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Effects of Agricultural Technology on Income of Cassava and Maize Farmers in Delta State, Nigeria

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Abstract:
Agricultural technology/innovation over the years has faced challenges from both the policy makers and the farmers. This study examined the effect of agricultural technology on the income of cassava and maize farmers in Delta State, Nigeria. Multistage sampling technique was used to collect primary data from one hundred and sixty (160) farmers. Data collected were analysed using descriptive statistics, budgetary technique and multiple regressions. The study revealed that the improved technology adopters are more educated and cultivated more land than the traditional technology users. The traditional technology adopters are older and more experienced in farming than the improved technology adopters. The budgetary analysis earned more income than the traditional result showed that increase in farm size and labour inputs will lead to increase in net farm income; while additional unit cost of planting material will decrease the net farm income. The probit mode identifies the determinants of improved technology adoption to include age, household, size, education, farm size, farming experience, extension contact and farm income. It is recommended that traditional technology adopter should adopt the improved agricultural technologies in order to increase the income per unit of land cultivated. Also, there is need for improvement in the education of the traditional technology adopters as a panacea for adopting improver technology.

Keyword: *Farmers, Income, Improved Agricultural technology.*

1. Introduction

Agricultural technology is defined as the application of innovations to control the growth and harvesting of animals and crops with the motive of promoting Agriculture. Agricultural technology allows for mechanization which boosts production in many parts of the world. It involves the use of farm machinery to facilitate rapid expansion which made dry season farming is made possible through irrigation. The application of fertilizer has not only increase food production quantitatively and qualitatively but also made the long term intensive use of agricultural land possible. (Amao et al(2007)

The use of pesticides has proved an effective way of checking the menace of pests which attack crops like cassava and maize. Herbicides have also been used to control weeds in different ways. Through the biological knowledge of genetics, it is possible to select disease and drought resistant crops. (FAO 2003)

Technology has also made dissemination of agricultural information to farmers easy through the print and electronic media the agricultural sector remains the most important sector of the economy of most developing countries. The sector remains significant in the Nigerian economy despite the strategic importance of the oil sector. The agricultural sector provides employment for about seventy percent of the population and accounts for more than one third of the Gross Domestic Product. The share of agriculture to the GDP stood at90 percent before independence in 1960, about 56 percent between 1960 and 1969 and more than 40 percent between 1986 and 2002 CBN (2002). Persistent increase in population experienced by the country and decades of neglect of the agricultural sector resulted in decline in food production. It was ascertained that food production increased in an arithmetic progression while the population increased in a geometric progression. This was the period of oil boom in the seventies when most rural dwellers left the land to seek for employment in the expanding petroleum sector. Since seventies the country's agricultural production has declined greatly to the extent that it is unable to provide the population with cheap and adequate food and necessary raw materials for the agro-based industries Matshe et al (2004). The aftermath of the neglect in the agricultural sector is that Nigeria engaged in massive food importation to bridge the gap between food supply and food demand. Food importation stood at 143 percent between 1970 and 1975 while the ratio of export to import declined to about 38 percent between 1976 and 1982, and Nigeria's food import bill rose from N88.3million in 1971 to N8.5 billion in 1991. The rise in the import bills had been attributed to the increase in the quantities of food imported. Food importation grow slowly and steadily partly because of the economic stabilization measure of 1981 and a partial ban since 1986which later partly led to heavy border trading in food and raw materials into the country World Bank (2003).

In order to boost food production, concerted efforts (short and long run) had been made by successive governments. This is evidenced by the establishment of many institutions and agencies. Some of whom include the establishment of the Federal Department of Rural Development(FDRD) in 1976 to coordinate and integrate rural and agricultural development and to initiate and develop appropriate strategies and projects which will help to increase agricultural productivity and employment opportunity in the country. The Directorate of Food,
Rural and Road Infrastructure (DFRRI) was established in 1978 to create easy access to rural areas to facilitate increased food production and ease the transportation of farm produce. The general view is that technology/innovation will have effects on the income of farmers in general and small scale cassava and maize farmers in particular. It is against this background that this study seeks to identify and categorize cassava and maize farmers based on technology use, estimate and compare the net farm income of the two categories of farmers and examine theeffect of technology on the income of the farmers.

