THE INFLUENCE OF FARMING PRACTICES ON WHEAT PRODUCTION IN MOIBEN DISTRICT UASIN GISHU COUNTY, KENYA

BY

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A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF A MASTERS OF ARTS DEGREE IN PROJECT PLANNING AND MANAGEMENT OF THE UNIVERSITY OF NAIROBI

2014
DECLARATION

This research project is my original work and has not been submitted in any other learning institution for the purpose of examination. No part of this proposal should be reproduced without prior permission of the author or Nairobi University.

SIGN__________________________ ________________

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This research project has been submitted with our approval as the University Supervisors

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DEDICATION
This research thesis proposal is dedicated to my wife Nduku and my children Derel,
Brian, Jeff and Nitta for their encouragement and support.
ACKNOWLEDGEMENT

I acknowledge the University of Nairobi for according me the chance to undertake this research studies. Secondly, my gratitude to my supervisor Mr. Koring’ura for the tireless support and guidance in writing this research project. To the University of Nairobi Lecturers Dr. Odundo, Mr. Simiyu, Mr. Liguyani, Mr.Ochieng and Mrs. Khatete for their input. I also wish to extent sincere gratitude to my respondents: staff and classmates from the university who spared their time to participate in this work. Finally, I deeply appreciate my wife Nduku, for her encouragement and Jeremiah copy typist for the long hours he dedicated in this work.
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<td>Eastern and Southern Africa</td>
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ABSTRACT

Farmers face many challenges in their farming practices which may arise from climatic conditions, pest and diseases and other environmental factors. The risk management practices include diversification and social mechanisms for coping with risk among large scale wheat farmers in Moiben District Uasin Gishu County. This study was guided by the following objectives; to identify the major types of risks that face large scale wheat farmers; to find out the agricultural practices by large scale wheat farmers on production; to establish the impact of farm equipment’s and machinery on wheat production; to find out the challenges of controlling pests and other wheat diseases. The study adopted a cross sectional quantitative and qualitative research design approach, where the cases under study were described as phenomenon in the real-life context in which they occurred. The study explored the existing principles and practices pertaining to the impact of risk management farming practices on wheat production in the light of the framework provided by Epstein’s model. The study targeted, all the large scale farmers in Moiben District with over 20 acres of land under cultivation of wheat, 74 farmers were identified (Ministry of Agriculture, Uasin Gishu County 2013). 20 farmers were sampled four from each of the five administrative units in Moiben district, for purposes of interview schedules, focus group discussion, and questionnaires this was done purposively; one agricultural officer from each of the five administrative units was also sampled. The study was undertaken between the months of June to July, 2013. It adopted the use of questionnaires, interview guides, focus group discussions as the primary collection tools. The analysis adopted quantitative and qualitative design in order to achieve the objectives of the study. Content analysis was used as the main method of data analysis qualitatively. While, quantitative data was analyzed and interpreted using descriptive statistical techniques. The data in this study consisted mainly of questioners, individual interview transcripts, focus group discussion and observations. The findings of the study established that along with investments and policy options to increase and diversify income sources both within and outside agriculture, policy support is required for building local capacity, establishing institutions that enhance access to information, seeds and services, insurance mechanisms to buffer production risks, and safety nets that help resilience and recovery from climate-induced shocks. The study recommends that Agricultural Finance Corporation (AFC) and other institutions should introduce insurance schemes to caution farmers against risks. The study further recommends that the government through the ministry of agriculture should control the supply of counterfeit seeds.
CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the study

According to Hardaker, Huirne, Anderson; Patrick; and Barry, (2004) farming is a risky occupation in different parameters, which may include and not limited to finances, climatic, or geographic conditions. On a daily basis, farmers are confronted with a never changing landscape of possible price, yield, and other outcomes that affect their financial returns and overall welfare. The consequences of decisions or events are often not known with certainty until long after those decisions or events occur, so outcomes may be better or worse than expected. When aggregate crop output or export demand changes sharply, for example, farm prices can fluctuate substantially and farmers may realize returns that differ greatly from their expectations. For an individual farmer, risk management involves finding the preferred combination of activities with uncertain outcomes and varying levels of expected return.

One might say that risk management involves choosing among alternatives for reducing the effects of risk on a farm, and in so doing, affecting the farm’s welfare position. Some risk management strategies (such as diversification) reduce risk within the farm’s operation, others (such as production contracting) transfer risk outside the farm, and still others (such as maintaining liquid assets) build the farm’s capacity to bear risk. Risk management typically requires the evaluation of tradeoffs between changes in risk; expected returns, entrepreneurial freedom, and other variables (Hardaker1997, pp 128).

Many small-scale farmers in Africa, Asia and Latin America cannot afford irrigation even when it is available and, hence, grow wheat under rain-fed conditions. The crop is, therefore, very vulnerable to climatic variability and change (Banziger and Araus, 2007). Historical trends clearly show that maize yields fluctuate more widely from year-to-year than is the case for rice and wheat. The current probability of failed seasons in maize farming systems varies between 8 and 35% (Hyman et al., 2008). Production fluctuations often give rise to price fluctuations that can adversely affect both poor producers and consumers
Although considered a temperate species, wheat is the most widely grown of any crop with around 220 million ha cultivated annually in environments ranging from very favourable in Western Europe to severely stressed in parts of Asia, Africa, and Australia (Braun et al., 2010). Wheat is one of the most susceptible crops to climate change and is especially sensitive to heat. Poor productivity growth or stagnation in the Green Revolution areas of South Asia and low yields in Africa, coupled with climate change, will make it more difficult to meet the growing demand for wheat (Rosegrant et al., 2009, pp 118).

Wheat is an important staple cereal in Sub-Saharan Africa (SSA). Wheat provides more than 60% of the food calorie intake to communities in Eastern and Southern Africa (ESA). In West and Central Africa, wheat provides about 30% of food calorie intake. However, climate change is expected to negatively impact wheat productivity in developing countries (Nelson et al., 2009). Climate change is also expected to reduce the suitability of wheat production in low-latitude regions, including most of the developing world. The reduction in wheat production on the African continent will occur in a context of increasing demand for this commodity due to rising populations and household incomes. Research in wheat productivity growth has a crucial role to play in enhancing adaptation to climate change at local, national and regional levels on the African continent.

Wheat is the third most important cereal crop in the world after maize and rice. In Kenya, wheat is the second most important cereal crop after maize (GoK, 2005). Wheat products are mainly consumed by the urban population and by the majority of middle and high-income earners in the rural areas and its demand exceed domestic production by more than 50% (Nyangito et al., 2002). Originally, wheat production was predominantly large scale. However, the sub-divisions and redistributions of most of the former wheat farms in the 1970s led to the emergence of small-scale wheat farming.

Thompson et al., (2010) makes a systematic review on the impact of climate change on the production/availability of food for human consumption. The author also identifies various adaptation strategies proposed in the literature relative to climate change and food security and intensification of agricultural production; increased practice of organic agriculture and the development and adoption of improved crops that would be tolerant to the additional stresses brought by climate change. Additional adaptation strategies include the
adoption by farmers of alternative agricultural practices that could enhance food production under climate change; the diversification of livelihood sources for farm households; the increased production and consumption of underutilized crops that would be better providers of food nutrients; and the enhancement of farmers’ awareness of climatic changes to reduce their risk of falling back on traditional methods that are maladaptive to climate change.

Climate change is a threat to agriculture and food security and there is an urgent need to identify priorities for future research. The relationship between climate change, agriculture and food security, however, is a complex one that is also shaped by economic policies and political decisions. Farm size, age, innovativeness and risk aversion determine the choice of risk management strategy by farmers (Pennings, et al., 2008). The identification of the sources of risk is important because it helps to choose the appropriate management strategy. Different farming systems, the ratio of agricultural income to total family income, as well as the size of arable land, differentiates their risk response.

Agricultural sector in Kenya is characterized by the existence of both large scale and smallholder farms. There are currently more than 5 million smallholder farmers who account for about 75% of the total agricultural production in the country (GoK, 2007). Large farms are fewer in number and produce the remaining 25%. The smallholder farms are mainly subsistence, in which food crops are grown together with cash crops. Important food crops include maize, wheat, tubers, beans, sorghum and millet. Cash crops on the other hand include tea, coffee, pyrethrum and fresh flowers (Nyikal and Kosura, 2005). The sector faces challenges that include high cost of inputs (especially the price of fertilizer and seeds), poor livestock husbandry, limited extension services, over-dependence on rain-fed agriculture, lack of markets, and limited application of agricultural technology and innovation (GoK, 2007).

