OPERATIONS RISKS MANAGEMENT AND WHEAT FARMING PRODUCTIVITY IN NAROK NORTH CONSTITUENCY

BY

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DECLARATION

This project is my original work and has not been presented for a degree in any other University.

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This Project has been presented for examination with our approval as University Supervisor.

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DEDICATION

This project is dedicated to my family, for the support and encouragement during the project.

ABSTRACT

The objective of this study was to establish the relationship between operation risk management and farm productivity in the agricultural industry in Kenya and the effectiveness of this relationship. Theoretically it is assumed that operation risk management leads to high farm productivity through risk identification and matching with appropriate risk management approach. Inferential statistics (correlations) with farm productivity as the dependent variable and operation risk management as the independent variable was used. These variables were used to establish whether there is a relationship between operation risk management and farm productivity. Thus know their effectiveness with respect to this relationship. Primary data was collected through questionnaires with regard to 2014 wheat farming season and analyzed using statistical tools. The population of 650 wheat farmers in Narok North Constituency was used. The means and standard deviation were calculated for the descriptive data and Karl Peerson was used to answer the research question. The study results indicated that there was weak negative relationship between operation risk management and wheat farm productivity. One of the limitations of the study was high cost of finding a respondent due to expansiveness of the area and poor road network especially during rainy season, thus low response rate. Also the overall rating of operation risk management was not fully captured since some wheat farmers belong to other counties and were not found. The study recommends for a formal operation risk management firm which can sample farmers and rate farm productivity based on various management approaches. This would help improve farm productivity to farmers in Narok Sub County.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Agricultural activities are a risky means of livelihood. Smallholders are constantly being confronted with uncertain economic, environmental, social and climatic outcomes on a daily basis. The agricultural sector in Sub-Saharan Africa (SSA) continues to be confronted with multiple shocks and crises (Chuku and Okoye, 2009), threatening the endowments of the sector and impeding efforts at attaining the Sustainable Development Goals (SDGs) in the region via the sector. These outcomes define the riskiness or otherwise of the agricultural sector in SSA.

Risk is uncertainty that affects an individual's welfare and is often associated with adversity and loss (Bodie and Merton, 2009). Risks is uncertainty that matters and involve the probability of losing money, possible harm to human health, repercussions that affect resources (irrigation credit) and other types of events that affect a person's welfare. Uncertainty is necessary for risk to occur, but uncertainty need not lead to a risky situation (Harwood, Heifner, Coble, Perry &Somwaru, 1999).

For an individual farmer, risks management involves finding the preferred combination of activities with uncertain outcomes and varying levels of expected return. Risk management is an integral function in the operations of agribusiness firms, whether they are involved in production, processing, or trading activities (Wagner, 2001). Distinguishing the different types of risks that an agricultural stakeholder confronts is useful to explore the different actions required for managing

them and this study seeks to determine operational risk management strategies employed by crop farmers.

1.1.1 Operation Risk Management

The traditional risks associated with operating farm and agribusiness firms can be categorized as business risk and financial risk (Miller, Dobbins, Pritchett, Boehlje and Ehmke, 2004). Business risk is commonly defined as the inherent uncertainty in the financial performance of a firm independent of the way it is financed. Thus, business risk includes those sources that would be present with 100 percent equity financing. The major sources in any production period are price, cost, and production uncertainty; a number of factors may affect price, cost, and production variability over time.

Financial risk is defined as the added variability of net returns that results from the financial obligation associated with debt financing (Miller *et al.,* 2004). This risk results primarily from the use of debt as reflected by leverage. Leverage multiplies the potential financial return or loss that will be generated with different levels of operating performance. Furthermore, there are other risks inherent in using debt. Uncertainty associated with the cost and availability of debt is reflected partly in interest rate fluctuations for loans and partly through non-price sources. Non-price sources, a type of institutional uncertainty, include differing loan limits, security requirements, and maturities, depending on the availability of loan funds over time. Thus, financial risk also includes uncertain interest rates and uncertain loan availability (Miller *et al.*, 2004).

Economic theory suggests a tradeoff between risk and returns, i.e. people who accept higher risk should expect higher returns assuming there are no other alternatives with equal returns less risky. Selecting the appropriate risk-return tradeoff is a critical management decision. Those who are particularly adverse to risk will desire alternatives where little risk is incurred and/or the reward (return) is very high relative to the amount of risk taken. Those who are less risk adverse will be willing to accept risk without expecting as big a payoff in return and will likely consider alternatives that more risk adverse managers may consider totally unacceptable from the perspective of risk-reward tradeoff. Managers have a variety of mechanisms for managing risk. The best method(s) of managing risk depends upon the nature of the risk involved. Four general procedures for managing risk are: (1) avoidance, (2) reduction, (3) assumption/retention, and (4) transfer.

1.1.2Farm Productivity

Wheat farming in Kenya is one of seven crops that are, central to achieving the development goals established by Ministry of Agriculture in Kenya (Republic of Kenya, 1986). Some100,000-120,000 ha of wheat have been harvested annually in Kenya during the 1980s, with average yields ranging from just under 1 tonne/ha. Wheat occupied 2.2% of the total area of crops and pastures for dairying in1983/84 (Republic of Kenya 1986). Wheat's share of the total value of crops and dairy output of Kenyan agriculture was also just over 21%, although, as a share of marketed output, wheat in recent years has ranged from 2.3-4.9% (Republic of Kenya 1987).Wheat is mainly grown in the cooler and medium-rainfall regions of Kenya, generally at elevations over 1,800 meters above sea level and mostly on large farms. The environments for growing wheat are diverse and found throughout Kenya.

The main growing regions are:

1. Nakuru district and neighbouring areas, centered upon Nakuru and areas to the south and west.
2. Mount Kenya, largely the northern and western slopes.
3. Uasin Gishu, centered upon Eldoret and comprising areas to the north and east Trans Nzoia, centered upon Kitale and the lower slopes of Mt. Elgon.
4. Narok, on new lands which until recently were Maasai pastoral lands.

The differences among these growing regions in rainfall and temperature, which are largely determined by altitude and topography, mean that wheat is grown somewhere in Kenya throughout the year. There is a lengthy period between the first dates of planting and harvesting wheat in the “earliest” growing region, lower Narok, and those in the “latest region, Eldoret. In some parts of Kenya wheat is grown during the short rains, being planted in September and harvested in March. Unlike many other countries, in Kenya the fleet of harvesters and machinery for growing wheat cat) therefore be occupied for an unusually large number of months of the year.

With the exception of Narok, the wheat-growing regions listed earlier were part of the large-scale mixed farm areas settled by Europeans. Since 1961, programs have been undertaken to settle more people in these areas, which are generally fertile and amenable to more-intensive cropping. Approximately one-third of the large-scale mixed farm area has been officially subdivided since Independence (World Bank 1982). Many of' the new settlers came from areas where maize and other subsistence food crops predominated but little if any wheat was grown.

The smallholder settlers naturally engaged in enterprises with which they were familiar and whose products they were accustomed to using: maize, other smallholder crops, and dairying.

1.1.3 Kenya Agriculture Sector

Agriculture is the mainstay of Kenya's economy. Overall, 80% of Kenya's population derives their livelihoods from production, processing and marketing of crops, livestock, fisheries and other sector related products. The agricultural sector generates 18% of formal and 60% of informal employment, and contributes 24% of Kenyan GDP directly, and 27% if agro-processing is included, with a value of about Ksh342 billion (US$ 4.6 billion). The sector also accounts for about 65% of total exports. Food and Agriculture Organisation [FAO], (2008) In this regard, Kenya Vision 2030 identified agriculture as the key sector through which to deliver the 10% annual economic growth rate envisaged under the economic pillar. To achieve this target, the agricultural sector developed the Agricultural Sector Development Strategy, which aims at transforming the country's smallholder agriculture sector from subsistence farming characterized by low productivity and value addition to an innovative, commercially-oriented, internationally competitive and modern agriculture /agribusiness sector.

However, starting from 2008, the country has been facing severe food insecurity problems (Kenya Agricultural Research Institute, 2013). These are depicted by a high proportion of the population having no access to food in the right amounts and quality. Official estimates indicate over 10 million people are food insecure with majority of them living on food relief. The growing threat of the adverse impacts of

climate change on the agricultural sector has prompted the government of Kenya to initiate economic diversification adaptation strategies at both national level and micro level (Recha et al., 2012).

One of the major challenges towards achievement of the agricultural sectors' objective is the non- availability of adequate risk transfer mechanisms (Adaptation to Climate Change and Insurance [ACCI], 2013). This is clearly demonstrated by the underdeveloped operational risk management and insurance market. Risk transfer instruments especially for catastrophic agricultural disasters are limited therefore smallholder farmers are left to cope with disasters on their own. The frequency of crop failure and livestock mortality has increased as a result of climate variability and change. Besides the negative effects of weather shocks on the livelihood of farmers, the high risk exposure limits access to credit as the formal financial institutions consider the agricultural sector risky. Agricultural insurance combined with other measures like risk reduction, can greatly reduce the immediate losses and long-term development setbacks from agricultural risks.

