EVALUATION OF AGRICULTURAL RISK MANAGEMENT STRATEGIES AMONG CASSAVA FARMERS IN DELTA STATE, NIGERIA

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Abstract

This study was conducted to evaluate agricultural risk management strategies among cassava farmers in Delta State, Nigeria. A well designed questionnaire was used to collect data from 240 cassava farmers. Descriptive statistic (means, percentages, and frequency counts) and inferential statistic (T-test and Logistic regression) statistics were used to analyze the data. Findings revealed that the majority of cassava farmers (76%) were women while (42%) were between the ages of 41 and 53, falling within the productive age range. The result reveals that majority of cassava farmers (98%) manage risk by diversifying their farms, indicating that farm diversification is a common strategy among respondents. The results of the logistic regression model at Pseudo R^2 of 69% indicated that the explanatory variables explained about 69% of the variations in the dependent variable. The coefficient for farm size is positive and significant at the 5% level. The coefficient for farming experience and age are also significant and positive. The coefficient for extension contact is significant and positive. A significant and positive relationship is found between the Membership of organization and agricultural risk management strategies. The result shows that the calculated t-value is 5.631, and the critical table value is 1.645. This suggests that the calculated t-value is greater than the critical value, indicating that there is a statistically significant difference between output of cassava farmers before and after agricultural risk management. Key constraints identified include: low income, pest and disease incidence, lack of access to technology, adverse weather and climate change. It was therefore recommended that government and relevant agricultural agencies should strengthen extension services by training and deploying more agents to rural communities. Financial institutions should offer accessible and farmer-friendly loan schemes to boost production.

Key words: evaluation, risk, management, strategies, farmers

INTRODUCTION

Cassava (Manihot spp.) is an annual crop in Nigeria, known for its starchy edible root tuber, which can remain in the soil for more than one year. Brought to West Africa by Portuguese traders in the seventeenth century (Njoku and Banigo, 2006), Nigeria is now the world's largest cassava producer, contributing 19% of global production and 35% of Africa's total output (Sanni et al., 2009). In Delta State, cassava farmers frequently intercrop with maize, yam, and vegetables.

Farmers depend mainly on rain-fed agriculture with low yields and inputs. Cassava farmers in developing countries face higher climate vulnerability and, lacking institutional risk management measures like crop insurance, rely on traditional strategies to offset

adverse effects on production (Birthal et al., 2021). Five general risk types affect farmers: production risk from uncertain natural growth processes, price risks from volatile market conditions, financial risks related to credit access and cash flow, institutional risks, and human/personal risks (USDA Economic Research Service, 2024).

Farmers employ risk mitigation (reducing probability or impact), risk transfer (shifting risk to other parties), and risk adaptation (adjusting practices to changing conditions) strategies (Birthal et al., 2021). Traditional strategies include crop diversification, precautionary savings, and social networks (Ngcobo and Jewitt, 2016). Enterprise diversification assumes incomes from different crops don't move in perfect correlation, offsetting low income from some activities with higher income from others (USDA Economic Research Service, 2024).

Social networks provide crucial risk management through informal insurance, labor sharing, and information exchange. However, traditional strategies face increasing challenges from climate change and market volatility. Agricultural micro-insurance is being tested to support cassava farmers against climate effects like droughts, floods, and pest infestations (Climate Analytics, 2023). Weather-indexed insurance offers particular promise through rapid payouts based on measurable weather parameters.

Financial institutions typically avoid agricultural financing, especially for small-medium farmers, due to perceived high costs and risks (Agricultural Economics Library, 2024). This financing gap limits farmers' investment in risk-reducing technologies. Microfinance institutions and mobile money platforms increasingly bridge this gap through tailored financial products.

Agriculture inherently carries risks, particularly in regions susceptible to floods, droughts, and cyclones (Kumar et al., 2011). Changes in planting schedules, management practices, varieties, and crop diversification are low-cost risk reduction options promotable through extension services (Harvey et al., 2014). Integrating climate information services with traditional knowledge represents a promising approach for enhancing adaptive capacity.

With global population projected to reach nearly 10 billion by 2050, food production must surge by up to 98%. Farmers will play pivotal roles, particularly in Asia and sub-Saharan Africa where approximately 80% of food is produced by small farms. Despite their contribution, around 90% of world farmers operate on less than two hectares. Cassava farmers face immense challenges affecting production and livelihoods, with increasing vulnerability from adverse climate projections (Zhang et al., 2024).

