INFLUENCE OF SOCIO-ECONOMIC FACTORS ON THE ADOPTION OF WEATHER-BASED AGRICULTURAL INSURANCE PRODUCTS IN NAROK COUNTY, KENYA

HOPE NANSHEMEZA

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other university. To the best of my knowledge and beliefs, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

Name: **Hope Nanshemeza**

Signature: 

Date:9/06/2023

Approval:

The thesis of Hope Nanshemeza was reviewed and approved for examination by the following:

Name of Supervisor: Prof. S. Wagura Ndiritu

School/Institute/Faculty: Strathmore University-Strathmore Business School

Head of School/Institute/Faculty: School Name:

Director, Office of Graduate Studies

ABSTRACT

Kenya has been facing a high number of natural disasters, having recorded various droughts in the last two decades. These are consequences of climate change. To mitigate the adverse impacts of this climate uncertainty, the government avers that farmers need to adopt various coping strategies. Among these is agricultural insurance, which is supposed to help low-income farmers reduce vulnerability. However, despite policies and initiatives being implemented to encourage farmers to adopt these insurance products, uptake remains low. The focus of this research was to investigate the influence of socio-economic factors on the uptake of weather-based agricultural insurance products in Narok County. The study specifically examined the effect of demographic factors, household income, household perception, household expectation, and crop insurance regulation on the uptake of weather-based agricultural insurance products in Narok County. The research was grounded on prospect theory and customer perceived value theory. A sample of 300 wheat farmers in Narok County was considered for the research. A structured research questionnaire was adopted for the examination with probit regression estimated to determine the marginal effects of socio-economic factors on the uptake of weather-based agricultural insurance products in Narok County. Analysis revealed that a majority, 53% (n = 159), were male farmers, with 47% accounting for female wheat farmers, which demonstrates inclusive participation in agricultural activities. The results revealed that, on average, the farmers had an income of KES 16,843 from farming activities. The research further focused on the rate of adoption of weather-based insurance products and the findings showed that 48% (n = 144) of the farmers have used weather index crop insurance, with 52% not using the product. The summary of the probit regression established that there was a positive but insignificant influence of 2.14% on the adoption of weather-based insurance products in Narok County that was predicted by the socio-economic factors. Overall, the research findings were that socio-economic factors do not have significant effects on the adoption of weather-based insurance products in Narok County. The first recommendation that can be drawn from the research findings is that the government needs to be more involved in the efforts to address the challenges facing agricultural insurance. The study also recognizes the role played by insurers in promoting crop insurance and the study recommends that insurers do more research on farmers' needs and their perception about insurance. Finally, this study calls on the government to step up education efforts and partnerships with local and international partners to provide up-to-date insurance education programmes for farmers and training for insurance experts.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

DEFINITION OF TERMS

Demographic factors	Demographic factors refer to those factors that identify individuals in a population such as their age, gender, education qualifications, marital status, income, ownership, and religion, among others.
Household financial status	Household financial conditions are a good indication of both the financial and monetary stability of the household.
Socio-economic-status	Socio-economic status (SES) is defined as measuring the combination of an individual's or group's economic and social status.
Weather-based insurance	Weather-based crop insurance for farmers has become a powerful tool that stabilizes farmers' income by ensuring prompt payment when the tool is linked to weather parameters such as rainfall and temperature.

DEDICATION

This work is dedicated to my grandmother, the late Fridah K. Kyabariseki, who taught me how to work and live in society. She taught me that it is never too late to chase a dream.

May her soul continue to Rest in Peace.

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CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

Agriculture for many years has formed the backbone of Kenya's economy. The agricultural sector contributes about 30% of the gross domestic product (GDP). The sector is the country's largest employer, accounting for 40% of the country's total employment and providing employment to more than 70% of the rural population (Birch, 2018). In addition, the sector contributes more than 60% of the total export earnings and about 45% of government revenue, while providing for most of the country's food requirements. The sector is estimated to have a further indirect contribution of nearly 27% of GDP through linkages with manufacturing, distribution, and other service-related sectors (ASDS, 2010). With no doubt, Kenya's agricultural sector directly influences overall economic performance through its contribution to GDP. Periods of high economic growth rates have been synonymous with increased agricultural growth.

In 2008, the Government of Kenya (GoK) launched Kenya Vision 2030, which has recognized agriculture as a very important sector in its economic pillar. Given the central role the agricultural sector plays in the economy, the GoK went further to develop and launch the Agricultural Sector Development Strategy (ASDS, 2010), whose overall aim is to strategically make the agricultural sector a key driver for achieving the 10% annual economic growth rate expected under the economic pillar of the Vision 2030. Despite Kenya's Vision 2030 and ASDS being in place, agriculture's erratic performance has persisted for two decades as important subsectors, particularly food crops, have performed poorly, especially compared to the dairy and export crop (tea, fruits, vegetables) subsectors. Food crop productivity is not growing as rapidly as demand, thus eroding food security in many poor households. Even when production is good, Kenya imports maize, wheat, and rice. The poor performance of Kenya's major food staple, maize, is very serious, especially considering that historically maize has been the focus of much agricultural policy and investment.

Agriculture's poor performance is partly symptomatic of climate change and variability and the droughts following in their wake. Severe droughts over the last decade have caused precipitous crop losses, killed livestock, led to spikes in food prices, increased food insecurity and malnutrition

among the poor, and periodically displaced large segments of the rural population. Because climate change increases agricultural risks, it has serious implications not only for agriculture but also for the natural resource base, food security, livelihoods, and the stability of the wider economy. Due to a combination of political, geographic, and social factors, Kenya is recognized as highly vulnerable to climate change impacts, ranked 152 out of 181 countries in the 2019 Notre Dame Global Adaptation Initiative (ND-GAIN Index) (World Bank, 2021). This level of risk and vulnerability begs for massive public and private investment in risk management to build resilience to shocks.

In Kenya, weather risk continues to pose a pressing concern, especially among small-scale farmers whose agricultural products can be quickly swept away with a season's weather failure. This continues to worsen because of the changing climate patterns globally, forcing farmers to increase their farm productivity to meet demand (Sibiko & Qaim, 2019). As the weather continues to pose these challenges, discussion on crop insurance has resurfaced among farmers, policymakers, and development institutions to counteract the uncertain global weather patterns (Ghimire et al., 2016). This weather unreliability reduces the potential income for millions of small-scale households. Worse still, private financial institutions are unwilling to extend credit facilities to farmers whenever there is an anticipation of drought, hail, or flood that could destroy farmers' produce (CCAFS, 2013).

1.1.1 Household Socio-economic Factors

Socio-economic status (SES) is defined as measuring the combination of an individual's or group's economic and social status. Socio-economic status tends to be positively associated with health and the overall well-being of the concerned individuals (Parcel, 1981). A closer examination of socio-economic status is useful in revealing inequities in access to resources that would be useful in improving household welfare. Household welfare can be viewed in terms of the wealth of the household, household health status, and the level of education in the household (Parker, Boyle, & Satin, 2017).

The socio-economic status of farmers plays a significant role in their propensity to take risks. Although farmers engage in farming to generate revenue, farming also provides a means through which the household can generate long-term wealth. Peer pressure and land management ethics are an essential factor in influencing farmers' practices on their farm (Barron & Gjerde, 1997). To

minimize their risk, farmers will consider learning best farming practices from their peers and applying some of the most effective risk mitigation being employed. Peers provide a social incentive to try out practices that are employed within the region. Some of the barriers to household risk management practices observed in India were related to price sensitivity to the insurance offered. On close inspection of this price sensitivity, it was found that household income influences the excess amount that could be used to purchase insurance (Cole et al., 2013).

Household financial conditions are a good indication of both the financial and monetary stability of the household. The household's financial condition could become more vulnerable to adverse shocks to its income and wealth (Rinaldi & Sanchis-Arellano, 2006). Income is central to household choices regarding decisions to obtain insurance. Households have found themselves weighing even when the insurance is most likely to benefit the household since income would be the limiting factor (Cole et al., 2013). Because farmers must consider the cost of farm inputs, in cases when insurance is a requirement, price consideration is key to decision-making.

1.1.2 Weather-Based Agricultural Insurance Products

Farmers increasingly face mixed weather-related risks in each cropping season. To reduce these risks, farmers diversify their production using mixed farming, using cheaper inputs instead of expensive ones, and adopting drought-tolerant seed varieties (Ullah, Jourdain, Shivakoti, & Dhakal, 2015). Weather-based crop insurance for farmers has become a powerful tool that stabilizes farmers' income by ensuring prompt payment when the tool is linked to weather parameters such as rainfall and temperature. Farmers have been slow in adopting it, considering that its design increases the basis risk and can lead to a low payout, thereby significantly affecting income (Shirsath, Vyas, Aggarwal, & Rao, 2019).

Agriculture is considered a risky enterprise due to its dependence on rainfall. In the wake of climate change, drastic changes in weather patterns increase rainfall unreliability and fluctuation in farmers' income. Crop insurance provides one way by which farmers can diversify their risk, in a deviation from the sale of farm and household assets, which diminishes household wealth and assets. Weather index insurance (WII) is designed with specific, single, or combinations of events in mind to function as triggers for payout. These events correlate with the index values and farm losses in produce or livestock (Salgueiro, 2019). Because of their dependence on a local weather station in a predefined area, the farms that purchase WII are located at 20-30 km from these

weather stations. This is the commonly adopted practice seen in Malawi, Kenya, India, and Ukraine (Peterson, Morehay, & Denberg, 2017).

This insurance is sold in standard units and farmers claim it is based on a standard contract for each unit purchased. The premium paid is uniform for buyers of the same index contract residing in a given region, and each certificate present is subject to receiving the same indemnity in case the triggering event occurs (Angelucci, 2008). Buyers of these contracts can purchase as many units as they wish. Although different countries have had different experiences, it is crucial to understand that the majority of the pilot programs are very recent. There is a need to allow more time to evaluate their sustainability and their impacts (Pomarici & Vecchio, 2019).

One of the important factors of WII is that it can quickly act as a warning tool for natural disasters at a national level (macro level). Armed with this information, farmers can quickly adjust their expected produce and allow their households to protect themselves from income shocks (Walters, Shumway, Chouinard, & Wandschneider, 2012). In Malawi, WII is delivered directly to individual farmers or through farmers' associations that function as an intermediary for protecting them against expected losses. The motivation behind its introduction was the exclusion of smallholder farmers from accessing credit, which would allow them to obtain good-quality farm inputs such as seeds and fertilizer that would decrease the impact of weather unreliability. Lenders were worried about the impact that drought would have on the output from these farms, thus limiting the amount of credit they could extend to farmers (Hill, 2010).

With the availability of insurance to mitigate adverse weather, lenders have continued to advance credit to farmers to buy better inputs, leading to increased yields (in some cases, as much as 300%). In Mongolia, weather-based insurance has found alternative uses, where farmers use the insurance contract as insurance against livestock mortality. Farmers with insurance contracts can access credit at a lower interest rate from their credit institutions. In Mali, crop insurance has been used to insulate cotton farmers against the adverse impact of weather on household income (Hattyin, Brennu, & Baine, 2018).

In Malawi, WII increases farmers' productivity and income when used in combination with advanced farm inputs. It has enabled farmers to be included in the financial ecosystem to obtain loans to finance their farming. The combination of insurance products and the use of advanced seed by Malawian farmers allowed them to mitigate against exposure to rainfall risk. These

benefits have also been experienced in other pilot projects in Peru and Mongolia, where the farmers have enjoyed lower interest rates. Weather index insurance was introduced to Kenya as an innovative means to tackle the increasing downward risk for farming. However, its uptake and efficacy lack proper documentation to allow for information tracking (Wairimu, Obare, & Odendo, 2016). WII would be helpful in reducing some of the problems associated with traditional indemnity-based insurance despite the recorded low uptake. WII is not sufficiently tailored to the needs and preferences of smallholder farmers.

In Kenya, WII has remarkably decreased weather-associated production risk for cereals (notably maize and wheat) and industrial crops such as tea, coffee, and sugarcane. Currently, Kenya has no specific agricultural insurance policies or guidelines, but several policy documents highlight the issue of agricultural sector production risks (e.g., droughts, floods, pest and disease outbreaks) and risk management initiatives. First, the Agricultural Sector Development Strategy (ASDS, 2010) recognized the inherent high risks facing smallholder farmers that prevent them from commercializing their production systems. Specifically, the ASDS underscored the "relatively high risk of crop failure due to increased frequency of dry spells and an uneven rainfall distribution." In addition to the adverse impacts of weather shocks on the livelihood of farmers (particularly smallholders), the high-risk exposure is also a bottleneck for them to access formal credit from commercial banks. The ASDS proposes that the "government should intervene to create a better environment for banks and mainstream financial institutions to develop products that address farmer needs." In recent years, the banking sector has entered the market for rural credit. But agricultural insurance remains underdeveloped. And only a few products are offered to smallholder farmers to protect their livelihoods against loss of produce from weather-related disasters.

The National Agribusiness Strategy 2012 recognizes that "lack of suitable risk management products is a barrier for potential investors in the agricultural sector." The strategy stresses the need to strengthen the range and robustness of insurance schemes for small agribusinesses, to create awareness, and to scale up agricultural insurance products. The strategy underlines the importance of two key interventions to achieve these objectives: (i) improvement in the data and information infrastructure and (ii) supporting farmer education and raising their insurance awareness.

The National Food and Nutrition Security Policy 2012 requires the government to adopt a risk management approach that is anticipatory and preventive (proactive) rather than being reactive. It is cognizant that emergency relief is extremely expensive and fiscally unsustainable. This policy, therefore, urges the government to find ways of increasing private sector participation in production risk management through agricultural insurance products. The National Risk Reduction Policy 2009 clearly states that "hazards such as floods, pests, and droughts do not make a disaster, but it is inability of a population to cope with hazards that transforms them into a disaster." The policy, however, does not include agricultural insurance as a potential market-based instrument for managing production risks. Instead, the policy sets out the mechanisms for increasing the resilience of smallholder farmers and the rural population in general.

It is clear that risk exposure of farmers has received attention by the government of Kenya. In 2021, the Ministry of Agriculture, Livestock and Fisheries (MALF) issued the National Agricultural Insurance Policy (NAIP, 2021) that would guide the development of an agricultural insurance market. The purpose of the NAIP is to outline measures that will foster the growth and development of agricultural insurance in the country. The NAIP also aims to identify the salient relationships and linkages between the key stakeholders in the agricultural insurance industry, and provide a framework for guiding specific policy actions or interventions, including the development of affordable and accessible agricultural insurance. In addition, the NAIP provides a platform for the Insurance Regulatory Authority (IRA) to effectively regulate the agricultural insurance industry.