The total production and yields for wheat follow a similar pattern as maize with significant harvest losses in 1984, 1994, 2001, and 2004 (ACCI, 2013). Wheat stem rust, Ug99, continues to threaten the livelihoods of hundreds of farmers in Kenya's Rift Valley region as controlling it pushes up production costs (International Research Institute [IRIN], 2010). The government employs a broad range of policy measures to support risk management in rural areas. One ex ante measure of the government is the provision of subsidized certified seeds and other farm inputs like fertilizers. The government also provides farmers with extension services through the Ministry of

Agriculture and other government institutions. In case of weather disasters like droughts, the government mobilizes resources to provide relief in order to protect the livelihoods of those affected. At present support for agricultural insurance is not yet part of the government's risk management strategy.

1.2 Statement of the Problem

The Kenyan agricultural industry makes the most important contribution to economic development in the country-it represents 24% of gross national product and 27% of the agro-processing industry. However extreme weather events are increasingly causing significant losses (ACCI, 2014). Kenya agricultural risks are exacerbated by a variety of factors, ranging from climate variability and change, frequent natural disasters, uncertainties in yields and prices, weak rural infrastructure, imperfect markets and lack of financial services like availability of credit and insurance to farmers (KARI, 2013; ACCI, 2014; Recha, Kinyagi & Omondi, 2012). These factors not only endanger the rural farmer’s livelihood and incomes but also undermine the viability of the agriculture sector and its potential to become a part of the solution to the problem of endemic poverty of the farmers and the agricultural labour.

In Narok County, wheat is the main crop grown for commercial use. In recent years due to unpredictable weather patterns, lack of market information by farmers, poor rural road network among other problems are experienced by wheat farmers in the area. What is not clear is to whether wheat farmers are adopting operational risks management strategies on crop insurance, product diversification, lease arrangements, excess production and reliable information on wheat farming in Narok County. The wheat production volume has declined over the past five years but it is not understood

whether farmers are utilising operational management techniques in ensuring that wheat farming is productive and profitable.

Efforts have been done within and outside the country to relate operational risks and wheat production across the world. For instance Kerer (2012) conducted a feasibility study of the uptake of agricultural insurance in western Kenya region but did not focus on other aspect of operational risks associated with wheat farming. Drollette (2009) conducted a research on management of production risk in agriculture in Utah State, United States but the research covered various crops types and therefore was not specific on wheat crop which forms principal grain crop in the county. Muchapondwa (2012) conducted a risk management research using community based wildlife conservation and wildlife damage insurance in Zimbabwe, the current study is not pegged on wildlife damage insurance but specific action that wheat farmers undertake to improve wheat production. Moreover, the study understands that inadequate research has been conducted to determine the operational approaches that have been employed to improve wheat farming in the area, a focus of this study. It was therefore of significant to investigate the operational risk and wheat farming production in Narok North Constituency.

1.3 Research Objectives

The study was to consider the following research objectives:

i. To establish the risks associated with wheat farming in Narok North Constituency.
ii. To determine the types of operation risk management approaches applied in wheat farming in Narok North Constituency.

iii. To determine the effectiveness of operation risks management approaches in wheat farming in Narok North Constituency.

1.4 Value of the Study

It was expected that the study was to be significant to wheat farmers, county government officers and future researchers. In practical terms, the farmers in Narok North Constituency were to benefit as the findings of the study were to provide ways through which they can manage operations risks in wheat farming. This was due to the fact that there has been less government intervention to help farmers manage risks and therefore this research was to provide them with the understanding on operational risk management to help farmers make better decisions in risky situations.

Secondly, it was expected that the results of the study would provide necessary information to county department of agriculture on how they can assist farmers through sensitising them on tackling operational risks management tools in wheat farming. The policy makers were also to benefit from the research findings in assessing the effectiveness of different types of operational risk protection tools. Theoretically, it was expected that the findings of the study would be of relevance to future researchers in operational risk management in agricultural production.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

In this chapter the research discusses literature on theoretical framework and the operations risk management in agriculture. Risk and uncertainty cannot be totally eliminated. In fact, doing so could result in elimination of the chance for a profit, since by definition one of the components of profit is a reward for risk-taking. However, some operational risks can be reduced, and there are several methods for improving one's ability to withstand adverse business conditions. The discussion in this section on strategies for managing operational risks will be relatively brief since a number of other sources of information on these strategies are available on the Internet and in publication form. The presentation of various scholarly works flows according to the themes and subthemes of the study. The theoretical framework is presented at the end. Information contained in this chapter was sourced from books, government articles, past theses and online journals.

2.2 Farm Production

Wheat is the principal cereal grain crop used for food consumption in the United States and most of the world. In terms of value of production and planted acreage, wheat is typically the Nation's fourth largest field crop. Only corn, hay, and soybeans are more important. Wheat is also a leading U.S. export crop, with exports accounting for almost half of total wheat production. U.S. wheat farmers are facing many challenges despite a strong domestic market demand for wheat products. Many wheat

farmers are not able to cover all of their production costs, even after Government payments are added to their income (Ali, 2002).

Informal discussions with farmers and contractors in Narok North district and other areas around it suggest that wheat area, including land devoted to small-scale wheat production, has increased in recent years. The increase has occurred because the price of wheat has been considered more favourable than prices of competing crops. In addition, payments to farmers for maize are often delayed for up to a year whereas payments for wheat are generally more prompt. Important as it may be, the number of small holdings producing wheat is not the central issue for this study. More important is the potential area for smallholder wheat production, which comprises 1) areas where wheat was grown on larger farms and where other crops or pasture are now grown on Smallholder settlements; 2) land that might be switched from other crops to wheat if the smallholder technologies were better developed; and 3) potential wheat land on large farms that are being subdivided or might be subdivided in the future. It is likely that the potential area for producing wheat on small holdings considerably exceeds the current area. Whether or not the area of smallholder wheat increases in the future will depend upon the availability of technology for growing wheat on small holdings and the economics of smallholder wheat production compared with alternative crop and livestock enterprises.

2.3 Operations in Farming

Farming in the tropical countries is labour intensive. The ratio of rural population to arable land in Asia is twice as great as in Africa and three times that of Latin America. It is estimated that human effort provides more than 70% of the energy required for

crop production tasks (FAO, 1987). Improvement in the existing tools, equipment and methods of work has significant effects in minimizing human strain and fatigue and increasing farm productivity. For field crops, farm activities may be categorized based on the physiological demand of work with reference to an individual's maximal working capacity: land preparation which entail ploughing, hoeing, harrowing: sowing which entail Broadcasting seed/fertilizer, manual uprooting seeds and transplanting, use of Planters for large scale: Weeding and intercultivation: fertilizer broadcasting, manual weeding, channel irrigation, knapsack spraying of pesticides and herbicides, weeder operation in dry soil, Harvesting: which entail grain cleaning, cutting crops, harvesting wheat using combine harvesters, shelling maize etc(Nag, Pranab Kumar, International Labour Organization, Geneva, 2011).

ACCI (2013) reports that Kenya's agriculture farming systems can be divided into a) rain-fed agriculture and b) irrigated agriculture. More than 93% of agriculture in Kenya is rain-fed. The performance of rain-fed agriculture varies with agro-climatic zones, and it is more predictable in humid and high-altitude areas and less predictable in other agro-climatic zones (Kerer, 2012). The humid and high-altitude areas are conducive for agriculture, but are also highly populated. The high population density has resulted in a land fragmentation which is making it unsuitable for commercial farming due to high average production cost per land unit. In medium-altitude and moderate areas, rain-fed farming is commercially more viable but changes in climate (i.e. increased frequency of dry spells and uneven rainfall distribution during the year) have lead to an increase in crop failures in these areas.

Irrigation agriculture is predominantly carried out in government supported irrigation schemes and in large-scale schemes for commercial crops such as rice and coffee (ACCI, 2013). Large scale farmers' account for 40% of irrigated land, smallholders for 42% and government-managed schemes account for the remaining 18% (Kerer, 2012). The majority of farmers in Kenya are smallholders. Farm sizes range from 0.2 to 3 ha of land. Smallholders account for 75% of the total agricultural output and 70% of marketed agricultural produce. The small farm size prevents mechanization and economies of scale. Therefore, a large part of smallholder agriculture is subsistence farming (Kerer, 2012).

2.4Operational Risks in Farming

The traditional risks associated with operating farm and agribusiness firms can be categorized as business risk and financial risk (Risk Management Agency, December 1997). Business risk is commonly defined as the inherent uncertainty in the financial performance of a firm independent of the way it is financed. Thus business risk includes those sources that would be present with 100 percent equity financing. The major sources in any production period are price, cost, and production uncertainty; a number of factors may affect price, cost, and production variability over time.

Financial risk is defined as the added variability of net returns that results from the financial obligation associated with debt financing. This risk results primarily from the use of debt as reflected by leverage. Leverage multiplies the potential financial return or loss that will be generated with different levels of operating performance. Furthermore, there are other risks inherent in using debt (Economic Research Service, Agricultural Economic Report No. 774, March 1999).

