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Research Article

Assessment of risks associated with cassava production in ibarapa central local government area of oyo state

Fatai Abiola Sowunmi*, Celestinah Temitope Orungbemi, Adejoke Modinat Adedeji

Department of Agricultural Economics, University of Ibadan, Ibadan, Nigeria.

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Abstract

The risk factors associated with cassava production contribute significantly to the loss in the crop yield. The study profiled the sources of risk and determined the loss of cassava yield due to these factors in Ibarapa Central Local Government Area. Two-stage sampling approach was adopted to choose samples while questionnaire was used to collect data from 124 cassava farmers. Data were analysed using difference of mean, likert scale and Tobit regression. Most of the cassava farmers (25.0%) were of middle age (37-47years) while 36.3% of the respondents had no formal education. Average farm size was 5.0 hectares. The study revealed that 28.2% of the respondents cultivated cassava only while 71.8% planted cassava and other crops. The study ranked institutional risk first, while economic and production risks were ranked second and third, respectively. Majority of the farmers identified loss of crops due to attack on cassava farm by grazing cattle (3.52). Other losses in cassava production were attributed to insufficient rainfall, high costs of transportation and labour. There was considerable variation ($p<0.05$) between the average expected output and actual output of cassava. Farm size ($p<0.01$), contact with extension agent ($p<0.04$), co-operative society ($p<0.05$) influenced output loss attributed to risk in cassava production. Government commitment to find a lasting solution to the attack on cassava farms by grazing cattle would reduce production risk in cassava substantially. Efforts aimed at raising farmers' productivity (use of improved cultivars, access to credit, integrated pest and disease control and increased extension contacts among others) rather than increase in cultivated land will reduce loss associated with risk in cassava production.

Keywords: Cassava farmers, institutional risk, likert scale, cassava farming

INTRODUCTION

Cassava is a dietary staple in much of tropical Africa. Nigeria is ranked as the leading producer of cassava in the world, accounting for 19% and 35% of the world and African productions, respectively. According to, Nigeria produces about 52 million metric tons of cassava per year. Generally, cassava is an essential crop in Nigeria, and Oyo State in particular. Cassava production in Oyo State is concentrated in the hands of smallholder farmers. Smallholder farmers are those who produce on small-scale basis, not involved in commercial agriculture but produce at a subsistence level [1]. Rural Cassava farmers are characterized by several cropping systems, strongly dependent on rudimentary inputs and cultural practices. In addition, unavailability of modern inputs as well as production credit has limited the smallholder farmers to use old and traditional inputs, such as hoe and cutlass. All these have resulted in low productivity. Cassava is rich in carbohydrate with numerous uses. Several foods consumed in Nigeria are derived from cassava. According to, cassava is an important raw material used in industries (agro, textile and pharmaceutical among others), feed for livestock and a source of foreign earners for the exporter of the processed form. Its availability all year round, tolerance to low soil fertility, resistance to drought, pests and diseases makes it a choice crop for the smallholder farmers in agro-ecological zones suitable for its cultivation in Nigeria. The role of cassava production in ensuring household food security, poverty reduction and sustained means of livelihood for smallholder farmers in particular cannot be overemphasized. Furthermore, its roots store well in the ground for months after maturity. Affirmed that cassava grows in fairly marginal soil with poor rainfall.

*Corresponding author Fatai Abiola Sowunmi, E-mail: fasowunmi@live.co.uk.