With regard to a legal framework, overall, the Kenya insurance market is governed by the Insurance Act (1984). The Act is administered by the IRA, which was established under the Insurance Amendment Act (2006). The Insurance Act requires that all assets, liabilities, and lives within Kenya must be insured with insurance companies that are registered in Kenya under the Insurance Act. Under the Amendment Act, agricultural insurance is not mentioned as a separate type of insurance. Instead, agricultural insurance is lumped under the "miscellaneous" section. Nonetheless, the IRA has been very supportive of index-based insurance products and has allowed their implementation to benefit smallholder farmers, although these products are not explicitly mentioned in the Insurance Act. Against this backdrop, my study aims to examine the factors that influence the adoption of weather index insurance products. The main question of this research is why smallholder farmers are not adopting weather index insurance despite the government's

support policy (e.g., subsidized premiums), strategic plans, and legal framework being in place. This study uses the case of wheat farmers in Narok County to investigate how socio-economic factors (e.g., income, education, wealth, and perception) influence the adoption of agricultural insurance.

1.1.3 Socioeconomic Factors and Uptake of Insurance Products

As mentioned before, agriculture is the backbone of the Kenyan economy. The sector significantly contributes to the country's GDP and provides employment opportunity for many rural people. Nonetheless, production from farming continues to decrease in the face of unreliable weather patterns that can wipe out household accumulated wealth and income and drive households into poverty (Ullah, Jourdain, Shivakoti, & Dhakal, 2015). Farmers employ multiple risk mitigation mechanisms to minimize their exposure to these continued catastrophic risks. Household characteristics influence the perceptions and factors that farmers rely on to decide on household risk. The experience of the farming households in their farming activities influences household insurance uptake decisions. Other factors that play a significant role are off-farm income, the size of landholdings, and the ages of the respondents (Ashfaq, Hassan, Naseer, & Baig, 2008).

The predisposal income in a household decides the extra amount after basic consumption that can support farm activities. Constraints to income influence the farmer's and household's perception regarding insurance adoption, and they opt to adopt it only when they perceive that the benefits derived from the insurance contracts far outweigh their costs. Despite the myriad advantages that insurance contracts carry with them, farmers perceive crop insurance as a form of taxation based on the premiums paid that they consider "high," making large-scale farmers the dominant group of those who can afford insurance (Ghazanfar, Qi-wen, Abdullah, Ahmad, & Lateef, 2015). The design of the weather insurance products protects the farmers from basis risk, which is the difference in price between hedged positions. The presence of a central weather station that will be used to collect information will ensure that farmers can act on the same information. At the same time, the common risk that farmers face ranges from production risk, market risk, and yield risk to financial risk; the proportion of these risks in most cases is directly correlated to the amount of expected return (Komarek, Pinto, & Smith, 2020).

Several household characteristics influence the decision-making on the amount of risk that the household can comfortably absorb. The household level of poverty influences the amount of

disposable income that the household has and would use to cushion the household (Fleetwood, 2011). Poverty being multi-dimensional requires a multi-approach to ensure that it can be correctly measured at the household level. A study by Khan, Hassan, & Shamsad (2014) used education as an indicator for household socio-economic status. This indicator is used to observe the household head's maximum level of education to decide literacy level. The level of household wealth has also been used as a socio-economic indicator that is useful in measuring the living standards within the household (Lundy, 2012).

1.1.4 Agricultural Sector in Kenya

Kenya has been applying risk management mechanisms since the colonial era in the early 1930s. The economic depression of 1930 forced the colonial government to introduce reforms. These aimed at reversing the declining commercial banks' lending to the agricultural sector due to severe and recurring droughts and locust outbreaks, which worsened food security in the country. The colonial government established the Land Bank and introduced ordinances related to agricultural production. The latter included the Wheat Ordinance 1933 and the Increased Production of Crops 1942. In addition, the colonial government introduced the guaranteed minimum return (GMR) scheme. This guaranteed farmers a floor (minimum) price for their produce and insured their production against "unavoidable" crop failure. In essence, the GMR scheme required each farmer receiving an agricultural loan under it to purchase insurance coverage against fire and other risks that might affect their production systems. The insurance coverage was provided according to the loan amount received by the individual farmers.

The GMR scheme continued after Kenya gained independence on December 12, 1963. GMR was used to address the main challenges facing agricultural production in three ways: (i) a guaranteed market and price for agricultural produce; (ii) agricultural risk mitigation through insurance against risks that individual farmers cannot manage, such as droughts and floods; and (iii) access to credit to enable farmers to access mechanization services to increase agricultural production. Agricultural credit was provided by the Agricultural Finance Corporation (AFC), which was established in 1963. Initially, the scheme helped increase agricultural production and farm income in Kenya since credit, insurance, and marketing services were linked. To date, the AFC continues to provide targeted agricultural credit to farmers. However, the insurance services of GMR were curtailed in the 1970s because of abuse and exploitation by farmers and politicians. For example,

large farmers and politicians colluded with GMR officials to defraud the scheme by declaring crop failure so that their production loans could be written off. These farmers would then sell their produce through friends or other marketing channels. Given these challenges, the government decided to discontinue the GMR scheme in 1978.

In the next two decades, following the discontinuation of the GMR scheme, agricultural insurance was not available in Kenya, except for a few large commercial farms. Agricultural insurance came back in the 2000s. From 2005, several insurance companies began to explore business opportunities in agricultural insurance. The commercialization of the dairy subsector increased demand for livestock insurance. In response, some of the leading insurance companies in Kenya started offering both crop and livestock insurance products. Livestock insurance was accessible by both small- and large-scale farmers. In contrast, crop insurance was limited to large-scale farmers because of the high administrative costs associated with offering the available products to smallholders. At that time, the only available products for crop insurance were multi-peril crop insurance (MPCI) and named-peril crop insurance (NPCI). Both MPCI and NPCI require pre-emergence and pre-harvesting crop inspection as well as physical inspection, which are too costly to administer under the wide geographically scattered smallholder production system.

The emergence of weather index-based insurance products in Kenya in 2008 enabled more smallholder farmers to begin accessing agricultural insurance. Weather index-based insurance is based on a specific parameter (e.g., rainfall) that is closely correlated with yield and is measured over a specific period of time at a particular weather station. The insurance policy is structured to make payouts whenever rainfall exceeds or falls short of certain levels, which are likely to cause crop yield losses. Payouts are calculated based on a pre-agreed sum insured per unit of the index. Index-based insurance has helped overcome the challenges of high administrative costs associated with MPCI and NPCI. Because payouts are based on weather data, index-based insurance has relatively low administrative costs and does not face moral hazard issues. Weather index-based insurance for agriculture is a growing market and is increasingly being used to manage risks associated with drought, high and low temperatures, and excess rain and floods. However, to date in Kenya, despite government subsidy on premiums, only a small proportion of smallholder farmers are covered under index-based crop and livestock insurance.

1.1.5 Farming in Narok County

Narok County, which has six sub-counties, is situated in the southern part of the Great Rift Valley, or south-west of Kenya, where it borders the United Republic of Tanzania. The county headquarters is Narok Town, located off the Narok Nakuru Road. The town is fast transforming itself into a cosmopolitan center with people from various parts of the country settling there for commercial activities. According to the Kenya Housing Population census (KNBS, 2019), Narok County had a population of 1,157,787 people, with a population density of 65 people per square kilometer. The county's annual GDP growth rate was 3.3%. The number of households in the county was 241,125. The county's main economic activities are pastoralism, crop farming, tourism, and trade. Narok is renowned for its commercial production of wheat and barley in Kenya.

Narok County has enjoyed large land tracts previously under the group ranch tenure system now converted into freehold tenure. This has allowed more households to be involved in commercial crop (especially wheat) and livestock farming in the county. The county has good ecological conditions for agriculture, tourism, forestry, and water development. The main crops grown in the county are wheat, barley, maize, beans, Irish potatoes, and several horticultural crops. However, the county is also facing major challenges which are adversely affecting its economic development. These include increasing impacts of climate change and variability, poorly developed economic infrastructure, unplanned human settlement, and a high level of unemployment among the youth. Uncontrolled urban development and continued population growth requiring settlement fueled the rapid decrease in forest cover from 44.8% in 1986 to 22.6% in 2019 (Mootian, Seno, & Mabwoga, 2020). The loss of vegetation cover is also caused by the destruction of forests due to human activities. These include overgrazing, charcoal burning, extraction of wood fuel, and cutting down of trees without replacement.

The county's good ecological conditions are influenced by the fertile soils, altitude, vegetation, and relatively reliable rainfall pattern. The county has four agro-climatic zones: humid, sub-humid, semi-humid to arid, and semi-arid. Two-thirds of the county is classified as semi-arid. Temperatures range from 20 ^{o}C (January to March) to 10 ^{o}C (June to September), with an average of 18 ^{o}C. Rainfall amounts are influenced by the passage of inter-tropical convergence zones giving rise to bi-modal rainfall pattern. Long rains are experienced between February and June,

while the short rains are between August and November. Rainfall ranges from 2,500 mm in the wet season to 500 mm during the dry season.

In the last decade, Narok County has become vulnerable to climate variability, partly due to the increasing impacts of climate change. Increasing climate variability (e.g., change in rainfall duration and intensity, and increase in temperature) and extreme events (e.g., droughts and floods) continue to adversely impact crop and livestock production systems, farm income, and food security in the county. Therefore, Narok County was purposely chosen for this study given that it is a large agricultural county (especially wheat) and it is increasingly becoming vulnerable to climate variability exacerbated by climate change. Given that Narok County is one of the largest wheat-producing areas in Kenya, this study examines the socio-economic factors influencing the adoption of WII as a risk management tool.

1.2 Statement of the Problem

Kenya's food sustainability continues to be threatened by the fluctuating weather patterns that give farmers massive losses that discourage them from pursuing farming. These unprecedented weather patterns directly influence household income and function as an obstacle to poverty eradication (Hattyin, Brennu, & Baine, 2018). The rollout of crop weather insurance is a risk mitigation factor that guarantees that a household's farming revenue can be protected from shocks caused by adverse weather conditions. WII has been used to ensure that farmers' losses can be mitigated to a minimum while at the same time supplying positive externalities such as the financial inclusion of farmers into the mainstream financial system.

Narok County is one of the country's major agricultural blocks that support commercial and small-scale farmers in wheat production (Addey, Jatoe & Kwadzo, 2021). Narok has seen its large fields turned into agricultural land as a means through which it contributes to the country's food basket. According to Otieno (2013), farmers in Narok continue to face massive financial losses, despite the awareness and availability of WII products. The continuous fluctuations in weather patterns have strongly affected farmers' income, and affected other sectors such as education and nutrition. The availability of WII has proven to be successful in mitigating the risk associated with fluctuations in weather patterns. Large commercial farms have mainly been the ones able to take advantage of WII products compared to small-scale farmers (Ortmann & Mohhamed, 2010). My research, therefore, was interested in examining the household socio-economic factors that are

influencing small-scale farmers in the adoption of WII. Despite its availability, households have not fully appreciated this product that protects them from catastrophic losses.

I sought to investigate the household living conditions to understand what factors influence the adoption of insurance products. Among the advantages of WII contracts is that they also ensure that farmers have access to credit facilities and can access a standing loan facility for the period of the insurance contract. This allows the farming household to save for its future once it has access to a bank account (Sanogo & Yaya, 2020). The contract acts as a lifeboat to protect household wealth and ensure that household sustainability is maintained. Therefore, my research sought to understand how these household socio-economic factors influence the adoption of weather index-based insurance.

1.3 Objective of the Study

1.3.1 General Objective

The main purpose of the study was to determine the influence of socio-economic factors on the adoption of weather-based agricultural insurance products in Narok County, Kenya.

1.3.2 Specific Objectives

i. To establish the effect of demographic factors on the adoption of weather-based agricultural insurance products in Narok County, Kenya.
ii. To determine the effect of household income on the adoption of weather-based agricultural insurance products in Narok County, Kenya.
iii. To establish the influence of household perception on the adoption of weather-based agricultural insurance products in Narok County, Kenya.
iv. To determine the effect of household expectation on the adoption of weather-based agricultural insurance products in Narok County, Kenya.
v. To examine the influence of crop insurance regulation on the adoption of weather-based agricultural insurance products in Narok County, Kenya.

1.4 Research Hypotheses

H_{O1} There is no significant effect of demographic factors (age, gender, education) on the adoption of weather-based agricultural insurance products in Narok County, Kenya

H_{O2} There is no significant effect of household income (size of land, monthly income) on the adoption of weather-based agricultural insurance products in Narok County, Kenya

H_{O3} There is no significant effect of household perception on the adoption of weather-based agricultural insurance products in Narok County, Kenya

H_{O4} There is no significant effect of household expectation on the adoption of weather-based agricultural insurance products in Narok County, Kenya

H_{O5} There is no significant effect of crop insurance regulation on the adoption of weather-based agricultural insurance products in Narok County, Kenya

1.5 Scope of the Study

1.6 Justification and Significance of the Study

There are many agricultural production and price risk management tools (e.g., production diversification, assets and income sources diversification strategies, agricultural insurance, WII, and agricultural finance and microfinance). WII has received great attention in Kenya in terms of both the government's support policy and strategy and the legal and institutional framework. Yet, the uptake of WII remains low throughout the country. This study examines why the uptake of WII is sluggish despite the government's efforts to put in place support policies and a legal and institutional framework. The null hypothesis tested in this study is that socio-economic factors have no influence on the adoption of weather index insurance in Narok County. Four socio-economic factors are considered in the study: income, wealth (as measured by the assets owned by the household—TV, motorbikes, land, house, etc.), education, and perception (i.e., whether the premiums are value for money given the perceived risk of loss).

Poorer smallholder farmers use most of their income to meet basic household needs. Thus, unless the premium is highly subsidized, they are more unlikely to adopt WII. Relatively wealthy farmers can diversify their assets in case of losses due to weather-related disaster. As such, unless they perceive that the premiums are low, they are unlikely to adopt WII. Smallholder farmers with a higher level of education are assumed to be more knowledgeable about the insurance products and their benefits. Hence, they are more likely to adopt WII. Finally, smallholder farmers who perceive that the premiums are not too high relative to the likely loss due to weather-related disaster are more likely to adopt WII.

The Constitution of Kenya (2010) distributed the functions of the government between the national and the county governments. Agricultural policy remained the function of the national government, while crop and animal husbandry became functions of the county governments. Further, legal notice No. 137 of 2013, in compliance with the Transition to Devolved Governments Act, 2012, mandated county governments to enhance farmers' access to affordable insurance packages and credit. The implementation of this policy is undertaken by various government agencies at the national and county level. These include the ministries responsible for agriculture; disaster management and relief services; national statistics; finance; and interior and coordination of national and county governments. The ultimate aim was to target farmers and pastoralists as the primary beneficiaries of an agricultural insurance program, which unfortunately did not succeed. This study will help the national and county governments understand the socio-economic factors influencing the adoption of WII, which is vigorously supported by the two levels of government.