Uncertainty associated with the cost and availability of debt is reflected partly in interest rate fluctuations for loans and partly through non-price sources. Non-price sources, a type of institutional uncertainty, include differing loan limits, security requirements, and maturities, depending on the availability of loan funds over time.

2.5 Risks in farming

The agricultural sector is exposed to a variety of risks which occur with high frequency (USAID, 2010). These include climate and weather risks, natural catastrophes pest and diseases, which cause highly variable production outcomes. Production risks are exacerbated by price risks, credit risks, technological risks and institutional risks. Risk management in agriculture ranges from informal mechanism like avoidance of highly risky crops, diversification across crops and across income sources to formal mechanisms like agriculture insurance, minimum support price system and futures markets.

Risk and uncertainty are ubiquitous and varied within agriculture and agricultural supply chains. This stems from a range of factors including the vagaries of weather, the unpredictable nature of biological processes, the pronounced seasonality of production and market cycles, the geographical separation of production and end users, and the unique and uncertain political economy of food and agriculture sectors, both domestic and international (Jaffee, Siegel & Andrews, 2010). The above statement represents the day-to-day realities of life for hundreds of millions of farmers in developed and developing countries around the world (Barkley and Hanawa, 2008).

However, the impacts of realized agricultural risks are not peculiar to farmers alone. The companies and service industries that supply the farmers, the processing and logistics companies that move the produce from farm to the markets (that is, the wider supply chain), and ultimately the consumer all suffer to one extent or another. In India, agricultural risks are exacerbated by a variety of factors, ranging from climate variability and change, frequent natural disasters, uncertainties in yields and prices, weak rural infrastructure, imperfect markets and lack of financial services including limited span and design of risk mitigation instruments such as credit and insurance. These factors not only endanger the farmer's livelihood and incomes but also undermine the viability of the agriculture sector and its potential to become a part of the solution to the problem of endemic poverty of the farmers and the agricultural labour (Government of India, 2012).

Agricultural risks can range from independent (for example, localized hail losses or an individual farmer's illness) to highly correlated (for example, market price risk or widespread drought). Managing risks in agriculture is particularly challenging, as many risks are highly correlated, resulting in whole communities being affected at the same time (Barkley and Hanawa, 2008). Clearly, given the widespread nature of resultant loss, financial recovery is particularly difficult and challenging. For governments, the fiscal implications of social safety net payments or the rebuilding of damaged infrastructure can be serious. For insurers, sudden losses suffered by a large number of policyholders places a strain on their reserves and financial stability. For farming communities, there is often no other option than to sell assets, normally at distressed prices.

2.6Risks Management approaches

Obviously, risk and uncertainty cannot be totally eliminated. In fact, doing so could result in elimination of the chance for a profit, since by definition one of the components of profit is a reward for risk-taking (Keller; Keller and Rigby-Adcock; Baquet, Hambleton, and Jose). However, some risks can be reduced, and there are several approaches for improving one's ability to withstand adverse business conditions. The discussion in this section on approaches for managing operational risks will be relatively brief and specifically focus on; product diversification, maintenance of excess production approach, utilisation of Lease Arrangements approach, effectiveness of information sourcing approach and Policies approach.

2.6.1Product diversification Risk Management approach

Product diversification can help lower production risk for agricultural producers (Drollette, 2009). Other literature refer product diversification strategies involve, geographic dispersion, variety selection, timeliness, drainage, the use of cultural practices best suited to particular areas, etc. are important ways to manage risk. By producing more than one crop or livestock product, farmers can reduce the risk of a total production loss (Miller et al., 2004). For example, a producer who operates a dairy and raises corn is not completely dependent on one product. Thus, his risk of a complete production loss due to an early frost would be less than a farmer who only grows corn (Drollette, 2009).

Diversification has been one of the more common methods used to reduce risk and uncertainty (Miller *et al.,* 2004). By having more than one enterprise in the farm business, the chance of a large loss from a given hazard is reduced. But for

diversification to be most effective, enterprises included in the business should not be subject to the same hazards or at least not to the same degree. Possibilities for risk reduction exist only if the returns from alternative individual investments or enterprises are affected by different forces or are basically more stable than those already in the business.

It is, therefore, important to understand whether the added enterprise is efficient and profitable. While the yield may have very little variability and low production risk, if that yield is consistently lower than what is needed to cover costs, the whole farm is not being helped by the diversification. Thus, adding an inefficient enterprise that creates continual losses might not be worth the lowered risk from diversification, and farmers should take these factors into account when making diversification decisions (Drollette, 2009).

Furthermore, diversification may also incur significant costs in the form of reduced efficiencies and scale economies that are foregone, when resources are diverted from a core business or a specialized operation to a new and very different business venture. Various hybrid forward contracts such as hedge-to-arrive contracts, basis contracts and minimum pricing contracts can allow more pricing flexibility. However, this flexibility may be accompanied with increased risk (Miller, et al., 2004).

2.6.2 Maintenance of Excess Production Risks Management approach

Production risk can also be reduced by maintaining excess production capacity. For example, in areas where weather conditions commonly postpone planting, a farmer with excess machinery or labour capacity will be able to catch up on planting to avoid

that risk of production loss. Similarly, livestock producers with excess feeding capacity can reduce the risk of loss if there is a drought, fire or some other event that makes feed unavailable. As with diversification, the cost of maintaining excess capacity should be weighed against the benefits of lowering production risk when making management decisions (Drollette, 2009).

A farmer may have enough machine capacity so that planting and harvesting crops can occur more rapidly than needed under normal weather conditions. By having such resources, the farmer can avoid delays at either planting or harvest that may reduce yield losses. Other methods of risk management in farming are also important, and focus on other types of issues than those specific to production, marketing, and finance. Legal risks and issues associated with farm liability, for example, have become increasingly important. In addition, tax concerns are a key issue in managing the income risks associated with year to- year income flows, as well as estate transfers from generation to generation (Keller; Keller and Rigby-Adcock; Baquet, Hambleton, and Jose, 1998). Government payments such as contract payments under the 1996 Farm Act can also be used to provide liquidity, for example, or to pay the premium for an options contract or a “buy up” crop insurance policy.

2.6.3 Utilisation of Lease Arrangements Risk Management approach

Utilizing leasing arrangements can also help reduce production risk. With a crop share or livestock share lease, the farmer shares production risk with the landowner. For example, under a crop share agreement, the landowner receives a portion of the crop yield as rental payment. If production yield is significantly reduced, the landowner

also receives a reduced quantity and the burden of the loss is shared between landowner and tenant.

A similar agreement with a livestock producer would also reduce his production risk by sharing it with the landowner (Drollette, 2009).Producers can also manage their farming risks by either leasing inputs (including land) or hiring workers during harvest or other peak months. Leasing refers to a capital transfer agreement that provides the renter (the actual operator) with control over assets owned by someone else for a given period, using a mutually agreed upon rental arrangement (Perry, 1997). Farmers can lease land, machinery, equipment, or livestock. Leasing has similarities with leveraging, in that both are methods used to expand control over resources. In addition, both commit the farmer to regular payments. Leasing appears, however, to have some advantages.

Although apparently increasing in recent years, leasing of non-real estate assets is at a lower level than of farmland (Koenig and Dodson, 1996). Land rental arrangements can fall either in the category of “share renting” or “cash renting”. With share renting, the landlord and tenant share in the operation’s returns and each provides a predetermined set of inputs. The two parties usually share input costs in the same proportions as outputs and share the risk of yield variability. They typically have equal say in management decisions, although the tenant usually carries out most of the production decisions. Often, the owner provides land, while the renter provides machinery and labour. In practice, the renter (as well as the owner) may have several such arrangements.

2.6.4 Effectiveness of Information Sourcing Risk Management approach

Having good and up-to-date information can greatly reduce the risk associated with agricultural production. Agricultural companies, as well as universities, are constantly doing research to test and develop new and better ways of producing various agricultural commodities. A farmer who is well informed about and follows new and proven production practices can reduce his production risk. For example, a producer who knows and follows proper care and milking practices on a dairy enterprise can help avoid many diseases, significantly lowering the risk of production loss. Similarly, a crop farmer who becomes aware of a recently emerging crop disease can apply disease-resisting pesticides and may save his crop from devastation (Drollette, 2009). Adopting new technologies can also help reduce production risk. For example, a crop producer who invests in new machinery or irrigation equipment may lower the risk of equipment or water problems reducing his yield. Similarly, biotechnology and the focus of genetic research on improving yield have produced seed varieties that are more resistant to drought and disease and can reduce production risk for farmers (Drollette, 2009).

One of the biggest problems in designing risk management instruments, whether by the private sector or the government, is what economists call information asymmetry. Put simply, farmers have good information about the circumstances of their business and are very well placed to assess risk – but the private sector and governments do not have access to the same level of information. There are incentives for farmers to disclose this information in ways favourable for their tax bill, payments or insurance indemnities. This makes it difficult for a private or government-assisted scheme to

make the initial calculation about the type and frequency of risk that can be insured (OECD, 2011).