Cassava farmers' decisions are subject to unpredictability of the state of nature, a large amount of their income is highly affected to drought, dependency on rain-fed agriculture, extensive damage to the environment, poor access to commodity market and extension services. This has led to enormous losses in cassava output and income of farmers. It therefore becomes important for farmers to obtain accurate cost-effective, risk management strategies on cassava production to maximize profit. What constitutes production risk in crop production (cassava) varies from one agro-ecological zone to the other. For instance, while climate change may manifest in high temperature and irregular and unpredictable rainfall in some agro-ecological zone, in others it may include increase in grazing cattle attach on farms as a result of decrease in grazing land that necessitates migration. The study is aimed at finding out what constitutes production risk and the extent it has affected cassava production in Ibarapa Central Local Government Areas of Oyo State; being the major cassava producing area in southwest, Nigeria The study seeks to rank the perception of cassava farmers on different risks encountered and factors influencing average yield loss attributed to risk in cassava production in Oyo State. To achieve the objective of the study, the following research questions are raised:

(i) What are the socio-economic characteristics of cassava farmers in the study area?

(ii) What are the risks associated with cassava production in the study area?

(iii) What are the factors influencing the output loss attributed to risks recorded by cassava farmers?

Previous studies on risks associated with farmers were done within and outside Nigeria and outside Nigeria. Most of these studies carried out in Nigeria had smaller scope in terms of risks among smallholder farmers, without in-depth analyses of how it influences the farmers' profit. This research was set to fill this gap as it sought to ascertain and compare the cassava farmers in relation to the risks faced by these farmers, as it will help highlight how these risks affect profit of the rural cassava farmers in Oyo state.

Theoretical framework and literature review

The utility theory is an integral part of risk and attitudes towards it. Scientist's claim that people tend to choose a less risky alternative if the same level of performance can be obtained in the future. Risk in agriculture arises due to uncertainty over factors determining returns to agricultural production. Agricultural risk is characterized by a high unpredictability of returns such that cassava farmers cannot forecast with certainty the amount of output expected.

Various analytical tools have been used by researchers in perception of risks. These are logit regression model, probit model. However, despite the wide usage of these analytical tools, their shortcomings have been well documented in literature. For instance, Logit assume linearity between the dependent variable and the independent variable. Probit requires normal distributions for all unobserved components of utility. Gross profit model measures only profitability and ignore other factors. Linear expenditure system is the restrictiveness. Heckman model is that the dependent variable is only observable for a portion of the data.

Measures of scales used in research include: Multiple choice scale, Semantic differential scale, Graphic rating scale, Staple scale, Ranking scale and among others. Multiple choice scale is time consuming. Semantic differential scale lacks standardization [2]. Graphic rating scale does not give differences in evaluation. Staple scale is not easy to conduct. Ranking scale addresses items in relation to each other.

METHODOLOGY

Description of the study area

Ibarapa central Local Government Area (LGA) of Oyo State was the study area. Ibarapa Igbo Ora and Idere are the two major towns in the LGA. Ibarapa central Local Government Area shares boundary with Ayete (Ibarapa North), Abeokuta (Ogun State) in South, Ibarapa East Local Government Area and Republic of Benin in the West. The average annual rainfall is 300mm and fairly high temperature. There are two distinct seasons; the first (raining) season commences from March and ends in October while the dry season starts in November and ends in February. The LGA falls within rainforest and derived savannah agro-ecological zones. The agro-ecological zones are suitable for the cultivation of tree crops and arable crops. Tree crops: cocoa, oil palm and cashew; arable crops: cassava, maize, yam and other vegetables are the common crops cultivated in the LGA. According to NPC (2010), the LGA had a population of 331,444 in 2006. The total land area of the LGA is 408,424km2. The major occupation in the study area is farming (small scale farming) (Figure 1).

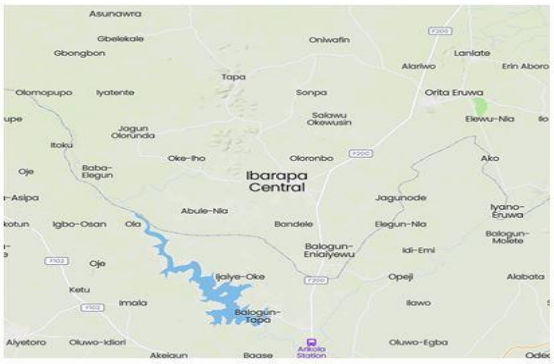

Figure 1. Map of Ibarapa Central LGA.