In Moiben District Uasin Gishu County and Kenya wheat and maize farmers are entirely commercial and therefore are driven by the desire to maximize profits. Therefore, there has been decrease in wheat and maize production in the past two years, 2013 is experiencing changes in rainfall distribution which is more likely to result in temporary excessive soil moisture or water logging in maize and wheat production areas and in particular Moiben District Uasin Gishu Country, this is further aggravated by the fact that the
district topography is flat. It’s against this background that this study will seek to establish the risk management strategies on wheat and maize

1.2 Statement of the problem

Farmers face many risks which arise from natural, economic and socio-political environments. Risk sharing institutions like national insurance and credit schemes that help reduce the burden of risk to society are weak in Uasin Gishu County. Private sector insurance products are still in their developing stages and this has prompted farmers to turn to self-risk management strategies that include diversification and social mechanisms for coping with risk. Wheat farmers in Moiben District Uasin Gishu County have in the recent past faced many risks in their farming activities. For example, according to data obtained from the National Cereal and Produce Board NCPB 2012 -2013 report, the County has recorded drought, crop diseases and pests as well as fluctuations in prices of both farm produce and inputs. As a result, there has been variability in income. The risk situation is complicated by the fact that they operate in an environment with weak markets. To exploit the current potential, farmers need to operate at the utmost sure level with minimum risks. By examining the factors that influence such risks and how the farmers can mitigate this risks, this study sought to provide the way forward to “increasing productivity and management of risks” among wheat farmers in Moiben District of Uasin Gishu County.

1.3 Purpose of the Study

This study sought to establish the risk management farming practices on wheat production by farmers in Moiben District Uasin Gishu County

1.4 The Objectives of the Study

The study sought to achieve the following specific objectives;

1. To investigate the types of risks among wheat farmers and how they manage the risks in Moiben District Uasin Gishu County
2. To find out how agricultural practices practiced by wheat farmers influences production in Moiben District Uasin Gishu County
3. To establish how the use of farm equipments and machinery influences wheat production by farmers in Moiben District Uasin Gishu County
4. To find out the challenges of controlling pests risks, and the influence it has on wheat production by large scale farmers in Moiben District Uasin Gishu County

1.5 Research Questions

The main objective of this study was to investigate the impact of risk management strategies on wheat production by large scale farmers in Moiben District Uasin Gishu County.

1. What are the most common types of farming risks that face wheat farmers and how do they manage the risks in Moiben District Uasin Gishu County
2. How does the farming practices used by farmers influence wheat production in Moiben District Uasin Gishu County?
3. How does the use of certified seeds and inputs influence wheat production in Moiben District Uasin Gishu County?
4. How does the use of machinery and equipment influence wheat production in Moiben District Uasin Gishu County?
5. How is the control of pests and other diseases influence wheat production in Moiben District Uasin Gishu County?
6. What are the challenges of controlling pests, and the influence it has on wheat production in Moiben District Uasin Gishu County?

1.6 Significance of the study

The study highlighted these concerns and references especially in climate, pests and agricultural practices. The information provided by the study would be of importance to the farmers in coming up with mutigative measures in management of agricultural risk.

1.7 Limitations of the study

The study was confined to Moiben District of Uasin Gishu County, which was chosen because it is one of the counties where wheat farming is the most important economic
activity. It characterized the risks that farmers face, how it affected their behavior, how they managed them and specifically focused on the role it plays on production.

Biasness of the respondents may lead to inaccurate results. The research study adopted interview schedules which controlled the variable of the study and also allowed the respondents to express their feeling and their opinion the researcher overcame this by concealing the identity of the respondents.

The respondent’s majority of them being old farmers were not willing to freely give information, however, the researcher assured them that the intention of the research is purely for academic purposes and the data provided would not be given to any person who is not party to the research.

1.8 Delimitations of the study

The study focused on the influence of wheat farming practices, risks and pests. The study was carried out in Moiben District, Uasin Gishu County, Kenya. The study findings were limited Moiben District, Uasin Gishu County, Kenya and its results may not be generalized to cover all other wheat farming areas in Kenya since the geographic and climatic conditions are different. The study may not also reflect what goes on in developed countries since the social demographic characteristics may be different. The researcher does not claim perfection as the study was faced with other limitations inherent in the study design adopted

1.9 Assumptions of the study

In this study the following assumptions were made:

Data collected for this study will be given accurate information on wheat production among farmers in Moiben District Uasin Gishu County.

Participants will recognize the importance of identifying and rating concerns and will voluntarily record their responses on the proposed questionnaires.
1.10 Definition of significant terms

**Production risk:** Includes weather, pests, equipment breakdowns, and anything else that directly affects the quantity and quality of production.

**Risk Management Strategies:** Methods and ways used to reduce the eventuality that may lead to low yields in a farm.

**Wheat production:** In this study refers to the farm output of the wheat by farmers who practice wheat farming.

**Risk management farming:** These are counteractive measures undertaken by farmers undertaken in addressing risks in the enterprise.

1.11 Organization of the study

This study is founded on the five chapters where chapter one discussed the following areas: background of the study; problem statement, purpose and objective of the study; research questions; significance; limitation; delimitation and assumption of the study. Chapter two addresses; the related literature studies, the concept of risk management practices; the concept of farming practices and the objectives of the study in related literature, conceptual framework; summary of literature review. Chapter three discusses; the research methodology, research design; target population, sampling procedure and design; data analysis and presentation. Chapter four discusses; data analysis interpretation and discussion of the findings. Chapter five discusses; the summary, discussion, recommendations of the study.
CHAPTER TWO
LITERATURE REVIEW

2.0 Introduction

This chapter discusses relevant literature on the impact of risk management farming practices on wheat production. It provides some insight on what has been said and documented by various authors and experts in the field of the study. It gives a review of issues surrounding the impact of risk management strategies on wheat production.

2.1 The concept farming practices in wheat production

According to Yesuf, (2000) farming risks reduce the willingness of farmers to undertake activities and investments that have high returns but with some chances of loss. The impact of risk is more severe on the poor than for the better-off farm households and this implies that it increases inequality. Risk results in unwillingness or slowness in the adoption of innovations inputs like improved seeds and chemical fertilizer are used in less than optimal quantities. The use of less than optimal levels of improved inputs is partly due to risk aversion (Yesuf, 2000, pp66)

Yesuf, (2000) writes about risks that vary across types of producers, other factors are also important in determining the risk inherent in a producer’s situation. Yield risk, for example, varies regionally, and depends on soil type, climate, the use of irrigation, and other variables. Farmers have many options in managing agricultural risks. They can adjust the enterprise mix (diversify) or the financial structure of the farm (the mix of debt and equity capital). In addition, farmers have access to many tools such as insurance and hedging that can help reduce their farm-level risks. Off-farm earnings are a major source of income for many farmers that can help stabilize farm household income. Indeed, most producers combine the use of many different strategies and tools.

Agriculture in general is interdependent on various factors which influence the performance and production of agricultural output. These factors in turn influence one another to further affect production. These factors include human factors, biotic factors,
climatic factors and edaphic factors. Farmers have a long record of adapting to the impacts of climate variability but predicted climate change represents an enormous challenge that will test farmers’ ability to adapt and improve their livelihoods (Takahashi K, 2007, pp218).

However, the economic performance of the agricultural sector is usually uncertain due to its biological nature in addition to relying mainly on rain fed agriculture and livestock rearing under natural conditions. This type of production is inherently risky because of variability of rainfall, animal mortality due to livestock diseases and fluctuations in output prices. The environment in most of low income countries is characterized by crop diseases, flooding, illness of household members and crime (Capitanio, 2008, pp90).

Ellis, (1988) identified four types of risks: natural hazards (weather, pests and diseases), market fluctuations (of output prices), social uncertainty (due to differences over control of resources) and state actions and wars. Hardaker et al., (2004), explains the three major types of risk in farming can be identified; yield, price and transaction risks and reports that the types of risks farmers face depend on the type of farming system, climate and policy and the institutional environment. Most economic analyses downplay the distinction between risk and uncertainty on the assumption that these are subjective issues based on the decision makers’ personal viewpoint about the occurrence of events.

2.2 The concept of production risk

Yield variability occurs because agriculture is subject to many uncontrollable events that are related to weather such as insufficient rainfall, diseases and pests. These are risks that arise because of natural causes (Bayene, 2008). Production for a specific crop depends on biophysical factors (erratic rain, type of soil and its quality, diseases and pests) and input prices, resource endowment and household specific consumption requirements. Yield risk can be measured using the coefficient of variation, which is a measure of randomness relative to the mean yield value. Yield variability has an effect on the goal of meeting rising aggregate demand and on price and market stability. It leads to unstable farmer income, unstable household food production, variable supplies and prices to consumers, (Hardaker et al., 2004, pp108).
**Price Risk**

This is the risk associated with changes in the prices of output or inputs which may occur when the farmer has made a commitment to produce. Farmers are exposed to unpredictable competitive markets for inputs and outputs. It includes risks that result from unpredictable exchange rates (Hardaker et al., 2004). Price and yield risks are not independent, they are related. High transportation and marketing costs in developing countries isolate local rural markets from national and international markets. Since yield fluctuations are correlated within a small area, local prices determined by local production and demand are volatile, and for an individual farmer are negatively correlated to their production. The farmers therefore face yield and price risks that are correlated depending on the level of regional market integration (de Janvry and Sadoulet, 1995).

Price risks depend on the consumers’ ability to substitute products and on the extent of market integration. Market integration is dependent on infrastructure and the types of markets available. Developing countries have poor infrastructure and thin markets (low productivity and so low marketed surplus). Price variability leads to income problems for farmers while inter-annual price variability makes planning difficult by introducing uncertainty (Hazzel, 1998 and Ellis, 1998). Price uncertainty generally leads to inefficient resource allocation (Gabre-Mahdin et al., 2003, pp 145).