Decision-making in farming is challenging, requiring proactive anticipation of potential problems and mitigation strategies. Central to successful risk management is accurate information availability through consistent data recording. Reliable information stands as farmers' most valuable asset, facilitating informed risk management decisions.

Risk management remains a major challenge leading to poverty among cassava farmers. Policies guiding cassava farmers have been neglected, with limited input access and inadequate business-friendly environments. The types and severity of risks vary geographically. Financial risks include interest rate fluctuations, insufficient cash flow for debt servicing, and changing credit terms. Climate risks' complexity and unpredictability

have led banks to avoid rural finance ventures, resulting in primarily state-owned agricultural banks as solutions. The need therefore for the study is apt.

Objectives of the Study

The broad objective was to evaluate Agricultural risk management strategies on cassava farmers in Delta State, Nigeria. However the specific objectives of the study are to:

i. describe the socio-economic characteristics of cassava farmers,
ii. ascertain the various Agricultural risk management strategies used by cassava farmers in the study area,
iii. evaluate the output of cassava farmers before and after Agricultural risk management,
iv. determine factors that influence agricultural risk management strategies among cassava farmers and
v. identify constraints to agricultural risk management strategies among the cassava farmers.

Research Hypothesis

The following hypothesis were formulated and tested to guide the study

Hoi: Agricultural risk management strategies have no significant effect on the cassava farmers output in the study area

Hoii: There is no significant relationship between cassava farmer's socio-economic and institutional characteristics and agricultural risk management strategies in the study area.

Theoretical Framework

Production Theory

It is an established fact that production typically involves joint production, meaning the creation of more than one physically distinct output. Examples include the production of wool and mutton or corn and straw. Often one or more of these joint-products are considered bad or dis-commodities. This research is based on the context of the Cobb-Douglas production function. While the function is widely recognized under this name, it was originally formulated and used by Knut Wicksell in 1900 (Velupillai 1973). It became closely associated with Charles Cobb and Paul Douglas because they were the first to empirically test it. Between 1927 and 1947, they carried out their analysis using real-world data. They carried out research in economics and mathematics, using data from developed countries across the globe. They defined capital as an actual value of machinery, buildings and equipment, facilities etc., while labor was seen as the total number of hours worked by employees during a given period.

Customarily, Cobb-Douglas function is written as:

$$\mathbf{Q = AL^a K^b}$$

Where Q = Output, L= Labour, K= Capital. A, a and b are positive parameters where a>0, b>0 and K independent variable, Q is explained by the residual A

In the Cobb-Douglas production function the following should be noted.

$a+b > 1$: increasing return to scale

$a+b = 1$; constant return to scale

$a+b < 1$: decreasing return to scale

Expressing Cobb-Douglas production function in linear logarithmic form;

$\log Q = \log A + a \log L + b \log K$

It is referred to as log linear production function when expressed in this form. Its expression includes labour and capital which serves as a theoretical guide in this work.

Theory of Shariah (A Bird in Hand Theory)

Despite the significant growth of Islamic products, there remains a lack of shariah compliant alternatives to meet the needs of local investors (Noordin, 2016). Local investors heavily depend on shariah compliant stocks, which play a crucial role in their investment port folios. As a result, the wealth of shariah-oriented investors is influenced by both dividend payouts and capital gains. The bird in hand theory is based on the saying, a bird in hand worth two in the bush. This theory challenges the dividend irrelevance theory proposed by Miller and Modigliani (1961), arguing that investors prefer receiving dividends now rather than waiting for future capital gains. It was introduced by Litner (1956) and Walter (1963), and is supported by the dividend relevance theory suggested by Gordon (1959), which asserts that investors value the certainty of dividends over the uncertainty of future capital gains. Both theories emphasize that investor's behaviour is influenced by dividend payouts, firms with higher dividend payout attract more investors and as a result tend to have higher market prices.