If government interventions in response to a catastrophe are based on pre-defined criteria, information is crucial for triggering and determining the scale of the assistance. Here too there can be serious information problems that get in the way of a strict application of pre-determined protocols. Governments can have difficulty identifying the scale of the event and the resulting damage, while there is strong public pressure to intervene rapidly. Pre-determined protocols have to recognize this difficulty and ensure that decisions are based on available relevant information. Some governments try to manage catastrophic risk with insurance because insurance companies have the means and knowledge to evaluate damage rapidly. Support to insurance is also one of the two risk management measures included as exempted measures in the green box of the WTO Agreement on Agriculture: “payments or support to crop insurance for natural disasters”, and “income safety net” stabilization payments (OECD, 2011).

2.6.5 Utilization Insurance Policies Risk Management approach

A major tool to reduce production risk is insurance (Drollette, 2009). According to Miller *et al.,* (2004), a common method used to reduce the financial consequences of adverse events is to buy insurance. The fundamental principle of insurance is to pay a premium for someone else to take the risk. Insurance programs are commonly used to manage health and medical risk, casualty risk, accident risk, liability risk, weather risk, etc.

For most major commodity crops such as corn, soybeans and wheat, crop insurance is available to reduce the risk exposures due to price and yield variability. Crop insurance is an example of a risk management tool that not only protects against losses but also offers the opportunity for more consistent gains (FAO, 2008). When used with a sound marketing program, crop insurance can stabilize revenues and potentially increase average annual profits. Crop insurance provides two important benefits. It ensures a reliable level of cash flow and allows more flexibility in your marketing plans; if you can insure some part of your expected production, that level of production can be forward-priced with greater certainty, creating a more predictable level of revenue.

The number of alternative crop insurance programs has expanded rapidly in recent years, and in many cases some form of crop insurance is a very cost-effective method of protecting the business from production or price risk in crop production. It is important to evaluate the full range of products that are available, because no one product works the best for all producers.

In United States, Multiple Peril Crop Insurance (MPCI) policies are designed to protect farmers against yield loss from natural causes such as adverse weather conditions, disease, and insects. These policies are based upon Actual Production History (APH) figures, and the farmer pays a premium for the insurance relative to the percentage of his APH yield he wishes to guarantee with the insurance. Though many insurance policies are available through private companies, the USDA's Federal Crop Insurance Corporation (FCIC) backs the policies and provides premium subsidies for farmers, significantly lowering the cost of insurance to farmers.

2.7Outcomes of Effective risk management on farm productivity

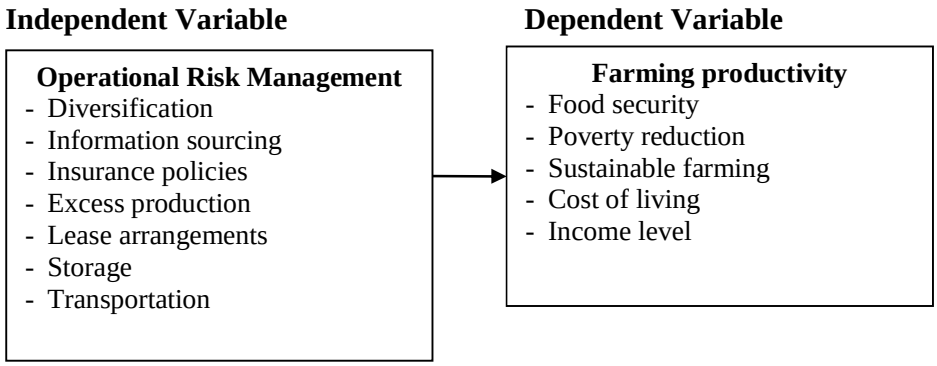
According to World Bank Action Plan, World Development Report 2008, Agriculture for Development (WDR 2008) on key thematic areas has help clients to improve sustainable agricultural growth, incomes, nutrition, and their resilience to climate change. Effective implementation of operation risk management in farming through adoption of the five approaches as explained above has helped in :(i) raising agricultural productivity and its resilience through support to better land and water management and improved technologies, including through CGIAR (formerly known as the Consultative Group on International Agricultural Research) and greater IFC support for critical inputs, such as fertilizer and farm equipment; (ii) linking farmers to markets and strengthening value chains through support to improve infrastructure, post-harvest handling, trade, and access to finance;(iii) facilitating rural non-farm income through improving the rural investment climate and skills development; (iv) reducing risk and vulnerability through support to risk management mechanisms, and greater transparency in food markets; and (v) enhancing environmental services and sustainability, including support to manage livestock systems, forests, oceans, and to enhance carbon capture in soils.

Successful implementation will continue to require addressing local, national, regional and global governance issues in agriculture. While, the new Action Plan maintains the strategic focus identified in the WDR 2008, it responds to the evolving global context with more emphasis on climate smart agriculture, private sector responses, agriculture risk management, nutritional outcomes, landscape approaches to agricultural production, and governance issues.

2.8 Conceptual Framework

Figure 2.1 below shows the conceptual framework for the research outlining the relationship between independent variable (operational risk management) and dependent variable (crop farming).

Figure 2.1 Conceptual Model



At first, the study assumes that extraneous variables occur first before interventions are made by applying the independent variables. For instance wheat farmers' diversification will be dependent on whether climate variability and change affect wheat farming that might force the farmer to shift or alternate farming methods in their farm.

Therefore at first, the study will look first the extraneous variables which involve risks in wheat farming which might include climate variability, uncertainty in crop yields and prices, weak rural infrastructure, imperfect markets, lack of financial services, pests and diseases attack. The independent variables for the study will involve methods through which farmers are applying in management of risk associated with crop farming through product diversification, excess production, insurance policies, and lease arrangements.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the research design and methodological procedures. Specifically the following are covered under this chapter; description of the research design, population for the study, sample design, data collection and data analysis procedures.

3.2 Research Design

The study was to adopt a survey research design technique. According to Leary (2004:105), surveys are by far the most common type of descriptive research. Ogula (2009) indicates that survey method is used to describe people and their beliefs, attitude or behaviours. They are used in virtually every area of social and behavioral science. In survey research, respondents provide information about themselves by completing a questionnaire or answering an interviewer's question. In this study, farmers were key respondents for the study. The study would seek to determine the operational risk management methods employed by farmers.

3.3 Population

A population is the group of interest to the researcher, the group to which the researcher would like to generalize the results of the study (Ogula, 2009:83). In this study the population involves 650 wheat farmers in Narok North Constituency.

3.4 Sample Design

Sampling is the process by which a researcher selects a sample of participants for a study from the population of interest (Leary 2004:109). Ogula (2009) defines sampling as process of choosing a small group of people or things from the population. This involves selecting the sample size and sampling procedures.

3.4.1 Sample Size

Considering that the population for the study was too large, a sample size was selected. Sample size determination was usually undertaken because resources do not permit researchers to study all members of the target population (Ogula, 2009). There are various techniques of selecting sample size for the study. Best and Kahn (1989) noted that in survey type studies, they should have larger samples than needed in experimental studies. The current study selected the sample size for the research based on Morgan and Krejcie (1970) table for sample size determination. Looking on the table, when the population is 650, the corresponding sample size is 168 farmers.

3.4.2 Sampling Procedure

The respondents for the study were selected using probability and non-probability sampling methods. The probability sampling method used was stratified random sampling technique. According to Ogula (2009), stratification ensures that different groups of the population are represented in the sample. Hereby the population will be divided into several stratas based on the locations of the farmers. For each location, the sample of famers will be selected randomly. The number of farmers to be selected will be proportional to the entire population (target). For non-probability sample,

purposive sampling was used to select farmers. In this procedure, the choice of sampling units depends on the subjective judgment of the researcher.

3.5 Data collection

This involves the process of designing instruments to be used in collecting the study. The researcher used questionnaire for farmers. The questionnaires were designed for farmers and consisted of close and open ended questions. The questionnaires were structured according to the objectives of the study through several sections. Some questions relating to the objectives of the study were designed in ordinal measurements (Liker scale).

Prior to administration of the research instruments to the field, they were tested for validity. Validity is the degree to which the data support the inferences that are made from the measurement. In this research the validity of the research instrument were determined through content validation measure. Reliability on the other hand refers to the accuracy or precision of a measuring instrument (Kerlinger, 1973). The reliability of the research questionnaire was determined through test re-test technique. This involves correlating the two sets of scores measured on two different occasions. Cronbach alpha correlation coefficient is the mostly commonly used measurement tool for this method. Therefore values of reliability above 0.7 were used as a benchmark in the current study as recommended by Kerlinger (1973).

3.6 Data Analysis

Refers to the procedure through which data from the field is organized, coded, entered, analyzed and presented in various methods. Considering that the study was

collected using qualitative and quantitative data, two methods were employed when analyzing them. First qualitative data were analyzed using content analysis by arranging them into themes and sub-themes of the study and presenting them as narrations in the next chapter. For quantitative data, Statistical Package for Social Sciences (SPSS Version 20.0) will help in data coding and entry. Thereafter data entered were analyzed using descriptive (frequencies, percentages, means and standard deviation) and inferential statistics (correlations). The correlations were used to determine the degree of relationship between the independent variables and depended variables. The results of the quantitative analysis were presented in tables, pie charts and other graphical formations.