### 2.2.1 The Impact of Climatic condition in wheat productions

Farmers have a long record of adapting to the impacts of climate variability but predicted climate change represents an enormous challenge that will test farmers’ ability to adapt and improve their livelihoods (Adger et al., 2007). Climate change is a threat to agriculture and food security and there is an urgent need to identify priorities for future research. The relationship between climate change, agriculture and food security, however, is a complex one that is also shaped by economic policies and political decisions. Appropriate climate change research, therefore, involves researchers from a broad spectrum of disciplines along with other stakeholders. Wheat is the most important cereal crop in the world and there is increasing concern about the impact of predicted climate change on the production and productivity of these key cereal crops.
Climate change is likely to lead to increased water scarcity in the coming decades (Lobell et al., 2008; Hendrix and Glaser, 2007). Changes in precipitation patterns will lead to more short-term crop failures and long-term production declines. Water scarcity, due to a reduction in rainfall, is projected to become a more important determinant of food scarcity than land scarcity and the resulting decline in global per capita food production will threaten future food security (Brown and Funk, 2008; Gleditsch et al., 2006, pp 98).

In some regions, changes in rainfall distribution will result in temporary excessive soil moisture or water logging in maize production areas. Currently water logging regularly affects over 18% of the total maize production area in South and Southeast Asia. Climate change is also likely to lead to an increase in temperature. Climate models show a high probability (>90%) that by the end of this century, growing season temperatures will exceed the most extreme seasonal temperatures recorded in the past century (Battisti and Naylor, 2009).

In Sub-Saharan Africa, maximum temperatures are predicted to increase by an average of 2.6°C across maize mega-environments (Cairns et al., 2012). While an increase in temperature of a few degrees is likely to increase crop yields in temperate areas, in many tropical areas even minimal increases in temperature may be detrimental to food production. High temperatures result in a reduction in crop yields by affecting an array of physiological, biochemical and molecular processes. Sensitivity to supra-optimum temperatures and mechanisms of tolerance depend on the severity, duration and timing of heat stress together with the developmental stage of the plant. The most significant factors associated with yield reduction under heat stress are increased sterility, shortened life cycle, reduced light interception and the perturbation of carbon assimilation processes (photosynthesis, transpiration, and respiration) (Reynolds et al., 2010, pp 112).

The effect of wheat is vital for global food security and poverty reduction. Together with rice, maize and wheat jointly provide at least 30% of the food calories to more than 4.5 billion people in 100 developing countries. In Africa, maize is the most widely grown staple crop, and it is rapidly expanding in Asia. The current cultivated area in over 125 developing countries exceeds 100 million ha. About 67% of the total maize production comes from low and lower middle income countries, indicating the vital role the crop plays in the livelihoods
of millions of poor farmers. Owing to the growing demand for feed and bio-energy, the demand for maize in the developing world is expected to double by 2050 and that for wheat to increase from 621 million tons during 2004 to 2006 to more than 900 million tons in 2050 (Rosegrant et al., 2007). Combination of stresses such as heat and drought stress on crop yields will be greater than the effect of each stress individually.

Increasing temperatures and a higher frequency of droughts and flooding will also affect ecosystem resilience, increasing outbreaks of pests and diseases (Young and Lipton, 2006). Temperature influences insect development, survival and distribution. As temperatures increase, insect populations are likely to increase and diversify. Climate changes will also influence the development of maize and wheat diseases, with increasing temperatures and incidents of drought exacerbating plant stress and increasing plant susceptibility (Garrett et al., 2011; Savary et al., 2011). Climate represents the key agro-ecosystem driving force of fungal colonization and mycotoxins production (Paterson and Lima, 2010). If the temperature increases n cool or temperate climates, the relevant regions may become more susceptible to aflatoxins. Wheat is particularly vulnerable particularly to climate change as exemplified by outbreaks of lethal aflatoxicoses in Kenya (Lewis et al., 2005, pp103).

2.2.2 Agricultural practices practiced

The aim of the farmer is to increase income and to reduce its variability. Although many policy interventions are aimed at reducing price variability, de Janvry and Sadoulet, (1995) report that the major concern of farmers is income variability and that stabilizing prices does not necessarily lead to income stability. Previous research shows that adding assets with higher levels of risk and higher expected rates of return can reduce risk because of the low correlation between farm and off-farm returns. Davis and Patrick (1999) found that education, net worth, age; livestock production and off-farm involvement influenced the level of off-farm investment by large scale farmers. They found that leverage had a negative effect while net worth, scale of the farming operation and off-farm involvement had a positive influence.
Mishra and Morehart, (2001) found that large farms were more likely to have off-farm investments than the smaller farms. Increased on-farm diversification and higher level of debt reduced the level of off-farm investment. Brown et al., (2006) found that financial liquidity through access to credit and receipt of remittances was significant in livelihood choice and household welfare of farmers in Kenya’s western and central highlands. A study in Ethiopia on determinants of off-farm participation by Bayene, (2008) found that human capital in the form of health and training on non-farm activities as well as availability of credit and transfer income were significant.

However, the economic performance of the agricultural sector is usually uncertain due to its biological nature in addition to relying mainly on rain fed agriculture and livestock rearing under natural conditions. This type of production is inherently risky because of variability of rainfall, animal mortality due to livestock diseases and fluctuations in output prices. The environment in most of low income countries is characterized by crop diseases, flooding, illness of household members and crime. All these create uncertainty (Capitanio, 2008, pp 102).

As a result of a combination of many factors, many people in low income countries including Kenya live in poverty and food insecurity. They face many risks and uncertainties which arise from natural, economic and socio-political environments. These risks and uncertainties easily trigger food shortages, deterioration in nutritional status and destitution (Pinstrup-Anderson et al., 2001, pp165).

A number of studies show that farmers are risk averse. They manage risk by preferring enterprises that provide satisfactory levels of security even if at the expense of higher income. They diversify into a number of activities to spread risk. They also prefer to use established techniques of production, and to be self-sufficient in food requirement through increased food production (Nyikal and Kosura, 2005). Risk plays an important role in farmer decision making and therefore affects agricultural productivity and thus growth and development. Lack of institutional innovations like crop insurance and affordable credit in developing countries to shift part of the risks from the private to the public sector makes risk management an important part of smallholder production decisions (Besley, 1995). Private
sector provided insurance products have not developed due to problems of moral hazard and adverse selection (Hazzel, 1998, pp103).

Wheat yields decline at supra-optimal temperatures (Wardlaw et al., 1989; Reynolds et al., 1994) and significant breeding effort will be required to maintain productivity in regions closer to the equator. Nonetheless, wheat is relatively well adapted to water deficits and is grown widely in semi-arid regions such as Central Asia, Australia, and throughout the Mediterranean region. In regions that become progressively more arid, wheat may become more competitive than crops, such as maize, that are currently grown. Wheat breeding has had considerable impact in marginal environments as well as temperate ones. For example, analysis of CIMMYT international nursery data shows clear and steady progress in the performance of both bread and durum wheat under drought (Trethewan et al., 2002; Braun et al., 2010). Analysis up to the present shows genetic gains of 0.5 to 1.0% per annum depending on the region (Lopes et al., 2012; Manes et al., 2012; Sharma et al. 2012). Recent effort has focused on breeding for earlier maturing cultivars that escape terminal heat stress and encompass resistance to diseases associated with warm humid environments (Joshi et al., 2007, pp124).

One of the most effective research strategies for wheat has been, and will continue to be, to change the phonological pattern of the crop so that critical growth stages do not coincide with stressful conditions or simply to finish the life cycle early before severe stress conditions occur. Another is to minimize the occurrence of stress through development of a good root system that, in the case of drought, permits water to be accessed deeper in the soil and, in the case of heat, permits transpiration rates that better match evaporative demand, thereby permitting maximal carbon fixation with the added benefit of cooler plants (Reynolds et al., 2010, pp65).

Given the time lag between technology development, deployment and on-farm adoption of new varieties, current research also needs to focus on institutional innovations and policy options that facilitate farmers’ access to existing and new farming technology. Agro-climatic research is also needed to understand and map the climate hotspots, vulnerability of livelihoods, current adaptation options and the institutional and policy
mechanisms that promote adoption of new technologies and enhance local adaptive capacity to climate change.

2.2.3 Impact of farm equipment and machinery

The arguments for increased investment in agricultural research are more convincing if there is evidence that it has a beneficial economic impact. La Rovere et al. (2010) evaluated the potential impacts by year 2016 of investing in drought tolerant wheat in 13 countries of East, Southern and West Africa. The study explored where the greatest economic and poverty reduction returns can be achieved. Yield variance reduction has been a priority for crop improvement programs (Gollin, 2006) and La Rovere et al. (2010) focused on the impact of drought tolerant wheat on variance of maize yields. The approach is relevant for climate change scenarios as it considers not only the conventional mean yield gains, but also the additional benefits from yield stability gains, or equivalently the climate or rainfall risk reduction.

