farmer knows are likely to arise; to cover the cost of unexpected items that may have been overlooked in the original estimation. In each case, the farmer knows from experience that there is a possibility (therefore a risk) that this additional cost will occur. Based on that experience, the farmer can add some cost as a contingency to those costs anticipated over a growing season or year. In practice, in the case of cost increases, a contingency allowance is calculated as a percentage of the specifically identified cost (e.g. labour, ploughing, fertilizer) and is then added to that cost.

The other contingency items are often included as a separate cost entry calculated as a percentage of the total costs. The amount included is usually determined by the experience of the individual farmer. It is not usually just a random amount. Including a contingency item in a farm budget is a useful planning tool that shows the direct impact of an unfavorable event

such as product price decreases, yield failure and cost increases on farm profit. If the calculation shows that the impact of the unfavorable event is too great, the farmer may not want to take the risk and will have to make some other plan for the farm. If the farmer goes ahead as planned, including the contingency and the unfavorable event occurs the farmer is covered. The farmer knows what to expect. If the event does not occur, the farmer enjoys additional gains.

Crop insurance is a simple risk management strategy what is covered is clear and the cost is immediately known.

Insurance: is an agreement that is designed to provide protection in the form of compensation against the consequences of significant risks. Some farmers, usually the "better off" more commercial farmers, can insure their farms against major risks, which have a low chance of occurrence but may have very adverse consequences. Such events include: the death of a farmer or a family member; sickness and accidents that disable the farmer; fires or other hazards that destroy capital items; loss of crops by hail, storms and floods. The farmer usually pays an insurance company (private or public) to provide protection against the consequences of these major risks. If the unfavorable event occurs, the insurance pays out compensation in terms of the insurance agreement. Crop or weather insurance is a simple risk management strategy. What is covered is clear and the cost is immediately known. However, farmers need to make careful calculations to determine the impact of the cost of the insurance (i.e. the premium) on their net income. It is rare that insurance is offered to smallholder farmers and affordable for them to use.

D. Human and personal risk: Human risk refers to the risks to the farm business caused by illness or death and the personal situation of the farm family. Accidents, illness and death can disrupt farm performance. In many countries labour migration away from rural areas is a common occurrence. Migration can cause labour shortages for the farm. Political and social unrest can also limit labour availability. The spread of HIV/AIDS has had a serious impact on labour availability and productivity in some areas. When farmers plant their crop or commit resources to raise livestock, they cannot be certain whether they will have enough labour to manage the farm enterprises.

Strategies to guard against unexpected changes in availability and productivity of labour

An aspect of managing risk for larger farmers is good human resource management. This includes: selecting casual workers with suitable skills and experience; ensuring workers are employed according to the relevant law (including fair pay); regular communication; ensuring the safety of workers; providing adequate supervision and discipline.

Labour planning: Another aspect of human risk management involves strategies to guard against unexpected changes in the availability and productivity of labour. Careful labour planning, such as using a seasonal labour calendar, ensures that farmers know exactly what and how much labour is needed at various times during the production season.

Labour productivity: To address labour productivity risks larger farmers may replace hand labour with animal power, tractors or motorized implements. Different production programmes including changing farm enterprises and enterprise mixes may also be looked at. Intercropping, improving farm layout, introduction of labour-saving technologies and similar actions can all contribute to a risk management strategy.

E. **Institutional risk:** Institutional risk refers to unpredictable changes in the provision of services from institutions that support farming. Such institutions can be both formal and informal and include banks, cooperatives, marketing organizations, input dealers and government extension services. Part of institutional risk is the uncertainty of government policy affecting farming, such as price support and subsidies. The risks farmers face are often a result of decisions taken by policy-makers and managers. Subsidies, food quality regulations for export crops, rules for animal waste disposal and the level of price or income support payments are examples of decisions taken by government that can have a major impact on the farm business.

There are a number of strategies to manage institutional risk.

Traditional institutions and social arrangements. The customs and organization of traditional societies tend to provide the individual family with a measure of security against risk. As part of a survival strategy the close bonds between community members have resulted in mutual assistance and self-help when required. Generally, the more fortunate and able members of the community are obliged to help their kinsmen or neighbours in times of need. This may relieve the situation in cases of sickness, injury or death of an individual member; however, it is less effective in situations where the entire community suffers. For instance, failure of rainfall or an attack of crop pests may affect all community members in the same way.

Producer groups: When farmers have sufficient trust in each other there is scope for them to work together informally as a producer group in order to reduce some of the risks associated with credit mobilization, the purchase of inputs and marketing. Groups for credit and marketing purposes can produce: economies of scale in input procurement, loan administration and marketing of produce; capital accumulation through savings and credit mobilization; timely delivery of services.

The risk reducing function of farmer groups comes from the pooling of capital of individual farmers into a common fund, collecting and disseminating information to its members, and bulk buying and marketing. Producer groups also serve to provide information to their members on the sources of additional financing, the potential prices of produce sold, the cost of inputs purchased, and the quality of those inputs and final products. Information of this kind shared with their members enables them to better cope with the many risks affecting the farm household system. The first step in the process of group formation is for farmers to understand the benefits of working together and to show commitment to coordinate their activities.

Producer groups can reduce some of the risks associated with credit mobilization, the provision of inputs and marketing.

Cooperatives: Forming and participating in more formal cooperative organizations also provides farmers the opportunity to benefit from volume sales of produce, bulk purchases of inputs and supplies, and the mobilization of credit. Cooperative marketing involves: consolidating loads to facilitate bulk buying by traders or bulk transport; sharing transport to reduce costs; negotiating jointly with buyers; purchasing inputs collectively to reduce costs; mobilizing savings and credit, with members providing mutual guarantees. Credit for individual farmers is more easily accessible through cooperatives and at lower transaction costs. Loan default and the costs of collecting delinquent loans can similarly be reduced when individuals are jointly liable for group loans. However, cooperatives and similar groupings are sometimes the source of risk for farmers, (e.g. when the managers or officers misappropriate the funds).