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ECONOMICS OF CASSAVA FARMERS' ADOPTION OF IMPROVED VARIETIES IN ISOKO NORTH LGA, DELTA STATE

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ABSTRACT

The study investigated the economics of cassava farmers' adoption of improved varieties in Isoko North Local Government Area of Delta State. Studies on the economic analysis of farmers adoption of improved cassava varieties in the study area is lacking. This therefore constitutes a research gap which must be investigated. The specific objectives were to: describe the socio-economic characteristics of the respondents; determine the respondents' level of awareness of improved cassava; assess the percentage of farmers who adopt the use improved cassava varieties; identify the constraints militating against the adoption of the improved cassava varieties in Isoko North local government area; and to determine the benefits level of cassava farmers. A multi-stage sampling procedure was used to compose a sample size of 175 respondents. Various descriptive statistics such as means, frequency counts, standard deviation and percentages, and inferential statistics (t-tests and binary logit regression) were used for data analysis. The results of the study indicated that all the cassava farmers were aware of the existence of improved cassava varieties, however, only 90.29% of the respondents adopted. Respondents agreed that high cost of planting material (X= 4.80), ineffective Extension delivery (X= 4.78), Agronomic problems (X=4.70), shortage of planting materials (X= 4.53), Land degradation (X =4.12) and poor access to market by farmers (X = 3.89) were serious constraints to adoption. The t-test result showed that there were significant differences between adopters and non-adopters in all the economic variables tested. The result of the logit regression indicated that educational level, age, farm size and household size were significantly related to adoption by respondents. From the finding of the study, it was concluded that adoption of improved cassava varieties for planting is economically beneficial to cassava farmers in the study area and recommended, among others, that extension institutions in the area should intensify efforts to ensure that all farmers adopt improved cassava cuttings for planting.

Key words: Cassava farmers, economic benefit, adoption, regression, improved varieties, constraint, statistics
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INTRODUCTION

Cassava is one of the major crops grown for food in Nigeria. It is the most widely cultivated crop in terms of area planted and the total number of farmers involved in its cultivation. Almost every household grows cassava and it serves both for food and major source of income (Nweke, 2003 and Manyong *et al.*, 2005). More than 228 million tons of cassava was produced worldwide in 2009, of which Nigeria produced about 45 million tons making it the world's largest producer (Adekanye, Ogunjimi and Ajala (2013). Nigeria remains the world leader in cassava production since 1990 (IFAD/FAO 2005). The total land area under cassava cultivation in Nigeria is about 41.215 million hectares (Manyong *et al.*, 2005). Cassava is used almost exclusively for consumption as 95% of the total output produced is used as food (Ikpi and Natalie, 1989). Cassava is an important source of dietary carbohydrate, and provides food for over 60 million people in Nigeria (Abdulahi, 2003). Cassava is rich in carbohydrates, calcium, vitamins B and C and essential minerals (Wobeto, Corrêa, De Abreu, Dos Santos and De Abreu, 2006; Howe, Maziya-Dixon and Tanumihardjo, 2009). However, nutrient composition differs according to variety and age of the harvested crop, and soil conditions, climate, and other environmental factors during cultivation (IITA, 2005). Current estimates show that the dietary calorie equivalent of per capita consumption of cassava in the country amounts to about 238 kcal (Cock, 1985: Hambidge, Miller, Westcott and Krebs, 2008).

Besides satisfying the dietary needs of the greater part of the population of Nigeria, and indeed most of Sub-saharan Africa, there is now a high demand for the roots as raw material for the manufacture of livestock feed, bio-fuel, pharmaceutical, textile industries and other industrial uses (Ojeniyi, 2001; Akanbi, *et.al*.; 2006, Iyagba, 2010). This production outputs are in the hands of small-scale farmers who cultivated between 0.5-2.5 hectares (Adeniji, Akoroda,. Adeniyi, Ugwu and de Balogun, 2005). This according to Nweke and Manyong (2000) has led to low returns and decline in local production of cassava primarily due to low-yielding varieties of the cassava stem planted. In an effort to reverse this trend and salvaging the fortune of cassava growers, the Collaborative Study of Cassava in Africa (COSCA) under the supervision of International Institute of Tropical Agriculture (IITA) launched an aggressive mass mobilization campaign on improved varieties of cassava stem in the late 1980s (Nweke *et al*, 1996).