Because farmers vary in their attitudes toward risk and their ability to address risky situations, risk management cannot be viewed within a “one size fits all” approach. That is, it is not wise to say that “All Midwestern corn farmers should hedge 50 percent of their crop in futures, “or that “No farmer should plan to obtain more than two-thirds of his or her income from a single commodity.” Different farmers confront different situations and structural characteristics, and as explained in this report, their preferences toward risk and their risk-return tradeoffs have a major effect on decision making in each given situation. A large, industrialized operation, for example, may hire marketing expertise to directly use hedging and options, while a small family farm may prefer to forward contract with other parties better able to hedge directly, (Hardaker et al., 2004, pp111).

Understanding risk in farming is important for two reasons. First, most producers are averse to risk when faced with risky outcomes. Someone who is risk averse is willing to accept a lower average return for lower uncertainty, with the tradeoff depending on the person’s level of risk aversion. This means that strategies cannot be evaluated solely in terms of aver-age or expected return, but that risk must also be considered. Second, identifying sources of uncertainty helps farmers and others address the most important strategies for
mitigating risk and aids in circumventing extreme outcomes, such as bankruptcy,(Hardaker et al., 2004, pp112).

Large-scale wheat production in Kenya involves the use of medium to large tractors (75-125 horsepower range) and compatible cultivation, planting, and spraying equipment, and combine harvesters (Hardaker et al., 2004). Typically, one or two plowings by one-way disc plows are followed by one or two disc harrowing before wheat is planted with a seed drill. If road leaf or brassy weeds are dense enough to require spraying, a wide, tractor-pulled boom spray is used. Wheat is usually harvested by self-propelled combine harvester and increasingly bulked and transported directly to depots set up to handle bulk wheat. Where transport considerations dictate or bulk grain facilities are distant, wheat is bagged and trucked to depots that receive bagged grain. A numbers of farmers take the wheat straw that is left in windows by the combine harvester and bale it, sell it, or use it for animal feed or bedding. After the bales and bags are removed, livestock often graze the wheat stubble for up to three months before plowing commences for the next year's crop.

2.2.4 Impact of pests, and other insects

The best way to control stem rust is to use resistance varieties, which is universally accepted. But its practical implementation remains a scientific challenge, because the fungus that causes wheat stem rust disease is difficult to control due to its nature of constantly evolving and mutating into new races. It is also important to note that the level of resistance expressed by varieties to stem rust can be significantly different to the one expressed to leaf diseases. Alternative control measures might prove economically feasible if areas of potential loss were identified in time to reduce damage by application of effective fungicides. Fungicides have become an integral part of disease-management programmes on cereal crops in many countries of the world. Most of the fungicides currently used for stripe rust and other wheat leaf disease control are not registered for the control of stem rust in Kenya. Therefore the choice of an appropriate chemical is difficult (Viljanen-Rollinson et al., 2006, pp247).

The use of appropriate fungicide is an effective but least employed method of rust management. Foliar fungicides can achieve economic control as long as they are applied at
an early disease onset (Loughman et al., 2005). Early intervention reduces damage to the leaves, stem and transport system ensuring translocation of nutrients, and therefore proper filling of grains. Chemical control is more effective when rust diseases are identified on susceptible varieties early in the growing season. Their effectiveness depends on varietal susceptibility, level of infection and stage of crop growth at application. In fields planted with moderately resistant (slow rusting) or resistant varieties, a fungicide application may not be necessary even if some disease occurs. However, fields planted with moderately susceptible or susceptible varieties should be scouted regularly, and any sign of disease may warrant a fungicide application. Although it is not advisable to plant very susceptible varieties, if sown two or more applications may be necessary to achieve a moderate level of control. Yield and quality studies with fungicides on grains have documented other benefits including bigger grain size and better milling quality (Bartlett et al., 2002, pp 101).

Carisse et al. (2009) recommends the use of action thresholds for rapid and accurate classification of the incidence of apple scab on leaves, and aid in scab management decision making. It has also been suggested that, stem rust infection thresholds be established to correctly determine the level of resistance in varieties in order to reduce the amount of fungicide treatments. But to gather sufficient data for this purpose, a massive national variety resistance evaluation process, and monitoring of the pathogen virulence is needed.

Paveley et al. (2003) demonstrated that it is possible to predict fungicide efficacy of a two spray programmes from the performance of their component single spray. In a related study, Kromann et al. (2009) concluded that timing fungicide sprays based on rainfall thresholds could be used to control attacks on pests. However, in the case of wheat stem rust in Eastern Africa where there is continuous cropping throughout the season it is difficult to predict an epidemic. The threshold system is used as a guide for whether or not there is adequate disease pressure to justify fungicide application. Fungicides are beneficial only if rust is present at high levels and occurs early in the season to cause yield loss. Timing of application is critical in managing stem rust, whose activity needs to be closely monitored. Unlike stripe and leaf rust, foliar fungicide applications targeting stem rust must be applied as soon as the disease is detected.
In Kenya, farmers who afford fungicides for stem rust control commonly use calendar-based fungicide spray schedules. Under heavy stem rust epidemics some farmers in wheat growing areas have been reported to apply as many as 5 times per crop cycle and sometimes they alternate contact and systemic compounds. In other crops, studies indicate that fungicide spray regimes should be tailored to host resistance than depending on blanket recommendation. But for stem rust where wheat resistance has broken down, (fungicide www.intechopen.com) Fungicides application should begin when the first rust pustule appears. This is repeated every 7 to 10 days for contact or 14 to 21 days for systemic fungicides depending on rain and temperatures.

Farmers will not be able to benefit from existing and future technology options if they are unable to access the improved seed and other technological innovations. There will be a need, hence, to address multiple market and government failures in the delivery of technologies, inputs and services (Cooper et al., 2008). This requires new institutional arrangements and policy instruments to enhance local capacity and stimulate the adoption of improved technologies for adaptation, managing risks and protection of vulnerable livelihoods.

Public- and private-supported extension programs can play a key role in information sharing by transferring technology, facilitating interaction, building capacity among farmers, and encouraging farmers to form their own networks. Extension services that specifically address climate-change adaptation include disseminating local cultivars of drought-resistant crop varieties; teaching improved management systems; and gathering information to facilitate national research work. The breeding and agronomic research work needs to be supported by other factors including complementary investments in climate-responsive information and input delivery systems; and strengthening of institutions to coordinate grain marketing with seed, fertilizer and credit delivery. The development of reliable seasonal weather forecast, record of reliable weather, and strengthening of early warning system are also crucial for facilitation of adaption to climate change.

Climate change is likely to lead to unpredictable extreme events and erratic rainfall and along with declining groundwater tables and scarcity of water for irrigation; this will cause volatility of supply and amplify cost of production and risks associated with wheat
farming. The welfare loss resulting from weather shocks, risk aversion and lack of appropriate ex-ante and ex-post risk management strategies can be significant even under current climates (Dercon, 2008). The ex-post impacts of climatic shocks include the direct production loss due to the shock and the subsequent disinvestment of assets that follows such shocks.

2.3 Theoretical framework

The theoretical framework for the study is based on literature on the farm household model and the investment theory. The farm household seeks to maximize utility subject to its limited resources and with a trade-off in its goal of minimizing risk. It does this by treating off-farm investment just like any other on-farm investment; it will only invest if the present value of the benefits of the investment exceeds the present value of the associated costs of the investment (Mishra and Morehart, 2001). Given that the farmer is usually capital constrained, the farmer will choose the investment with the highest net present value (NPV). The NPV of the off-farm investment is given by;

\[ NPV = \int_{t=0}^{T} e^{-rt} (R_t - C_t) dt, \]

Where \( T \) is time, \( r \) the discount rate, \( R_t \) the expected net returns of the investment and \( C_t \) represents the expected costs of the investment. Economic research into risk attitudes is based on a set of axioms proposed by Von Neumann and Morgenstern (1947) and later developed by others. The axioms are used to demonstrate that an Individual's risk attitude can be inferred if the preference ordering and distributional properties of the risky prospect are known.

2.4 Conceptual framework

The problem is conceptualized in Figure 1. Biophysical factors, characteristics that hinder wheat production. These factors introduce different types of risks to the farming activity; these are climatic limitations in terms of rainfall amounts and dry spell, agricultural practices practiced, impact of farm equipments and machinery and impact of pests, and other insects. These risks interact with large scale farmers in Moiben County to determine the type of risk management strategy. Some farmers opt for off-farm investments. The decision
affects the outcome, which is stability of income and consequently the level wheat production. As illustrated in the figure below

![Conceptual framework](image)

**Figure 1 Conceptual framework**

### 2.5 Knowledge gap

Generally, business risk can be measured by two methods; the standard deviation or the coefficient of variation (Alimi and Ayanwale, 2005). The coefficient of variation does not account for substantial skewness but other methods that include value at risk (VaR), tail value at risk, excess tail value at risk, expected policyholder deficit, and default value do (Powers and Powers, 2009). When enterprises have the same standard deviation but different mean, the standard deviation cannot help decide which enterprise should be chosen. The coefficient of variation becomes a better measure because it normalizes the standard deviation by dividing it by the corresponding mean (Penson and Lin, 1980).

