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**Determinants of Khat Farmers' Awareness of Agricultural Insurance:  
Evidence of Igembe North Sub County, Meru County, Kenya**

<sup>1</sup>David Lee Muraya

<sup>1</sup>Department of Agricultural Economics, Agribusiness Management and Agricultural Education.  
Chuka University P.O. Box 109 – 60400 Chuka, Kenya.

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**Abstract**

In Kenya, majority of farmers rely on rain-fed agricultural systems hence making risk and uncertainty an integral part of farming. Weather conditions can directly impact agricultural output and performance. Mitigating these hazards is a top objective for avoiding revenue loss and improving smallholders' wellbeing. Agricultural insurance, a long-standing idea, is now recognized and supported by public and private organizations as a crucial risk management instrument in light of climate change concerns. Awareness of agricultural insurance plays a crucial role in its adoption, as it helps individuals understand the benefits and protections it offers against unexpected agricultural financial losses. Ultimately, widespread understanding of insurance options and their value can lead to higher adoption rates, ensuring more individuals and families are adequately protected. This paper's data was collected from 323 khat farmers in Meru County, Kenya. According to empirical findings, credit access and occupation had a positive and significant effect on awareness of agricultural insurance. The farmer's age and the gender of the household decision maker had a negative and significant effect on awareness of agricultural insurance. This study finds that credit access has a significant impact on khat farmers' awareness of agricultural insurance. The study found that awareness was proportionate to loan access hence recommends strengthening farmers' credit facilities to access more financial resources. The findings of this study will provide decision-makers with evidence-based tools for effectively marketing and establishing demand-driven insurance solutions to fulfil the needs of khat farmers.

**Keywords:** Insurance, Awareness, Credit access, Khat

**Introduction**

Agricultural insurance is widely recognized as a novel strategy of protecting agribusinesses (Kramer et al., 2022). In most industrialized countries, the number and variety of insurance products available to producers have increased dramatically (Kramer et al., 2022). The majority of this rise is due to different government subsidies, such as subsidized payments, delivery and loss adjustment expenses, and the public provision of protective services (Mahul & Stutley, 2010). Crop and livestock insurance has been available in a number of African countries since the early twentieth century, although the market remains modest. However, there is a small agricultural insurance market in Africa due to the agricultural industry's delayed expansion and insufficient capitalization (Nshakira-Rukundo et al., 2021). According to (Hess et al., 2016),

approximately 653,000 farmers have some level of protection, and current system coverage suggests that nearly 2 million African smallholder farmers have insurance. One of the Kenyan government's Vision 2030 goals is to ensure access, efficiency, and stability in insurance as a basis for the country's economic transformation.

In Kenya, agricultural insurance acceptance and penetration have made little progress although it remains extremely low, with less than 1% of farmers and pastoralists insured (Sibiko et al., 2018). Agricultural insurance makes up less than 1% of total insurance premiums (Kenya, 2013). A few companies in Kenya provide crop insurance. Agriculture insurance can be written by any insurance firm, but by 2020, only eight companies were doing so (Kramer et al., 2022). Crop and livestock insurance are a few of the agricultural insurance options available in Kenya. Crop insurance protects crops from physical loss or damage, including drought, uncontrolled pests and diseases, windstorms, heavy rainfall, and fire. Livestock insurance protects against natural disasters, biological hazards (such as pests and diseases), idiosyncratic/individual risks (such as fire, hail, and theft), and systemic risks that affect a large area, such as Tsetse flies, armyworm, and fall-worm (Timu & Kramer, 2023). In Kenya, agricultural insurance is classified into two broad categories: indemnity-based and index-based insurance. Several pilot attempts to introduce agricultural insurance in Kenya have been implemented with technical assistance from the World Bank and other development agencies. Kilimo Salama, created by the Syngenta Foundation for Sustainable Agriculture, is the most visible and successful of these efforts, followed by Kilimo Salama Plus and Ngao ya Mkulima (Karanu, 2015).