Sample selection and data collection

Two-stage sampling technique was used to choose 124 cassava farming households from whom data was collected. In the first stage, ten (10) cassava producing villages were purposively selected. In the second stage, 15% of cassava farmers (ranges from 7-13 per village) were chosen randomly from each of the selected villages using the list from the local branch of Cassava Farmers Association of Nigeria. Data were collected using structured questionnaire [3]. Questions were asked on the respondents' age, gender, household size, marital status, educational status, farming experience and size of land cultivated. Others were cassava output in the last harvest (expected and actual), identified risks and coping strategies.

Data analysis

Descriptive statistics was used to profile the socioeconomic characteristics of the respondents. This included charts, tables, charts and estimation of mean, standard deviation and scenes. Difference of means was used to determine whether there is variation between the average output and expected output of farmers that cultivated cassava in the study area. The model used is given as:

$$Z = \frac{\mu_{AO} - \mu_{EO}}{\sigma_{(\mu_{AO} - \mu_{EO})}} \quad \text{.....(1)}$$

$$\sigma_{(\mu_{AO} - \mu_{EO})} = \sqrt{\frac{\sigma_{AO}^2}{n_{AO}} + \frac{\sigma_{EO}^2}{n_{EO}}} \quad \text{.....(2)}$$

Where:

μ_{AO} = the average actual output in the previous cassava harvest (ton)

μ_{EO} = the average expected output in the previous cassava harvest (ton)

σ_{EO}^2 = the variance of expected output in the previous cassava harvest (ton)

σ_{AO}^2 = the variance of actual output in the previous cassava harvest

n_{AO} = the number of respondents

n_{EO} = the number of respondents

The perception of cassava farmers on the different categorization of cassava production risks was assessed using Likert scale. The scaling was as follows (Table 1).

Table 1. Cassava farmers' perception risk indicator.

Effect of risk indicator	Score
Not at all	0
Not severe	1
Moderately severe	2
Severe	3
Very severe	4

The factors influencing yield loss in cassava production attributed to risk was determined using Tobit regression.

$$Y = \eta_0 + \eta_1 L_1 + \eta_2 L_2 + \eta_3 L_3 + \eta_4 L_4 + \eta_5 L_5 + \eta_6 L_6 + \eta_7 L_7 + \varepsilon_0 \quad (3)$$

Where Y is the dependent variable

Y = Average yield loss (tons) per farmer/harvest

L1 = Age (year) of respondents

L2 = Gender of respondents

L3 = Household size of respondents

L4 = Educational status (No formal education =0, others =1)

L5 = Farmland size (ha)

L6 = Contact with extension workers in the last three weeks (Yes=1, No=0)

L7 = Membership of cooperative / farmers association (Yes = 1, No = 0)

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

The study showed that 68.5% of cassava farmers only and 67.4% of farmers who planted cassava with other crops were within the age bracket of 37-69 years respectively. The study also revealed that 94.3% of cassava farmers only were male while 79.8% of cassava farmers with other crops were also male. It revealed that 71.4% and 80.9% of cassava farmers only and cassava farmers with other crops respectively were married and the average household size of cassava farmers and cassava with other crops were 6 and 5 respectively. It revealed that 54.8% of the farmers had formal agricultural training. Furthermore, 42.9% of cassava farmers only and 42.7% of cassava farmers with other crops had an average farming experience of 30 years. It also revealed that 77.1% and 80.9% of cassava farmers only and cassava farmers with other crops have a farm size of 5 and 4 hectares respectively. In addition to, 57.5% of respondents source of cultivar are from friends. The study showed that 60% and 74% of cassava farmers only and cassava farmers with other crops had an average yield loss of 4 tons respectively while 75.3% and 65.7% of cassava farmers and cassava farmers with other crops had an average of 34 and 44 per bundle of stem cutting respectively. There was considerable variation between the average expected output and the average actual output in the last cassava harvest in the study area. This may be attributed to attack by grazing cattle and high cost of labour [4]. It revealed that 79% of the respondents had an actual average yield of 19.4 tons while 75.8% had an expected average yield of 33.0 tons (Tables 2 and 3).