CHAPTER FOUR

DATA PRESENTATION, INTERPRETATION AND DISCUSSION

4.0 Introduction

This chapter presents analysis of findings of data collected from the field on the application of operations risks management methods on productivity of wheat farming in Narok North constituency. The result presented in this study are interpreted and discussed according to themes of the study. An interpretation is made and discussed by comparing the findings with scholarly articles cited in the literature review section. The data collected for the research came from large and small scale farmers who are involved in wheat farming in the region. A total of 164 farmers from Narok North Constituency participated in the answering research questions.

4.1 Demographic information of respondents

This involved determining the general characteristics of wheat farmers based on their gender profile, education level, farm size, main economic activity aside from wheat farming and wheat production rate in the last three years. Table 4.1 gives the gender profile of respondents.

Table 4.1 Gender of respondents

Gender profile	Frequency	Percent
Male	144	87.8
Female	20	12.2
Total	**164**	**100.0**

Majority 144 (87.8%) of wheat farmers were male with only 20 (12.2%) being female. This implies that wheat farming is male dominated. This could be due to socio-cultural values that restrict women to household activities rather than engage in

profitable farming activities. Moreover, when asked to indicate their education level, the results are presented in Figure 4.1.

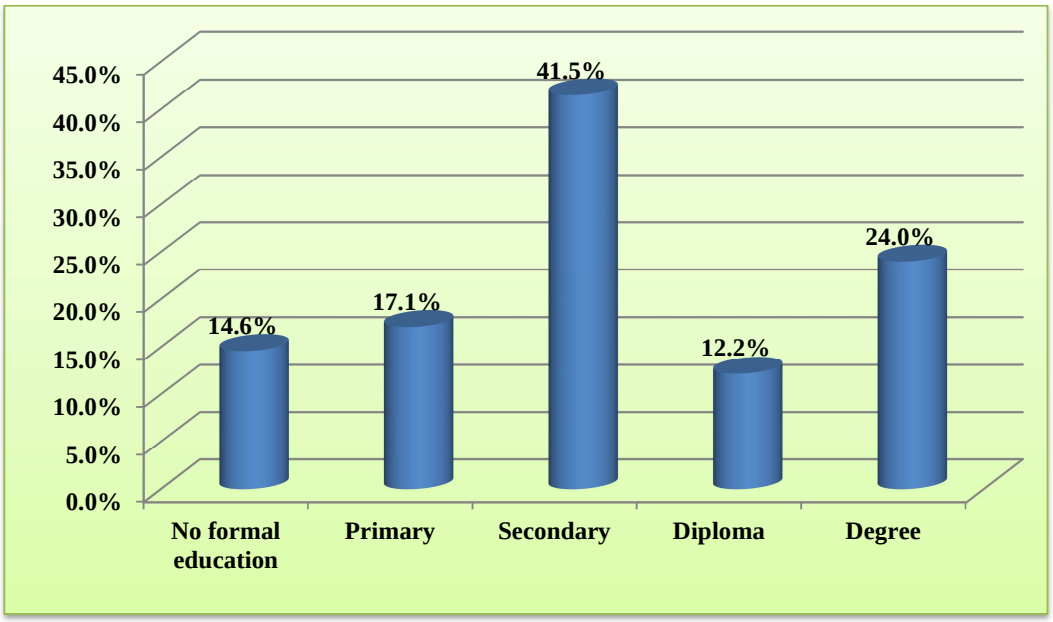


Figure 4.1 Education levels of wheat farmers

It is seen that most 41.5% of farmers had secondary level of education, 24.0% mentioned that they had degrees, 17.1% had basic primary education, 14.6% had no formal education while 12.2% indicated to have diploma education qualifications level. This shows that wheat farmers have basic education which would enable them to understand and apply operational risk management approaches towards improvement of wheat production. Moreover, the wheat farmers were requested to give their economic activity apart from the crop under study. Their responses are illustrated in Table 4.2.

Table 4.2 Other economic activities of wheat farmers

Activity	Frequency	Percent
Pastoral farming	4	2.4
Pastoral farming and crop farming	12	7.3
Crop farming	124	75.6
Business	16	9.8
Farming and business	8	4.9
Total	**164**	**100.0**

It is evident that most 124 (75.6%) were full time crop farmers due to the prevailing conditions in Narok North Constituency that favours agriculture, 16 (9.8%) said that they engaged in business, 12 (7.3%) mixed pastoralism with crop farming, 8 (4.9%) said that they were involved in crop farming and business while 4 (2.4%) said that they engaged in pastoral farming. Furthermore, the research sought to know the land to which farmers dedicated to wheat farming in Narok North Constituency. Their responses are given in Figure 4.2.

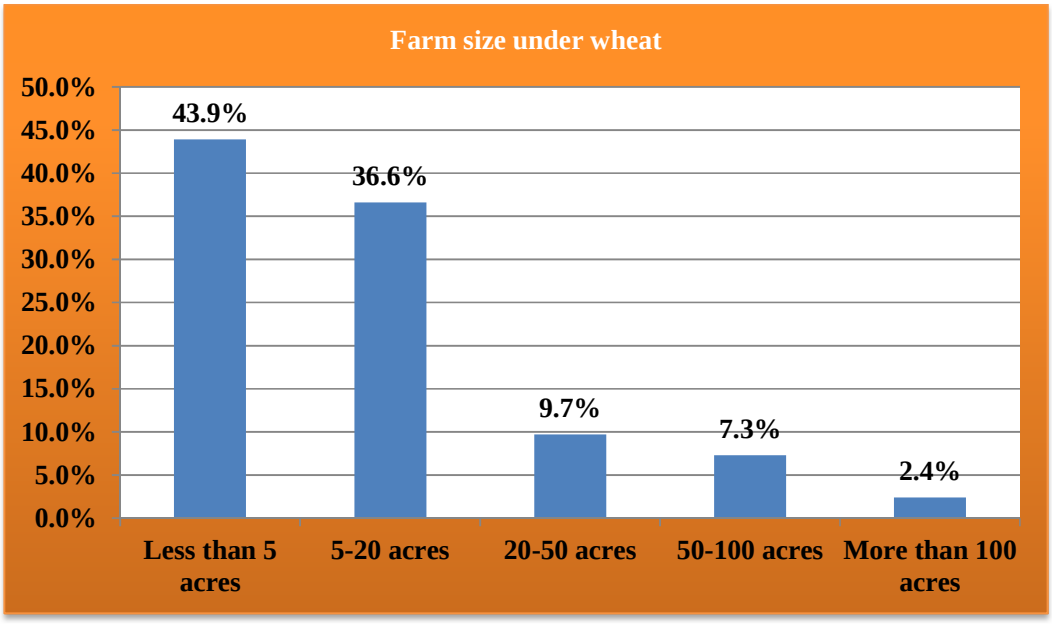


Figure 4.2 Land under wheat farming

Most 43.9% of wheat farmers who participated in the research planted the crop on less than 5 acres, 36.6% planted it between 5-20 acres, 9.7% was for 20-50 acres, 7.3% planted wheat between 50-100 acres while 2.4% farmed wheat on more than 100 acres. Therefore the study ensured that small, middle and large scale farmers were captured by the research in determining operational risk employed in wheat farming in Narok North Constituency. Their wheat production level is given in Table 4.3 below.

Table 4.3 Wheat production level in Narok North Constituency

Level	Frequency	Percent
Poor	28	17.1
Below average	56	34.1
Fair/Average	72	43.9
High	8	4.9
Total	**164**	**100.0**

According to 72 (43.9%) of farmers, their wheat production level for the past three years has been on average, 56 (34.1%) said that their wheat yield was below average, 28 (17.1%) said that wheat output yield was poor and only 8 (4.9%) said that their wheat farming productivity was high. This suggestions that wheat farmers have experienced low production levels for the past three years and this has forced a significant number of them to reduce their acreage dedicated to the crop while others said that they are forced to substitute wheat with green maize (*mukohoro*).

4.2 Agricultural Risks Experienced by Wheat Farmers in Narok North Constituency

Farmers were asked to indicate the extent to which the experienced and incur losses associated with wheat farming in their locality for the past three years. Through a

scale of five; never (1), rarely (2), sometimes (3), occasional (4) and always (4), they were asked to rate their responses. The descriptive statistics results are given in Table 4.4.

Table 4.4 Agricultural risks experienced by wheat farmers

Risks	N	Mean	Std. Deviation	Occurrence of risk
Commodity prices	164	3.2927	1.45685	**Sometimes**
Drought	164	3.1951	.97123	
Market information	164	3.1707	1.58059	
Cost of production	164	3.1707	1.32743	
Insects	164	3.0732	1.22129	
Epidemic diseases	164	3.0732	1.22129	
Infrastructure	164	2.9512	1.32834	
Crop failure	164	2.9024	1.26888	
Inputs	164	2.8780	1.47278	
birds	164	2.8780	1.31429	
Animals	164	2.6585	1.22569	
Poor yields	164	2.6585	1.09902	
Frosts	164	2.1463	1.47887	**Rarely**
Hailstorms	164	2.1463	1.09793	
Debts	164	1.9756	1.30102	
Flooding	164	1.8049	.99618	
Windstorms	164	1.7561	.96007	
Fire	164	1.3902	.66010	**Never**
Valid N (List wise)	**164**	**2.6179**	**1.22121**	

Results shows that the major risk faced by farmers on several occasions is due to changing and unpredictable wheat commodity prices (M=3.29 and SD=1.45). The farmers lamented that imports from neighbouring countries saturated the local market and the prices declining.