Awareness is a fundamental necessity that helps people to grow, advance in society, and expand their competence and thinking power (Narender & Sampath, 2014). Farmers are more likely to use crop insurance as a risk mitigation technique when they can access more information about it. Olila and Pambo (2014) on determinants of farmers' awareness about crop insurance Trans-Nzoia County, Kenya found out that the independent variables that significantly influenced farmer awareness were Gender, education, and household income. Female-headed households were more aware of crop insurance as compared to male-headed households. This could be attributed to the fact that women usually spend more time on farms than men. The number of years of schooling had a positive effect on awareness. It was revealed that educated farmers are more aware of crop insurance schemes than those with less education. The level of household income positively influenced agricultural insurance awareness. This could be explained by the fact that higher-income farmers can get information on risk management strategies as they interact with various financial institutions. (Kumar et al., 2011) found farmers' social participation and education level positively and significantly influencing the farmers' awareness about crop insurance schemes or products. Participation in social and community-based organizations like farmers' associations, self-help groups, watershed associations, and cooperative credit societies increases the probability of being aware. (Ghazanfar et al., 2015) in Pakistan revealed that education and previously availed agricultural credit were the two most important factors which affected the awareness of the farmers regarding crop insurance.

### **Statement of the problem**

Lack of information about agricultural insurance is a key concern for the agricultural sector, particularly in developing countries. Many farmers are either uninformed of the availability of such insurance or have a limited knowledge of its benefits, resulting in low adoption rates. The lack of information exposes farmers to the financial consequences of crop failures, animal losses, and natural calamities. Misinformation and misconceptions about the cost, coverage, and claims process worsen the situation by discouraging farmers from purchasing insurance. Furthermore, weak outreach and education efforts fail to close the knowledge gap, continuing a cycle of financial insecurity and risk in the farming community. This paper sought to close the knowledge gap on the factors influencing khat farmers' awareness of agricultural insurance in Igembe North Sub County, Meru County, Kenya.

### **Research Objectives**

- i. To determine the khat farmers' characteristics in Igembe North Sub County, Meru County, Kenya.
- ii. To determine the factors influencing Khat farmers' awareness of agricultural insurance in Igembe North Sub County, Meru County, Kenya.

### **Research Questions**

- i. What are the characteristics of khat farmers' in Igembe North Sub County, Meru County, Kenya?
- ii. What are the factors influencing Khat farmers' awareness of agricultural insurance in Igembe North Sub County, Meru County, Kenya?

### **Materials and Methods**

#### **Study area**

This study was carried out in Igembe North Sub-County, one of Meru County's nine sub-counties (as shown in figure 1 below). According to County (2018), Meru County is located between latitudes 37° west and 38° east, within 0° 6' of the North Pole and approximately 0° 1' of the South Pole. The county has a total area of 6,936.2 square kilometers. The County's gazetted forest cover is 972.3 square kilometers, or 14.02% of the total county area (Wafula, 2018). Igembe North Sub-County has 1172.83 square kilometers and has 169,317 residents (Kenya, 2019). Igembe North Sub-County is located in Meru County's higher parts and receives an average of 700 mm to 1000 mm of precipitation per year, with a typical annual temperature of 15°-17°C. The elevation is between 2000 and 2500 meters above sea level (County, 2018). Igembe North has the biggest area under khat production and the highest khat output. Agriculture is primarily rainfed, which leads in low production during the dry seasons, causing farmers to incur significant losses.

