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Analysis of Khat Farmers' Perception on Agricultural Insurance and Risk Attitude: A Case Study of Meru County, Kenya

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ABSTRACT

Individuals' evaluations of innovations may differ from those of experts due to a lack of knowledge or erroneous impressions. Most people consider their perceptions to be appropriate. The potential influence of the perception of risk management instruments on the choice to utilize them has rarely been explored. Individual risks can be categorized as either risk averse, risk neutral or risk loving. A farmer's risk attitude affects how they handle uncertainty, especially in situations like farming where outcomes are unpredictable. Risk-averse farmers are more likely to seek insurance than risk-loving or risk-neutral farmers. An increase in risk aversion is associated with an increase in insurance use. This study aimed at determining the perception of khat farmers' on agricultural insurance and their risk attitude. The data used in this study was obtained from khat farmers in Meru County, Kenya, from a sample of 323 farmers. The study employed the principal Component Analysis model to determine their perception and Risk attitude. Empirical results suggest that khat farmers perceive agricultural insurance as inevitable and needful. Further, the results also indicate that insuring companies can be trusted and a full compensation on losses suffered. Khat farmers love to explore investment opportunities for their finances and prefer high returns for their investment even though there are risks. The results suggest that khat farmers are risk loving. The study recommends insurance program that offers full compensation to khat farmers in case a loss is suffered. The study further recommends strengthening on awareness on the importance of agricultural insurance to enhance khat farmers' perception on agricultural insurance scheme.

Keywords

Insurance, Perception, Risk attitude, Khat, Farmers.

Introduction

Smallholder farmers are vulnerable to a variety of climate hazards. Agriculture insurance is increasingly being promoted as a means of protection. However, Sub-Saharan Africa continues to have the lowest agricultural insurance penetration [1]. Instead, smallholder farmers continue to rely on ineffective mechanisms such as asset depletion [2,3], livestock reliance [4,5], and savings, even when insurance is available [6]. Agricultural insurance is unpopular, unappealing, and underutilized by the majority of farmers in low-income and middle-income countries [7]. This is despite evidence of its ability to improve farmers' and pastoralists' lives, unlock investment in production, and eventually reduce poverty.

Literature Review

Agricultural insurance is one of the techniques that agriculturalists can employ to reduce hazards on their farms. Although agriculture insurance has gained acceptance around the world, particularly in most developed countries, it has made little progress in Kenya due to already existing perceptions among small holder farmers that it is only for larger-scale farmers due to their levels of investment [8]. Individuals' evaluations of innovations may differ from those of experts due to a lack of knowledge or erroneous impressions. Most people consider their perceptions to be appropriate [9,10]. The potential influence of the perception of risk management instruments on the choice to utilize them has rarely been explored. How do risk bearers view risk management instruments, such as the perceived benefits and costs of utilizing them, and how does this perception influence their use of risk management tools? [11].

In general, there are three dimensions to risk perception. (1) Risk aversion - where persons possess a concave utility function, meaning that as risk increases, they are more likely to use risk mitigation strategies. (2) Risk neutrality - where people are unconcerned about risk. (3) Risk-loving - in which individuals exhibit a convex utility function and expand risky activities even when the probability of loss is large. Risk-averse farmers are more likely to seek insurance than risk-loving or risk-neutral farmers. An increase in risk aversion is associated with an increase in insurance use [12,13].

Risk aversion is also influenced by how people evaluate the likelihood of a shock occurring [14]. Previous shocks might also prompt people to take protective and preventive measures, such as risk-averse behavior, increasing the likelihood of buying insurance [15]. Farmers may, however, underestimate the likelihood of weather shocks and hence seek less insurance [16,17]. The majority of studies on farmers' risk attitudes have found that farmers are risk-averse [18-23]. This can be attributable to farmers' fear of losing their farm financial investments in the event of a risk outcome.