Although water may be primarily limiting for agricultural production and crop growth (e.g., Voortman et al., 2003), the instant soil water is available nutrient deficiency will be the limiting factor. Obviously, the two states will alternate during the crop season and in the end
determine final yields (Gregory et al., 1997). To further complicate matters different nutrients can alternate to limit growth in different stages in a situation where soil water is readily available (e.g., Penning de Vries, 1984)

2.6 Summary of literature review

Risk has a negative effect on welfare. Under the situation of isolated markets, there is a negative correlation between the individual’s own production and the market price. The expected profit will be lower under uncertainty than under certainty. This is because a good year for an individual producer corresponds with a good year for most other producers thus resulting in a fall in the local market price. Since the producer receives a low price whenever output is high, and a higher price when output is low, for average production the farmer receives a price lower than the average price. This implies that risk affects even the welfare of risk-neutral farmers (de Janvry and Sadoulet, 1995, pp118).

Farmers can raise their agricultural output, earnings and productivity by: increasing land under cultivation, applying more purchased inputs, hiring more labor and equipment, switching from subsistence to higher value cash crops, or by selling a greater proportion of crop yield. These methods, however, expose them to more risks since output or market prices may fall below expected levels. The farm household decision in such a situation will depend on its assessment of the risks involved and its capacity to withstand the losses should the outcome turn out bad (Evans and Ngau, 1991, pp88)

However, other studies have registered low formal insurance cover in agriculture as reported by (Skees and Barnett, 2006), who attributed this to poor contract enforcement, asymmetric information, high transaction costs, and high exposure to spatially covariate risks. It is becoming evident that with increase in population and rampant crop failures, food shortage is now common even among food crop producers that were expected to be self-sufficient in food production. Therefore the farmers need trainings that will caution them from the risks that are quite often due to lack of mutigative strategies.
CHAPTER THREE;

RESEARCH METHODOLOGY

3.1 Introduction

This chapter provides a detailed description of the preferred research design. It describes research methodologies. This covers the research design, target population, data collection, and data analysis and presentation.

3.2 Research Design

The study adopted a cross sectional qualitative research design approach, where the cases under study were described as phenomenon in the real-life context in which they occurred. McMillan and Schumacher (2006) describe a research design as the procedure for conducting a study, “including when, from whom and under what conditions the data will be obtained.” In a research design, a modus operandi must be followed that gives the researcher the confidence that the results obtained are due to the factors that were studied and not to extraneous or irrelevant factors. The study explored the existing principles and practices pertaining to the impact of risk management farming practices on wheat production in Moiben District, Uasin Gishu County in the light of the framework provided by Epstein’s model. For the purpose of this study, the qualitative methodology was the most suitable to be used in an exploratory field. This allowed the researcher to become intimately acquainted with the life world of the participants and thus to understand the risks and farming practices from different perspectives (Bridgemohan, 2002). Accordingly, face-to-face interviews, focus group discussions and observations were employed to gather the data (DSJ Research, 2005).

Interactive field research was conducted in this study, which involved face-to-face interactions between the researcher and the selected participants to explore their experiences concerning the farming practices and the risk management practices their social beliefs, perceptions, thoughts and actions, after which these were described and analyzed (McMillan & Schumacher, 2006). The data were collected in the form of words or narratives derived from the transcripts of focus groups and individual interviews.
As mentioned before, this study was qualitative and had an emergent and flexible design that continued to evolve throughout the research process (with each new research decision dependent on prior information). Moreover, it did not involve pre-planned, sequential, fixed steps, which could be followed (DSJ Research, 2005). Instead, a topic guide (discussion guide) was used to explore various issues in-depth and the discussion between the researcher and the participants was informed largely by the respondent’s own thoughts and feelings.

3.3 Study Area

The study was conducted in Moiben District Uasin Gishu County, Rift Valley province in Kenya and the District shares common borders with Trans Nzoia to the North, Keiyo Marakwet County to the East. The District is divided into five administrative divisions namely; Merewet, Torocho moi, Moiben, Toloita and Kabusbere. The County covers a total area of 3,327.8Km2. It is a highland plateau with an altitude that fall gently from 1,500m above sea level. Moiben receives relatively lower amounts of rainfall. The dry spells begin in November and end in February. Temperatures range between 8.4oC and 26.1oC. An estimated 90 percent of the land area in the District is arable out of which about 2,000 km2 is classified as high potential and about 1,000 km2 is medium potential. The District is basically agricultural, producing about one third of the total wheat produced in Kenya (DAO, 2013).

3.4 Target Population

According to Kothari (2004), a population can be defined as including all people or items with the characteristic one wish to understand, because there is very rarely enough time or money to gather information from everyone or everything in a population, the goal becomes finding a representative sample (or subset) of that population. In this study large scale wheat farmers were targeted. The study targeted, all the large scale farmers in Moiben District with over 20 acres of land being categorized among large scale farmers, (Ministry of Agriculture, Uasin Gishu County 2013), there are approximately 74 large scale farmers in Moiben District. The respondents included all the large scale farmers as shown in Table1 below.
Table 3.1: Target Population

<table>
<thead>
<tr>
<th>Administrative units in Moiben</th>
<th>Large scale farmers</th>
<th>Target Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merewet</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Torochmoi</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Moiben</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Toloita</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Kapsubere</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>74</td>
<td>74</td>
</tr>
</tbody>
</table>

(Source: County Agricultural officer, 2013)

3.5 Sampling

3.5.1 Selection of wheat farmers

The selection of the farmers was done in stages. During the first stage, the researcher selected a purposive sample from four farmers out of the five administrative zones in Moiben District. Accordingly, the study selected a representative sample of one agricultural officer from each of the five selected zones.

3.5.2 Sampling Procedure

The selection of the study sample was purposive sampling which included all the large scale farmers in Moiben District. Stratified random sampling was used to categorize farmers in stratum depending on the size of their farms in hectares.

3.5.3 Sampling size

Purposive is used where the study population is well identifiable. This ensured that there was no bias in sampling given that the universal population of the farmers in Moiben District. The sample was categorized in stratum to enable the researcher to identify with different level of large scale farmers and their risks and production of wheat it also gave them equal opportunity of representation. According to Kerlinger, (2003), the higher the sample size the more accurate the information gathered from the respondents. The distribution of the sample size is illustrated in Table 3.2 below.
Table 3.2: Sample Population

<table>
<thead>
<tr>
<th>Administrative units in Moiben</th>
<th>Target Population</th>
<th>Procedure</th>
<th>Sample Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merewet</td>
<td>15</td>
<td>Purposive</td>
<td>4</td>
</tr>
<tr>
<td>Torochmoi</td>
<td>12</td>
<td>Purposive</td>
<td>4</td>
</tr>
<tr>
<td>Moiben</td>
<td>16</td>
<td>Purposive</td>
<td>4</td>
</tr>
<tr>
<td>Toloita</td>
<td>20</td>
<td>Purposive</td>
<td>4</td>
</tr>
<tr>
<td>Kapsubere</td>
<td>11</td>
<td>Purposive</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>74</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

(Source Author 2013)

3.6 Research Instruments

As mentioned before, this study was both quantitative and qualitative and had an emergent and flexible design that continued to evolve throughout the research process (with each new research decision dependent on prior information). Moreover, it did not involve pre-planned, sequential, fixed steps, which could be followed (DSJ Research, 2005). Instead, a topic guide (discussion guide) was used to explore various issues in-depth and the discussion between the researcher and the participants was informed largely by the respondent’s own thoughts and feelings:– Interview guide for farmers; Focus group discussion for farmers; Interview guide for divisional agricultural officers. The various instruments used, enabled the researcher to either confirm information or to seek further clarification. Direct field observations were also undertaken to aid further analysis of the data.

3.7 Questionnaire

This is a collection of items to which a respondent was expected to react in writing. This method collects a lot of information over a short period of time. In this study, structured and semi-structured questionnaires were used to collect valuable information from the farmers. This allowed the respondents to give their opinions where necessary. The advantage of the questionnaire is that it generates a considerable amount of data and enables the researcher to obtain a wider coverage of description data at a comparatively low cost in terms of time, money and effort. Since it is a standard research instrument it allows for uniformity
in the manner in which questions are asked and makes it possible to be compared across respondents (Cohen & Manion, 2003). Four farmers were selected for questions irrespective of their gender and age from each of the five administrative units as shown in the Table below;

**Table 3.3: Questionnaire for farmers population**

<table>
<thead>
<tr>
<th>Administrative units in Moiben</th>
<th>Target Population</th>
<th>Procedure</th>
<th>Sample Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merewet</td>
<td>15</td>
<td>Purposive</td>
<td>4</td>
</tr>
<tr>
<td>Torochmoi</td>
<td>12</td>
<td>Purposive</td>
<td>4</td>
</tr>
<tr>
<td>Moiben</td>
<td>16</td>
<td>Purposive</td>
<td>4</td>
</tr>
<tr>
<td>Toloita</td>
<td>20</td>
<td>Purposive</td>
<td>4</td>
</tr>
<tr>
<td>Kapsubere</td>
<td>11</td>
<td>Purposive</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>74</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