## Map of the study area

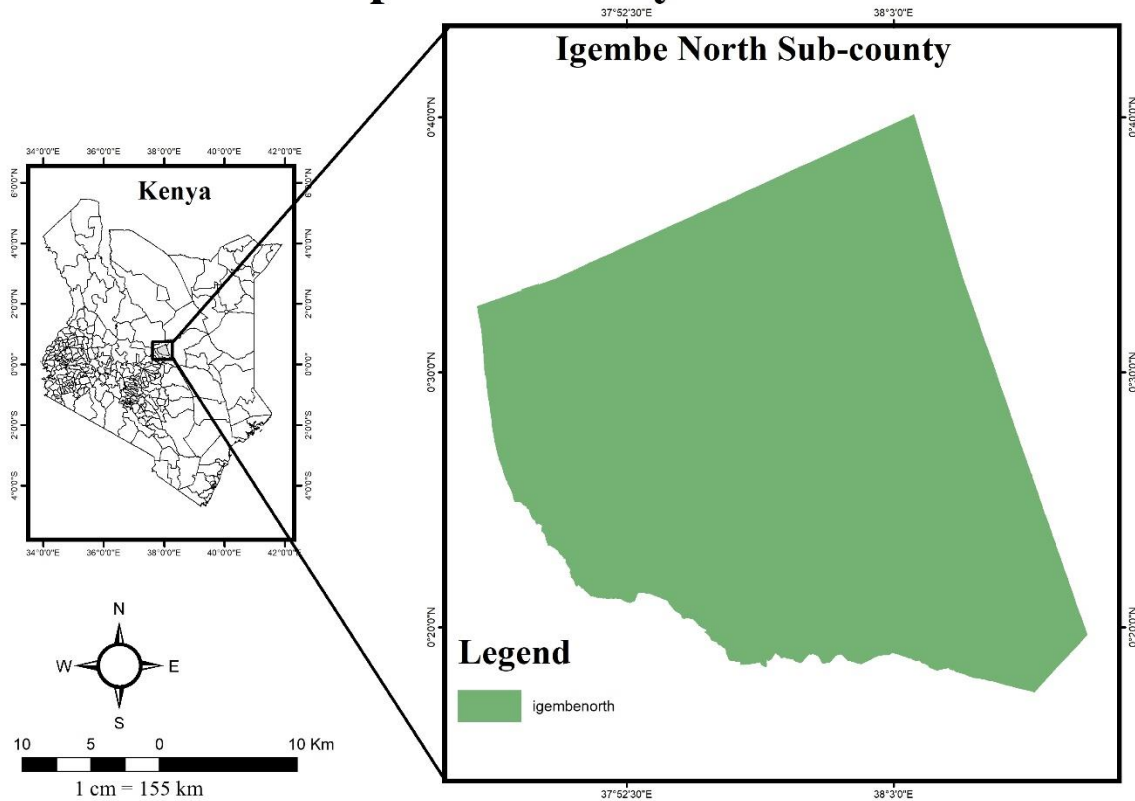


Figure 1: Map of the study area

### Research design

The study used a descriptive research design. The design helped to describe the connection between farmer and farm characteristics and factors under study and the awareness for agriculture insurance among khat farmers in Meru County, Kenya. According to Kothari (2004) the descriptive research design is the best method for a researcher to obtain information from a moderately more significant number of cases at a particular time; hence, the approach helped to obtain representative information from the respondents that enhanced a better understanding of factors influencing khat farmers' awareness of agricultural insurance. This design helped define the study's variables clearly and stated how each was measured with the precision of the population of concern.

### Target population

The study focused on khat farmers in Igembe North Sub-County, Meru County. The Sub-County has approximately 54,000 khat farmers (Statistics, 2019). The study focused on the five wards in Igembe North Sub-County: Naathu, Amwathi, Antubetwee/Kiongo, Ntunene and Antuambui for their highest khat production and the largest market in Kenya.

**Sample size**

According to Cohen *et al.* (2002), an ideal sample size should be adequate to guarantee the accuracy and dependability of the data. There is no set sample size, but it varies depending on the study's goals and the characteristics of the population being studied. In general, a sample's reliability increases with its size. The sample size was determined using the Cochran formula. (Mweshi and Sakyi, 2020):

$$n = \frac{z^2 \cdot P \cdot Q}{e^2} \dots\dots\dots (1)$$

Where:

n = Sample size for the large population

Z = Normal distribution Z value score, (1.96)

p = proportion of the target population estimated to be aware of agricultural insurance, where for this study, it is estimated at 30% (0.3)

q= proportion of the target population estimated to be aware of agricultural insurance, where for this study, it is estimated at **q = (1 - p) = 1 - 0.3 = 0.7**

e=acceptance error of 5% (0.05)

$$n = \frac{1.96^2 \times 0.3 \times 0.7}{0.05^2} = 322.6944 = 323 \dots\dots\dots (2)$$

The sample size was obtained from the five wards in Igembe North Sub-County (Table 1).