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 [24], 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 [25]. Igembe North Sub-County has 1172.83 square kilometers and has 169,317 residents [26]. Igembe North Sub-County is located in Meru County's upper highlands and receives 700 mm to 1000 mm of precipitation per year, with an average annual temperature of 15°-17°C. The elevation ranges from 2000 to 2500 meters above sea level [24]. Igembe North has the largest area of khat production as well as the highest output. Agriculture is predominantly rain fed, which results in low production during the dry seasons, causing farmers to suffer significant losses.

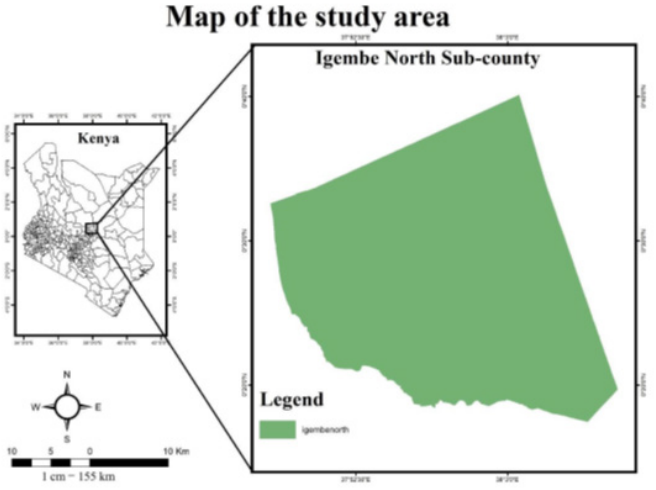

Figure 1: Map of the study.

Research Design

The study followed a descriptive research strategy. The design aided in describing the relationship between farmer and farm characteristics, factors under investigation, and awareness of crop insurance among khat farmers in Meru County, Kenya. The approach helped to obtain representative information from the respondents that improved a better understanding of factors influencing khat farmers' awareness of agricultural insurance. Kothari [27] states that the descriptive research design is the best way for a researcher to gather information from a moderate more significant number of cases at a given time. This design served to clearly describe the study's variables and explained how each was measured with the precision of the population under consideration.

Target Population

The study concentrated on khat farmers in Igembe North Sub-County, Meru County. The Sub-County contains around 54,000 khat farmers [28]. The study focused on the five wards of Igembe North Sub-County: Naathu, Amwathi, Antubetwee/Kiongo, Ntunene, and Antuambui, which have the largest khat production and the biggest khat market in Kenya.

Sample Size

According to Cohen et al. [29], an optimum sample size should be sufficient to ensure the data's accuracy and reliability. There is no standard sample size, but it varies according to the study's objectives and the characteristics of the population under study. In general, a sample's dependability rises with its size. The sample size was calculated using the Cochran formula [30]:

$$n = \frac{Z^2.P.Q}{e^2} \quad \text{..... (1)}$$

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

e=acceptance error of 5% (0.05)

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

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	

Research Instrument

This study used primary data, collected by use of a semi-structured questionnaire. This allowed respondents to freely complete the study instrument. There were both structured (closed-ended) and open-ended questions. Each questionnaire included an identification number for tracking purposes.

Analytical Model

The perceptions of the respondents were examined using a 5-point Likert scale. Specific questions varied from strongly disagree to strongly agree. The data was analyzed using the principal component analysis (PCA) model. This technique's objective was to re-orient the data to summarize a large number of original variables with a small number of "factors" or "components" that capture the most information (variation) from the actual variables. The principal component analysis is sensitive to scale discrepancies in the variables since it aims to maximize variance. The data should be standardized, and correlations should be used instead of covariance among the original variables. The variance of the elements is maximized by principal component analysis. Varimax rotation was used to apply principal component analysis, with a single eigenvalue cutoff and factor loading larger than 0.3. Jackson [31] states that the decomposition of the eigenvalues that are primary components is as follows:

$$C = V\Lambda V' = \sum_{i=1}^{p} \lambda_i V_i V_i^{!} \quad \ldots\ldots (3)$$