3.7.1 Interview guide for farmers

Accordingly, face-to-face interviews focus group discussions and observations were employed to gather the data (DSJ Research, 2005). This design makes use of an interpretive perspective (Stake, 2000) interactive field research in this study, between the researcher and the selected participants sought to explore their experiences concerning the impact of risk management farming practices on wheat production in terms of their individual and social beliefs, perceptions, thoughts, benefits and actions, after which they were described and analyzed (McMillan & Schumacher, 2006). Four farmers were selected purposively for interview purposes irrespective of their gender and age from each of the five administrative units as shown in the Table below;
Table 3.4: Interview guide for farmers population

<table>
<thead>
<tr>
<th>Administrative units in Moiben</th>
<th>Target Population</th>
<th>Procedure</th>
<th>Sample Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merewet</td>
<td>15</td>
<td>Purposive</td>
<td>4</td>
</tr>
<tr>
<td>Torochmoi</td>
<td>12</td>
<td>Purposive</td>
<td>4</td>
</tr>
<tr>
<td>Moiben</td>
<td>16</td>
<td>Purposive</td>
<td>4</td>
</tr>
<tr>
<td>Toloita</td>
<td>20</td>
<td>Purposive</td>
<td>4</td>
</tr>
<tr>
<td>Kapsubere</td>
<td>11</td>
<td>Purposive</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>74</strong></td>
<td></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

3.7.2 Selection of participants for the focus group interviews

A focus group discussion is a purposive debate developed to explore people’s beliefs, attitudes and opinions. Focus groups that can range from six to twelve members can vary in according to the number of participants involved (Creswell, 2008). In order to maximize the trustworthiness of the study, the focus groups consisted of homogeneous members of the target population (Creswell, 2008). Indicate that the focus groups can consist of participants “who are similar in terms of social class, age, level of knowledge, cultural/ethnic characteristics and sex. This created an environment where participants were comfortable with each other and feel free to express their opinions”. Four famers were considered for a focus group discussion from each of the administrative units as shown in the Table below;
Table 3.5 Focus group participants

<table>
<thead>
<tr>
<th>Administrative units in Moiben</th>
<th>Target Population</th>
<th>Focus groups farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merewet</td>
<td>15</td>
<td>4 farmers</td>
</tr>
<tr>
<td>Torochmoi</td>
<td>12</td>
<td>4 farmers</td>
</tr>
<tr>
<td>Moiben</td>
<td>16</td>
<td>4 farmers</td>
</tr>
<tr>
<td>Toloita</td>
<td>20</td>
<td>4 farmers</td>
</tr>
<tr>
<td>Kapsubere</td>
<td>11</td>
<td>4 farmers</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>74</strong></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

3.7.3 Interview guide for divisional agricultural officers

Accordingly, face-to-face interviews, and observations was employed to gather the data (DSJ Research, 2005). This design makes use of an interpretive perspective (Stake, 2000) interactive field research in this study, between the researcher and the selected participants sought to explore their experiences concerning the impact of risk management farming practices in terms of their individual and social beliefs, perceptions, thoughts, benefits and actions, after which they were described and analyzed (McMillan & Schumacher, 2006). One divisional agricultural officer was considered for an interview guide from each of the administrative units as shown in the Table below;

Table 3.6: Interview guide divisional agricultural officers

<table>
<thead>
<tr>
<th>Administrative units in Moiben</th>
<th>Target Population</th>
<th>Procedure</th>
<th>Sample Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merewet</td>
<td>4</td>
<td>Purposive</td>
<td>1</td>
</tr>
<tr>
<td>Torochmoi</td>
<td>6</td>
<td>Purposive</td>
<td>1</td>
</tr>
<tr>
<td>Moiben</td>
<td>5</td>
<td>Purposive</td>
<td>1</td>
</tr>
<tr>
<td>Toloita</td>
<td>7</td>
<td>Purposive</td>
<td>1</td>
</tr>
<tr>
<td>Kapsubere</td>
<td>9</td>
<td>Purposive</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>31</strong></td>
<td></td>
<td><strong>6</strong></td>
</tr>
</tbody>
</table>
3.8 Data collection instruments and methods

Given the focus of the study a quantitative and a qualitative interpretive paradigm were employed, this allowed the researcher to study people in their natural settings and to make inferences regarding the meanings the people bring to them (Stake, 2000). This study sought to establish the impact of risk management farming practices on wheat production in Moiben district. The researcher felt that focus groups consisting of information-rich farmers would allow the exploration of the complexities of the impact of risk management farming practices involvement wheat production. The goal of the focus groups was to describe and explain the points of view of large farmers risks associated with wheat production. They allowed the researcher to obtain information about impact of risk management farming practices and with identified suitable questions for the subsequent individual interviews (Education Research Network for West and Central Africa, 2005).

3.9 Data analysis

Content analysis was used as the main method of data analysis qualitatively. It involves identifying, coding and categorizing the primary patterns of data (Patton, 2004). While, quantitative data was analyzed and interpreted using descriptive statistical techniques. The data in this study consisted mainly of questionnaires, individual interview transcripts, focus group discussion transcripts and observations. This was carried out to determine the main themes that emerge from it. This enabled the researcher to verify with the participants if the analysis portrayed their views.

3.10 Reliability and Validity of the Instruments

3.10.1 Reliability

According to (Poggenpoel, 2002), the verifiability of quantitative research is assessed in terms of its reliability and validity, qualitative research is more accurately assessed in terms of its trustworthiness. This study used the Lincoln and Guba’s model for ensuring the trustworthiness of qualitative data. The criteria applied are described below:
Truth value

The truth-value demonstrates how the research is conducted and how accurately the phenomenon under study is described (UNISA, 2003). In addition, it determines how confident the researcher is and to what extent, the findings are true for the particular subjects as well as the context within which the study has been undertaken.

According to Lincoln, (2002), the truth-value, can also be termed “credibility,” which is the alternative to internal validity. They argue that internal validity that is based on the idea that there is a single reality to be measured, should be replaced with the idea that there are multiple realities, which the researcher needs to represent as accurately as possible. The researcher remained sensitive to the needs of all the participants in this study, the researcher also maintained objectivity and avoid making value judgments about the ideals and points of view of the participants, even if they contrasted sharply with his own viewpoints.

Consistency

Consistency, which is the alternative to reliability, refers to “the extent to which the findings would be consistent if the study” if they were to be repeated in similar contexts or with the same subjects (McMillan & Schumacher, 2006). Moreover, to ensure consistency, the study used Lincoln and Guba’s strategy of dependability. This accounted for the variables, which might result in changes in the experience or phenomenon of impact of risk management farming practices on wheat production and for changes, which occur because of an increasing understanding of the study setting.

3.10.2 Validity

According to Creswell and Miller (2000), qualitative researchers routinely employ member-checking, triangulation, thick descriptions, peer reviews and external audits. According to Leedy and Ormrod (2001), triangulation entails the use of multiple methods in data collection. They add that it is “a validity procedure where researchers search for convergence among multiple and different sources of information” to formulate themes or categories in a study. As a validity procedure, triangulation is a step taken by researchers.
employing a researcher’s lens and it is the systematic process of sorting through the data to find common themes or categories by eliminating overlapping areas.

According to Creswell & Miller (2000), a popular practice for qualitative inquirers is “to provide corroborating evidence collected through multiple methods such as observations,” interviews and documents to locate major and minor themes. The narrative account is valid because researchers go through this process and rely on multiple forms of evidence rather than on a single incident or data point in the study (Creswell & Miller, 2000). In this study the participants were provided with the opportunity to validate the interview and questionnaire summaries and extracted themes or make changes to the findings in order to ensure factual clarity of the data (Cohen et al., 2003).

3.11 Ethical Considerations

The research methods describe the procedures used to collect and analyze the data. McMillan and Schumacher (2006) state that qualitative researchers need to be sensitive to ethical principles regarding informed consent, confidentiality, anonymity, privacy and being considerate of the participants. Accordingly, in this study, the researcher developed cooperation, trust, openness and acceptance of the subjects as well as providing ethical protection of the subjects as discussed in the next section.

Informed consent

The researcher obtained informed consent from all the participants by means of a dialogue, during which each participant was informed of the purpose of the study and also be assured of the confidentiality of the data obtained and the anonymity of the respondents (McMillan & Schumacher, 2006).

Anonymity and confidentiality

The participants were assured of their anonymity and the confidentiality of their responses. Thus, settings such as their homes, personal life and personal details of the participants were not identifiable in print. McMillan & Schumacher (2006) recommend the use of code names for people and places as a common practice employed by researchers and, accordingly, this practice was employed in this study to ensure anonymity.
Summary of the Chapter

This chapter has discuss the methodological procedures to be used in data collection and analysis. It has described in detail the research design; location and population of the study; sample and sampling procedures; data collection; reliability and validity; ethical considerations and data analysis.
CHAPTER FOUR

4.0 DATA PRESENTATION, INTERPRETATION, ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter contains the analyzed data collected in the field through the questionnaires, interview schedules and focus group discussions administered to farmers and agricultural officers in Moiben District, Uasin Gishu County. The findings of this study were analyzed in relation to the research questions. This chapter is divided into two major sections, the general information and the specific information.