1.6.1 Crop Insurance Service Providers

The level of insurance penetration among farmers is still considered exceptionally low, and it is estimated to be at about 3%. My research will help to unearth some of the deciding criteria that households consider before making an insurance purchasing decision. The research will also allow crop insurance providers to better understand the household characteristics of their clients and, therefore, tailor-make products that would serve these farmers. Equally, my research will shed some light on farmers' perceptions regarding their products, thus allowing providers to review them.

1.6.2 Policymakers

Amongst the challenges that both providers and receivers of insurance products face is the framework for the distribution of such policies. The insurance sector is in the initial stages of developing infrastructure to allow it to roll out its products with ease to the public and the different sectors of the economy. My research will allow policymakers to understand both the supply and demand sides as well as the characteristics that define both sides. This will enable them to formulate the right policy that will help in the continued propagation of insurance products.

1.6.3 Academia

Research in the insurance industry is still ongoing as research continues to create awareness of weather-based index insurance and its functionality in the public. My research will contribute to

the body of academic research as it provides more information on the features of insurance products as well as insights into how customers perceive the value created by these products. Because WII is a novel product that still has low penetration, my research can form part of the content awareness campaign to bring to light the functionality of this insurance product.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter provides the study's literature review. In it, I review the literature from other researchers on crop insurance and successful studies that have already been done. The studies highlight the development of crop insurance and the gaps that remain to be filled. The literature review focuses on the factors influencing the adoption of crop insurance policies by households. My study is pegged on two theories: prospect theory and customer perceived value theory. The empirical literature discusses some of the findings from global studies, and regional and local studies that have already been conducted.

2.2 Theoretical Review

As pointed out above, my research adopted two theories that review crop insurance: prospect theory and customer perceived value theory. My study follows a multi-theory approach, as selected theories are more consistent with known facts relevant to our research variables. The significance of a theoretical review is to develop an understanding of given observable facts (phenomena), besides creating further insight into the knowledge that is already available. Scholars underpin their research studies with theoretical perspectives even as they try to extend knowledge on certain topics in academia (Getz & Page, 2016).

2.2.1 Prospect Theory

This theory was first suggested in 1979 and later developed by Daniel Kahneman and Amos Tversky in 1992. The theory hinges on the premise that individuals are more likely to make their decisions based on the potential value of the losses and gains they face rather than on the outcome (Levy, 1992). The theory is used to explain the different choices that humans make when decision-making involves risky choices. It uses human psychology to account for the alternative decisions that are available under these risky conditions. It is a generalization of the expected utility theory, which fails to explain the collection of available observations during decision-making involving risky choices. The model tries to use real-life choices to make probabilistic decisions rather than using optimal decisions (Yu & Cheung, 2020).

Prospect theory is premised on several key assumptions. First, the decision is made relative to a given reference point, which might be wealth, income, or a factor that influences the decision. The second assumption of the theory is that people are risk-averse when it comes to potential gains and the final assumption is that decision-making would be premised on loss aversion. In my study, the presence of WII as crop insurance is meant to provide a farmer with certainty of income at the end of the season, and, if a weather disruption occurs, then compensation would be equal to the faced losses. The insurance acts to avert potential losses that the farmer would have faced if it were not available. The relevance of this theory in my study is that farmers are expected not to be motivated to act and accept insurance unless they are convinced that the insurance can protect their wealth, their farm inputs, or assets on their farm.

Yu & Cheung (2020) used the theory to explain the uncertainty that users face in resource allocation in a communication network. The theory was useful in explaining the channel fluctuations that network users face when choosing a wireless channel for transmission. The fluctuations they expect to experience influence their choice of network to use.

Small-scale farmers depend on their produce to sell and convert to income. Periods that have experienced low harvest pose a challenge to farmers as reduced income affects other aspects of their lives. Prospect theory is helpful in my study to check on the options for farmers and the impact that WII as crop insurance would have on ensuring that farmers have their income protected. The availability of WII ensures that farmers spend less on inputs, and there is a contingency plan in place that guarantees the protection of their income in case of adverse weather conditions. Contingency plans are helpful in the presence of climate variation because this is a strong determinant of the agricultural sector's performance (Reddy et al., 2018). Farmers are willing to undergo risk at the farm when they can be assured of either produce or compensation at the end.

Prospect theory allows farmers to use the insurance contract to transfer their risk and therefore function as a potential investment besides their farming activities. In the need to protect small-scale farmers from wild fluctuations in their earnings, the presence of WII provides them with secured prospects of having a secured future income. The challenge when it comes to the provision of WII as a crop insurance scheme is that small-scale farmers might take an excessive risk that might end up being costly to the insurer. When insurers onboard a concentration of farmers with

elevated risk without their knowledge, it can cause a moral hazard situation. Farmers' motivation would be the payout regardless of the amount of risk they bring to the insurer while the insurer would end up suffering losses due to the high probability of a high payout.

Weather index insurance makes use of weather stations that use standardized measurements in triggering payment. Both the farmers and the insurance provider increase transparency by tracking the recordings from weather stations daily and using them as a criterion for determining the payout amount and standards. In using WII, prospect theory can be used to predict farmers' coverage decisions accurately as their choices are influenced by their level of perceived risk. Price loss coverage (PLC), agricultural risk coverage (ARC), and individual revenue protection (IRP) are some of the protections that smallholder farmers could obtain to offset the mammoth risks they face.

2.2.3 Customer Perceived Value Theory

Customer perceived value (CPV) theory is premised on value recognition (Monroe, 1990; Zeithaml, 1988) or customer value (Butz Jr. & Goodstein, 1997). Zeithaml (1988) defined CPV as consumers' feeling of the overall utility they achieve from a product based on what they receive vis-à-vis what they gave out. The theory uses a consumer's pre-purchase belief (expectation) to determine the value (post-purchase) that the customer would derive from the product. Customers make their purchase decision based on the value they expect to receive from a given product and not necessarily the product's price. The customer's interest has little to do with the given product's price; instead, it deals with the abstract cost. When customers compare the difference between the perceived benefit and cost and the difference is positive, then the customers' perceived value is high, and they are likely to buy the product.

Figure 2.1 Kotler's Perceived Value Model

For businesses and enterprises to be successful, they need to understand the values of products and services from the customer's perspective if they are to gain a competitive advantage (Aulia, Sukati, & Sulaiman, 2016). In my study, at the household level, crop insurance would be the product of interest that the insurance company is providing for farmers; however, the product must meet farmers' needs, and its utility must exceed its acquisition cost. Small-scale farmers use mixed farming as a way of diversifying their risk. The produce from the farm is used to supplement other sections of the farm. For farmers to consider using crop insurance, the perceived benefit must be greater than the cost of acquisition of the insurance product.

Cases when farmers opt to purchase crop insurance are influenced by their risk perceptions and the available risk management options that they are considering. It is common to find adoption of crop insurance by large, less tenured, and highly leveraged farms with perceived high yield risk (Sherrick, Ellinger, Barry, & Schnitkey, 2004). Small-scale farmers have less landholding and limited inputs for agricultural production, and they face low yield risk by diverting their resources to other farm activities. These factors exacerbate household shock whenever facing catastrophic events.

My study uses customers' perceived value to highlight how farmers view the crop insurance contract against potential losses at the farm. WII is viewed in terms of farmers' value by holding the contract to the end. Some of the key features of WII are the transparency of the insurance product, its low operational cost, and its ability to allow farmers to access credit (Hill, Hoddinott, & Kumar, 2013

2.3 Empirical Review

Globally, crop and livestock insurance has a long history. It started in Germany in the late 1700s and by the 19th century many European countries and the United States (U.S.) had adopted crop insurance, mainly against hail storms. In the U.S., the government started getting involved in the late 1930s, when federal crop insurance was created in Title V of the Agricultural Adjustment Act of 1938. Government insurance schemes were also implemented in European countries such as Portugal, Spain, and the former Soviet Union. In the 1950s, agricultural insurance schemes were set up in many developing countries. For example, between 1950 and 1980, several public sector MPCI schemes were established in Latin America (Brazil, Costa Rica, and Mexico) and Asia

(India and the Philippines), which were linked to seasonal production credit programs for smallholder farmers.

The main justification for the government-funded agricultural insurance schemes was the market failure caused by, among others: (i) a lack of sufficient insurance market infrastructure, which limited the supply of suitable insurance products for farmers; (ii) a low risk awareness and lack of insurance culture amongst farmers, which led to low uptake rates of agricultural insurance; (iii) a low understanding of insurance amongst farmers, which potentially led to mis-selling of insurance products; (iv) asymmetric information between farmers and insurers, which on the one hand leads to a reluctance from farmers to buy insurance, and on the other hand to high premiums due to the insurers' fear of moral hazard and adverse selection; (v) flaws in the design of post-disaster relief, which led to crowding out of private insurance if farmers relied too much on government relief, instead of protecting their production systems through insurance products; (vi) the possibility of catastrophic events, which threatened the financial stability of insurance companies and deterred them from entering into the agricultural insurance market; (vii) an underdeveloped reinsurance market due to regulatory impediments, small market demand, and lack of sufficient data to base premium setting; and (viii) low market development due to regulatory overlay and other government provisions. These factors remain relevant for Kenya and many other developing countries.

The Kenyan government hails agricultural insurance as one of the ways to reduce the risks inherent in the agricultural sector and reduce the exposure of farmers and other value chain actors. From the 1990s, the government reverted to promoting private agricultural insurance backed by public-private partnership arrangements. This support included promulgating insurance legislation and regulations, providing insurance premium subsidies, covering administrative costs of data collection and loss assessment, establishing public sector reinsurance facilities, and supporting agricultural insurance promotion and training of smallholder farmers. However, despite the government's efforts to implement agricultural insurance schemes, the private sector has been reluctant to fully embrace agricultural insurance due to attendant risks. Furthermore, Kenya's agricultural sector has operated with no specific policy and insurance uptake by farmers remains low. In order to successfully de-risk the sector, it is important to understand what factors contribute to the low uptake of agricultural insurance products among farmers in the country.

2.3.1 Demographic Factors and Adoption of Weather-Based Agricultural Insurance Products

Demographic factors refer to those factors that identify individuals in a population such as their age, gender, education qualifications, marital status, income, ownership, and religion, among others (Ashfaq, Hassan, Naseer, & Baig, 2008). Demographic factors such as age, income, and family size have significant associations with an individual's intention to pay for agricultural insurance as a farm risk management approach. Literacy levels are a great sign of a country's level of development. A country with high literacy rates tends to have more knowledgeable citizens who can better take advantage of the opportunities around them. Insurance products are valuable tools that can be used to mitigate risk; however, they must be useful to financially literate audiences for them to work. Financially literate customers tend to be aware of the insurance product's working mechanism and can use it to protect themselves from unexpected risks. Kenya's adult literacy rate is 81.53%, with the male literacy rate at 84.99% and the female rate at 78.19% (UNESCO, 2020).

Insurance products are complex products whose premiums are based on a relative assessment of the likelihood of an event happening. It takes a careful balancing act to ensure that both the provider (the insurance provider) and the insured (the farmer) are protected from the adverse effects that the insurance is meant to protect from (Deng, Barnett, Yu, Hoogenboom, & Garcia, 2017). The insurance provider is worried about adverse selection when it comes to choosing a household that he/she will consider when offering insurance products, as adverse selection would mean that the insurance company pools only risky households that are likely to be affected (Ortmann & Mohhamed, 2010).

Farrin, Miranda, & O'Donoghue (2016), in their report to the U.S. Department of Agriculture on farmers' risk management choices, focused on the impact of wealth, savings, and alternative approaches to farm risk management. The findings from their research were that wealth is the most significant determinant of agricultural insurance demand and uptake. Crop insurance demand was shown to be primarily driven by farmers' financial wealth rather than farmers' attitude toward risk. Interestingly, high-wealth farmers chose to self-insure rather than purchase insurance while low-income households failed to purchase crop insurance because they could not afford it. Moreover, farmers who purchased insurance sought premiums with long-term arrangements (over multiple seasons). The study used data on savings and insurance among grain farmers in the United States

from the Agricultural Resource Management Survey and the Von Neumann-Morgenstern expected utility model to determine the demand for insurance. This model assumes that farmers will choose a level of insurance coverage that maximizes the utility of their wealth. This study did not examine how other demographic factors such as gender influence risk management decisions and used only data from grain farmers.

Reporting that just 5% of farm households in India have actively insured their two major crops, rice and wheat, Biswal and Bahinipati (2022) investigated the effect of demographic and psychological factors on crop insurance adoption. Their study used a literature review strategy and found out that most of the studies examining how socio-economic, educational, and structural factors influence crop insurance adoption were guided by the expected utility theory framework and behavioural economics principles. Economic factors such as wealth and income positively affect insurance adoption, whereas credit constraints and high premiums were a hindrance to insurance adoption. In India, caste was the most significant determinant of crop insurance adoption as it influences the farmer's education, exposure to, and understanding of agricultural insurance, as well as affordability of insurance premiums over time. On the behavioural biases, the certainty effect, loss aversion, and hyperbolic discounting were associated with reduced demand for crop insurance due to the perception that, while insurance premium payments are obligatory, indemnity is not. Although this study provides important insights, the caste factor is unique to the Indian market and has little relation to the Kenyan agricultural scene.

Malawi's Maganga, Chiwaula, & Kambewa (2021), on the other hand, are of the opinion that, although several factors might influence farmers' willingness to pay (WTP) for an index insurance product, gender, the previous record of climate shocks, the terms of extension contacts, and access to remittances are the main factors influencing farmers' WTP. The study used parametric and non-parametric estimates and observed that, although male farmers are more likely to purchase crop insurance, they too have a price range past which they will not purchase insurance products. Moreover, the type of crop was also determined to significantly influence farmers' uptake decisions.

In Ghana, the analysis of Tangonyire and Akuriba (2021) revealed that gender is the most significant determinant of low insurance uptake in the region. The research adopted a cross-sectional design and used a mixed methodology in analyzing the socioeconomic factors

influencing farmers' specific adaptive strategies to climate change. The research analysis also revealed that, although most of the farmers were male, gender dynamics play a significant role in influencing the strategies women adapted to confront climate change. The study also observed that many of the farmers also lack access to land and financial instruments and this influences their ability to acquire fertile land. This study specified the strategies adopted to climate change while my study focused on the adoption of weather-based agricultural insurance.

Ortmann and Mohhamed (2010), in their study of the factors influencing insurance adoption by 74 commercial dairy farmers in Eritrea, found education key to informing farmers of the functionality and benefits of insurance products. The farmers who had some education reported significant improvement in household living standards due to their knowledge of the mitigation of risk using insurance products. Their study points out the need to have insurance products targeted to farmers who have some level of education that would allow them to understand how the products work.

Echchabi and Ayinde (2012) studied the belief and adoption of Islamic insurance in Malaysia involving 200 random Malaysian customers. The study was interested in finding out the willingness as well as customers' behaviour that influence their adoption of insurance products. The findings indicated that Malaysian customers were willing to adopt insurance products; however, their level of willingness depended on product compatibility and their awareness. Awareness of products is enhanced through educating farmers on the features of the products.