Theory of Risk

The utility function allows for the estimation of favourable and unfavourable risk outcomes under uncertainty. There has also been limited effort to connect the various approaches to studying risks, one of the approach is exemplified by the work of (Coombs, 1964; Coombs & Huang, 1969; Coombs & Meyer, 1968; Combs & Pruitt, 1960; Pruitt 1962). Coombs investigated the variable that influence the perception of risk in gambles and how perceived risk impact preferences among them. His theory suggests that each individual has an ideal level of risk. The study of risk taking has attracted significant interest not only from decision making researchers but also from scholars in personality and social psychology. In fact, the inclination to seek or avoid risk has been explored in numerous studies in relation to other psychological factors. A very different approach to studying risk can be found in the economic and business literature, which primarily focuses on normative rather than descriptive issues. The portfolio selection is analyzed in terms of risks associated with each available option. In this context, risk is either defined by the distribution of returns (e.g., Markowitz, 1959; Tobin, 1958) or by the characteristics of the utility function (e.g., Pratt, 1964).

Despite the diversity of approaches, several basic assumption are shared across the study of risk: a) Risk is considered a property of options e.g Gambles, b) options can be meaningfully ranked based on their level of risk. c) The risk of an option is linked to the variance of its outcomes. This was first noted by economist I. Fisher in 1906 and later reiterated by Allias in 1953 in his critique of expected utility theory. Beyond these fundamental assumptions there is no consensus on the nature of risk. Although different assumptions about risk perception have been proposed, they have not been derived from more fundamental principles.

RESEARCH METHODOLOGY

Study Area and Sampling Technique: This study was conducted in Delta State, Nigeria. A multi-stage random sampling method was adopted to select two agricultural zones from the three agricultural zones of the state. Secondly, a random selection of three (3) local government area (LGAs) from the two sampled zones, making a total of six (6) local government areas and four (4) communities was selected from the selected local government areas, making a total of twenty (24) communities, and ten (10) cassava farmers was sampled from each of the selected communities, which gave a total sample size of two hundred and forty (240) respondents.

Method of Data Collection and Data Analysis: Both primary and secondary data were used for the study. Primary data were collected based on the objectives of the study using well designed questionnaire and secondary data were collected from both published and unpublished materials. Data collected were analyzed using both descriptive ad inferential statistical tools such as frequency, percentage, mean, mode, Likert scale rating, and binary logistic regression model.

Model specification.

Logistic regression model

The possibility of a farmer adopting a risk management strategy or not was investigated using a logit model. Risk management strategies is a dummy or binary dependent variable that takes the value 1 if the farmer adopt risk management strategies and 0 (zero) otherwise. Allow Yi to represent the farmer's decision to adopt or not adopt risk management strategies. Yi is thought to be influenced by a collection of risk features, socio factors, institutional factors, and relationship factors (Xi). The following is the relationship between dependent and independent variables:

$Y_i = \beta_1\beta_2X_i + \mu_i$ .....(1)

Since we just want to know whether or not cassava farmers adopt risk management strategies, we therefore define another variable $Y*$ such that:

$Y_1^* = 1$ if the farmer adopt risk management strategies

$Y_1^* = 0$ if the farmer does not adopt risk management strategies.

Hence

$Y_i^* = \beta_1 + \beta_2X_i + \mu_i$, $Y = 1(Y_i^* > 0)$ ……(2)

This means Y is one when $Y_i^* > 0$ and Y is zero if $Y_i^* \leq 0$.

As a result, it is presumed that μ_i is unrelated to X_i and that μ_i has standard logistic distribution. In addition, $\mu_i$has a symmetric distribution about zero. The probability (pi) that the cassava farmer will adopt risk management strategies is estimated using the logistic function

$$Pi = \frac{1}{1+e^{-Y^*i}} = \frac{1}{1+e^{-(\beta1+\beta2X+\mu i)}} \quad \text{……(3)}$$

The Equation restricts Pi to lie between 0 and 1 as required for probability

$$1 - Pi = \frac{e^{-(\beta1+\beta2X+\mu i}}{1+e^{-(\beta1+\beta2X+\mu i)}} \quad \text{……(4)}$$

Let $\beta_1 + \beta_2X + \mu_i = Z$

Then it becomes

$$1 - Pi = \frac{e^{-z1}}{1+e^{-z}} \quad \text{……(5)}$$

Rearranging

$$e^z = \frac{Pi}{1-Pi} \quad \text{……..(6)}$$

Taking the log of both sides

$$lne^z = \ln\left[\frac{Pi}{1-Pi}\right] \quad \text{…….(7)}$$

$$Z_1 = \ln\left[\frac{Pi}{1-Pi}\right] \quad \text{…….(8)}$$

$$\ln\left[\frac{Pi}{1-Pi}\right] = \beta_1 + \beta_2X_1 + \mu i \quad \text{…….(9)}$$

The cumulative logistics probability model is econometrically specified as follows:

$$Pi = Y_i^* = F(\beta_1 + \sum\beta_2X_i) = F(Z_i) = \frac{1}{1+e^{-Z_1}} \quad \text{……..(10)}$$

Where, Pi is the probability that a farmer will adopt risk management strategies or not. Xi represents the i^{th} explanatory variable; and β_1 and β_2 are parameters to be estimated.