$V_i V_i^{!} = \delta_{ij}$ (that is, orthonormality)

$$\lambda_1 \geq \lambda_2 \geq \cdots \geq \lambda_p \geq 0$$

Where C is the p x p correlation or covariance matrix analyzed, V_i are the eigenvectors or principal components .The Kaiser-Meyer-Olkin (KMO) sampling adequacy test was used to determine whether there was a statistically significant difference in the importance of each derived element related to farmers' perceptions of agricultural insurance and to rank factors. Perceptions and risk attitude can be modelled as explanatory variables with a link between a binary dependent variable and a collection of independent variables, which can be binary or continuous [32].

Results and Discussion

Descriptive Statistics of khat farmers' Perceptions on agricultural insurance in Igembe North sub-county, Meru County, Kenya.

This study attempted to understand khat farmers' perceptions on agriculture insurance. The study employed a five-point Likert scale with values ranging from 1 to 5, with 1 representing strongly disagree, 2 representing disagree, 3 representing uncertain, 4 representing agree, and 5 representing strongly agree. The mean values indicate the average perception score for each aspect (Table 2). Khat farmers perceive agricultural insurance should be compulsory to all farmers, insurance is essential in the farm, all crops and livestock should be insured, total compensation should be received in case a loss is suffered, policies influencing agricultural insurance should be formulated at the county level, insurance support farmers in case of losses and insurance companies can be trusted.

Table 2: Summary statistics for the aspects used to measure khat farmers' perception on agricultural insurance in Igembe North sub-county, Meru County, Kenya.

Variable	Mean	Std. Dev.
Insurance being compulsory	3.257	1.318
Insurance is essential	3.301	1.266
All crops and livestock insured	3.307	1.393
Total compensation received	3.	1.336
Loss shared by insurers and farmers	2.944	1.339
Policy formulation at the County level	3.885	1.118
Insurance support farmers	3.449	1.403
No need for insurance	2.697	1.374
Insurance is a form of tax or cost.	2.731	1.457
Insuring companies can be trusted	3.207	1.212

Principal component analysis on khat farmers' perception on agricultural insurance in Igembe North sub-county, Meru County, Kenya

Principal Component Analysis (PCA) was done on identical variables to reduce all data from the unique connected variables into smaller principal components [33]. Factors were rotated using orthogonal rotation varimax method to place less strongly correlated variables under each aspect, making interpretation easier [34]. All factors with eigenvalues greater than one were maintained and examined using Kaiser's criterion. Two components were built using the clusters obtained during the unconstrained grouping test.

Table 3 displays the results of a rotating elements matrix of distinct variables for responses and the factor loadings for each factor. The unexplained column displays the overall variance of each variable maintained in the factors. Small values for the principal components denote factors that did not fit the factor solution well and were eliminated from the study. The rotational element matrix considered variables with high factor loadings greater than or equal to 0.3 [35].

The Principal Component Analysis included ten variables, with two principal components with eigenvalues greater than one maintained for further analysis. These two Principal components accounted for 78.27% of the variance in the dataset. Each component is described in terms of the factors that are highly connected to it.

The first component explains the 61.27% variance (Table 3). Comp 1 is equivalent to necessity, need of agricultural insurance and the trustworthiness of insuring companies. It is positively correlated with agricultural insurance being compulsory to all farmers, the essentiality of agricultural insurance and support to khat farmers indicated the essentiality of agricultural insurance to khat farmers. A positive correlation was also indicated on the variable trust of agricultural insurance companies with approximately 58% agreeing that insurance companies can be trusted. Furthermore, a positive correlation was indicated on the variable insuring of all crops and livestock thus, showing the need for agricultural insurance. The first component also negatively correlates with the variables no need for agricultural insurance and the view of

agricultural insurance as a cost or tax. Approximately 63% of the respondents disagreed that there is no need for agricultural insurance and agricultural insurance is a form of tax or cost. This shows it needfulness to the Khat farmers.