Cassava is used almost exclusively for consumption as 95% of the total cassava outputs produced were used as food (Ikpi and Natalie, 1989). In an effort to reverse this trend and salvaging the fortune of cassava growers, the Collaborative Study of Cassava in Africa (COSCA) under the supervision of International Institute of Tropical Agriculture (IITA) launched an aggressive mass mobilization campaign on improved varieties of cassava stem in the late 1980s (Nweke *et al*, 1996).This technology has been disseminated to cassava farmers in Nigeria for adoption. The issue is: have farmers in Isoko North local government area adopted improved cassava varieties for planting?

Study carried out by Nweke and Manyong (2000) revealed that cassava farming has been transformed from being a staple food to a source of income as well. Among cassava growing households, this has contributed about 20% to household income, the study concluded.

Some studies have been carried out to investigate factors related to adoption of improved cassava varieties in Nigeria (Ezedinma, 1989; Akoroda *et al*, 1989, Neste, 1993; Nweke *et al*, 1996, Tewe and Bonkanga, 2001 and Nweke, 2003). How these factors that influence the adoption of improved varieties of cassava stem in Isoko North Local Government area of Delta State have not been ascertained. Moreover, research on the economic analysis of farmers' adoption of improved cassava varieties in the study area is lacking. Hence, there exist research gaps in the literature on adoption of and economics considerations of improved varieties of cassava in this area. Whether farmers in the area are aware of the existence of improved cassava stem or not had also not been investigated.

The general objective of this study is to ascertain economics of cassava farmers' adoption improved varieties in Isoko North Local Government Area of Delta State. The specific objectives were to:

i. describe the socio-economic characteristics of the respondents;
ii. determine the respondents' level of awareness of improved cassava;
iii. assess the percentage of farmers who adopt the use improved cassava varieties;
iv. determine the benefits cassava farmers as a result of their adoption of improved cassava varieties; and
v. identify the constraints militating against the adoption of the improved cassava varieties in Isoko North local government area.

The following hypotheses, which are stated in the null forms, were tested:

Ho_1: There is no significant between adopters and non- adopters of improved cassava varieties in terms of income, yield, labour costs and disease/pests management

Ho_2: There is no significant relationship between farmers' adoption of improved varieties of cassava and their socio-economic characteristics.

METHODOLOGY

The study area was Isoko North Local Government Area (LGA), Delta State, Nigeria. Isoko LGA is one of the 25 LGAs of Delta State. It has an estimated land area of 463 km^2 and a population of 144,155 (NPC, 2006). Isoko North LGA is bounded to the South West by Isoko South LGA, to the West by Ughelli North LGA, to the North by Ndokwa West LGA and to the East by Ndokwa East Local LGA, all in Delta State. The Isoko North Local Government Area comprises 13 clans, namely, Ozoro, Ovrode, Okpe-Isoko, Oyede, Ofagbe, Otor-Owhe, Owhelogbo, Emevor, Aradhe, Bethel, Ellu, Iyede and Otor-Iyede. The LGA has a striking topography with no noticeable hills and a fertile land suitable for agriculture.

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A multi-stage sampling procedure was used to select respondents for the study. Four out the 13 clans in Isoko North LGA of Delta state were identified as major areas for cassava farming. Well structured questionnaire was used to collect data from 180 cassava farmers across these four communities. However, only 175 questionnaires were found useful for data analysis.

The first stage involved the selection of four (4) clans out of the thirteen (13) clans in the LGA. Next, a community was randomly selected from each of the four clans selected. Next 5 percent of the farming households who plant cassava were selected from each of the communities and used for the study. Data generated were analyzed by both descriptive and inferential statistics.