Varadan and Kumar (2012) also studied the impact of crop insurance on rice farming in Tamil Nadu, India, involving 180 farmers spread over 44 villages. The study found access to credit, education, and off-farm income as some of the factors that significantly affected crop insurance adoption. Farmers who were educated were more informed about the insurance agencies and the features of the insurance products. The farmers should understand the terminologies used in the insurance industry for them to comprehend their working mechanisms.

2.3.2 Household Income and Adoption of Weather-Based Agricultural Insurance Products

In India, Swain and Hembram (2020) sought the factors determining the adoption of agricultural insurance products with a specific focus on an area-based crop yield insurance scheme introduced in 2016. The study used a field survey of a drought-prone area and used data from farmers who had access to loans provided in the scheme and non-users. Probit regressions were used in classification of the factors and the analysis revealed that income plays a key role in determining

the choice of insurance scheme. Farmers from higher castes who owned their own land and had larger household income and indebtedness as well as risk-averse farmers were more willing to adopt the insurance scheme. However, inefficient loss assessment units, complicated after-service, and delay in compensation payment were sources of dissatisfaction among the farmers.

While Swain and Hembram (2020) used probit regressions, Akter et al. (2016) used a multinomial logit model in analysis of the factors affecting farmers' willingness to adopt crop insurance in Bangladesh. The study specified farmers from flood-prone regions and findings from the analysis were that loan size, age, distance from rivers, farming experience, type of crop, and farmers' risk attitude all significantly influence willingness to pay for crop insurance. The researchers called for the provision of loan facilities and increased awareness of the benefits of crop insurance.

Isaboke (2021) used Cragg's double hurdle model in analyzing the factors that influence farmers' participation in weather index insurance in Embu County, Kenya. The study specified maize and wheat farmers from different locations and, based on the analysis, the size of the household, the size of land, the house head's perception of insurance products' value, and access to insurance information through digital channels have significant impacts on farmers' participation in WII. Ownership of mobile phones and affordability of insurance premiums were all determined to have positive influences while larger households that are far from registered agro-veterinary products' outlets were less likely to purchase WII.

Ma, Baker, & Smith (2021) studied how income inequality influenced personal decisions on disaster preparedness among users of homeowners' insurance products. The study involved 265,807 households recorded in the government's federal emergency management agency in Puerto Rico. It used secondary data that had been recorded in the government database. The study adopted the Gini coefficient as a measure of income inequality among the households, and the findings showed that households that had significantly more income were more likely to adopt the use of housing insurance. The study also pointed out the extent to which households that had low income needed support in the form of subsidies to afford housing insurance. Although the findings were relevant to the adoption of housing insurance, the household characteristics could be checked against my study to understand the dynamics that farmers face in the adoption of crop insurance.

A study by Sadati et al. (2010) on the effective factors of adoption of crop insurance among farmers in Behbahan County in Iran involved 150 farmers selected using the Cochran formula. The study's findings showed that income from agriculture and satisfaction with the insurance product were among the factors that positively influenced the adoption of agricultural insurance among farmers. Although the use of this insurance had been going on for a while in Iran, it is still relatively new to Kenya and an understanding of the influence of income would be key to adoption. The study would be mapped well in the Kenyan context, considering that it also involved small-scale farmers.

A study by Sanogo and Yaya (2020) covered wealth status, health insurance, and maternal healthcare use in Gabon. That study explored the association between wealth and the use of compulsory health insurance in maternal healthcare. The study subjects involved 8,422 at their reproductive age and grouped them into women who had health coverage vis-à-vis those who did not. The findings revealed that, following the wealth index, maternal health use was higher among women from wealthier households than for those who hailed from a household with a lower wealth index. Although that study was interested in reviewing the impact of household wealth on maternal healthcare insurance adoption, my study focuses on crop insurance, while examining the impact of household wealth on crop insurance adoption.

2.3.3 Household Perception and Adoption of Weather-Based Agricultural Insurance Products

Senapati (2020) focused on farmers living in coastal and rainfed areas prone to risky weather in an assessment into the factors that determine farmers' intention to purchase market-based agricultural insurance products in India. The study's hypothesis was that paying for crop insurance would produce less risk-averse behaviour and improve the efficiency of resource use on the farm. The research used a probit model with the goal of verifying how farmers' risk perceptions influence insurance purchase decisions. Observations were that risk aversion has indirect but significant impacts on farmers' willingness to purchase insurance products while the terms of the insurance and insurance history have direct impacts on future crop insurance choice decisions.

In Zambia, Kaunda and Chowa (2023) used probit regression models in assessing the determinants of weather index insurance uptake among smallholder farmers. The study adopted quantitative methods in analysis and observed that awareness of existing WII and its importance, farmers' age, and availability of alternative sources of income have significant impacts on farmers' behaviour.

Only knowledge of WII had a positive impact, however, as other factors such as the farmers' gender, level of education, access to WII extension services, price function, and distance to the insurance service provider had insignificant effects. This study was unique to farmers in Kasama District and their level of knowledge on WII may not be reflective of the Kenyan agricultural scene.

A different study conducted by Lawal and Ajayi (2014) sought to examine farmers' beliefs and awareness of agricultural insurance in Oyoo State in Nigeria. The study sought information from 160 crop and livestock farmers selected from the state using a two-stage sampling method. The findings showed that farmers had shallow awareness of the working of the insurance product; therefore, very few of them insured their farms. Among the major obstacles identified were a low level of awareness, a lack of adequate awareness, and a communication gap among the stakeholders that influenced their awareness. That study recommended the use of agricultural insurance agencies for awareness creation (Lawal & Ajayi, 2014).

Otieno (2013) studied the adoption of index-based crop insurance among wheat farmers in Narok, Kenya. Data from 174 participants were collected using a methodology that included focus groups, questionnaires, and personal interviews from different regions within the county. This study evaluated current household livelihood and risk management strategies and farmer interest in WII. The findings showed that, despite recurrent tragedies and awareness of WII, farmers preferred alternative risk mitigation strategies. Moreover, increasing access to formal financial services made no difference, which led to the conclusion that, generally, the farmers have a negative perception of modern risk management products. The current study expounded on these findings through analysis of farmers who deal with cash as well as food crops.

Noor Khan and Hasan (2022) also sought the drivers of crop insurance uptake in Bangladesh but used an exploratory design that relied on logistic regression models in analysis. Findings were that, while education, previous exposure to risk and perceptions of the risk factor, extension education, awareness of crop insurance, and monthly income all predict intention to pay for crop insurance uptake, older farmers in cooperative societies and with access to alternative risk management strategies showed little willingness to pay for crop insurance. Moreover, previous risk experience, monthly income, and education and experience had the most significant effects on adoption intention.

These findings were also reported in China, where Zhiming (2020) used a fuzzy-set qualitative comparative analysis to examine the factors that influence farmers' willingness to pay for low-temperature index-based mandarin orange insurance. The study specifically sought out mandarin orange farmers' socio-demographic characteristics, government subsidies, household expectation, the design of the insurance product, the price–performance ratio, and after-sales services and how these impact farmers' willingness to purchase insurance. The conclusions were that low insurance uptake was due to the high cost of the insurance premium relative to payout, low indemnity, high cost of planting mandarin orange, limited government support through subsidy, and high degree of distrust between the insurance company and farmers. This study is unique to the Chinese mandarin insurance package offered in Nangfeng County, China, and can be used only to advance findings on farmers of specific crops.

Wang et al. (2022) used interviews in analyzing the factors that influence Cambodian farmers' willingness to pay for WII. The study looked at data from rice farmers and examined the farmers' climate change perceptions and experience, risk attitudes, and awareness of WII and relied on binary logistic models in analysis. Findings were that, generally, farmers have limited knowledge on how to use innovative financial products to address the weather challenges presented by climate change. However, while married farmers who are landowners and employed a number of off-farm laborers were more likely to pay for WII, large households were less likely to pay for WII insurance. This study examined a specific insurance scheme offered to Cambodian rice farmers; hence, its focus on the amount they are willing to pay for WII. My study does not address a specific insurance scheme.

Ghana's Ankrah et al. (2021) also observed that low awareness of available agricultural insurance products was the most significant factor impeding the adoption of the insurance products. The research employed a mixed-methods approach and a cross-sectional survey design. The study findings revealed that, despite most of the farmers considering the insurance products to be an effective tool to deal with agricultural risks, the farmers' inability to comprehend such instruments has been the main factor contributing to the products' low adoption. The farmers could not discern between the insurance products, decide on fair prices, and develop trust in the products' terms. The study concluded that bridging this information gap would change the farmers' perceptions of WII and encourage more farmers to purchase the products.

2.3.4 Household Expectation and Adoption of Weather-Based Agricultural Insurance Products

Stoeffler, Carter, Guirkinger, & Gelade (2021) conducted a study examining the spillover impact that index insurance had on agricultural investment by a group of cotton farmers in Burkina Faso. The study was based on a randomized evaluation design. It involved a group of 1,200 farmers who took part in randomized control trials. The study found that there was no impact on cotton farming by the index insurance. The study, however, also pointed out a significant effect of the insurance payout on the farmers who were hit by a shock and used the insurance as a risk-management tool. It functioned as a means through which they were able to save their household wealth. The essence of adopting insurance products is to minimize the impact on household wealth.

Bulte, Cecchi, Lensink, Marr, & Asseldonk (2020) studied whether bundling crop insurance with certified seeds impacted crowd-in investment in Kenya among smallholder farmers. Their study used randomization on a group of 780 farmers. The study analysis revealed that farmers increased their interest in the bundled crop insurance as it increased the expected returns from their farming ventures and ensured that household living standards were not affected. The households that opted to adopt hybrid seeds were protected from an adverse effect on their household wealth whenever a catastrophic weather event occurred. Confirming that the agricultural sector's productivity is dependent on natural resources and farmers' vulnerability to weather risks, (Aulia, Sukati, & Sulaiman, 2016) looked into the factors determining farmers' willingness to pay a high premium for different types of agricultural insurance in Mongolia.

Sibiko, Veettil & Qaim (2018) reported low confidence in insurance products as one of the main factors impacting uptake of insurance products in Kenya. The study was on the factors influencing choice of WII among smallholder farmers and captured data on farmers' risk preferences, past experiences with weather shocks, and attitudes toward the existing WII contracts. The analysis revealed that the farmers' expectations on the amount of insurance premium rate charged by the insurance provider and the payout period varied significantly from their expectations. In particular, risk-averse farmers, the very targets of the insurance products, were reported to have low preference for WII contracts. The study averred that designing and offering contracts to groups,

rather than individual farmers, would improve uptake. This study used choice-experimental data, which might be subject to hypothetical bias.

A study by Coble, Knight, Pope, & Williams (1996) on modeling farm-level crop insurance demand using panel data was conducted among wheat farmers in Kansas (USA) to decide the multi-peril crop insurance demand. Data were obtained on 354 farms that had continuously participated in the program from 1977 to 1990. The study found that households were willing to consider multi-peril crop insurance if the difference between their farm revenue and their production cost was guaranteed to be positive and would positively affect their wealth. Those farmers who had planted their wheat without considering an insurance option found a significant effect on their household wealth every time losses were reported. Although that study was interested in reviewing the impact of insurance on household wealth for those that practiced wheat farming in Kansas, my study is interested in reviewing the household factors that would affect the adoption of the insurance product.

Low adoption was also reported in Bangladesh where Islam et al. (2021) investigated the factors affecting farmers' willingness to adopt crop insurance in disaster risk management across three districts. The study used a multinomial logit model in analysis of data from rice farmers in highly agricultural areas that experience a high number of natural disasters. The findings from this research were that age, loan size, distance from the major river, farming experience, farming type, and risk attitude all influence farmers' willingness to pay for crop insurance. The study asserts that older farmers who faced previous risks with little financial help and those far away from the river were more unwilling to pay for the particular insurance products. Land ownership status, education, access to information, and off-farm income availability had insignificant effects on farmers' willingness to purchase rice insurance products.

Arshad, Amjath-Babu, Kächele, & Müller (2016) also determined that farmers' understanding of crop insurance has a significant impact on a household's intention to use insurance as a risk mitigation tool. The study used data from Pakistani farmers who are regularly exposed to extreme weather events and employed a double-bounded dichotomous contingent valuation method. Results were that, since the farmers are critically aware of the climate risks, their understanding of the value offered by insurance and the affordability of the insurance products were the main determinants of the likelihood to purchase WII. The study was based on a hypothetical crop insurance program while my study specified existing insurance products.

In another Ghanaian study, Adzawla, Kudadze, Mohammed, & Ibrahim (2019) looked at the association between farmers' perceptions on climate change and their willingness to insure their farms using double hurdle and ordered probit regressions. The study used multistage sampling in selecting study respondents and, after data analysis, it was revealed that the farmers' education level and membership in farmer groups had positive impacts on their intention to insure their farms, while the existence of remitters, income diversification, and climate risk perception all positively impacted farmers' willingness to pay for agricultural insurance products. This study specified the farmers' perceptions while my study includes factors beyond the control of farmers such as their age.

2.3.5 Crop Insurance Regulation and Adoption of Weather-Based Agricultural Insurance Products

Carter, De Janvry, Sadoulet, & Sarris (2014) propose that, despite the many promises offered by index insurance programs, the gap between the high promise and low uptake remains large and they suggest opportunities to scale up product uptake. In a review of previous literature, the researchers suggested that the farmer's decision to pay for index insurance is highly dependent on stochastic income, expected value, and ability to afford constant payments over time. The researchers added that low uptake is due to the low correlation between yield losses and payouts due to basis risk arising from poorly designed contracts. The study affirmed that recent experiences influence both intent to purchase and pay for weather index insurance in that recent losses increase the intent to insure the farm while recent experience with insurance payouts influences willingness to resume payments. The conclusion was that policy development is necessary to encourage the development of technology and contractual and institutional innovations, and to enable insurers to recognize index insurance as a formal risk to propose risk layering and the intervention of the state through certification of insurance standards and provision of subsidies.

Nshakira-Rukundo, Kamau, & Baumüller (2021) also carried out a literature synthesis on the reason for low uptake of agricultural insurance among African farmers in research that sought to inform on how to improve product acceptance. The review averred that insurance uptake remains low due to a host of factors that can be grouped into the product's quality, design and affordability, awareness of the product's value, behavioural and sociocultural factors, and government intervention. The study revealed that most of these challenges can be addressed through proper

government involvement in the provision of demand and supply subsidies as well as the design of policies and laws guiding insurance principles and insurance product design and quality. Moreover, the researchers showed how governments can also stabilize prices to ensure that premiums remain affordable and attractive to insurance providers.