The second component is equitable to compensation after loss and it accounts for 17 % of the variation (Table 3). It is positively correlated with the variable total compensation from the insuring company after a loss is suffered. The PCA loading for the total compensation are strong. The variable total loss shared between the insuring company and the insured farmer is negatively correlated to the second component compensation. Khat farmers desires to be fully compensated by the insuring company in case any losses occurs. Ghazanfar et al. revealed the existence of negative perceptions of the farmers about crop insurance i.e. farmers perceived crop insurance as a kind of tax and they believed premium was so high that it was out of range of poor farmers and only large scale farmers could afford it.

The appropriateness of the data for analysis was tested using the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) and an overall KMO value of 0.925 obtained, indicating a magnificent KMO. The identification of the correlation matrix as an identity matrix was also tested using the Bartlett's test of sphericity where a p-value of 0.000 was exhibited, this indicated that PCA could be carried out. The study Cronbach Alpha coefficient was $\alpha = 0.8999$ indicating the questionnaire was reliable for the study (Table 3).

Table 3: Results of the Principal Component Analysis model to categorizing the features of farmers' perception of agricultural insurance in Igembe North sub-county, Meru County, Kenya.

Variable	Comp1	Comp2	Unexplained	KMO	Alpha test
Insurance being compulsory	**0.3781**	0.0209	0.1232	0.952	0.8752
Insurance is essential	**0.385**	0.0463	0.08846	0.942	0.8745
All crops and livestock insured	**0.3589**	0.0455	0.2071	0.965	0.8799
Total compensation received	-0.0404	**0.702**	0.1521	0.504	0.9196
Loss shared by insurers and farmers	0.099	**-0.6793**	0.1552	0.583	0.9114
Policy formulation at the County level	0.0869	-0.1732	0.9027	0.815	0.9177
Insurance support farmers	**0.3755**	0.058	0.1302	0.939	0.877
No need for insurance	**-0.3768**	-0.0038	.13	0.954	0.8751
Insurance is a form of tax or cost.	**-0.3781**	-0.0503	0.1199	0.962	0.8759
Insuring companies can be trusted	**0.3674**	0.0718	0.1642	0.968	0.8784
Overall KMO				0.925	
Test scale					0.8999
Eigen value	6.1266	1.7002			
Proportion	0.6127	0.17			

Descriptive Statistics of khat farmers' risk attitude of khat farmers in Igembe North sub county, Meru County, Kenya

The study also attempted to determine the risk attitude of Khat farmers. The study employed a five-point Likert scale with values ranging from 1 to 5, with 1 representing strongly disagree, 2 representing disagree, 3 representing uncertain, 4 representing agree, and 5 representing strongly agree. Khat farmers are anxious about decisions made, prefer bank deposits to keep their money safe than have it in cash, they take a long time to make investment decisions, they would like their investment money to be safe and they would better be safe than sorry in their khat business (Table 4).

Table 4: Summary statistics for the aspects used to measure risk attitude of khat farmers in Igembe North sub county, Meru County, Kenya.

Variable	Mean	Std. Dev.
Anxiety about the decisions made	4.2074	0.954073
Prefer bank deposit for safety	4.2539	0.865456
View risk as an opportunity	1.9505	0.967175
Long time to make investment decision	4.1115	1.024525
Keep Investment money safe	4.0372	1.065486
Explore investment opportunities	3.8978	1.062676
Go for the best opportunity even if risks are involved	1.8328	0.896806
High risk to attain more revenue	1.9195	0.955382
Be safe than sorry in my khat business	4.0093	0.989027
Expose to risk for more khat yields	1.904	0.925862
Khat business at risk	1.8885	0.891624
Willingness to take risk	1.7895	0.848243

Principal component analysis on khat farmers risk attitude in Igembe North sub-county, Meru County, Kenya

The Principal Component Analysis included twelve variables, with two principal components with eigenvalues greater than one maintained for further analysis. These two principal components accounts for 44.81% of the variance in the dataset. Each component is described in terms of the factors that are highly correlated to it. This two variable had the strong PCA factor loading as indicated in Table 5 below.