In categorizing the cassava grower into adopters and non-adopters of improved varieties a threshold concept was used (Daramola, 1987). This was used to divide cassava farmers into two (adopters and non-adopters). The common models used in this threshold concept include Probit, Logit and Tobit (Nassimbeni, 2001). Logit model was preferred and adopted for this study because of easy computation of the dichotomy value involved. The model is stated thus:

$$p\ (Y = 1) = \frac{e^{\beta x}}{1+e^{\beta x}} \quad \text{..... 1}$$

$$p(Y = 0) = 1 - \frac{e^{\beta x}}{1+e^{\beta x}} = \frac{1}{1+e^{\beta x}} \quad \text{..... 2}$$

$$Y_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + et \quad \text{..... 3}$$

Where,
X_1 - X_8 = Explanatory variables.

The following explanatory variables are hypothesized to be factors influencing adoption process of improved cassava varieties. This borrows from the works of Herath and Takeya (2003). They are Gender (X_1) measured as male or female, Age (X_2) measured in years, Marital status (X_3) measured as a dummy variable, Educational level (X_4) measured by respondents indicating whether they had primary, secondary, tertiary or no formal education. Farming experience (X_5) measured in years, Farm size (X_6) measured in hectares, Household size (X_7) measured in numbers, and access to extension (X_8) measured by number of contact farmer had with extension agent.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Cassava Farmers

The socio-economic characteristics of the cassava farmers are presented in Table 1. About seventy four percent were male, against only 26 percent who were female. The age of the

farmers ranged from 17 to 71 years with an average of 49.8 years. This implies that the farmers were still in their economic active ages. About 78 percent of the respondents were literate since they had one form of formal education or the other. Given this level of literacy it is expected that information can be disseminated with ease among these cassava farmers. Basically, the levels of education of farmers have significant impact on productivities, income earning opportunities and ability of farming households to effectively adopt better management practices. The average year of farming experience was 24.6 years. This indicates that most of the farmers had been growing cassava for long. The average household size was 7 persons. Polygamous nature of the people probably explains the large family size recorded in the area. Household size is used as a proxy for labour because members of the household are a potential source of farm labour. Farm labour availability reduces labour constraints faced during the peak of the farming season (Teklewold *et al*., 2006). Farm sizes in the study area were rather small; majority of the farmers had farm sizes of between 0 – 5 hectares as shown in Table 1. Fragmentation due to land tenure systems, nearness to farms and resource endowment of farmers may be responsible. The finding agrees with that of Onemolease (2005) who observed that the average farm size was 1.2 hectares in Edo State. Also, Okunlola and Adekunle (2000) asserted that 53% of Nigerian farmers have less than 4 hectares. The implication of this finding is that majority of the cassava farmers operate small holdings.

Cassava Farmers' Level of Awareness and Adoption of Improved Varieties

The result in Table 2 shows the level of awareness and adoption rate of improved cassava varieties by farmers in the Local Government Area. The results indicate that all the cassava farmers were aware of the existence of improved cassava varieties in the area. In spite of this however, only 90.29% 0f the respondents adopted improved varieties. The non-adopters adduced many reasons for not using improved cassava cuttings for planting.

Respondents' Benefits of Adoption of Improved Cassava Varieties

The results in Table 3 shows the respondents' benefits level from use of improved cassava varieties. Increased income ($\overline{X}$ = 4.77) was ranked by the respondents as the most important benefit to them as a result of their use of improved cassava varieties. This was followed by improved yield ($\overline{X}$ = 4.75). The other benefit items to the respondents were reduction in farm cost ($\overline{X}$ = 4.72), reduced incidences of pests and diseases ($\overline{X}$ =4.68), improved competence in farm management ($\overline{X}$ =4.70), and good agronomic practices ($\overline{X}$ = 4.64).

Constraints to Adoption of Improved Cassava Varieties

Table 5 shows respondents' perceived constraints to the adoption of improved cassava varieties in Isoko North LGA. Respondents agreed that high cost of planting materials (X= 4.80), ineffective extension delivery (X= 4.78), agronomic problems (X=4.70), and shortage

of planting materials (X= 4.53) were regarded as constraints to the adoption of improved cassava varieties.