4.2 Background Information

The background information section of the study sought to establish answers to the major objectives of the study. It was designed to address the answers to the major research questions of the study and provided information on which the recommendations were made. This section was further divided into; background information, most common types of risks that face large scale wheat farmers, the agricultural practice used by wheat farmers and the influence on production, the impact of farm equipments and machinery influences wheat production and The challenges of controlling pests, and the influence it has on wheat production by large scale farmers.
<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>15</td>
<td>75</td>
</tr>
<tr>
<td>Female</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age bracket</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 – 30 years</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>31 – 40 years</td>
<td>6</td>
<td>30</td>
</tr>
<tr>
<td>41 – 50 years</td>
<td>11</td>
<td>55</td>
</tr>
<tr>
<td>51 years and above</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How much land do you cultivate</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>20- 50 acres</td>
<td>7</td>
<td>35</td>
</tr>
<tr>
<td>51- 100 acres</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Above 100 acres</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

This study therefore established that 75% of the respondents are male 25% female, data obtained qualitatively from the focus group and the interview schedules further established that among the Nandi community farming activities is a male function and responsibility, this therefore explains the low percentage of female who undertake large scale farming for commercial purposes. However, the focus group further clarified that majority of the female/women do farming for house hold consumption. This study therefore found out that large scale farming is male dominated, and concluded that the reason for male dominance in large scale farming is cultural. The study recommends that female/women who have the capacity and land to large scale farming should be encouraged.

The age factor was another area that the researcher’s sought to establish in relation to large scale wheat production. This study found out that irrespective of gender there were large scale wheat farmers between that ages of 18-30 years, however, 30% of the farmers were of the age between 31 - 40 years, while majority of the large scale wheat farmers were
of the ages between 41 – 50 years at 55% and above 51 years at 15%. Data obtained from the focus group and the interview schedules further established that large scale wheat farming is an expensive venture that requires capital of between Kshs. 40,000 per acre; this therefore explains the reason why young women and men will not have the financial muscle to venture into large scale wheat production, another factor raised was the risks associated with large wheat farming. This study therefore recommends that the risks facing farmers have increases inflicting fear among the young generation on large scale wheat production. The insurance firms should come up with mutigative strategy to caution the risks and this will encourage the young to venture in large scale wheat production.

On how much land is cultivated, the study found out that 35% of the farmers cultivate between 20- 50 acres, while majority cultivate between 51-100 acres at 50% and the remaining 15% cultivate above 100 acres. Data obtained from the focus group and the interview schedules confirmed that there have been price variations in sale of wheat in market with majority of farmers not very comfortable with the storage scheme introduced by the National Cereal and Produce Board NCPB, this has lead to famers abandoning maize production to wheat production, for the reason that they take shorter time to grow and have a ready market.

4.3.1 The most common types of risks that face large scale wheat farmers

The study sought to establish the most common types of risks that face large scale wheat farmers in Moiben District Uasin Gishu County, and establish whether farmers identify the most common types of risks that agricultural households faced, descriptive statistics were used and the results are presented in Table 4.2

Table 4.2: The most common types of risks that face large scale wheat farmers

<table>
<thead>
<tr>
<th>Risks faced by farmers</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weather (drought)</td>
<td>11</td>
<td>55</td>
</tr>
<tr>
<td>Price/market</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Institutional</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Pest attack</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
Farmers reported climatic conditions and weather (drought) risk as the most serious. This type of risk is composed of weather and pest attacks. It is becoming apparent that with the current global climate changes, drought risk is creating a great concern for many farmers and 55% reported this as a major risk. This is consistent with AERC (2009) which noted drought as a single largest risk. Similar findings were reported by Salimonu and Falusi (2009).

In situations where produce prices are liberalized as it is in Kenya, seasonal and regional fluctuations are expected. Therefore, market/price risk was the second major risk faced by farmers comprising 25%. Institutional risk was not major (10%) and this was mainly the unreliable weighing scales of buyers of farm products and sometimes non-payment for produce delivered to buyers. Pest attack was not a major problem being reported by only 25% of the farmers. With elaborate outreach programs by agrochemical dealers, any reported pest attacks may have been due to negligence or financial constraints by those concerned. These findings are comparable with those of Salimonu and Falusi (2009) who identified that global warming /climatic conditions, market price fluctuation, and pest and diseases respectively as the major agricultural risk among large scale wheat farmers in Nigeria.

4.3.2 The agricultural practice used by wheat farmers and the influence on production

The study sought to establish the agricultural practice used by farmers’ and the influences wheat production in Moiben District Uasin Gishu County, and establish whether practice used by farmers’ has an influences wheat production, descriptive statistics were used and the results are presented in Table 4.3

<table>
<thead>
<tr>
<th>Agricultural practice used by farmers</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of new agricultural technology</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Use of citified seed and pesticide</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Use of citified fertilizers</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Planting on season</td>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
Farmers reported that the basic risk management strategy is simply using good agricultural practices; planting on season was the most preferred risk management strategy at 40% among large scale farmers. These practices can reduce costs and increase efficiency for optimum production. This study confirms Beyene (2008) whose study found out that these practices not only limit your legal risk from environmental mishaps, they can reduce costs and improve profitability, thus reducing financial risks among large scale wheat farmers.

In Kenya situation the geographical climatic conditions are not consistent, and especially in Moiben District this may from time to time affect the production of wheat, however, use of new agricultural technology is likely to enhance the knowledge of weather patterns in time for planting. On the use of technology 15% of the farmers practice, while of use of certified seeds and pesticides 20% of the farmers practice and 25% of the farmers practice use of use of certified fertilizers. Data obtained qualitatively for the interview schedules and focus group guide established that with good agricultural practices and support from the ministry of agriculture on supply of certified seeds and pesticides the farmers will improve their production and limit the risks. These findings were comparable with Salimonu and Falusi (2009) whose study reported a higher crop performance with improved support from the relevant authorities to caution the risks associated with wheat farming.

### 4.3.3 The impact of farm equipments and machinery influences wheat production

The study sought to establish the impact of farm equipments and machinery on wheat production in Moiben District Uasin Gishu County, and establish whether farm equipments and machinery has an influence on wheat production, descriptive statistics were used and the results are presented in Table 4.4

**Table 4.4 The impact of farm equipments and machinery influences wheat production**

<table>
<thead>
<tr>
<th>Statement</th>
<th>SA</th>
<th>A</th>
<th>N</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of good farm equipments and machinery affects wheat production</td>
<td>F</td>
<td>12</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>60</td>
<td>20</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Use of effective farm equipments and machinery improves wheat production</td>
<td>F</td>
<td>11</td>
<td>2</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>%</td>
<td>55</td>
<td>10</td>
<td>30</td>
<td>10</td>
</tr>
</tbody>
</table>
The farmers were found to be risk averse implying that they were not fully aware of the risks associated with farm equipments and machinery and its effect wheat production. Majority of the respondents were in strong agreement with the fact that lack of good farm equipments and machinery would affect wheat production, however, they could not explain how. This study concedes with (Hardaker et al., 2004) that large scale wheat production requires full equipped mechanical, technical and equipment muscle to achieve high productivity, In addition to well serviced and maintained combine harvesters to reduce wastage. The farmers at 60% strongly agreed, 20% agreed, that lack of good farm equipments and machinery affects wheat production.

On the benefits associated with effective farm equipments and machinery and the impact of wheat productions 55 % strongly agreed, while 30% disagreed on the fact that good machines have an impact of wheat production. Data obtained from the focus group and interview schedule revealed that majority of the old farmers in the age of above 50 years regarded ownership of farm equipments and machinery very high with almost all the farmers’ interviewed of the age above 51 years owning either a tractor and a harvester, they said that they use the machines in their farms and hire out for commercial purposes.

4.3.4 The challenges of controlling pests, and the influence it has on wheat production by large scale farmers

The study sought to address the challenges of controlling pests, and the influence it has on wheat production by large scale farmers in Moiben District Uasin Gishu County, and establish whether farmers identify the best way of controlling pests, descriptive statistics, were used and the results are presented in Table 4.5
Table 4.5 The challenges of controlling pests, and the influence it has on wheat production by large scale farmers

<table>
<thead>
<tr>
<th>Challenges of controlling pests</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counterfeit pesticides</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>Lack of knowledge on the right pesticide</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Lack of training of pest control techniques</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>Failure by agricultural extension officers</td>
<td>8</td>
<td>40</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

Farmers have been faced with attack from pests for a long time; this however has been handled well in the past by agronomists. Failure by agricultural extension officers to effectively train wheat farmers has left majority of them vulnerable at 40% while lack of training on pest control techniques at 25%. This study concedes with Carisse et al. (2009) recommends the use of action thresholds for rapid and accurate classification of the incidence of apple scab on leaves, and aid in scab management decision making on the use of pest controls, this however, must be done by a professional agronomist or a trained agricultural extension officers who will from time to time monitor the progress growth of wheat. Lack of knowledge on the right pesticide by farmers was 20% while counterfeit pesticides were at 15%. Data obtained qualitatively from focus group and the interview schedule revealed that majority of the large scale wheat farmers do not have any knowledge or formal training on wheat farming. This they attributed to lack of support from the agricultural extension officers and the government. This study recommended that there is need to group the farmers into societies, unions or cooperatives. This will facilitate positive interactions especially on risk sharing. This will present a collective bargaining front, and serve as a conduct for transmitting government extension recommendations to the farmer.
CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

In this chapter, a summary of findings, conclusions and recommendations are made. This was guided by the following research questions: to find out the how agricultural practices practiced by large scale wheat farmers’ influences production; to establish how the use of farm equipments and machinery influences wheat production and to find out the challenges of controlling pests. This section is comprised of the following section, summary of the findings, on the major types of risks that face large scale wheat farmers;

5.1 Summary of finding

This study focused on identifying the most prevalent risks facing large scale wheat farmers in Moiben District, the impact it has on production and the risk management strategies they employ. It became apparent that with the current global climate changes, drought risk is creating a great concern for many farmers and 55% reported this as a major risk. This could be as a result of the climate change that is expected to increase incidences of drought. However, use of new agricultural technology is likely to enhance the knowledge of weather patterns in time for planting. On the use of technology 15% of the farmers practiced, while the use of certified seeds and pesticides 20% of the farmers practice and 25% of the farmers practice use of use of certified fertilizers. The findings established that with good agricultural practices and support from the ministry of agriculture on supply of certified seeds and pesticides the farmers will improve their production and limit the risks. The findings suggest that there is room for insurance products that are tailored to meet farmers needs while addressing potential problems of transaction costs and moral hazard.