The first component accounts for 35.85% variance and is positively correlated with the variables view risk as an opportunity, having khat business at risk and the willingness to take up risks. It is negatively correlated with the variable anxiousness about investment decisions made and preference for bank deposits to keep money safe than having it in cash. This designate that khat farmers are not anxious about investment decisions and prefer holding their money in cash than bank deposits. The second component accounts for 8.96% variance and is positively correlated with the variable exploring investment opportunities for their money and negatively correlated to the variable keeping investment money safe even if it means lower returns. This denotes that khat farmers would prefer high returns for their investment even though there are risks. The results suggest that that khat farmers are risk loving. The results are inconsistent with Belhenniche et al. [18], Korir et al. [19], Demiryürek et al. [20], Dadzie et al. [21], Waithira [22] and Bibek [23], who found out that majority of the respondent were risk averse.

The appropriateness of the data for analysis was tested using the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) and an overall KMO value of 0.8869 obtained, indicating an excellent KMO. The identification of the correlation matrix as an identity matrix was also tested using the Bartlett's test of sphericity where a p-value of 0.000 was exhibited, which indicated that PCA could be carried out (Table 5).

Table 5: Results of the Principal component analysis on khat farmers risk attitude in Igembe North sub-county, Meru County, Kenya.

Variable	Comp1	Comp2	Unexplained	kmo	alpha
Anxiety about the decisions made	**-0.3333**	0.2698	0.4437	0.8677	0.8007
Prefer bank deposit for safety	**-0.3311**	0.1764	0.4949	0.8795	0.8016
View risk as an opportunity	**0.3063**	0.1577	0.5695	0.9114	0.8061
Long time to make investment decision	-0.2883	-0.2113	0.5944	0.8826	0.8084
Keep Investment money safe even if it means lower returns.	-0.2589	**-0.4894**	0.4541	0.8442	0.8144
Explore investment opportunities	-0.045	**0.7177**	0.4373	0.5977	0.8423
Go for the best opportunity even if risks are involved	0.2926	-0.0787	0.6249	0.898	0.8081
High risk to attain more revenue	0.2572	0.0322	0.7142	0.9223	0.8141
Be safe than sorry in my khat business	-0.2908	0.0302	0.6351	0.9166	0.8085
Expose to risk for more khat yields	0.288	-0.2371	0.5827	0.876	0.8091
Khat business at risk	**0.3372**	0.0314	0.5097	0.8916	0.8007
Willingness to take risk	**0.3166**	0.082	0.5614	0.8908	0.8037
Overall				0.8869	
Test scale					0.8233
Eigen values	4.3026	1.07557			
Proportion	0.3585	0.0896			

Conclusion and Recommendations

Agricultural insurance is an effective instrument for controlling agricultural hazards, and it may be used as a risk mitigation approach in practically any field of human activity. Improving individual perception builds trust and understanding of how agricultural insurance works. When farmers see its benefits and reliability, they are more likely to adopt it. This shift in mindset encourages wider acceptance and participation. Khat farmers in Igembe North Sub County perceive that the agricultural insurance is necessary and essential in khat farming and the agricultural insurance can be trusted. They also expect a full compensation in the case that a loss is suffered in their khat farming business. The study recommends creating more awareness on agricultural insurance to enhance and improve khat farmers' perception on insurance. Additionally, insurance companies offering insurance program can establish program that offers full compensation to khat farmers in case a loss is suffered. A farmer's risk attitude affects how they handle uncertainty, especially in situations like farming where outcomes are unpredictable. Khat farmers in Igembe North Sub County would love to explore investment opportunities for their money and would prefer high returns instead of keeping their investment money safe. These indicates that they are risk loving.

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