Table 2. Comparing farmers who planted cassava only and cassava with other crops based on socio-economic characteristics.

Variables	Cassava only		Cassava with other crops		
	Mean	Standard deviation	Mean	Standard deviation	Z-test
Age	51.4	16.5	53	15.7	-0.5
Household head monthly income	24857.1	16327.8	27168.5	16693.3	-0.7
Farming experience	29.9	17.6	30	17.2	-0.02
Bundle of cassava stems planted	44.2	51.27	33.5	30.9	1.2
Farmland size	4.6	3.9	3.6	4.8	1.2
Source: Field survey (2016)					

Table 3. Comparison of the average expected output and average actual output.

Variables	Mean	Standard deviation	Z-test
Expected output	33	7.8	2.1
Actual output	19.4	2.7	
Source: Field survey (2016)			

Ranking the perception of cassava farmers on different risks encountered

Table 4 shows the ranking of the perception of cassava farmers on different risks encountered in the study area using likert scale. The average of likert score for each of the risk component is shown on table 4 from which attack on cassava farm by grazing cattle is ranked 1st (3.52).This can be linked to climate change which led to migration of Fulani herds with their cattle to southwest to feed grasses for the cattle. The negative effects of the activities of Fulani herdsmen on crop production have been an age-long menace but more pronounced recently. The damage to crops is enormous while crop farmers are sometimes killed. They pose a major risk to crop farmers and their households. According to Onubuogu and Esiobu (2016), the herdsmen are bent on ensuring that crop farms are turned to graze land and rendering crop farming households homeless through frequent attacks.

Changes in world price of crude oil was ranked 2nd while changes in exchange rate was ranked 3rdwith average likert score of 3.15 and 3.13 respectively. This result can be related to each other as fall in world price of crude oil leads to depreciation of a nation's currency, this is in agreement with Butzer et al. (2015). This can be used to explain high costs of transportation and hiring labour which waere ranked 4th and 5th respectively as fall in world price of crude oil will make petrol expensive leading to high cost of transportation and depreciation in currency affect the spending power of the farmers thus reducing the income available to hire labour (Table 4).

Table 4. Ranking the perception of cassava farmers on different risks encountered.

Risk	Likert score	Rank	Inference
Attack on farm by grazing cattle	3.52	1st	Severe
Changes in world price of crude oil	3.15	2nd	Severe
Changes in exchange rate	3.13	3rd	Severe
High cost of transportation	3.09	4th	Severe
High cost of hiring labour	2.83	5th	Severe
Poor accessibility	2.5	6th	Severe
Insufficient rainfall	2.31	7th	Severe
Pests problem	2.22	8th	Severe
High input prices	2.1	9th	Severe
Excessive rainfall	2.06	10th	Severe

Theft in the farm	2.02	11th	Severe
Low price of cassava	1.98	12th	Not severe
Labour shortage (land preparation and planting)	1.85	13th	Not severe
Labour shortage during harvesting	1.85	13th	Not severe
Loss/low profit margin	1.81	15th	Not severe
Low demand for cassava by processor	1.77	16th	Not severe
Disease problem	1.66	17th	Not severe
Inconsistency in government policies	1.19	18th	Not severe
Illness /injury of the farmer	1.11	19th	Not severe
Flood	1.04	20th	Not severe
Ethnic clash or war	1.04	20th	Not severe
Delay in input supply (cassava cuttings)	0.94	22nd	Not severe
Fire outbreak	0.74	23rd	Not severe
Loss of land due to war	0.43	24th	Not severe
Source: Field survey (2016)			

In Table 5, different risks components encountered by the respondents were grouped into production, economic, social, institutional and natural or environmental risk. Institutional risk was ranked 1stwith average likert score of 2.49. The Institutional risk included: inconsistency in government policies, changes in exchange rate of naira to other currencies and changes in world price of crude oil. According to David (2008) institutional risks faced by farmers are often a result of decisions taken by policy-makers and managers. Economic risk was ranked 2nd with average likert score of 2.26. Economic risk indicates the risks connected with changes in price of output or of inputs that may arise after the commitment to production has begun (high costs of hiring labour and transportation, low price of cassava, low demand for cassava by processor and low profit margin) (Table 5).