Baimisheva, Kurmaeva, Gaziyanova, Baimeshev, & Aiesheva (2019) are also of the opinion that the government has a significant role to play in promoting insurance products. The researchers based their findings on the Russian economy. The study focused on the government's policy and used an abstract-logical method and situational and system analysis with professional insight being used to model suggestions for improvement. The researchers reported significant policy gaps emerging from different starting periods for the insurance: crop insurance started in 1993, animal insurance in 2013, and aquaculture insurance in 2019. Poor legislative developments, lack of financial loans affiliated with insurance premiums, underdeveloped weather assessment stations impeding information access, and limited awareness of index insurance products were problems. The research associated poorly developed policies with increased distrust of the insurance system by both insurance providers and farmers. The study calls for additional incentives, policies directing insurance product development and claims processes to expand the line of insurance products offered and streamline claim settlement, development of small business insurance, and promotion of insurance as a risk management tool.

Gao, Shu, Cao, Zhou, & Shi (2021) looked into the influence of China's agricultural insurance subsidy policy on farmers' intent to use insurance as a risk mitigation strategy. The research used the time-varying difference-in-difference (DID) method to ascertain the effect of the policy. The analysis revealed a positive association between the policy and farmers' income. However, the policy failed to improve the uptake of innovative agricultural products and had heterogeneous effects in different regions. Areas with high straw yields were determined to be more receptive to policy influences. Reasons were that the policies do not highlight the importance of farm product insurance and the researchers called on the government to expand the scope of the program to include yield and subsidies for insurance premiums.

2.4 Research Gaps

The reviewed literature has presented an explicit background on the household factors influencing

the adoption and effectiveness of crop insurance products. However, there are noticed biases about the adoption and effectiveness of crop insurance in Kenya. Past studies pointed out crop insurance penetration among developed nations instead of developing nations, particularly Kenya. Despite the importance of insurance in protecting households from adverse weather shocks and erosion of household wealth, penetration is still incredibly low in Kenya. Other countries in sub-Saharan Africa are gradually embracing it as a tool for risk mitigation and poverty eradication. The studies reviewed presented contextual gaps (Gao, Shu, Cao, Zhou, & Shi, 2021), methodological gaps (Nshakira-Rukundo, Kamau, & Baumüller, 2021), and conceptual gaps (Echchabi & Ayinde, 2012). Gao et al. (2021) investigated China, Nshakira et al. (2021) used a literature synthesis, while Echchabi and Ayinde (2012) covered insurance uptake in Islamic states and focused on the poverty variable.

Although the government has been a key driver of policies that put the infrastructure in place to allow for wider penetration in the country, the literature is scant on the government's help in creating awareness and an enabling environment for penetration. There has been some successful use of crop insurance in several regions of Kenya, especially among commercial farmers. Small-scale farmers are the worst affected after catastrophic events, and their losses end up affecting other areas of their lives. Within one bad crop cycle, these families can easily be trapped in poverty affecting the household living standards. Therefore, my study sought to understand what household socio-economic factors influence small-scale farmers' weather-based index insurance adoption.

2.5 Conceptual Framework

This section presents a conceptual framework for connecting the variables that will be used in the study. It presents a diagrammatic relationship between the dependent and independent variables used. These variables have been identified based on the synthesis of the literature (Figure 2.2).

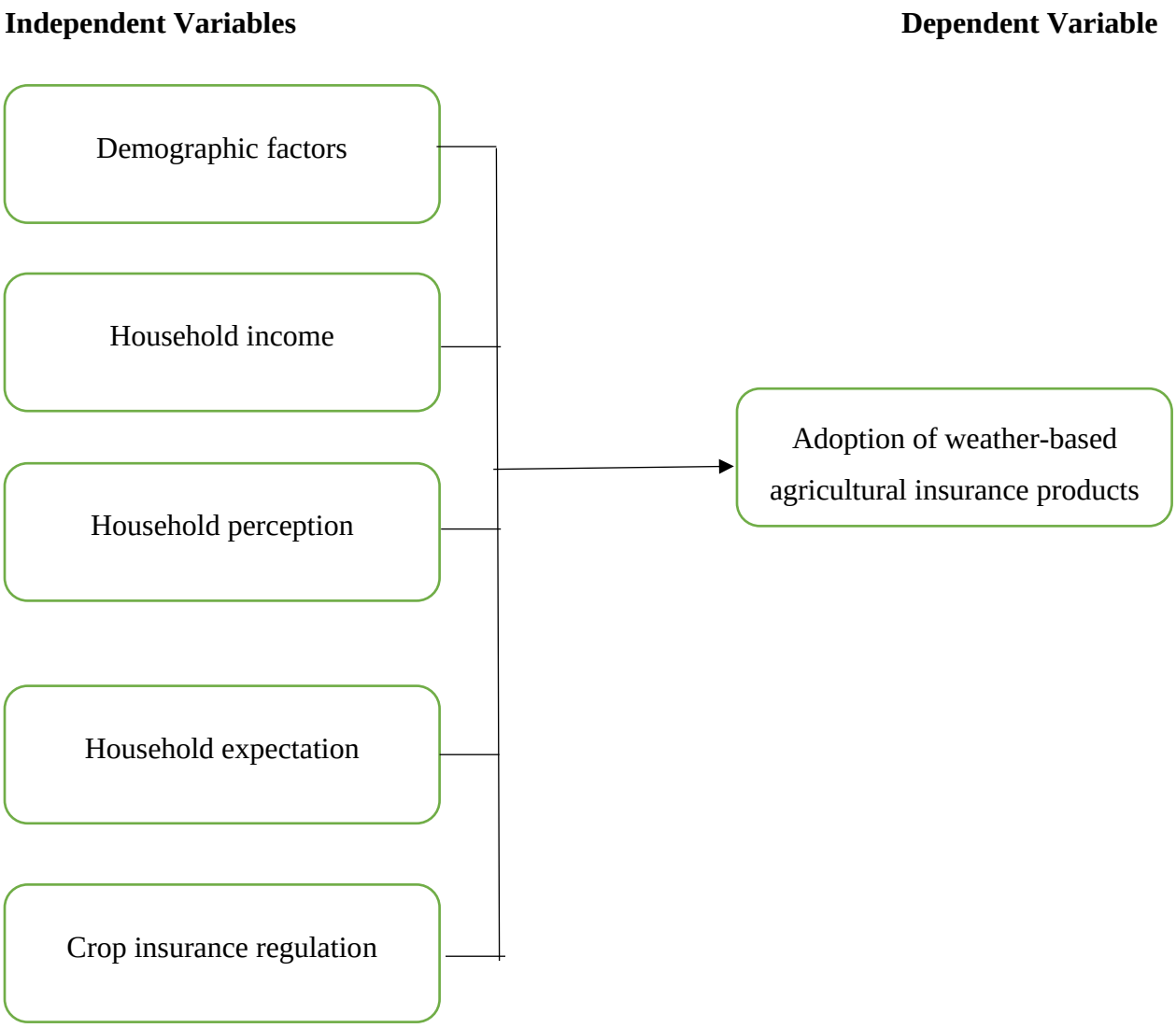

Figure 2.2 Conceptual Framework

Operationalization refers to how the variables used in the study are going to be measured and the units used to measure them. The various variables have been operationalized as shown in Table 2.1 below.

Table 2.1 Operationalization of Study Variables

Variable	Indicators	Measurement	Analysis
Demographic factors	• Age	Continuous variable	Descriptive,
	• Gender	Binary variable	correlation, and
	• Education	Continuous variable	probit regression
Household income	• Size of land	Continuous variable	Descriptive,
	• Monthly income	Continuous variable	correlation, and
	• Household size	Continuous variable	probit regression
Household perception	• Awareness of risk • Education on insurance products • Awareness of premium charges	5-point Likert scale (ordinal variable)	Descriptive, correlation, and probit regression
Household expectation	• Value for money • Improved standard of living • Protection of income	5-point Likert scale (ordinal variable)	Descriptive, correlation, and probit regression
Crop insurance regulation	• Simplicity of product • Claims process • Standardize competition	5-point Likert scale (ordinal variable)	Descriptive, correlation, and probit regression
Adoption of WBAI	• Rate of adoption	Binary (yes/no)	Descriptive, correlation, and probit regression

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

The third chapter of the survey presented the methodology that will be applied in the course of undertaking this research. The focus was on the research philosophy used, the research design, the population of interest, and the sampling design. The data collection instruments, the research procedures, and the data analysis and presentation as well as the ethical considerations are covered.

3.2 Research Philosophy

The positivism philosophy is similar to the development and nature of knowledge that has key assumptions on the way in which the world is viewed by researchers. It's stated that that positivists' objective is to test a theory or description through observation in order to predict and control forces that surround us (Saunders, Lewis, & Thornhill, 2009). Hence this approach was adopted in the current study to deduce the level of interaction between the socio-economic factors and the adoption of weather-based insurance products. Further, the philosophy allows for the use of various quantitative techniques in testing how variables are related to each other.

3.3 Research Design

A research design could be perceived as the general plan to answer research questions and outline the objectives, data sources and data collection tools, expected constraints, and ethical considerations (Saunders, Lewis, & Thornhill, 2009). My study adopted a descriptor-explanatory research design with cross-sectional data. Descriptive studies pursued came up with an accurate assessment of events or situations, while explanatory studies found a step further to evaluate and combined the data using statistical tests to try to establish causal relationships among the variables (Saunders, Lewis, & Thornhill, 2009).

A descriptor-explanatory research design was preferred because I used it to obtain information about the status and to describe the existing situation concerning the variables in a situation, allowing a quantitative description of trends and an examination of the variables over time since this would be a cross-sectional study. Cross-sectional studies use data with observations made across time and enable researchers to study any changes and developments in variables (Saunders,

Lewis, & Thornhill, 2009). My study considered the cross-sectional data on the various households.

3.4 Target Population

Target population is a group of individuals, objects, or items from which samples are drawn for measurement. It refers to an entire group of persons or elements with at least one thing in common and the larger group from which the sample is taken (Saunders, Lewis, & Thornhill, 2009). The population of interest for this research was 650 wheat farmers drawn from Narok County. This group was selected as it was ideal in the investigation on the link between the socio-economic factors and the rate of adoption of weather-based insurance products.

3.5 Sampling Design and Sample Size

This study employed a multi-stage sampling method to determine its sample size. The area of study was chosen using purposive sampling due to its concentration of small-scale farmers. The regions for the study were later selected using simple random sampling and, finally, the farmers were selected using random sampling to fill out the questionnaires. Further, purposive sampling was used to select the wheat-growing region whose farming population was considered among the 650. The study employed a binomial formula for small samples (1967) to determine the study's sample size. The sample size was determined to be the following:

$$\frac{NZ_{2*}P*q}{E2(N-1)+Z_2\ (P*q)}$$

where

N = Population of wheat farmers in

The sample was therefore calculated as

$$2 * 650*1.962 *0.5*0.5$$

$$E2\ (N-1) + 2\ (P*q)$$

The sample size is given as = 241.68, which is approximately 242 wheat farmers. To ensure that there was an adequate and reliable estimate from the sample as well as ease of access to the farmers and to minimize errors in the model, the sample size was adjusted to 300 farmers.

3.6 Data Collection Instruments

The survey relied on primary research data that were collected directly from the farmers. The research constructed a structured questionnaire to aid in the data collection process. The questionnaire collected various demographic data from the farmers, socio-economic perceptions, and the adoption rate of weather-based insurance products. The households provided information on the socio-economic conditions at the household level as well as the likelihood of adopting insurance. The variables were grouped by categories that would allow farmers to make their respective choices.

3.7 Data Collection Procedures

The process of data collection entails all the steps that the research adopts in the course of conducting the field work. The data collection instrument was availed to the participants who were given a minimum of a week to provide their responses prior to picking of the questionnaires. The research also ensured that all necessary approvals were obtained before conducting the field work to ensure compliance with the institutional requirements. The research tool was pretested among a pool of 30 farmers (10%) to ascertain the reliability of the study instrument and validity. Reliability of research shows the extent to which the techniques of data collection and procedures employed in analyzing the data result in consistent findings (Saunders, Lewis, & Thornhill, 2009). The validity of the research refers to the extent to which the research gives a true representation of what it is supposed to measure.

3.8 Data Analysis and Presentation

The research employed Stata version 15 and SPSS 25 to conduct data analysis. Descriptive data were presented in the form of percentages, mean, standard deviation, and frequency. The relationship between variables or the interdependence of the variables was analyzed using probit regression model. The research presented the data analysis findings using graphs, bar charts, and pie charts. The regression equation considered for my study is as shown below and it can be modelled as follows:

$$Y = \beta_0 + \beta_1 DF + \beta_2 HI + \beta_3 HP + \beta_4 HE + \beta_5 CIR + \varepsilon \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where

Y represents the rate of adoption of weather-based insurance products (binary variable)

DF is the demographic factors

HI is the level of household income

HP is the degree of household perception on weather-based insurance products

HE is the degree of household expectation on weather-based insurance products

CIR is the level of crop insurance regulation

ε represents the error term in the regression model

$\beta_0 - \beta_5$ represents the beta coefficients for the selected variables and the constant of the model

3.9 Ethical Considerations

When conducting my research, ethics were ensured so that the respondents did not have to worry about the use of their information. Free, prior, and informed consent (FPIC) was employed when distributing the questionnaire, with full disclosure to the respondents. The researcher sought consent from the school's ethical review board and obtained an introduction letter for this research before approaching the NACOSTI for permission to conduct the fieldwork. During the data collection exercise, the respondents were allowed to maintain confidentiality, anonymity, and a right to skip questions if they believed the questions might intrude. The findings from the study will be used solely for academic purposes.

CHAPTER FOUR

PRESENTATION OF RESEARCH FINDINGS

4.1 Introduction

The fourth chapter presents the results emanating from the analysis of the collected research data. This section presents both the descriptive and inferential analysis. The chapter is divided into various sections based on the research instrument.

4.2 Background Information

The research was interested in collecting survey data from 300 farmers out of the target population of 650 wheat farmers within Narok Country. The questionnaires were presented directly to the farmers and, due to the ease of accessibility, the survey was able to obtain responses from the selected sample. This was deemed adequate and suitable for conducting the quantitative analysis on the interaction between selected socio-economic factors and the adoption of weather-based agricultural insurance products.

4.2.1 Demographic Analysis

The study was interested in the demographic analysis of the participants included in the survey and the main queries were on their gender, education, and age. The findings are shown in Table 4.1 below.

Table 4.1 Demographic Information

		Frequency	**Percentage**
Head of household	Yes	161	53.7
	No	139	46.3
	Total	300	100.0
		Frequency	Percentage
Gender	Male	159	53.0
	Female	141	47.0
	Total	300	100.0

	Minimum	**Maximum**	**Mean**	**Std. Deviation**
Kindly indicate your age in years	18.00	81.00	48.7900	18.59584
	Minimum	Maximum	Mean	Std. Deviation
How many years of schooling do you have?	6.00	19.00	12.2215	3.97186

The research data indicated that a majority of the participants, 54% (n = 161), were the head of the household; hence, they would be expected to be aware of the adoption of weather-based insurance and how the socio-economic factors have contributed to the uptake. Analysis revealed that a majority, 53% (n = 159), were male farmers, with 47% accounting for female wheat farmers, which demonstrates inclusive participation in agricultural activities. On average, the study showed that the farmers were at least 48 years of age, with the youngest being 18 years of age. Analysis also revealed that the farmers have spent at least 12 years in school, with a minimum of 6 years indicating accessibility to formal education.