The study further found out that risks that happened to occur from time to time were fluctuating commodity prices, drought (M=3.19 and SD=0.97), market information (M=3.17 and SD=1.58), cost of production (M=3.17 and SD=1.32), insects and pests attack (M=3.07 and SD=1.22), epidemic diseases (3.07 and SD=1.22), infrastructure

challenges (M=2.95 and SD=1.32), crop failures (M=2.90 and SD=1.26), agricultural inputs prices (M=2.87 and SD=1.47), birds (M=2.87 and SD=31), animals and poor yields. Moreover, research results showed that occurrence of frosts, hail storms, debts, flooding and windstorms occur on rare times in Narok.

The farmers further acknowledged that they have never (M=1.39 and SD=0.66) witnessed incidences of fire outbreak in their wheat firms. When asked to indicated other types of operational risk that they encountered in wheat farming they mentioned; existence of intermediaries/brokers (9.8%), constant weather changes (14.6), agricultural farm machinery (2.4%), lack of knowledge on proper wheat farming land cultivation methods (4.9%), seed selection (7.3%), changes in wheat input prices (4.9%), theft cases (7.3%) and labour issues (2.4%). The summary of risks associated with wheat farming in Narok county are given in Figure 4.3.

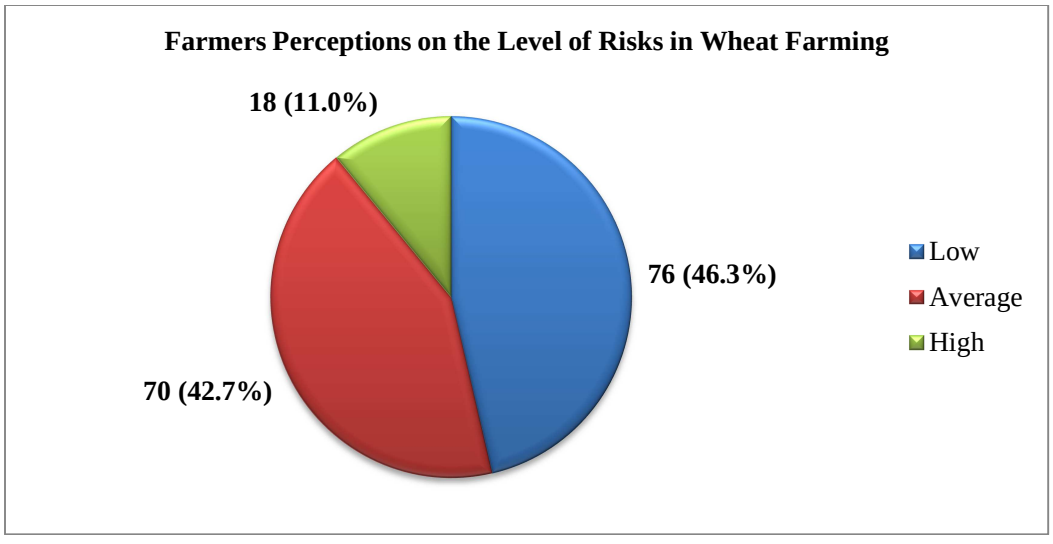


Figure 4.3 Farmers perceptions on the level of risks in wheat farming

Results reveal that 76 (46.3%) termed the level of risks associated with wheat farming as low, 70 (42.7%) said that the risks in wheat farming are of moderate threat while 18 (11.0%) said that the level of risks is high.

This shows that farmers encountered various types of risk while farming wheat and the study seeks to determine operational risk management methods employed by farmers.

4.2.1 Relationship between Risks and Wheat production in Narok North Constituency

The study conducted a correlation analysis to determine the kind of relationship that existed between the farmers experience with various risks and their wheat production. The results of the analysis are illustrated in Table 4.5.

Table 4.5 Relationship between risks and wheat yields in Narok North Constituency

		Wheat agricultural risks	**Wheat productivity**
Wheat agricultural risks	Pearson Correlation	1	-.199*
	Sig. (2-tailed)		.010
	N	164	164
Wheat productivity	Pearson Correlation	-0.199*	1
	Sig. (2-tailed)	.010	
	N	164	164
*. Correlation is significant at the 0.05 level (2-tailed).			

Correlation results show that there exist a weak negative relationship (-0.199) between occurrence of risks and wheat productivity in Narok North Constituency. The relationship is also significant (p=0.010) at 95% confidence interval. This implies that

increase in risks associated with wheat farming would lead to reduction in production of wheat and vice versa. Therefore application of operation risk management method could be beneficial to farmers to improve their wheat farming crop yield.

4.3 Operation Risk Management Methods in Wheat Farming in Narok North Constituency

This is the second objective of the research that investigates operation risk management methods applied in wheat farming in Narok North Constituency. The study presented farmers with several risks management methods to which they were supposed to indicate the extent to which they applied them in wheat farming. The statements were on a scale of five: never (1) to always (5) and results summarised in Table 4.6.

Table 4.6 Operation risk management methods applied in wheat farming

	N	Mean	Std. Deviation	Extent of application
Hiring of workers during peak months (e.g. harvest time)	164	4.2195	1.32020	
Use of machine planting and harvesting	164	4.2195	1.11899	
Renting of farm implements during planting and harvesting period	164	3.8780	1.21736	**Occasional**
Crop variety selection	164	3.6585	1.22569	
Leasing inputs	164	3.5610	1.47034	
Adopting new technology	164	3.2927	1.50653	
Seeking up to date information on wheat farming, diseases and pest control	164	3.2439	1.53136	
Altering the timing of operations	164	3.1951	1.40498	**Sometimes**
Hiring or buying extra machinery	164	3.1951	1.76148	
Market information research for harvested wheat	164	3.0000	1.62798	
Product diversification	164	2.9512	1.43491	
Postpone planting	164	2.3902	1.10499	**Rarely**

Agricultural loan (e.g. from AFC)	164	1.9512	1.32834	
Sharing production risk with landowner	164	1.5610	1.19403	
Crop insurance	164	1.3415	.78669	**Never**
Valid N (List wise)	**164**	**3.0439**	**1.3356**	**Sometimes**

Result show that the risk management method commonly employed by many farmers on occasional times in Narok North Constituency is hiring of workers during peak months (M=4.21 and SD=1.32) especially during harvesting time. Secondly, the farmers also said that they normally use agricultural machine during the period of planting and harvesting (M=4.21 and SD=1.11), renting of farm implements during planting and harvesting period (M=3.87 and SD=1.21), crop variety selection (M=3.65 and SD=1.22) and leasing of inputs (3.56 and SD=1.47). the findings further showed that farmers from time to time (sometimes) adopted new technology on wheat farming, seek up to date information on wheat farming, diseases and pest control, altering the timing of operations, hiring or buying extra machinery, conducting market information research for harvested wheat and product diversification.

Thirdly, the wheat farmers said that they employed the following risk management methods once in a blue moon (rarely); postponing wheat planting (M=2.39 and SD=1.10), taking agricultural loan (M=1.95 and SD=1.32) and sharing production risks with landowners (M=1.56 and SD=1.19). Lastly, the farmers indicated that they never (M=1.34 and SD=0.78) insure their wheat crop. Use of crop insurance method has not been embraced by majority of farmers in Narok North Constituency. Other operational risk management methods that farmers indicated through open-ended question were; early planting (19.5%), fertiliser application (9.8%), crop rotation (14.6%), shift cultivation (4.9%), growing substitute crop like maize (4.9%), double harrowing (2.4%) and pre-harvesting practices for other crops like maize before wheat

matures (2.4%). To compute the overall utilisation rate of risk management methods, the results are presented in Figure 4.4 below.