Test of Hypotheses

H_{01}: There is no significant difference between Adopters and non Adopters farmers in terms some Economic Benefits.

Table 6 shows the difference in benefit level between adopters and non adopters farmers. The t-test result in Table 6 shows that there were significant differences between adopters and non adopters in all the economic variables tested. The reason for the difference may be due to the fact that the adopter farmers were exposed to the use of improved cassava cuttings which enhance their economic wellbeing. From Table 6 it can be observed that adopters of improved cassava varieties were on the average, better off than the non adopters in all the variables tested.

Ho_2: There is no significant relationship between farmers' adoption of improved varieties of cassava and their socio-economic characteristics.

The relationship between some socio-economic characteristics of farmers and their adoption of improved cassava varieties is presented in Table 7. The dependent variable is adoption of improved cassava varieties by farmers, while the independent variables included age, gender, marital status, educational level, farming experience, farm size, household size and access to extension services. The overall model is significant at 1 % according to the model chi-square (248.462). It means that the model with the explanatory variables is better at predicting the adoption of the respondents than a model without the explanatory variables. The model classifies 90.3% of the responses correctly which equally confirms its usefulness. The R^2 value (0.767) implies that the explanatory or independent variables jointly account for about 77% variation in the respondents' likelihood to adopt improved varieties.

The result of the logit regression indicates that educational level, age, farm size and household size were significantly related to adoption by respondents. Rahman, Ogungbile and Tabo (2002) indicated that length of time of farming business can be linked to the age of farmers, access to capital and experience in farming may explain the tendency to adopt innovations and new technology. The co-efficient for household size is negative (b = -0.449) which mean that respondents with lower family size are more likely to adopt improved cassava cutting than those with higher family size. Rahman et al (2002) asserted that the adoption index of an innovation or practice may be either positively or negatively related to the household size depending on the nature of age structure and the amount of labour contributed among members. It is more likely that respondents with larger family size will be distracted from acquiring knowledge because they will devote part of their useful time for family issues.

The co-efficient for access to extension delivery is positive (b= 5.528) which means farmers exposed to extension services are more likely to adopt improved cassava cuttings than farmers who are not exposed.

5.2 Conclusion and Recommendation

Available empirical evidence from the study confirms the fact that all cassava farmers were aware of the existence of improved cassava varieties in the study area; however only 90.29% of farmers were adopters. From the study, it was evident that the adoption of improved cassava varieties had considerable influence on the welfare of farmers in that it improved the incomes and farm yields of cassava farmers, and also reduced their labour costs. Therefore adoption of improved cassava varieties for planting is economically beneficial to cassava farmers in the study area. Extension delivery systems in the area should therefore intensify their efforts to ensure that all cassava farmers in Isoko North Local Government area gain access to improved cassava cuttings as this will invariably improve the economic well-being of cassava farmers in the area. Based on the findings of the study, the following recommendations were suggested.

1. Extension institutions in the area should therefore intensify efforts to ensure that all farmers adopt improved cassava cuttings for planting.

2. Since education plays a major role in adoption, it is imperative that farmers in the area be enlightened, extension approach used in the area should be participatory in nature. Farmer Field School should be encouraged in the study area as it provides a better forum for farmers' education.

3. From the age distribution of respondents, it was quite obvious that the youth were not actively involved in cassava farming. It is therefore strongly recommended that the youth in the area should be encouraged to get involved in cassava farming by providing them with loans and other necessary inputs.

4. The study was carried out on cassava. Similar study should be carried out on other crops like oil palm, kolanuts, yam, plantain, pepper, pineapple, etc that are cultivated in the area.