4.3 Household Income

The research further presented the participants with questions pertaining to their household income and size and the findings are presented in this section (Table 4.2).

Table 4.2 Household Income

	N	Minimum	Maximum	Mean	Std. Deviation
What is the size of the farm? (acres)	300	1.00	12.00	6.5367	3.50566
	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
How many members are currently part of your household?	300	.00	12.00	5.8567	3.73219
	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
What is the approximate household monthly income in KES	299	3485.00	29867.00	16843.8796	7711.91586

The results revealed that, on average, the farmers had at least 6.53 acres of land for farming, with household size averaging about six members. The findings demonstrated that the maximum income for the households was KES 29,867 monthly from farming activities, with an average of KES 16,843 per household, showing that agriculture is relied on as a source of income in the households.

4.3.1 Comparative Analysis of Income from Farming Activities

The participants were also asked for their level of income with and without agricultural-based insurance products and the comparison is presented in this section. On their perception of insurance products impacting household income, 49% (n = 149) agreed that they saw changes in their income, while 51% did not agree to this assertion. Further analysis is shown in Table 4.3 below.

Table 4.3 Analysis of Income from Farming Activities (in KES)

Without Insurance	2021	2020	2019	2018	With Insurance	2021	2020	2019	2018
Maximum	79100	69986	89285	64232		1193 07	12965 3	14918 6	19660 6
Minimum	5535	7347	5772	5613		6500	7047	15791	21074
Average	44242 .13	37887 .61	51505 .45	31495 .69		6138 7.3	60511 .12	85450. 5	10902 8.2
Sum	56187 50	48117 27	65411 92	39999 52		7796 187	76849 12	10852 214	13846 587

From the results, the study showed that, on average, in 2018 the farmers earned KES 31,495 without any insurance coverage as compared to KES 109,028 within the same period. In more recent analysis from 2021, the farmers indicated they earned on average KES 44,242 without any insurance as compared to KES 61,387. The findings demonstrate that, with an insurance product acquired, the farmers were able to earn more in their farming activities, which is an indicator that uptake of insurance policies can lead to higher income levels within the farms.

4.3.2 Overview of Farmers' Income

The research further considered accessibility to credit, financing of farm activities, and analysis of other means of income access. The summary of the results is shown in Table 4.4 below.

Table 4.4 Overview of Farmers' Income

		Frequency	Percentage
Access to bank account	Yes	167	55.7
	No	133	44.3
	Total	300	100.0
		Frequency	**Percentage**
Access to credit	Yes	130	43.3
	No	170	56.7
	Total	300	100.0
		Frequency	**Percentage**
Farming as primary source of income	Yes	134	44.7
	No	166	55.3
	Total	300	100.0
		Frequency	**Percentage**
Income from off-farm activity	Yes	141	47.0
	No	159	53.0
	Total	300	100.0
		Frequency	**Percentage**
Source of funding for farming	Personal finance	99	33.0
	Family finance	108	36.0
	Bank finance	93	31.0
	Total	300	100.0

The findings pointed out that a majority of the farmers, 56% (n = 167), had access to a bank account, showing that there was increased accessibility to formal financial services in the area. The results indicated, however, that only 43% (n = 130) were able to access credit facilities, which could imply limited credit advancement towards farming activities. The analysis further revealed that 36% (n = 93) of the farmers relied on family finance as a source of funding for farming activities, with 31% accessing bank finance and 33% relying on their personal finance. The results showed that 45% (n = 130) relied on farming as the primary source of income while 55% had other alternative sources of income, showing diversification in income-generating activities. This is

consistent with findings that revealed that 47% had other off-farm activities that generated income for the family.

A review of the accessibility to basic needs within the households as shown in Figure 4.1 revealed that 51% of the households did not have access to electricity, 53% had no access to clean and sufficient water, 51% had no access to clean sanitation, and 52% had no access to cooking fuel. This is consistent with the national housing survey on demographics, which has classified Narok as a marginalized area.

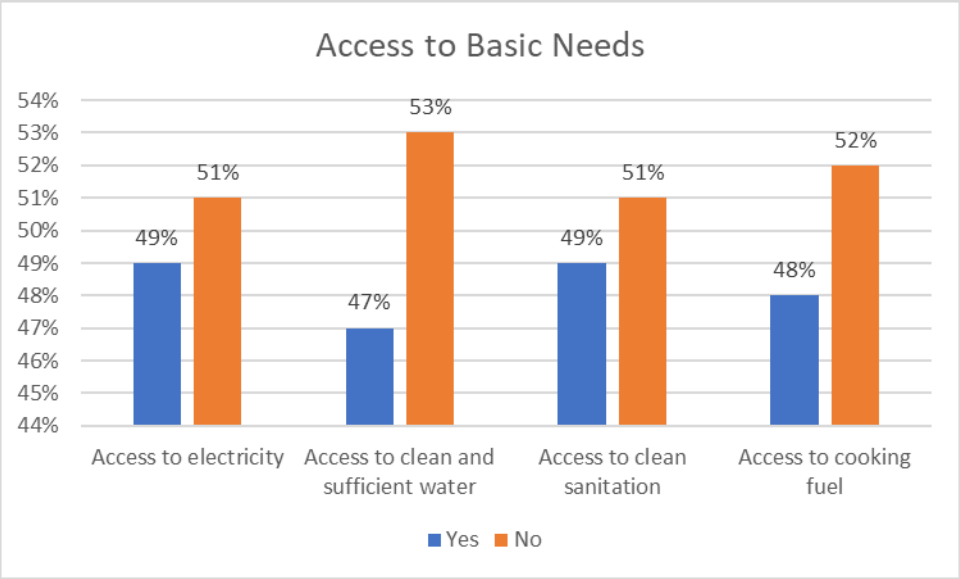

Figure 4.1 Access to Basic Needs

4.4 Descriptive Analysis

4.4.1 Household Perception of Weather-Based Agricultural Products

The third variable of the study reviewed the farmers' perception on agricultural insurance products and the findings are presented in this section. Likert scale statements were used and the results are presented in Table 4.5 below.

Table 4.5 Analysis of Household Perception of Weather-Based Agricultural Insurance Products

Household perception	N	Sum	Mean	Std. Deviation
I understand the risk covered by weather-based index insurance	300	894.00	2.9800	1.46061

The premium charged for weather index insurance is affordable	300	868.00	2.8933	1.39587
I am aware of seminars on crop insurance education	300	857.00	2.8567	1.38414
I can access the weather index insurance through a credit facility	300	885.00	2.9500	1.39307
The insurance product can protect from income loss	300	882.00	2.9400	1.41057

To some extent (mean = 2.98), the farmers indicated they understand the risk covered by weather-based index insurance. Further analysis showed to some extent that the farmers were aware the insurance product can protect from income loss (mean = 2.94, dev = 1.410). The findings also noted that to some extent the farmers can access weather index insurance through a credit facility (mean = 2.95, dev = 1.393).

4.4.2 Household Expectation of Weather-Based Agricultural Products

The third objective of the research focused on the expectation on weather-based agricultural products among farmers and the findings are shown in Table 4.6.

Table 4.6 Analysis of Household Expectation of Weather-Based Agricultural Products

Household Expectation	N	Sum	Mean	Std. Deviation
The insurance protects the household from income loss during bad weather	300	919.00	3.0633	1.37317
The insurance prevents family wealth erosion	300	957.00	3.1900	1.43321
The insurance product allows us to save money for future use	300	911.00	3.0367	1.40066
The insurance products provide value for money when purchased	300	888.00	2.9600	1.38738
The insurance products allow the family to sustain their standard of living	300	921.00	3.0700	1.45792

The analysis showed that to some extent (mean = 3.19, dev = 1.433) the farmers were aware the insurance prevents family wealth erosion. The findings revealed to some extent that the farmers noted the insurance product allows them to save money for future use (mean = 3.036). A mean of 3.07 indicated that farmers understood that the insurance products allow the family to sustain their standard of living. Further review demonstrated to some extent that the farmers were aware the

insurance protects the household from income loss during bad weather (mean = 3.063, dev = 1.373).

4.4.3 Crop Insurance Regulation

The study presented the farmers with statements concerning the degree of crop insurance regulation and the summary of the responses is as shown in Table 4.7.

Table 4.7 Analysis of Crop Insurance Regulation

Crop Insurance Regulation	N	Sum	Mean	Std. Deviation
The insurance product prices are standardized between competitors	300	918.00	3.0600	1.39866
There are sufficient mechanisms to allow for follow-up of insurance payments	300	880.00	2.9333	1.43612
The insurance products are simple to understand and use	300	947.00	3.1567	1.36810
I understand the grievance mechanism available	300	868.00	2.8933	1.39826
I buy the insurance product from a licensed broker	300	915.00	3.0500	1.41214

The respondents noted to some extent that the insurance products are simple to understand and use as shown by the mean of 3.156. The analysis pointed out that to some extent the farmers understand the grievance mechanism available (mean = 2.893). To some extent the farmers noted the insurance product prices are standardized between competitors (mean = 3.06, dev = 1.398). The farmers noted they are aware to some extent that there are sufficient mechanisms to allow for follow-up of insurance payments (mean = 2.933, dev = 1.436).

4.4.4 Adoption of Weather-Based Insurance Products

The research further focused on the rate of adoption of weather-based insurance products and the findings showed that 48% (n = 144) of the farmers have used weather index crop insurance, with 52% not using the product. This showed a net growth in adoption rates among the wheat farmers. Further analysis is provided in Table 4.8 below.

Table 4.8 Analysis of Adoption of Weather-Based Insurance Products

Adoption of Weather-Based Insurance Products	N	Sum	Mean	Std. Deviation
The insurance premiums are high	300	918.00	3.0600	1.40105
There has been adequate creation of awareness	300	887.00	2.9567	1.42415
The insurance products are simple to understand and use	300	879.00	2.9300	1.38498
The income generated from farm activities is enough to cover the insurance premium	300	873.00	2.9100	1.47733
Compensation is done on time	300	873.00	2.9100	1.47733

The participants noted to some extent that the income generated from farm activities is enough to cover the insurance premium as well as compensation is done on time as shown by the mean of 2.910 and deviation of 1.477. The results revealed to some extent that there has been adequate creation of awareness on the weather-based insurance products (mean = 2.956). Further, the farmers noted that the insurance products are simple to understand and use (mean = 2.930).

4.5 Correlation Analysis

The study adopted Pearson correlation analysis to determine the level of association between the predictor variables and the adoption of weather-based insurance products. The matrix is provided in Table 4.9 below.

Table 4.9 Correlation Matrix

			Adoption of WBAP	Household Perception	Education Level	Household Expectation	Regulation	Age	Household Size	Size of Farm	Male	Female	Income
Pearson	Adoption of WBAP	Correlation coefficient	1.000										
		Sig. (2-tailed)	.										
		N											
	Household perception	Correlation coefficient	0.027	1.000									
		Sig. (2-tailed)	0.638	.									
		N	300										
	Education level	Correlation coefficient	-0.054	0.101	1.000								
		Sig. (2-tailed)	0.346	0.080									
		N	300	300									
	Household expectation	Correlation coefficient	-0.061	-0.025	0.096	1.000							
		Sig. (2-tailed)	0.290	0.658	0.095	.							
		N	300	300	300								
	Regulation	Correlation coefficient	-0.021	-0.086	0.001	0.003	1.000						
		Sig. (2-tailed)	0.716	0.133	0.986	0.957	.						
		N	300	300	300	300							
	Age	Correlation coefficient	-0.062	0.063	0.073	0.036	0.025	1.000					
		Sig. (2-tailed)	0.282	0.275	0.207	0.525	0.663						
		N	300	300	300	300	300						

			Adoption of WBAP	Household Perception	Education Level	Household Expectation	Regulation	Age	Household Size	Size of Farm	Male	Female	Income
	Household size	Correlation coefficient	0.065	0.565	0.009	0.186	-0.075	0.041	1.000				
		Sig. (2-tailed)	0.260	0.329	0.870	0.748	0.192	0.474					
		N	300	300	300	300	300	300					
	Size of farm	Correlation coefficient	-0.056	0.018	-0.040	-0.020	-0.011	0.043	-0.079	1.000			
		Sig. (2-tailed)	0.328	0.745	0.489	0.729	0.844	0.449	0.169				
		N	300	300	300	300	300	300	300				
	Male	Correlation coefficient	-0.049	-.0340	0.057	0.088	-0.007	-0.049	-0.041	-0.002	1.000	-1.000**	
		Sig. (2-tailed)	0.395	0.557	0.324	0.126	0.894	0.389	0.472	0.9651			
		N	300	300	300	300	300	300	300	300			
	Female	Correlation coefficient	0.049	0.034	-0.057	-0.088	0.007	0.049	0.041	0.002		1.000	
		Sig. (2-tailed)	0.395	0.557	0.324	0.126	0.894	0.389	0.472	0.965			
		N	300	300	300	300	300	300	300	300	300		
	Income	Correlation coefficient	0.102	0.088	0.071	-0.042	0.034	0.056	-0.030	-0.002	-0.029		1.000
		Sig. (2-tailed)	0.076	0.126	0.222	0.465	0.553	0.330	0.604	0.966	0.617		
		N	300	300	300	300	300	300	300	300	300	300	

The results on the relation between demographic factors and the adoption of weather-based insurance products in Narok County showed an insignificant negative relation of age (r = -0.062) and male farmers (r = -0.049) as well as positive insignificant association of female farmers (r = 0.049) and negative relation between years in school (education) (r = -0.054). The analysis of the second objective on household income showed that there was an insignificant negative effect of farm size (r = -0.056) and household monthly income (r = 0.102). The third objective revealed that household perception had a positive and insignificant relation with the adoption of weather-based insurance products in Narok County (r = 0.027). Analysis further indicated that household expectation had a negative insignificant relation with the adoption of weather-based insurance products in Narok County (r = -0.061). Lastly, crop insurance regulation was found to have a negative and insignificant relation with the adoption of weather-based insurance products in Narok County (r = -0.021).

4.7 Regression Analysis

The research focused on determining the effect of socio-economic factors on the adoption of weather-based insurance products in Narok County (r = 0.027). Since the dependent variable was a binary variable, a probit regression model was adopted and the marginal effects of the variables included in the model are presented in line with the objectives of the research (Table 4.11).