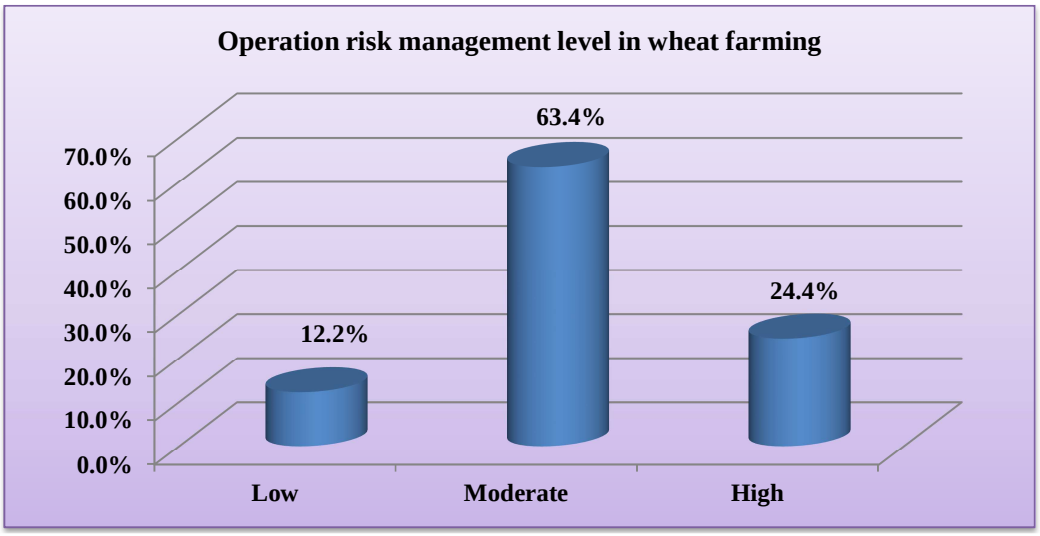


Figure 4.4 Application of operation risk management methods in wheat farming

Results show the adoption and application of operational risk management method in wheat farming by farmers in Narok North Constituency is on average for 63.4% of them. Only 24.4% indicated that adoption rate of risk management method as high while 12.2% said that their operational risk management methods utilisation was low.

4.3.1 Relationship between Operational Risk Management Method and wheat productivity

The study wanted to find out the kind of relationship that existed between farmers application of various operational risks management methods in relation to their wheat production output by conducting a Karl Pearson correlation analysis. The findings are presented in Table 4.7.

Table 4.7 Relationship between operational risk management method utilization and wheat productivity

		Risk management method	Wheat productivity
Risk management method	Pearson Correlation	1	.232**
	Sig. (2-tailed)		.003
	N	164	164
Wheat productivity	Pearson Correlation	.232**	1
	Sig. (2-tailed)	.003	
	N	164	164

**. Correlation is significant at the 0.01 level (2-tailed).

Results shows that there exist a weak positive effect (r=0.232) between risks management methods applied by farmers and wheat production in Narok North Constituency. The correlation is also significant at the 0.01 level (p=0.003). This shows that the relationship appears to be weak due to the fact that few farmers are using operational risk management methods in wheat production but the statistics promise that continuous usage of operational risk management strategies by farmers in the study area would automatically shield their farming from losses and poor production.

4.4 Effectiveness of Operation Risks Management Methods in Wheat farming

The third objective of the research was to find out the effectiveness of operation risk management methods in wheat farming in Narok North Constituency. Through Likert scale question of five: 1-Strongly disagree to 5-Strongly disagree, the farmers were asked to give their level of agreement to which they agreed with 12 statements on the effectiveness of risk management methods on wheat farming production. The results of the analysis are presented in Table 4.8.

Table 4.8Effectiveness of operation risks management methods in wheat farming in Narok North Constituency

Effectiveness	N	Mean	Std. Deviation	Effectiveness level
Awareness of emerging crop disease(s) can apply disease-resisting pesticides and may save crop from devastation	164	4.6098	.58101	
Having good and up-to-date information can greatly reduce the risk associated with agricultural production	164	4.2683	.94055	
Adopting new technologies (investing in new machinery) can also help reduce production risk	164	4.0244	.81362	**Effective**
Adoption of new crop varieties has maximised crop production	164	3.8780	.89155	
By using agricultural implements, delay in planting and harvesting have significantly reduced	164	3.7317	.79952	
Choosing low-risk enterprises has helped reduce overall production risk	164	3.6341	1.00931	
Product diversification has lowered production risk in crop farming	164	3.4390	1.23445	
Utilising crop insurance has protected my farming enterprise against losses while offering opportunity for more consistent gains	164	3.0732	1.33642	**Moderately effective**
Crop insurance has protected price risk in crop production	164	3.0000	1.25322	
Utilising of lease arrangements has minimised production risk in wheat farming	164	2.4634	1.10986	
Leasing of land on seasonal basis improves your flexibility to respond to changing market conditions	164	2.4390	1.25417	**Not effective**
Renting limits short-term borrowing capacity of an operation because of the absence of collateral to back a loan	164	2.2439	1.26841	
Valid N (List wise)	**164**	**3.4004**	**1.04101**	**Moderately effective**

The responses reveal that majority of farmers strongly agreed with the statements that awareness of emerging crop disease(s) can apply disease resisting pesticide and may save wheat crop from devastation (M=4.60 and SD=0.58). The farmers also tended to

agree (M=4.26 and SD=0.94) that having good and up-to-date information can greatly reduce the risk associated with wheat production. They also approved the statement (M=4.02 and SD=0.81) that adoption of new technologies can help reduce production risk in wheat farming. This was also further evidenced when they concurred with the statement (M=3.87 and SD=0.89) that adoption of new crop varieties has maximised crop production. The respondents also agreed (M=3.73 and SD=0.79) with the statement that through adoption of agricultural implements, delay in planning and harvesting are effective methods to minimise risks associated with wheat production. Lastly, the farmers said that it is effective (M=3.63 and SD=1.01) when they chose low-risk enterprises that would help reduce overall production risks.

The farmers also said that product diversification has moderately (M=3.43 and SD=1.23) lowered production risk in wheat farming. They also highlighted that utilisation of crop insurance has moderately (M=3.07 and SD=1.33) protected wheat farming against losses while offering opportunity for more consistent gains and they rated crop insurance as a moderately effective method (M=3 and SD=1.25) in protecting wheat crop against price risk.

However, the farmers termed the following three statements as not effective; utilisation of lease arrangements has minimised production risk in wheat farming (M=2.4 and SD=1.10), leasing of land on seasonal basis improves flexibility to respond to changing market conditions (M=2.43 and SD=1.25) and renting limits short-term borrowing capacity of an operation because of the absence of collateral to back a loan (M=2.24 and SD=1.26). Average statistics reveal that the farmers rated

the operations risk management methods as moderately effective (M=3.4 and SD=1.04) in wheat farming in Narok county. This is tabulated in Table 4.9.

Table 4.9 Effectiveness of operational risk management methods

Operational risk management methods	Frequency	Percent
Not effective	4	2.4
Moderately effective	88	53.7
Highly effective	72	43.9
Total	**164**	**100.0**

At least, 88 (53.7%) cited that operational risk management methods are effective in wheat production, 72 (43.9%) indicated that the methods are highly effective and only 4 (2.4%) indicated that operational management methods are highly effective. This implies that majority of farmers believe that operational risk management methods are effective in improving wheat production in Narok North Constituency. Moreover, a correlation coefficient was conducted to tests the farmers perception on the effectiveness of risk control method and wheat production. The results are presented in Table 4.10.

Table 4.10 Effectiveness of operational risk management and wheat productivity

		Effectiveness of operational risk management	Wheat productivity
Effectiveness of operational risk management	Pearson Correlation	1	.316**
	Sig. (2-tailed)		.000
	N	164	164
Wheat productivity	Pearson Correlation	.316**	1
	Sig. (2-tailed)	.000	
	N	164	164
**. Correlation is significant at the 0.01 level (2-tailed).			

Statistics shows that farmers had positive perceptions (r=0.316) on the effectiveness of operational risk management methods on wheat productivity in Narok North Constituency. Moreover, the correlation is significant at the 0.01 level (p=0.001).

This shows that farmers have faith in the use of operational risk management methods in improving wheat farming.

4.4.1 Farmers' responses on how risks associated with crop farming can be managed

Through open ended question, the wheat farmers were asked to propose several measures through which operational risks associated with wheat production can be managed. Their responses are illustrated in Table 4.1.

Table 4.11 Farmers' responses on how risks associated with crop farming can be managed

Suggestions	Frequency	Percent
Information to farmers through seminars and workshops will increase their capacity to use modern and sustainable wheat farming practices	32	19.5
Relay of timey weather forecast will help farmers to make proper arrangements on planting, weeding and harvesting time	16	9.8
Use of hybrid seeds instead of indigenous ones	8	4.9
Looking for good market for wheat production	4	2.4
Adequate machinery will help farmers plant at the right time	4	2.4
Famers should have timing for high rain and low rainy season	4	2.4
Insuring wheat crop	4	2.4

Farmers recommended that farmers should be provided with extension services inform of farm visits, seminars and workshops to increase their capacity to adopt sustainable and productive wheat farming methods. They also suggested that the weatherman should provide timely and reliable weather forecast information so as to

avert situations where farmers have counted loss as a result of increased dryness especially in the year 2014 when rains came late.

The farmers also stressed the need for the provision and supply of hybrid seeds that are resistant to pest and disease attack. They also suggested that farmers should employ agricultural machinery services instead of relying on manual labour to save time. They also tended to suggest that adequate planning before planting is necessary to avoid rust minute rush where farm input dealers tend to increase the prices but buy in advance. Lastly, the farmers suggested that there is need for awareness on the importance of insuring their crops. They have suffered losses as a result of their crops being attacked by birds, changing weather patterns, market instability and drought and feel that if farmers can be educated on the importance of insuring their wheat crop could be beneficial.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents the summary, conclusions and recommendations of the study findings on the effect of operational risk management methods in improving wheat farming in Narok North Constituency.