Table 1: Sample size for khat farmers’ awareness of agricultural insurance in Igembe North Sub-County, Meru County, Kenya

Wards	Frequency	Percent	Cum.
Naathu	67	20.74	20.74
Amwathi	62	19.2	39.94
Antubetwee/kiongo	63	19.5	59.44
Ntunene	69	21.36	80.8
Antuambui	62	19.2	100
Total	323	100	

**Sampling Procedure**

The research employed a multistage sampling procedure. During the first phase, Igembe North Sub-County was purposively selected because of its leading production in khat in Meru County (as shown in figure 1 above). In the second stage, stratified random sampling was used where the strata were obtained in the form of wards in Igembe North Sub-County: Naathu, Amwathi, Antubetwee/Kiongo, Ntunene and Antuambui wards. The third stage involves simple random sampling of khat farmers from the selected wards, with each stratum having an equal chance of being picked from the population.

**Research instrument**

Primary data was used for this study, where a semi-structured questionnaire was used for data collection. This allowed respondents to respond to the study instrument freely. There were both structured (closed-ended) and unstructured (open-ended) questions. Each questionnaire had an identification number for tracking purposes.

**Analytical model**

The probit model was used to find the factors affecting awareness levels. This model was used because agricultural insurance awareness is a qualitative dependent variable measured as a dummy variable. Asteriou and Hall (2007) have highlighted that the probit model is more advanced than Logit model. This model addresses non-normality of residuals, heteroscedasticity, and a reduced R-square, making it suitable for this paper. The model was specified as shown below;

$$Y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \beta_3x_3 + \dots + \beta_ix_i + \varepsilon_i \dots \dots \dots (8)$$

Where:

Y= dependent variable

$\beta$ =coefficient

$X_i$  = independent variable. They include Gender, Occupation, Age, Years of experience, Household size, Members earning income, Size of land owned, Distance to the market, Credit access, Group membership, Income, Schooling years, Khat bushes owned

$\varepsilon_i$ =Error term

Awareness=f (Gender, Occupation, Age, Years of experience, Household size, Members earning income, Size of land owned, Distance to the market, Credit access, Group membership, Income, Schooling years, Khat bushes owned)

$$\begin{aligned} \text{Awareness} = & \beta_0 + \beta_1(\text{Gender}) + \beta_2(\text{Occupation}) + \beta_3(\text{Age}) + \beta_4(\text{Years of experience}) \\ & + \beta_5(\text{Household size}) + \beta_6(\text{Members earning income}) \\ & + \beta_7(\text{Size of land owned}) + \beta_8(\text{Distance to the market}) + \beta_9(\text{Credit access}) \\ & + \beta_{10}(\text{Group membership}) + \beta_{11}(\text{Income}) + \beta_{12}(\text{Schooling years}) \\ & + \beta_{13}(\text{Khat bushes owned}) + \varepsilon \dots \dots \dots (9) \end{aligned}$$

**Results and Discussions**

The results indicate that 43.34% of the respondent farmers were aware of agricultural insurance. These results are consistent with Olila and Pambo (2014) who found that out of the sampled small and large-scale farmers, only 36% were aware of crop insurance in Trans-Nzoia County, Kenya. However, the results contradict Jepchumba (2015) who found that out of 30 respondents, 22 farmers knew about agricultural insurance in Kesses Sub-County, Uasin Gishu County, Kenya. Furthermore, Oguz and Diyanah (2021) on farmers' perceptions of agricultural insurance in Altinekin District, Konya, Turkey 86.67% of the respondent farmers knew information about agricultural insurance. Kirimi et al. (2015) on the uptake of crop insurance in Kenya found a relatively high awareness of crop insurance in the study region. Kilimo Salama was the most renown crop insurance product, followed by Kilimo Salama plus and Ngao ya Mkulima, each recording participation rates of 97%, 25%, and 12 %, respectively, among target households.