$Y = \beta_o + \beta_1X_1 + \beta_2X_2$ ……. + e ……(11)

Where Y = risk management strategies (dummy, if the farmer adopt risk management strategies = 1, otherwise = 0).
X_1 = farm size (ha)
X_2 = farming experience (years)
X_3 = sex (1 = male, 0 = female)
X_4 = extension contact (1 = yes, Otherwise = 0)
X_5 = age (years)
X_6 = Income level (₦)
X_7 = marital status (1 = married, 0 = otherwise)
X_8 = Household size (number of person)
X_9 = Educational status
X_{10} = membership of organization (yes = 1, otherwise = 0)

RESULT AND DISCUSSION

Socio- economic characteristics of the respondents

Table 1 showed the socio-economic attributes of the respondents and are discussed below.

Analysis showed 76.25% of respondents were female and 23.75% male, indicating more female cassava farmers in the research area, possibly because men focus on other businesses. This aligns with Ajah et al. (2022) findings on cassava farmers. Age distribution showed 13.75% between 22-30 years, 40% between 31- 40, 42.50% between 41-53, and 3.9% above 54 years, indicating most respondents fall within economically active age brackets, consistent with Owoeye and Toluwase (2018). Marital status revealed 58.30% married, 33.50% single, and 9.20% widowed. Higher married percentages may reflect family labor benefits on farms, aligning with Onyemauwa et al. (2023) who reported 66% married cassava farmers. Educational levels showed 31.25% completed primary education, 41.25% secondary, 21.25% tertiary, and 6.25% had no formal education, indicating moderate education levels similar to Ajayi and Okoedo-Okojie (2008). Farming experience indicated 42.50% had 11-15 years' experience, 38.9% had 6-10 years, 7.50% had 16-20 years, and 11.25% over 20 years, suggesting experienced farmers. This supports Ironkwe et al. (2012) findings on farming experience's influence on technical efficiency. Household size showed 48.8% had 4-6 family members, 48.75% had 1-3 members, with smaller percentages in larger household categories, aligning with Owoeye and Toluwase (2018). Farm size analysis revealed 54.75% operated 1-2 hectares, 26.25% operated 2-3 hectares, indicating largely subsistence-based cassava farming, consistent with Onu and Echebiri (2019). Farmland ownership showed 50% rented farmlands, 36.3% leased, and 13.8% purchased, suggesting reliance on temporary land arrangements affecting long-term investments, as highlighted by Ironkwe et al. (2012). Finance sources showed 53.8% relied on money lenders, with others using cooperatives (11.3%), commercial banks (12.5%), friends (17.5%), microfinance banks (2.5%), and personal savings (2.5%), aligning with Adeagbo and Awoyinka (2006). Annual income showed 36.4% earned NGN 151,000-200,000, with 31.2% earning NGN 101,000-150,000, similar to Owoeye and Toluwase (2018) distributions. Credit access revealed 63.7% lacked access while 36.6% had access, highlighting common agricultural system issues. Extension service access showed 91.3% had no access versus 8.3% with some contact, indicating significant support gaps. Cooperative membership showed 61.3% were members versus 38.8% non-members, facilitating resource sharing and credit access.