Table 4.10 Summary of Probit Regression Model

Log likelihood = -201.26145	Number of obs = 297 LR $chi^2(9)$ = 8.80 Prob > chi^2 = 0.4560 Pseudo R^2 = 0.0214

The summary of the probit regression established that there was a Pseudo R^2 = 0.0214, indicating that 2.14% of the changes in the adoption of weather-based insurance products in Narok County can be predicted by the socio-economic factors. However, the likelihood ratio chi^2 = -201.261, N = 297, Prob > chi^2 = 0.4560, which was greater than the critical value of 0.05, indicating there was no statistical significance in the model adopted in predicting the adoption of weather-based insurance products (Table 4.10).

Table 4.11 Marginal Effects of Socio-Economic Factors on Adoption of Weather-Based Insurance Products

Average marginal effects					**Number of obs = 297**	
Expression: Pr(aip), predict ( )						
Variable	**dy/dx**	**std. err.**	**Z**	**P>|z|**	**[95% interval]**	**conf.**
Household income	-0.218	0.118	-1.85	0.065	-0.449	0.013
Size of the farm	0.006	0.008	0.86	0.392	-0.008	0.022
Household size	-0.007	0.007	-0.097	0.331	-0.022	0.007
Age in years	0.001	0.001	1.09	0.276	-0.001	0.004
Household perception	-0.002	0.008	-0.29	0.773	-0.020	0.014
Household expectation	0.007	0.008	0.87	0.386	-0.009	0.024
Crop insurance regulation	0.002	0.008	0.34	0.733	-0.013	0.019
Education level	0.007	0.007	1.03	0.305	-0.006	0.021
Male	0.041	0.057	0.72	0.470	-0.071	0.154
Female	0	(omitted)				

Based on the above findings, the hypotheses of the study are interpreted as follows:

H_{O1} There is no significant effect of demographic factors on the adoption of weather-based agricultural insurance products in Narok County, Kenya

The study findings led to the acceptance of the null hypothesis that there was no significant effect of demographic factors on the adoption of weather-based agricultural insurance products in Narok County, Kenya. The results showed a positive insignificant effect of age of the farmer, with a $P>|z| = 0.276 > 0.05$, gender (male) $P>|z| = 0.470 > 0.05$, and years of education of the farmer $P>|z| = 0.305 > 0.05$.

H_{O2} There is no significant effect of household income (size of land, monthly income) on the adoption of weather-based agricultural insurance products in Narok County, Kenya

The study findings led to the acceptance of the null hypothesis that there was no significant effect of household income on the adoption of weather-based agricultural insurance products in Narok County, Kenya. The marginal effects established that there was a negative insignificant effect of household income $P>|z| = -1.85 > 0.05$ and positive insignificant effect of household size $P>|z| = 0.331 > 0.05$ on the adoption of weather-based agricultural insurance products in Narok County, Kenya.

H_{O3} There is no significant effect of household perception on the adoption of weather-based agricultural insurance products in Narok County, Kenya

The regression findings led to the acceptance of the null hypothesis that there was no significant effect of household perception on the adoption of weather-based agricultural insurance products in Narok County, Kenya. The marginal effects established that there was a negative insignificant effect of household perception $P>|z| = 0.773 > 0.05$ on the adoption of weather-based agricultural insurance products in Narok County.

H_{O4} There is no significant effect of household expectation on the adoption of weather-based agricultural insurance products in Narok County, Kenya

The probit regression led to the acceptance of the null hypothesis that there was no significant effect of household expectation on the adoption of weather-based agricultural insurance products in Narok County, Kenya. The marginal effects established that there was a positive insignificant effect of household expectation $P>|z| = 0.386 > 0.05$ on the adoption of weather-based agricultural insurance products in Narok County.

H_{O5} There is no significant effect of crop insurance regulation on the adoption of weather-based agricultural insurance products in Narok County, Kenya

The study findings led to the acceptance of the null hypothesis that there was no significant effect of crop insurance regulation on the adoption of weather-based agricultural insurance products in Narok County, Kenya. The marginal effects established that there was a positive insignificant effect of crop insurance regulation $P>|z| = 0.733 > 0.05$ on the adoption of weather-based agricultural insurance products in Narok County, Kenya.

CHAPTER FIVE

DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of the study, a discussion of the study's findings, the conclusions, and recommendations that can be drawn from the findings.

5.2 Summary of the Study

Kenya has been facing a high number of natural disasters, having recorded various droughts in the last two decades. These have resulted in significant losses to farmers in terms of crop destruction and death of animals. These are consequences of climate change. To mitigate the adverse impacts of the climate uncertainty, the government avers that farmers need to adopt various coping strategies. Among these is agricultural insurance, which is supposed to help low-income farmers reduce vulnerability. However, despite policies and initiatives being implemented to encourage farmers to adopt these insurance products, uptake remains low. A better understanding of the factors that drive farmers towards purchasing insurance products will help financial institutions, government organizations, policymakers, and all other stakeholders to find solutions to the low uptake of crop insurance.

This study proposed to assess the socio-economic factors influencing the adoption of weather-based agricultural insurance products in Narok County, Kenya. The following objectives guided the research: to establish the effect of demographic factors (household income, household perception, household expectation, and crop insurance regulation) on the adoption of weather-based agricultural insurance products in Narok County, Kenya. The study adopted a descriptor-explanatory research design that used cross-sectional data obtained from 300 wheat farmers drawn from Narok County. Structured questionnaires were adopted in the data collection and descriptive and inferential methods were used in the analysis.

Analysis of the farmers' demographic factors revealed that a majority of the farmers are males, are the heads of their households, and averaged 48 years of age. The analysis revealed that most of the farmers come from large families, averaging six members. The farmers affirmed that they have received more than 12 years of education, and farm on at least 6.53 acres of land. While the average monthly income was KES 30,000, most of the farmers relied on agriculture as the main income-generating activity. However, despite this low income, there was no indication that these farmers felt a significant pinch after purchasing insurance products since 51% indicated that purchasing

insurance products does not significantly dent their income. Moreover, the analysis revealed a positive effect of insurance purchasing on agricultural productivity.

On further analysis, the study determined that a majority of the farmers have access to a bank account and were able to access credit facilities. Despite this, the majority of funding for farming activities was obtained from family finance. Few farmers used bank loans and even fewer farmers personally financed farming activities. Materially, the analysis demonstrated that most of the farmers lack access to electricity, clean and sufficient water, clean sanitation, and cooking fuel, an indication that these farmers have low-income lifestyles and lack some of the basic necessities.

5.3 Discussion of Findings

5.3.1 Demographic factors in the adoption of weather-based agricultural insurance products

The first objective looked into the effects of demographic factors on farmers and the results showed an insignificant negative relation between age and gender in the adoption of agricultural insurance. These findings differed from findings in the United States, where Farrin, Miranda, & O'Donoghue (2016) reported that age as a ddemographic variable has a significant impact on the adoption of agricultural insurance. Islam et al. (2021) also reported a significant association between age and farmers' willingness to adopt crop insurance in Bangladesh. Akter et al. (2016) also concluded that age influences previous experiences, which inform future decisions, and, according to Kaunda and Chowa (2023), older farmers in Zambia with alternative sources of income are more likely to purchase index insurance than younger farmers due to their knowledge of the products and understanding of the potential benefits of insurance. Coble et al. (1997) argue that crop insurance adoption affects household wealth in a positive way. Nonetheless, I found that farmers regard the purchase of insurance as a loss of wealth.

It was also ascertained that female farmers are more likely to purchase insurance products, a finding that disputes evidence from Malawi's Maganga, Chiwaula, and Kambewa (2021), whose analysis revealed that men are more likely to purchase insurance products. It also contests Tangonyire and Akuriba (2021), who were of the opinion that, in Ghana, gender dynamics are the most significant determinants of low insurance uptake as women were excluded from formal decision-making on and knowledge and understanding of financial instruments. However, these findings seem to agree with those of Kaunda and Chowa (2023), who asecrtained that farmers' gender and education attainment level had insignificant effects on their willingness to adopt insurance products in Zambia. On the other hand, the evidence that larger households are unlikely to purchase index-

based insurance is in line with that of Wang et al. (2022), who ascertained that households with large families are less likely to participate in the purchase of crop insurance.

Regarding the farmers' education level and its effect on adoption intention, although the research ascertains that the number of years in school has no significant predictive power on adoption intentions. Ortmann and Mohhamed (2010) found education to be a key factor influencing adoption decisions as it helps inform farmers of the functionality and benefits of insurance products. Varadan and Kumar (2012) also suggested that farmers with higher educational qualifications were more informed about insurance agencies and the features of insurance products. The researchers affirmed that insurance uptake requires farmers to properly understand and be able to interpret the terminologies used in insurance contracts and the mechanisms and principles behind insurance product offerings. Moreover, in India, the caste system was reported to be a major hindrance to the effective adoption of agricultural insurance products as it leaves a lot of the farmers uninformed and ignorant of available policies and projects that shield against loss (Swain & Hembram, 2020).

5.3.2 Household Income in the Adoption of Weather-Based Agricultural Insurance Products

The analysis of the second objective on household income showed that there was an insignificant negative effect of household income on farmers' intention to adopt agricultural insurance products. These findings are in contrast to those made in India by Swain and Hembram (2020), who found a significant link between farmers' income and willingness to purchase insurance products, affirming that higher income makes the farmers more risk-averse. Similarly, Ma, Baker, & Smith (2021) also confirmed that, in Puerto Rico, households with diversified sources of income are more likely to purchase agricultural insurance. Kaunda and Chowa (2023) also confirmed that the availability of alternative sources of income has a significant impact on farmers' insurance purchase behaviour. However, according to Sadati et al. (2010), income from agriculture is an adequate motivator for insurance purchases provided the insurance product satisfies the farmer's expectations.

The analysis also found no significant association between land ownership and adoption of weather-based agricultural insurance products. This is in agreement with Islam et al. (2021), whose analysis determined that there exists an insignificant effect of land ownership status, education, access to information, and off-farm income availability on farmers' willingness to purchase rice insurance products. These findings are in contrast to expectations of prospect theory and evidence from researchers such as Wang et al. (2022), who observed a significant association between married landowner farmers and the likelihood of insurance purchase. Moreover, Isaboke (2021)

found a significant association between the size of the land under farming and farmers' intention to purchase insurance products. Swain and Hembram (2020) and Tangonyire and Akuriba (2021) also ascertained that the culture and gender norms that influence resource ownership determine land ownership factors and, in addition, women's intention and ability to purchase insurance products.

5.3.3 Household Perception in the Adoption of Weather-Based Agricultural Insurance Products

The third objective was on the effect of farmers' perceptions of insurance products on adoption intention and the findings revealed that household perception has insignificant effects on the adoption of weather-based insurance products in Narok County, implying that farmers' awareness of weather risks, education on insurance products, and awareness of premium charges have minimal influences on their intention to purchase index-based insurance products. This finding is contradictory to the assertations in customer perceived value theory, which suggests that a consumer's pre-purchase perception significantly influences purchase behavior. It further contradicts empirical evidence from Senapati (2020), who avers that awareness of risks induces risk aversion behaviour, which had significant impacts on farmers' willingness to purchase insurance products. Moreover, according to Kaunda and Chowa (2023), while other socio-economic factors have insignificant effects on insurance uptake, knowledge of insurance risks and potential remedies has the most signifiant association with intention to purchase agricultural insurance.

The findings demonstrated that household perceptions have different effects on adopting crop insurance. Farmers weigh these perceptions in order to adopt crop insurance when they are informed, as found in my study, of the risks covered by the insurance and their affordability of the premiums charged, which led to decreasing probability of insurance adoption. The perceptions of the importance of awareness of insurance education, protection from income loss, and value for money led to an increase in likelihood of adoption of insurance. Research evidence from Lawal and Ajayi (2014) also revealed a significant association between farmers' awareness of insurance products and their workings and willingness to pay for insurance products. These researchers suggested that low level of awareness, misinformation, and preconceived biases are among the main factors contributing to low insurance uptake.

The findings of my study indicate that being a household head is negatively associated with the

adoption of weather-based insurance. Research conducted in other domains of science, for instance, in health sciences with the question of health insurance, reveals that household headship positively influences the adoption of voluntary health insurance (Oraro et al., 2018). Moreover, having insurance guarantees that farmers can have access to credit. Studies have shown that access to credit might provide some sort of protection against unforeseen fluctuations in income (Ravi, 2006). Noor Khan and Hasan (2022) also observed that farmers' perceptions of insurance quality, awareness of crop insurance, and previous risk exposure influence decisions to purchase insurance products. Indeed, in Ghana, Ankrah et al. (2021) found that low awareness of available agricultural insurance products was the most significant factor impeding the adoption of the insurance products. The researchers were of the opinion that more education on available products would increase adoption intention among crop farmers as it would remove doubt on pricing schemes, increase the products' visibility, and bridge the information asymmetry between index-based insurance providers and farmers.

5.3.4 Household Expectation in the Adoption of Weather-Based Agricultural Insurance Products

The fourth objective was on the influence of a household's expectation on insurance product adoption and the results determined that there is a negative but insignificant effect on the adoption of weather-based insurance products in Narok County. This finding also contradicts the expectations of customer perceived value theory, which asserts that evaluation of cost vs benefits with regard to alternatives would influence purchase decisions. The theory suggests that developing products that meet the expectations of the consumer would result in their successful adoption. However, this could imply that insurance providers are designing products that do not meet farmers' expectations. This finding contradicts the observations made by Stoeffler et al. (2021) in their analysis that suggestede that the amount paid out by the insurer serves as an attraction feature that can influence farmers' behaviour.

There was agreement that insurance products provide value for money when purchased, which positively influences purchase decisions. This finding is similar to that made by Bulte et al. (2020), who were also of the opinion that insurance firms can package insurance products in different ways to increase their appeal to consumers. The researchers demonstrated how bundling crop insurance with certified seeds increased the value proposition of the insurance schemes. Sibiko, Veettil, & Qaim (2018) made similar assertions in their study, which found a significant effect of farmers' expectations of the insurance premium cost, payout and payout period, and purchase decisions. The researchers were of the

opinion that bundling insurance contracts and offering them to groups would increase farmers' intention to purchase insurance products. Arshad et al. (2016) are also of the opinion that presenting insurance products as valuable risk management tools and linking them to agricultural equipment is a suitable strategy that insurance firms can use to attract customers.

5.3.5 Crop Insurance Regulation in the Adoption of Weather-Based Agricultural Insurance Products

Lastly, the study investigated the effect of crop insurance regulation on weather-based agricultural insurance products and reported a negative and insignificant relation. The study affirms that crop insurance regulation did not have any significant impact on farmers' uptake of agricultural insurance products. This finding contrasts assertions made in both consumer perceived value theory and prospect theory, which both assert that streamlining policies guiding the development and growth of the insurance industry would give the products more recognition as viable risk mitigation strategies, while at the same time make insurance service providers introduce products of higher quality that can meet the expectations of customers and satisfy their needs. The finding is also contrary to findings from Carter et al. (2014), which revealed that regulations are key to increasing insurers' as well as consumers' confidence in the legality of agricultural insurance, and improving product design and value proposition in conjunction with other sectors of an economy.