Table 5. Grouping of risk components encountered by respondents.

Risk components	**Average likert score**	**Ranking**
Production risk	1.84	3rd
Economic risk	2.26	2nd
Social risk	1.62	4th
Natural risk	1.54	5th
Institutional risk	2.49	1st
Source: Field survey (2016)		

Factors influencing output loss in cassava production

Table 6 shows that the log likelihood has a negative value (-433.47). This implies that the tobit regression result can be used to explain the relation between the dependent variable (average yield loss) and the explanatory variables (socio-economic variables). The result shows that 3 out of 7 coefficients of the regressors were significant ($p<0.05$). Specifically, the coefficients of farm size and membership of association were significant and positively influenced average cassava yield loss. The coefficient of farmer's contact with extension agent was significant and negatively influenced average yield loss. Thus, one hectare increase in farm size will lead to approximately 0.83% increase in average yield loss in cassava production. This is may be due to the fact that cassava farmers in the study area were small scale farmers and may find it difficult to manage large hectares of land. This finding is in agreement with Rapsomanikis that an inverse relationship exists between farm size and productivity for most small-sized farms. Thus, as the farm size increases, the loss in cassava output increases. The

result also revealed that contact with extension agents was had a negative effect on average yield loss of cassava. The result implies that for every one contact with the extension agents, there will be 6.7% reduction in the output loss in cassava production. This may be related to the trainings and ideas on new technology on how to cope with risk associated with cassava production the extension agents pass to farmers [5]. The result agrees with that farmer access to extension services significantly reduces production inefficiencies and yield losses Also, the result showed that membership of association has a positive relationship with average yield loss of cassava but this result is contrary to the a'priori expectation. The log likelihood shows a negative value of -433.47187 which implies that the Tobit regression result can be used to explain the relation between the dependent variable (average yield loss) and the explanatory variables (socio-economic variables) (Table 6).

Table 6. Result of Tobit regression analysis.

Variables	Coefficient	Std. Err	t-value	P > |t|	dy/dx
Age of respondents	0.027872	0.056304	0.5	0.622	0.00523
Sex	-0.86798	2.125751	-0.41	0.684	-0.0753
Household size	0.227443	0.282167	0.81	0.422	0.00589
Educational Status	-0.92099	1.824487	-0.5	0.615	-0.00013
Farmland size	0.4389769**	0.176148	2.49	0.014	0.00826
Contact with extension agent	-3.609821**	1.745026	-2.07	0.041	-0.0665
Membership of cooperative society	3.520836**	1.74956	2.01	0.046	0.0323
Constant	0.649067	4.00665	0.16	0.872	

Dependent variables: cassava output loss, Level of significance: **means significant at 5%, Log likelihood= -433.47187
No of observation=124, LR chi 2(7)=15.25, Prob. >chi2=0.0329, Pseudo R2= 0.217
Source: Field survey (2016)

CONCLUSION AND RECOMMENDATIONS

Lack of formal education and fewer contacts by extension agents due to their small number were responsible for the cassava output loss in the study area. Attacks by grazing cattle on cassava farms were the common risk to cassava production. The need for government to find a lasting solution to the attack on cassava farms by grazing cattle would reduce cassava production risk substantially. Efforts aimed at increasing the extension agents would make the agents more accessible to crop farmers to provide farmers with necessary copy strategies against production risk.

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