Table 1: Distribution of respondents according to Socio-economic characteristics

Parameter	Frequency	Percentage	Mean/Mode
Gender			
Male	57	23.75	
Female	183	76.25	Female
Age of respondent			
22-30	33	13.75	
31-40	96	40	40 years
41-53	102	42.50	
54-64	9	3.75	
Marital status			
Single	78	32.50	
Married	140	58.30	Married
Widowed	22	9.20	
Educational Level			
Primary	75	31.25	
Secondary	99	41.25	Secondary
Tertiary	51	21.25	
No formal education	15	6.25	
Farming experience			
3-4yrs	18	7.50	
6-10yrs	93	38.75	11 years
11-15yrs	102	42.50	
16-20yrs and above	27	11.25	
Household size			
1-3	78	32.5	
4-6	117	48.75	
7-9	24	10	5 persons
10-12	12	5.0	
13-15	9	3.75	
Farm size			
1.0-2.0 ha	129	53.75	
2.2-3.0 ha	63	26.25	
3.2-4.0 ha	12	5	2 hectares
4.1-5.0 ha	27	11.25	
5.2-5.3 ha	9	3.75	
Source of cassava farmland			
Purchased	33	13.75	
Leased	87	36.25	Rented/Freehold
Rented / freehold	120	50	
Source of finance			
Money lender	129	53.75	
Cooperative society	27	11.25	
Commercial banks	36	15	Money Lender
Micro finance bank	6	2.50	
Friends	42	17.50	
Personal saving	6	2.50	
Annual income NGN			
1000 - 50,000	9	3.75	

51000 - 100,000	48	20	NGN 135,000
101,000 - 150,000	72	30	
151,000 - 200,000 & above	111	46.25	
Access to credit			
Yes	87	36.3	No
No	153	63.7	
Access to extension services			
Yes	21	8.8	
No	219	91.3	**No**
Members of cooperative			
No	93	38.8	**Yes**
Yes	147	61.3	

Source: Field Survey, (2025).

Various agricultural risk management strategies used by the cassava farmers

Reveals that a significant majority of cassava farmers (98%) manage risk by diversifying their farms, indicating that farm diversification is a common strategy among respondents. Similarly, 98% of the farmers cultivate improved varieties of cassava, reflecting a strong preference for high-yield and disease-resistant crops. Mixed or inter-cropping is also widely practiced, with 93% of farmers adopting this method to minimize risks associated with mono-cropping. Regular weeding is another popular strategy, practiced by 90% of the farmers, which helps maintain crop health and reduce pest-related losses. Additionally, 87% of the respondents have off-farm investments, suggesting a strategy to spread income sources and reduce dependence on farming alone. Fertilizer use was reported by 55% of the farmers, indicating a moderate reliance on soil enhancement techniques. Half of the respondents (50%) are members of cooperative societies, which can provide financial support, input access, and market linkages. Contract sales are utilized by 32% of the farmers, showing limited engagement in formal marketing arrangements. Lastly, only 23% of the farmers insure their crops, suggesting that agricultural insurance is not yet widely adopted as a risk management strategy among cassava farmers in the study area. These findings are consistent with those of Ajetomobi (2010), who reported that diversification, improved varieties, and intercropping were the most common risk management practices among smallholder farmers in Nigeria.

These findings align with similar studies, such as those conducted in Ideato South Local Government Area, Imo State, Nigeria, where mixed cropping, off-farm investments, and low adoption of agricultural insurance were also identified as common practices among cassava farmers (Osuji, Igberi, & Ehirim, 2023).

Table 2: Rank order of various agricultural risk management strategies used by the cassava farmers

Strategies	Frequency	percentage	ranking
1. Cultivation of improved varieties	235	98	2nd
2. Insurance	56	23	9th
3. Co-operative	121	50	7th
4. Diversified farming	237	99	1st
5. Mixed/inter cropping	223	93	3rd
6. Regular weeding	215	90	4th
7. Fertilizer use	132	55	6th
8. Contract sales	76	32	8th
9. Off farm investment	208	87	5th

Source: Field survey data, (2025). (Multiple choice responses recorded)

Evaluation of the adoption levels of risk management strategies by cassava farmers

Strategies like diversified farming, cultivation of improved varieties, mixed/intercropping, regular weeding, and off-farm investment had high mean scores (above 2.5), indicating they were widely adopted by farmers. These are practical and familiar approaches to managing risks on and off the farm. Membership of co-operatives and fertilizer use showed moderate adoption, suggesting that while some farmers utilized these strategies, there may had been barriers such as cost, access, or awareness. Contract sale and agricultural insurance had very low mean scores, implying that formal or institutional risk management strategies were barely used. This could have been due to low awareness, limited availability, or mistrust in such systems.

Table 3: **Evaluation of the adoption levels of risk management strategies by cassava farmers**

Strategies	Strongly adopted	Moderately adopted	Low adoption	Score	Mean	Remark
1. Cultivation of improved varieties	155	67	13	612	2.55	Accepted
2. Insurance	33	13	10	135	0.56	Not accepted
3. Co-operative	87	23	11	318	1.33	Not accepted
4. Diversified farming	176	51	10	640	2.67	Accepted
5. Mixed/inter cropping	160	47	32	606	2.53	Accepted
6. Regular weeding	184	24	7	607	2.53	Accepted
7. Fertilizer use	67	54	11	320	1.33	Not accepted
8. Contract sales	22	25	29	145	0.60	Not accepted
9. Off farm investment	187	19	2	60 1	2.50	Accepted

Source: Field Survey Data, (2025).