Khat farmers aware of agricultural insurance were younger, earned more income from khat farming, were nearer to the khat markets, depended on agriculture as their main source of revenue and had access to credit (Table 2).

Table 2: Descriptive statistics for determinants of khat farmers' awareness for agricultural insurance

Variable	Overall		Aware		Unaware		t-Stat	p-value
	Mean	Sd	Mean	Sd	Mean	Sd		
Age	43.483	11.007	41.943	10.836	44.661	11.021	2.213	0.0138**
Schooling years	9.737	5.785	10.235	7.731	9.355	3.637	-1.357	0.0878
Years of farming experience	18.322	10.098	18.179	10.391	18.432	9.895	0.223	0.4119
Size of the household	5.161	2.281	5.064	1.875	5.235	2.552	0.666	0.253
Earning members	1.526	0.753	1.6	0.632	1.469	0.831	-1.542	0.0621
Income from Khat	159033.4	214070.8	187192.9	240396.6	137490.7	189378	-2.078	0.0192**
Size of land owned	1.629	1.749	1.689	2.006	1.583	1.528	-0.535	0.2964
Market distance	4.437	2.959	4.114	2.808	4.683	3.055	1.717	0.0435**
Khat bushes owned	360.774	500.31	405.651	613.009	326.443	391.312	-1.412	0.0794
Gender	0.954	0.211	0.929	0.258	0.973	0.163	1.871	0.0311**
Occupation	0.728	0.446	0.829	0.378	0.651	0.478	-3.628	0.0002***
Access to credit	0.049	0.217	0.093	0.291	0.016	0.127	-3.178	0.0008***
Group membership	0.136	0.344	0.171	0.378	0.109	0.313	-1.615	0.0537

Sd= Standard deviation \*\*\* Significant at 1%; \*\* significant at 5%

The determinants influencing khat farmers' awareness of agricultural insurance were estimated using the logit model. The results of the logit model are presented in Table 3 below. The results of the model chi-square tests using appropriate degrees of freedom show that the model's overall goodness of fit was statistically significant. Prob > chi2 0.000 combined with a log-likelihood of -193.00632 show that the logit model produced a decisive outcome. A mean VIF of 1.96, with independent variables having a VIF ranging from 1.10 to 3.30. The VIF for independent variables is less than five, implying no multicollinearity

Table 3: Estimation results of the probit model on farmers' awareness of agricultural insurance

Awareness	Coefficient	P-Value	Marginal effect	P-Value
Gender	-1.269 (0.641)	0.047**	-0.281 (0.129)	0.03**
Occupation	1.268 (0.328)	0.000***	0.279 (0.064)	0.000***
Age	-0.067 (0.023)	0.003***	-0.015 (0.005)	0.004***
Years of experience	0.025 (0.022)	0.239	0.005 (0.005)	0.285
Household size	0.128 (0.083)	0.124	0.026 (0.019)	0.181
Members earning income	0.317 (0.181)	0.081	0.079 (0.043)	0.065
Size of land owned	0.011 (0.124)	0.93	0.002 (0.029)	0.949
Distance to the market	-0.088 (0.049)	0.074	-0.021 (0.012)	0.078
Credit access	1.799 (0.729)	0.014**	0.389 (0.119)	0.001***
Group membership	0.184 (0.378)	0.628	0.050 (0.091)	0.582
Income	-0.001 (-0.001)	0.058	-0.007 (0)	0.06
Schooling years	0.049 (0.034)	0.15	0.011 (0.008)	0.143
Khat bushes owned	-0.001 (0.001)	0.736	-0.001 (0.001)	0.709
_cons	0.839 (1.025)	0.413		
Mean VIF	1.96			

Standard errors are shown in parentheses. Statistical significance levels: \*\*\*1% and \*\*5% Pseudo-R2 = 0.1267.