5.2 Discussion of the findings

Pest attack was not a major problem being reported by only 25% of the farmers. However, with elaborate outreach programs by agrochemical dealers, any reported pest attacks would be controlled in time before the damage is done on wheat. These findings were comparable with those of Salimonu and Falusi (2009) who identified that global warming
/climatic conditions, market price fluctuation, and pest and diseases respectively as the major agricultural risk among large scale wheat farmers. The findings further established that along with investments and policy options to increase and diversify income sources both within and outside agriculture, policy support is required for building local capacity, establishing institutions that enhance access to information, seeds and services, insurance mechanisms to buffer production risks, and safety nets that help resilience and recovery from climate-induced shocks. The success of adaptation options would depend on the availability of resources and ability to mix technological and institutional innovations to address location specific challenges that adversely affect agriculture and livelihood systems.

Farmers reported that the basic risk management strategy is simply using good agricultural practices; planting on season was the most preferred risk management strategy among large scale farmers. The findings of the study revealed that these practices can reduce costs and increase efficiency for optimum production. The finding further confirms Beyene, (2008) whose study found out that these practices not only limit your legal risk from environmental mishaps, and they can reduce costs and improve profitability, thus reducing financial risks among large scale wheat farmers.

The findings of the study revealed that years of experience in farming had significant and positive effects of the effect on the probability of effective farm equipments and machinery. This explained the fact that older farmers are experienced and therefore use effective equipments and machinery for good wheat production. The farmers were found to be risk averse implying that they were fully aware of the risks associated with farm equipments and machinery and its effect wheat production. This study concedes with (Hardaker et al., 2004) that large scale wheat production requires mechanical, technical and equipment muscle to achieve high productivity. In addition to well serviced and maintained equipments and machinery.

Farmers have been faced with attack from pests for a long time. The findings of the study revealed that coping with chronically low and variable yields of wheat production is critical for the survival of large scale wheat farmers and the developing agricultural economies where agro-climatic conditions are challenging, technological progress is slow, and market institutions are poorly developed. Often, use of improved seed is limited by poor
adaptation to local conditions, while use of fertilizers is uneconomic, either because moisture
cannot be controlled through irrigation, or transport and transactions costs are prohibitive,
exacerbating low productivity.

5.3 Conclusions

There has been great concern on wheat production in Kenya, with the County failing
to meet its demand and therefore importing the wheat from other countries. The study
concluded that the reason for insufficient production of wheat is not limited to the good
agricultural practices and support from the ministry of agriculture on supply of certified
seeds and pesticides for the farmers to improve their production and limit the risks.

5.4 Recommendation

The risks facing farmers have increased inflicting fear among the young generation
on large scale wheat production. The study recommends that Agricultural Finance
Corporation (AFC) and other institutions should introduce insurance schemes to caution
farmers against risks. The study further recommends that the government through the
ministry of agriculture should control the supply of counterfeit seeds.

5.5 Suggestions for further studies

The researcher recommends a similar study to establish the risks associated with
maize farming in the country. He further recommends a study to establish the training needs
to farmers on the best farming practices in the country.
References


APPENDICES

Appendix I: Letter from the University
Appendix II: Permission for the study
Appendix III: Questionnaire
Appendix IV: Interview schedule for farmers
Appendix 1: Questionnaire
I am a student perusing a Masters in Project Planning and Management, the study topic is “The Influence of Farming Practices on Wheat Production in Moiben District Uasin Gishu County, Kenya”. Your help in answering these questions is highly appreciated. Your responses will be confidential. They will be pooled together with responses of many other households and analyzed.

QUESTIONNAIRE IDENTIFICATION
Date (day/month/year) ____/____/2013
 Enumerator name: ________________________________
 Location: ________________________________

SECTION A: BACKGROUND INFORMATION/ FARM ACTIVITIES AND FACILITIES
1. (a) Farmers name: ________________________________
   (b) Respondents name: ________________________________
   (c) Farmers Gender Male { } Female { }

2. Age of the farmers
   18-30 Yrs { } 31- 40 Yrs { } 41-50 Yrs { } Above 50 yrs{ }

3. How much of your land (owned, rented or free access land) is under Wheat cultivation
   (i) 20- 50 acres { } (ii) 51- 100 acres { } (iii) Above 100 acres

4. Did you have any extension contact? (Tick) Yes { } No { }

5. What are your farming objectives? ………………………………
   (A) Food supply (B) income/profit (C) other (Specify)…………..
(Section B)

(Please use the following Key).

Strongly agree =1       Agree= 2       Neutral =3       Disagree= 4        strongly disagree=5

1. What are the most common types of risks that you face as a large scale wheat farmer?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weather (drought) and other related factors</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Price/market of the wheat</td>
<td></td>
</tr>
<tr>
<td>Institutional risks e.g. lack of support from agricultural officers</td>
<td></td>
</tr>
<tr>
<td>Pest attack</td>
<td></td>
</tr>
</tbody>
</table>

b) Tell us whether you performed the following activities on your wheat field in time.

<table>
<thead>
<tr>
<th>Farming practice of activity</th>
<th>Was the activity done in time</th>
<th>If no, why?</th>
<th>Farming input Did you but enough</th>
<th>If not why?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Which farming practices do you apply when cultivating your wheat farm?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use of new agricultural technology</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Use of citified seed and pesticide</td>
<td></td>
</tr>
<tr>
<td>Use of citified fertilizers</td>
<td></td>
</tr>
<tr>
<td>Planting on season</td>
<td></td>
</tr>
</tbody>
</table>

b) Do you have farm equipments and machinery?
c) Are the equipments and machinery yours or you hire?

Mine { } Hire { }

3. What is the impact of farm equipments and machinery influences wheat production?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of good farm equipments and machinery affects wheat production</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Use of effective farm equipments and machinery improves wheat production</td>
<td></td>
</tr>
</tbody>
</table>

Do you experience any pest problem?

Yes { } No { }

If yes how do you control the pests?

.................................................................................................................................

4. What are the challenges you face as a farmer in controlling of pests and other diseases that affect your wheat

<table>
<thead>
<tr>
<th>Statement</th>
<th>Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counterfeit pesticides</td>
<td>1 2 3 4 5</td>
</tr>
<tr>
<td>Lack of knowledge on the right pesticide</td>
<td></td>
</tr>
<tr>
<td>Lack of training of pest control techniques</td>
<td></td>
</tr>
<tr>
<td>Failure by agricultural extension officers</td>
<td></td>
</tr>
</tbody>
</table>
Appendix II: Interview schedule for farmers

Date (day/month/year) ____/___/2013

 Enumerator name: __________________________

 Location: __________________________

 1. (a) Farmers name: __________________________
    (b) Respondents name: __________________________
    (c) Farmers Gender Male { } Female { }

 2. Age of the farmers

   18-31 Yrs { } 31-40 Yrs { } 41-50 Yrs { } Above 50 yrs{ }

 How many acres in total land holdings do you own? ACRES ________

 Does the household have title to the land? ________

 How many acres do you hire in/out? ________

 What is the rent per year? ________

 Have you borrowed any cash in 2012? ________

 i) If yes, how much? ___________________ where was it borrowed? ________

 ii) Was the credit given? __________________ If not, why? _______

 iii) Did the you buy inputs on credit? ________

 iv) If yes, where from? ________

 Do you practice any other crop farming? ________

 If yes? Which other crop do you cultivate ________

 What are the most common types of risks that you face as a wheat farmer?

 ..................................................................................................................

 Which farming practices do you apply when cultivating your wheat farm?

 ..................................................................................................................

 Do you have firm equipment?
If yes? Which type of equipment? ........................................

Do the farm equipments and machinery give you good service?

Yes { } No. { }

Do the equipments improve your production?

...........................................................................................................

Do you experience attacks from pests and other diseases on your wheat?

If yes what are the causes .................................................................

How do you mitigate against attacks from pests and other diseases

What are the challenges you face in controlling attacks from pests and other diseases

..............................................................................................................