Strongly Adopted (SA) = 3, Moderately Adopted (MA) = 2, Low Adoption (LA) = 1, *Mean $\geq$ 2.5 is significant(widely adopted), * Mean $\leq$ 2.5 is insignificant

Factors that influence agricultural risk management strategies among cassava farmers

Logistic regression analysis results showed several significant factors as discussed below:

Farm Size: Positive and significant coefficient (2.28, $p<0.001$) indicates larger farms require more risk management strategies. Larger holdings face greater climate, pest, and market risk exposure, making farmers more inclined toward protective strategies including diversification, insurance, and improved seeds. This enables economies of scale in accessing risk-mitigating technologies (Abdulai & Huffman, 2014) and better institutional support access (Olarinde & Manyong, 2007).

Farming Experience: Significant positive coefficient (0.032, $p<0.05$) shows longer experience associates with higher strategy adoption. Experienced farmers better understand seasonal changes, pest cycles, and market fluctuations, building intuition for proactive decisions (Meuwissen et al., 2001). They're more likely to adopt preventive measures and possess better understanding of available technologies (Dercon, 2002).

Extension Contact: Significant positive coefficient (0.035, $p<0.1$) indicates extension agent contact impacts strategy adoption. Extension agents inform farmers about emerging

risks, available technologies, and resilience-enhancing practices, increasing awareness and willingness to adopt modern risk management (Anderson & Feder, 2004). They bridge researchers and farmers, translating technical knowledge into practical advice (Feder et al., 2011).

Income Level: Significant positive coefficient (5.46, $p<0.001$) suggests higher income enables greater strategy adoption. Financial stability allows investment in risk management practices, though wealthier farmers might also perceive greater vulnerability, motivating protective strategies.

Organizational Membership: Significant positive coefficient (0.048, $p<0.05$) shows group membership increases strategy adoption. Membership provides shared resources, pooled knowledge, and collective risk-sharing mechanisms like cooperative insurance (Barrett et al., 2001), improving information dissemination and market access (Deressa et al., 2009).

Age: Significant positive coefficient (0.035, $p<0.05$) indicates older farmers adopt more strategies, likely due to accumulated experience with various risks and better understanding of available technologies.

Table 4: Logistic regression on factors that influence agricultural risk management strategies among cassava farmers

Variables	Coefficient	Std. Err	Z	P> Z
Farm size (ha)	2.28456	3.586999	2.42	0.002***
Farming experience (years)	.0320658	.057806	2.63	0.043**
Extension contact	.0347655	0.652539	3.22	0.062*
Marital status	-1.232144	.1239742	-2.48	0.023**
Age	.03467583	.3412334	3.43	0.046**
Sex	-.4035554	.3215728	-0.51	0.652
Income	5.463744	2.485762	3.35	0.001***
Membership of organization	.0483326	.0123107	1.66	0.048**
Household size	-2231894	.2310928	2.00	0.007**
Education	-.1235694	.4210659	-0.92	0.358
Constant	-2.421997	1.43208	1.60	0.32
LR chi2 (11)	87.65			
Prob> Chi2	0.0000			
Pseudo R^2	0.6900,			
Hosmer Lemeshow Goodness fit	0.43(p=0.82)			

Source: Computation from Field Survey Data, (2025).
***, **, * represent 1%, 5%, and 10%. P<Z is significance at <5% level

T-test Analysis of output of cassava farmers before and after adopting agricultural risk management

The result on Table 5 shows that the calculated t-value is 5.631, and the critical table value is 1.645. This suggests that the calculated t-value is greater than the critical value, indicating that there is a statistically significant difference between output of cassava farmers before and after agricultural risk management. This suggests that the statistical analysis supports the idea that agricultural risk management does have an impact on cassava output.

This finding aligns with studies showing that risk management interventions, such as crop insurance, extension support, and improved inputs, enhance productivity by reducing vulnerability to climatic and market risks (Dercon, 2002; Meuwissen, Huirne, & Hardaker, 2001). Hence, ARM positively influences output among cassava farmers (Nhemachena & Hassan, 2007; Yesuf & Bluffstone, 2009).