The coefficient values describe the effect of each explanatory variable on the likelihood of knowledge about crop insurance. Furthermore, the marginal effects show what might happen if farmers were made aware of crop insurance. The independent variables that influenced farmers' awareness of agricultural insurance were Gender, occupation, age and credit access. Occupation had a positive and significant effect on khat farmers' awareness of agricultural insurance at a 1% significant level. This could be attributed to the fact that most respondents depend on khat



farming as their main source of livelihood in the area of study. The marginal effect indicates that a unit change in the main occupation of the farmers will lead to an increase in awareness by 27.9%.

Gender negatively and significantly influenced awareness at a 5% significant level. Female-headed households were more aware of agricultural insurance compared to male-headed households. The marginal effect indicates that a unit change in the gender of the farmer will lead to a decrease in awareness by 28.1%. This could be because women typically spend more time on farms than males hence are more willing to learn new farm technologies than men. According to Karaya et al. (2013), women play a significant role in primary food production and are hence the primary caretakers of food security. The results are consistent with Olila and Pambo (2014) who found that female-headed households had more knowledge of crop insurance compared to male-headed households in Tranzonia County, Kenya.

The age of the farmer had a negative and significant effect on their awareness of agricultural insurance. This indicates that younger farmers are more aware of agricultural insurance compared to older farmers. Younger farmers may have an advantage when it comes to adopting new technologies and learning about insurance due to their familiarity with digital tools and a potentially more adaptable mindset. Younger individuals often have grown up with technology and are more comfortable exploring and adopting new information. The marginal effect indicates that an increase in age by one year leads to a decrease in awareness by 1.5%.

Credit access had a positive and significant effect on the khat farmers' awareness of agricultural insurance at a 1% significant level. Indeed, having access to credit can play a significant role in enabling farmers to seek more information and benefits of agricultural insurance. When farmers seek for loans, they are informed about the concept and benefits of crop insurance as part of the loan package. Credit availability is frequently associated with financial literacy programs that teach farmers how to manage financial risks. Farmers with access to financing can invest in agricultural insurance, enhancing productivity and income. The marginal effect indicates that a unit increase in credit will result in an increase in awareness of agricultural insurance by 38.9%. The results are consistent with Ghazanfar et al. (2015) who also discovered that credit availed positively and significantly correlated to farmer's awareness of crop insurance scheme.

### **Conclusion and Recommendations**

Farmers can use agricultural insurance to mitigate the impact of natural catastrophes and climate hazards on their farms. Farmers profit from agriculture insurance as it provides compensation for climate shocks. Agricultural insurance helps farmers manage risks and make significant investments in agriculture. The study sought to determine the factors influencing farmers' awareness of agricultural insurance. The results indicate that a larger percentage of farmers were unaware of agricultural insurance. According to the research findings, credit access and occupation had a positive and significant effect on awareness of agricultural insurance. The farmer's age and the gender of the household decision maker had a negative and significant impact on awareness of agricultural insurance. The results indicate that the variable credit access had a large influence on farmers' awareness of agricultural insurance. Access to credit can play a critical role in raising farmers' awareness of agricultural insurance by combining educational

efforts, demonstrating practical benefits, and leveraging established trust relationships. This interconnected approach helps farmers understand the value of insurance, resulting in more informed and resilient agricultural practices. The study would recommend credit institutions to package agricultural loans with insurance products. In addition, credit institutions should frequently work with insurance firms to develop products that address the special needs of farmers. The study also recommends that the National and County government improve credit facilities to allow farmers access to more financial capability and training.

### **Recommendations for further research**

- i. An agronomic study to analyze the effects of pests and diseases on khat farming and how these factors affect market quality and profits.
- ii. A technical efficiency study to determine the gross margins of khat farming.

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### **Conflicts of Interest**

The authors declare no conflicts of interest.

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