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APPENDIX

Table 1: Socioeconomic characteristics of respondents

Variable	Frequency	Percentage
Gender		
Male	46	26.29
Female	129	73.71
Age (years)		
Below 20	9	5.14
20 – 29	16	9.14
30 – 39	45	25.71
40 -49	27	15.43
50 – 59	63	36.00
60 and Above	15	8.57
Marital Status		
Never Married	45	25.71
Married	105	60.00
Divorced	10	5.71
Separated	8	4.57
Widowed	7	4.00
Educational Level		
No formal	22	12.57
Primary	68	38.86
Secondary	76	43.43
Tertiary	9	5.14
Farming Experience (year)		
Less than 5	22	12.57
6 – 10	49	28.00
11 – 15	46	26.29
16 and Above	58	33.14
Farm Size (Hectare)		
0.5 and below	122	69.71
0.5 – 1.0	31	17.71
1.1 – 1.5	8	4.57
1.51 – 2.0	10	5.71
Above 2.0	4	2.29
Household Size (Number)		
5 and below	44	25.14
6 – 10	108	61.71
Above 10	23	13.14

Source: Survey data, 2014

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Table 2: Cassava farmers' awareness and level of adoption of Improved Varieties

Variable	Frequency	Percentage
Awareness		
Yes	175	100.00
No	0	0.00
Adoption		
Yes	158	90.29
No	17	9.71

Source: Survey data, 2014

Table 4: Mean Distribution of Respondents' Benefits From use of Improved Cassava Varieties

S/N	**Benefits of Use**	**Mean**	**S.D**	**Rank**
1.	Improved Income	4.77	0.57	1st
2.	Increased Yield	4.75	0.55	2nd
3.	Reduction in Farm Cost	4.72	0.56	3rd
4.	Low incidence of pests and diseases	4.68	0.50	4th
5.	Competency in Farm management	4.70	0.62	5th
6.	Improved agronomic practices	4.64	0.67	6th

Source: Field Survey 2014

Likert scale: 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = Agree, 5 = strongly Agree

Table 5: Respondents' Perceived Constraints to Adoption of Improved Varieties

Constraints	**Mean**	**SD**	**Rank**
High cost of improved Cuttings	4.80	0.77	1st
Poor Extension delivery	4.78	1.20	2nd
Agronomic problems	4.70	0.94	3rd
Shortage of planting materials	4.53	0.51	4th
Land degradation	2.52	0.73	5th
No market Access	2.49	0.55	6th
Pests and Diseases	1.41	0.71	7th
Limited Processing	1.17	0.56	8th
Poor Quality Starch	1.16	0.65	9th

Source: Survey data, 2014

Likert Scale: 1 = not very serious, 2 = not serious, 3 = undecided, 4 = serious, 5 = very serious

Table 6: Differences Between Adopters and Non-adopters of Improved Cassava Stem

	Adopters		Non-adopters			
Feature	**Mean**	**SD**	**Mean**	**SD**	**T-value**	**Remark**
1. Income	459000	0.71	187000	0.80	3.23	Significant
2 Yields	700	0,63	256	0.71	2.56	Significant
3. Labour cost	48000	0.77	77640	0.51	3.21	Significant
4.Pestsanddiseases management	12620	0.79	23192	0.57	3.12	Significant

Source: Survey data, 2014 significant at $P < 0.05$

Table 7: Relationship between selected socio-economic variables and adoption of improved varieties

Explanatory Variables	**Co-efficient**	**t-value**	**Sig**	**Odd Ratio**
Constant (X_0)	-0.653	-0.342	0.733	0.520
Gender (X_1)	-0.037	-0.787	0.431	0.963
Age (X_2)	-0.045	-2.905	0.031	0.956
Marital Status (X_3)	-0.189	-0.336	0.736	0.828
Educational level (X_4)	0.126	3.468	0.003*	0.882
Farming Experience (X_5)	0.536	1.586	0.004*	1.709
Farm Size (X_6)	0.008	2.413	0.009	1.008
Household Size (X_7)	-0.449	-2.327	0.020*	0.780
Access to extension (X_8)	5.528	7.682	0.000*	212.134
Model chi-square (X^2)	248.462			

***** Significant at $P < 0.05$
Nagelkerke R^2 77%
Overall % Correct Classification 90.3
Significant level 0.00