Table 5: T-test Analysis of the output of cassava farmers before and after Agricultural risk management practices

Category	Mean	Std. Deviation	Std Error	T-test	Prob
Output of cassava farmers before and after Agricultural risk management	0.243	0.636	0.231	5.631	0.000***

Note: *** represent 1% significance level.
Source: Computation from Field Survey Data, (2025).

T-test probability < 5% level which shows there was a statistically significant difference between the variable before and after agricultural risk management practices at 1%.

Constraints to agricultural risk management strategies among cassava farmers

Table 6 presents the major constraints affecting agricultural risk management strategies among cassava farmers. Key constraints identified include: low income (mean = 3.06), pest and disease incidence (mean = 2.74), lack of access to technology (mean = 3.34), adverse weather and climate change (mean = 2.47), inadequate extension services (mean = 3.58), limited access to agricultural credit (mean = 3.16), poor market linkages (mean = 2.03), low output prices (mean = 2.42), environmental challenges such as erosion, flooding, and soil degradation (mean = 3.18), and inadequate availability of improved cassava stem varieties (mean = 2.28). The results revealed that inadequate extension services (mean = 3.58) constitute the most significant constraint faced by cassava farmers in managing agricultural risks in the study area. This finding aligns with studies emphasizing the critical role of extension services in improving farmers' resilience to risk through access to timely information, innovations, and best practices (Aker, 2011). Without effective extension support, farmers are less equipped to adopt risk-reducing technologies and practices.

Table 6: Rank order of the constraint to agricultural risk management strategies

Rank order of the constraint to agricultural risk management strategies	VS	S	NS	NVS	Score	Mean	Remark
Low income	111	76	11	42	736	3.06	Accepted
Pest & Diseases	92	43	57	48	659	2.74	Accepted
Lack of technology	154	34	29	27	803	3.34	Accepted
Weather/ climate change	56	65	56	63	594	2.47	Not accepted
Lack of extension agent	176	45	2	17	860	3.58	Accepted
Low access to agricultural credit	123	54	43	20	760	3.16	Accepted
Poor linkages between market	21	65	56	98	489	2.03	Not accepted
low price of output	34	87	67	52	583	2.42	Not accepted
Erosion, flooding & soil degradation	132	54	21	33	765	3.18	Accepted
Inadequate improved stems variety	43	56	68	73	549	2.28	Not accepted
Total						**28.26**	

Above 2.50 = constraint, below 2.50 = not a constraint. Source: Field Survey Data, (2025)
(VS = very severe, S = severe, NS = not severe, NVS = not very severe).

Conclusion

This study highlights the significant role agricultural risk management strategies play in enhancing cassava production among cassava farmers in Delta State, Nigeria. The results demonstrate that farmers actively adopt multiple strategies such as farm diversification, use of improved cassava varieties, mixed cropping, and regular weeding to mitigate various agricultural risks. These practices are influenced by socio-economic and institutional factors including farm size, experience, income level, extension contact, and organizational membership. Importantly, the t-test analysis confirms a statistically significant increase in cassava output following the adoption of these strategies, underscoring their effectiveness. Despite the positive outcomes, farmers face several challenges, particularly limited access to extension services, agricultural credit, and modern technologies. Addressing these constraints through targeted policy interventions and support systems will be crucial in sustaining productivity and resilience among cassava farmers.

Recommendations

Based on the findings of this study, the following recommendations were made:

i. Government and relevant agricultural agencies should strengthen extension services by training and deploying more agents to rural communities.
ii. Financial institutions should offer accessible and farmer-friendly loan schemes. This will help cassava farmers invest in inputs like improved varieties, equipment, and risk-reducing technologies.
iii. Regular training workshops should be organized to educate farmers on modern risk management practices, climate-smart agriculture, and the use of improved technologies to boost productivity.
iv. Encouraging farmers to form or join cooperatives can enhance their access to information, credit, inputs, and markets. This collective strength can also help manage production and market-related risks more effectively.
v. Public and private sectors should invest in infrastructure such as irrigation, drainage systems, and flood control to help farmers cope with adverse weather conditions.
vi. Governments and NGOs should facilitate the distribution of high-quality cassava stem varieties and other inputs at subsidized rates to increase adoption and reduce vulnerability.

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