5.1 Summary

The purpose of conducting this research was to determine the level at which operation risk management methods are utilised by wheat farmers in Narok North Constituency, Kenya. The study targeted small, medium and large wheat farmers in Narok North Constituency. Data collected primary data from farmers through use of questionnaires that were had close and open ended questions. Data analysis was conducted using descriptive; frequencies, percentages, means and standard deviation and use of inferential statistics; correlation analysis to test the relationship between independent variable on dependent variable. The findings of the study revealed that majority of wheat farmers were male with only 12.2% found to be female wheat farmers.

On the production front, result of the study showed that farmers reported production losses in the past three years with only 4.9% indicating their wheat production has been always been high. The results of the study further showed that farmers in Narok North Constituency encounter various risks associated with wheat farming. These were mostly based on fluctuating commodity prices, drought, market information, cost of production, insects, epidemic diseases, infrastructure challenges, crop failures,

high prices of agricultural inputs, birds, and poor yields among other risks. The results of the study showed that farmers who experienced several risks, their wheat production was always poor while those who tended to manage risks, their wheat production tended to be on average.

Results of the study further revealed that the operational risk management methods used by farmers involved hiring of workers during harvesting time, use of agricultural implements, renting of agricultural implements, crop variety selection, leasing agricultural inputs for a specific period of time, adopting new technological advancements in wheat farming and seeking up to date information on wheat farming, diseases and pest control, market availability and new farming methods. It was established that almost all farmers did not utilise crop insurance method to indemnify their wheat from losses. They neither took agricultural loans from Agricultural Finance Corporation to help them. The correlation statistics computed revealed that there existed a weak positive effect (r=0.232) between operational risk management and wheat farming productivity. Furthermore, it was established that 43.9% of wheat farmers had positive perceptions on the effectiveness operational risk management strategies in wheat farming.

5.2 Conclusion

The study has found out that agricultural risks are commonly experienced by wheat farmers in Narok North Constituency. For the past three years, small, medium and large scale farmers have recorded decline in their wheat production output as a result of non-management of risks associated with; imperfect markets, drought occasioned by unpredictable weather patterns experienced during the beginning and mid of 2014,

lack of market information, increased cost of wheat farming due to rise in input prices, disease and pest attack, poor road infrastructure, crop failures and birds attack. This explains why farmers have incurred losses for the past three years.

Karl Pearson correlation results revealed that there existed a negative effect (r=-0.199) between occurrence of agricultural risks and wheat productivity. Farmers who experienced agricultural risks in their farm, they tended to incur losses in their wheat farming enterprises. This explained why a negative relationship existed between agricultural risks and wheat productivity and the correlation was significant at the 0.05 level (2-tailed). The study also learn that the majority (M=3.04 and SD=1.34) of farmers rarely used operational risks management methods in wheat farming in Narok North Constituency. Farmers tended to prefer to hire workers during peak months (M=4.21 and SD=1.3) and hire agricultural machinery more often (M=4.21 and SD=1.11) as compared to postponing planting, taking agricultural loan and sharing of production risks which they utilised less often.

To the surprise, almost all of the farmers agreed (M=1.34 and SD=0.78) that they insured their wheat farming enterprise against risks. This showed that the majority of farmers do not have information on how they can get access to agricultural insurance which is a new insurance product introduced around the country. This explained why a weak positive effect (r=0.232) was obtained where scores for risks management methods were compared with wheat productivity. However, the statistics reveal that if farmers accept to continuously adopt more and current operation risk management methods, wheat productivity would improve significantly (p=0.003). This underscores

the need for utilisation of operations risk management measures in cushioning wheat farmers against losses.

Moreover, it was evident from the findings of the study that farmers increased awareness on new emerging crop diseases and pests, having up to date information on wheat farming markets, adoption of new agricultural machinery and proper timing would be effective in ensuring profitable and sustainable wheat farming enterprises. However, the farmers said that utilisation of lease arrangements, leasing of land and short-term borrowing are not effective methods of managing agricultural risks in wheat farming in Narok North Constituency. Nevertheless, the farmers had positive perceptions (r=0.316) that utilisation of operational risks management methods are effective in ensuring profitable and sustainable wheat productivity.

5.3 Recommendations

Based on the findings of the study, the study makes the following recommendations;

(i) Wheat farmers need to be provided with information on the importance of insuring their crop against unpredictable weather patterns, unreliable markets and other agricultural losses associated with it.

(ii) There is need for county government to subsidise the cost of hiring agricultural implements (tractors, planters, sprayers and combine harvesters) so as to cushion farmers against paying high cost to private persons who charge exorbitant fees during ploughing, harrowing, planting, spraying and harvesting.

(iii) The county department of agriculture need to provide farmers with skills on new wheat farming varieties, farming methods, new markets, and new crop disease and pest control

5.4 Suggestions for Further Studies

The study suggests further study to be done on;

(i) The reasons why there's low uptake of agricultural crop insurance by wheat farmers.

(ii) The effectiveness of operational risk management methods on maize farming in Narok County.

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APPENDIX 1: QUESTIONNAIRE FOR FARMERS

Instructions

Please do not write your name anywhere on this questionnaire. Please tick [√] where appropriate or fill in the required information on the spaces provided.

Section A: Demographic Data

1. Your gender?

   Male [ ] Female [ ]

2. Education level

   No formal education level [ ] Primary [ ] Secondary [ ]
   College [ ] University [ ]

3. Farm size

   None [ ] Less than 5 acre [ ] 5 -20 acres [ ] 20-50 acres [ ]
   50-100 acres [ ] More than 100 acres

4. Main economic activity _____

5. What is the area under crop farming (in your farm and then one you've leased) _____

6. What is your average season harvest of crop in terms of bags _____

7. How can you rate your crop production level?

   Very high [ ] High [ ] Average [ ] Below average [ ] Poor [ ]

Section B: Wheat Agricultural Risks

8. To what extent do you incur losses as a result of the following indicators given in Table below? Key: 1-Never, 2-Rarely, 3-Sometimes, 4-Occasional and 5- Always.

Risk	← **Occurrence of the risk in crop farming** →				
	Never	**Rarely**	**Sometimes**	**Occasional**	**Always**
a. Hailstorms / storms					
b. Drought					
c. Epidemic Diseases					
d. Flood					
e. Infrastructure					
f. Inputs					
g. Debt					
h. Cost of production					
i. Crop failure					
j. Market information					
k. Poor yields					
l. Insects					
n. Animals					
o. Birds					
p. Fire					
q. Windstorms					
r. Frosts					
s. Commodity prices					

9. What other type of risks do you experience with crop farming? (Explain in detail please)

……
……
……

Section B: Operational Risk Management Methods in crop Farming

10. The following statements seek your opinion on how you manage risk associated with crop farming in your constituency. Tick the extent to which you manage the following risk on the scale provided

Management	← **Operational risk management methods** →				
	Never	**Rarely**	**Sometimes**	**Occasional**	**Always**
a. Products diversification					
b. Insurance of crops					
c. Crop variety selection					
d. Altering the timing of operations					
e. Hiring or buying extra machinery					
f. Postpone planting					
g. Use of machine planting and harvesting					
h. Sharing production risk with landowner (to whom you have leased land from)					
i. Hiring of workers during peak months (e.g. harvest time)					
j. Leasing inputs (including land and machinery)					
k. Renting of farm implements during planting & harvesting period					
l. Seeking up to date information on wheat farming, diseases and pest control					
n. Adopting new technology					
o. Market information research for harvested wheat					
q. Agricultural loan (e.g. from AFC)					

11. As a farmer, apart from risk management mentioned above, which other measures do you apply to ensure profitable and productive crop farming enterprise? (Mention them in detail please)

……
……
…….

Section C: Effectiveness of Risk Management Strategies in Wheat Farming

12. The following statements seek your perception on how operational risk management methods influence your wheat farming practices in your constituency. Indicate your level of agreement on the Likert Scale: Strongly Disagree (SD), Disagree (D), Uncertain - (UN), Agree (A) and Strongly Agree (SA).

Effectiveness of operational risk management in wheat farming	**SD**	**D**	**UN**	**A**	**SA**
a. Adoption of new crop varieties has maximised production					
b. Product diversification has lower production risk in crop farming					
c. Choosing low-risk enterprises has help reduce overall production risk					
d. By using agricultural implements, delay in planting and harvesting have significantly reduced					
e. Utilising of lease arrangements has minimised production risk in wheat farming					
f. Leasing of land on seasonal basis improves your flexibility to respond to changing market conditions					
g. Renting limits short-term borrowing capacity of an operation because of the absence of collateral to back a loan					
h. Having good and up-to-date information can greatly reduce the risk associated with agricultural production					
i. Awareness of emerging crop disease(s) can apply disease-resisting pesticides and may save crop from devastation					
j. Adopting new technologies (investing in new machinery) can also help reduce production risk.					
k. Utilisation of Crop insurance has protected my farming enterprise against losses while offering opportunity for more consistent gains					
m. Crop insurance has protected price risk in crop production					

13. What's your perception on the effectiveness of operational risk management strategy in wheat farming?

……

……

……

14. How can risks associated with crop farming among farmers be managed?

……

……

……

The end

Thank you