The literature synthesis by Nshakira-Rukundo, Kamau, & Baumüller (2021) also revealed a significant association between government intervention and insurance uptake, affirming that proper government involvement in the provision of demand and supply subsidies as well as the design of policies and laws guiding insurance principles, insurance product design, and quality can all help address uptake challenges. In Russia, Baimisheva et al. (2019) also revealed that the government has a significant role to play in promoting insurance products. The researchers reported that a lack of legislation and policies on certain insurance products, lack of financial loans affiliated with insurance premiums, and inadequate weather data were the main factors contributing to low demand for insurance products.

5.4 Conclusions

Overall, the research findings were that socio-economic factors do not have significant effects on the adoption of weather-based insurance products in Narok County. This shows that insurance service providers should consider factors beyond farmers' socio-economic factors to stimulate

interest and engender support for innovative insurance products. Furthermore, the study concludes that crop insurance regulations have not helped the situation either as they did not improve the rate at which farmers adopted agricultural insurance products. This could be due to the limited consideration of farmer expectations or an incompatibility between the approaches and farmers' understanding of the insurance projects. This conclusion reveals that recognizing crop insurance as part and parcel of the insurance industry, setting up insurance product standards, simplifying the product, standardizing competition, and refining the claims process do not have any significant influence on farmers' intention to purchase crop insurance products.

On the first objective, which was the influence of farmers' demographic factors on the adoption of weather-based agricultural insurance products, the study concludes that demographic factors do not have a significant effect. Specifically, farmers' age, gender, and years of education had no significant effect on the uptake of crop-based index insurance.

Regression analysis of the second objective on the impact of household income on the adoption of weather-based agricultural insurance products in Narok County led to the conclusion that a household's income has no significant impacts on the adoption of insurance products. Moreover, the study concludes that farmers who do not own the land they till and hail from larger homes with low monthly income have no intention to adopt crop insurance products.

On the third objective, which looked at the influence of household perception on the adoption of weather-based agricultural insurance products in Narok County, the study concludes that farmers' perception of the insurance products does not significantly influence adoption intentions. Specifically, the study concludes that a household's awareness of the risks they face, their awareness of insurance premiums, and understanding of the insurance product have no significant impact on farmers' intention to adopt agricultural insurance.

The fourth objective was on the effect of household expectation on the adoption of weather-based agricultural insurance products in Narok County and the analysis results led to the conclusion that household expectation has no significant effect on farmers' intention to adopt crop insurance products. However, there were minimal positive effects, meaning that packaging insurance products as valuable products to farmers would lead to a slight uptick in insurance product uptake.

5.5 Recommendations

This study looked at the influence of socio-economic factors on the adoption of weather-based agricultural insurance in Narok Country and found that socio-economic factors such as demographic variables such as income, household perception, household expectation, and crop insurance regulation do not have significant impacts on the uptake of weather insurance products by wheat farmers in Narok County. The first recommendation that can be drawn from the research findings is that the government needs to be more involved in the efforts to address the challenges facing agricultural insurance. This study calls on the government, after recognizing agricultural insurance as a financial instrument, to ensure that the country's laws and regulations are consistent with international standards as this would open pathways for insurers to access global markets for risk transfer and provide an enabling legal and regulatory environment whereby insurance contracts can be enforced.

The study also recognizes the role of the government in indirectly supporting the sector and calls on the government to ensure that critical tools for information gathering are available. This can be done by building weather station infrastructure and data systems to improve the quality of weather data. This would provide remote-sensing and area yield data that could be used reliably, in a timely fashion, and on a scale that is sufficient to reduce basis risk. Furthermore, given that agricultural insurance is still a relatively new instrument, the government needs to play a more central role in supporting agrometeorological research and product design. This would ensure that the products developed can be fine-tuned and applied across different markets. Moreover, such efforts would ensure that products can be designed for specific markets depending on market expectations. Finally, this study calls on the government to step up education efforts and partnerships with local and international groups to provide up-to-date insurance education programs for farmers and training for insurance experts. Increasing awareness of crop insurance through public education would increase farmers' awareness and increase coverage uptake.

The study also recommends that more be done to ensure that the subsidy programs initiated by the government are appropriate and relevant to all players in the insurance sector. Subsidies can be made more effective by ensuring that they are offered through competent and capable insurance institutions, that the amount offered to farmers is capped to prevent uneven distribution of the subsidies, that effective monitoring and evaluation systems are put in place, and that the subsidies are channelled through appropriate intermediary institutions. These subsidies should also be directed at poor families to ensure that they have the requisite financial capability to benefit from

crop insurance. This study also calls for coordination between all involved parties, asserting that proper coordination would reduce duplication efforts and improve the quality of working partnerships. Moreover, strong coordination mechanisms would also help reduce disputes between insured farmers and insurance companies.

The study also recognizes the role played by insurers in promoting crop insurance and the study recommends that insurers do more research on farmers' needs and their perceptions about insurance. This is because, despite farmers considering the probability of future risk, insurance follows actuarial structures informed by past experiences and any difference in subjective and objective viewpoints can generate resistance. This would enable insurers to better identify the needs of different farmers and help in the development of useful insurance products that can meet the expectations of customers. This would also improve the firms' ability to design better products and offer them under suitable terms and conditions that can satisfy customer needs and still fall within their price range.

Finally, the study also recognizes that there may be low trust in insurance service providers and recommends that insurance firms demonstrate the ability to reimburse farmers exposed to the various types of risk when due. Insurance firms need to establish closer relationships with farmers by re-evaluating customer engagement and involving them in the design of insurance products. This would not only ensure that the products offered in a particular market are unique to the needs of the market but would also improve the particular market's understanding of the terms of insurance contracts. It would also improve the insurer's ability to make better insurance premium pricing decisions, which determine product affordability.

5.6 Limitations of the Study

This study limited itself to a descriptive research design that collected data from one specific region in Kenya. Moreover, the study limited itself to examining socio-economic factors and their influence on insurance adoption among wheat farmers and to using elements identified in the prospect and customer perceived value theories. These theories focus more on the customer's intention and less on institutional influences of insurance uptake decisions. The study adopted probit regression analysis, but the assumption of linearity between the dependent variable and the independent variables is the main drawback of probit regression. This affects an accurate interpretation of the estimates. Additionally, the sample size was small to offer generalization of the results, and, consequently, the probit regression estimates are not precise or accurate. Another

limitation of probit regression analysis is that it offers only the direction of the relationship between dependent and independent variables (negative and positive), and this relationship does not offer insights into the causation.

Moreover, by focusing on insurance offered to wheat farmers, the study failed to address factors that influence the uptake of other types of agricultural insurance such as animal and aquaculture insurance. Moreover, the study did not examine the factors that influence the uptake of fully subsidized or unsubsidized insurance products.

5.7 Areas for Further Research

This study recognizes that there are different types of index insurance and calls on analysis into the factors that influence uptake of these instruments, not just crop-based weather insurance. The study also recommends that there be an examination into the factors that influence the uptake of index insurance among high-income farmers given that this study focused on low-income farmers. The findings from this study would complement the findings from current research and provide a better understanding of the relationship between income and uptake of insurance products. Furthermore, it would be important to analyze the relationship between demographic characteristics such as age and gender and uptake of insurance products. This would provide a better understanding of how gender and age affect insurance purchase decisions.

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APPENDICES

Appendix I: Consent Letter

TO: THE RESPONDENT

FROM: Hope Nanshemeza

RE: RESPONDING TO THE ATTACHED QUESTIONNAIRE

I am Hope Nanshemeza, a postgraduate student undertaking a Master of Science in Development Finance (MDF) at Strathmore Business School. As partial fulfilment of the requirements for the award of the master's in finance degree, I am carrying out a study on household socio-economic factors influencing the adoption of crop insurance products with an interest in Narok. The research is intended to review some of these household characteristics that influence crop insurance adoption.

It is academic research; all the information you provide in this questionnaire will be kept in strict confidence and only used for this research. With this, I do not make direct reference to your name or that of your organization in any presentation or report to that study. I would appreciate any additional information; in the form of suggestions and comments, which you deem necessary to make my research findings more conclusive, relevant, and reflective of the study area.

I kindly request for you filling the attached questionnaire to the best of your knowledge. Your name or other identifying information is not required on this document.

Thank you in advance,

Yours sincerely,

Hope Nanshemeza

Appendix II: Questionnaire for Small-Scale Farmers

SECTION A: PERSONAL DETAILS

(Kindly tick (√) where appropriate)

1. Are you the head of the household?

   Yes [ ] No [ ]

2. What is your gender:

   Male [ ] Female [ ]

3. Kindly indicate your age in years …….

4. What is the size of the farm? (Approximate Acreage) ……

SECTION B: DEMOGRAPHIC INFORMATION

5. How many years of schooling do you have? (Indicate a number) ……...

6. How many members are currently part of your household? (Indicate a number) ……

7. How would you describe the farm that you currently own?

   Family Owned [ ]

   Communal Owned [ ]

   Private Property [ ]

   Hired/Rented Farm [ ]

SECTION C: CHARACTERISTICS OF THE FARM HOUSEHOLD INCOME

8. Do you have a bank account?

   Yes [ ] No [ ]

9. Do you have access to a Credit facility?

   Yes [ ] No [ ]

10. What is the source of funding for farming activities?

    Personal Finance [ ]

    Family Finance [ ]

    Bank Finance [ ]

11. Is farming your Primary source of income?

    Yes [ ] No [ ]

12. What is the approximate household monthly income in KES…….

13. Do you do any off-farm activity for income?

Yes [ ] No [ ]

14. Does the use of Crop insurance impact household income?

Yes [ ] No [ ]

15. Provide the income amount for the previous 5 seasons when insurance was in place and when it was not. **(*Kindly provide approximations that are as close to the true figure as possible*)**

Year	Income without Insurance use	Income with insurance Use
2021		
2020		
2019		
2018		
2017		

SECTION D: HOUSEHOLD-LEVEL OF AWARENESS OF CROP INSURANCE PRODUCTS

16. Have you heard about Agricultural Insurance?

Yes [ ] No [ ]

17. What is your source of information on crop insurance? To what extent do you rely on these as a source of information Likert as on question 19

Fellow Farmer [ ]
Research institution [ ]
Insurance Agent [ ]
NGOs [ ]
Nobody-(Personal research) [ ]
Others (Specify) ……

18. Using a tick kindly indicate the extent to which you agree with the following statements

Perception statements on Weather index Based on Insurance Education	1= Not at all	2= To a Small Extent	3= To Some extent	4= To a Moderate Extent	5 = To a Great Extent
I understand the risk covered by a weather-based index insurance					
The premium charged for weather index insurance is affordable					
I am aware of seminars on crop insurance education					
I can access the Weather index Insurance through a credit facility					
The insurance product can protect from income Loss					

SECTION E: HOUSEHOLD-LEVEL LIVING STANDARDS

19. Do you have electricity at home?

Yes [ ] No [ ]

20. Which of the following do you own?

Telephone [ ]
Radio [ ]
Television [ ]
Bicycle [ ]
Motorbike [ ]

21. Do you have access to clean and Sufficient Water at home?

Yes [ ] No [ ]

22. Do you have access to clean sanitation within the homestead environment?

Yes [ ] No [ ]

23. At home, do you have access to improved cooking fuel?

Yes [ ] No [ ]

SECTION F: HOUSEHOLD EXPECTATION OF THE INSURANCE PRODUCT

24. Kindly fill the following section by selecting the appropriate box for each statement

Household expectations of the insurance Statements	1= Not at all	2= To a small extent	3= To some extent	4= To a moderate Extent	5 = To a Great Extent
The insurance protects the Household from income loss during bad weather					
The insurance prevents family wealth erosion					
The insurance product allows us to save money for future use.					
The insurance products provide value for money when purchased.					
The insurance products allow the family to sustain their standard of living.					

SECTION G: HOUSEHOLD PERCEPTION OF INSURANCE REGULATION

25. Using a tick kindly indicate the extent to which the reasons presented influence your perception of the insurance regulation.

Crop insurance Regulation Statements	1= Not at all	2= To a small extent	3= To some extent	4= To a moderate Extent	5 = To a Great Extent
The insurance product prices are standardized between competitors.					
They are sufficient mechanisms to allow for follow-up of insurance payments.					
The insurance products are simple to understand and use					
I understand the grievance mechanism .available.					
I buy the insurance product from a licensed broker.					

SECTION H: HOUSEHOLD ADOPTION OF THE INSURANCE PRODUCTS

26. Have you used weather index crop insurance?

Yes [ ] No [ ]

27. Using a tick kindly indicate the extent to which the reasons presented influence your adoption of weather-based crop insurance.

Crop insurance adoption Statements	1= Not at all	2= To a small extent	3= To some extent	4= To a moderate Extent	5 = To a Great Extent
The insurance premiums are high					
There has been adequate creation of awareness.					
The insurance products are simple to understand and use					
The income generated from farm activities is enough to cover the insurance premium.					
Compensation is done on time					

Appendix III: Research Facilitation Letter

Ole Sangale Rd, Madaraka Estate,
P.O Box 59857 00200, Nairobi, Kenya.
Cell: +254 703 414/6/7, Twitter: @SBSKenya
Email: info@sbs.ac.ke or vist www.sbs.strathmore.edu

Strathmore UNIVERSITY
BUSINESS SCHOOL

Saturday, 13 June 2020

RE: FACILITATION OF RESEARCH – NANSHEMEZA, HOPE

This is to introduce Nanshemeza Hope who is a Master of Science in Development Finance student at Strathmore University Business School, admission number MDF 103004 /17. As part of our MDF Program, Hope is expected to do applied research and undertake a project. This is in partial fulfilment of the requirements of the MDF course. To this effect, she would like to request for appropriate data from your organization.

Hope is undertaking a research paper on "**ASSESSING THE DETERMINANTS OF THE ADOPTION AND EFFECTIVENESS OF AGRICULTURAL INSURANCE PRODUCT IN KENNYA."** The information obtained from your organization shall be treated confidentially and shall be used for academic purposes only.

Our MDF seeks to establish links with industry, and one of these ways is by directing our research to areas that would be of direct use to industry. We would be glad to share our findings with you after the research, and we trust that you will find them of great interest and of practical value to your organization.

We appreciate your support and shall be willing to provide any further information if required.

Yours sincerely,

Veronica Muniu,
Manager | Graduate Programmes, Strathmore University Business School

Appendix IV: Research Permit

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **320278**

Date of Issue: **02/July/2020**

RESEARCH LICENSE

This is to Certify that Ms.. Hope Nanshemeza of Strathmore University, has been licensed to conduct research in Bomet, Kericho, Laikipia, Nairobi, Nakuru, Uasin-Gishu on the topic: ASSESSING THE ADOPTION AND EFFECTIVENESS OF AGRICULTURAL INSURANCE PRODUCTS IN KENYA for the period ending : 02/July/2021.

License No: **NACOSTI/P/20/5545**

320278

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

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