2. Methodology

2.1. The Study Area

The study area is Delta state, which is located in southern part of Nigeria. It has population above one million (National Population Commission 2005). The state has twenty-five (25) Local Government areas from three agricultural zones, namely, Delta North, Delta South and Delta Central.

2.2. Sampling Technique

Multistage sampling method was used to select the respondents used for the study.
Registered farmers were considered as the respondents. The first stage involved the purposive selection of two local government areas (blocks) from each agricultural zone. The second stage involved the selection of two cells of the blocks selected in stage one. The third stage involved the selection of three farming communities. In the last stage, 7 cassava and maize farmers were randomly selected from each of the farming communities giving a total of 168 cassava and maize farmers. Descriptive statistics was used to describe the socio-economic characteristics; budgetary technique and multi regression model were also used.

2.3. Multiple Regression Model

Multiple regression model was used to examine the effect of technology on the income of the farmers. The Cobb-Douglas functional form of the model is specified as:

$$LnY_i = \beta o + \beta_1 lnX1i + \beta_2 lnX2i + \beta_3 lnX3i + \beta_4 lnX4i + \beta_5 lnX5i + \beta_6 lnX6i + \mu i$$

Where:
Yi = Net Farm Income (Naira)
X_{1i} = Farm Size (Hectare)
X_{2i} = Labour input (Man days)
X_{3i} = Fertilizer (Kg)
X_{4i} = Herbicide (Litre)
X_{5i} = Cost of Planting Materials (Naira)
X_{6i} = Technology use (1= improved technology, 0 = traditional technology)

3. Results and Discussion

3.1. Socio-economic Characteristics of Cassava and Maize Farmers

The summary statistics of the socio-economic characteristics of the cassava and maize farmers is presented in Table 1. Forty-two percent of the farmers under improved technology have their age between 41 and 50years and the mean age of this category of farmer is47.2years. On the other hand, thirty-seven percent of the farmers under traditional technology have their age in this group. The mean age of farmers under this category is 49.4years. This implies that the two categories of farmers are still in their active ages but the traditional technology adopters are older than their improved technology adopter counterparts. Majority (91.1 percent) of the improved technology adopters are males. Also, majority (91.4 percent) of the traditional technology adopters are males. This is an indication that farming activity in the study areas is dominated by men. The study also revealed that majority of the farmers have marital responsibility in addition to farming and because wives are part of family labour in most developing countries. In addition, majority (46.7 percent) of the improved technology adopters had secondary education as against majority (45.7percent) of traditional technology adopters who had primary education. This indicates that the improved technology adopters are more educated than their traditional technology counterparts. Education increases the level of awareness of the farmers on the importance of innovation. Majority (42.2 percent) of the improved technology adopters have between 11and 20 years of experience in farming as against 40 percent of the traditional technology adopters who have over 30 years of experience in farming. The mean values of farming experience of the two categories of farmers are 15.8 years and 16.5 years respectively implying that the traditional technology adopters are more experienced in farming. In terms of farm size, majority (74.4 percent and 78.6 percent) of the improved technology

adopters and traditional technology adopters respectively have less than one hectare of farm land. This shows the subsistence level of agriculture in the study area. Ozowa (2005)

Variables	Improved Technology			Traditional Technology		
	Frequency	Percentage	Mean	Frequency	Percentage	Mean
Age						
< 30	4	4.4		2	2.9	
31-40	22	24.4		10	14.3	
41-50	38	42.2	47.2	26	37.1	49.4
51-60	16	17.8		4	5.7	
> 60	10	11.1		28	40	
Sex						
Male	82	91.1		64	91.4	
Female	8	8.9		6	8.6	
Marital Status						
Married	71	78.9		64	91.4	
Single	14	15.6		2	2.9	
Widow	5	5.6		4	5.7	
Educational Level						
No Formal Education	13	14.4		12	17.1	
Primary Education	17	18.9		32	45.7	
Secondary Education	42	46.7		24	34.3	
Tertiary Education	18	20.0		2	2.9	
Years of Farming Experience						
< 10	24	26.7		19	27.1	
11-20	38	42.2	15.8	8	11.4	16.5
21-30	26	28.9		15	21.4	
>30	2	2.2		28	40.0	
Farm Size (Hectare)						
< 1.0	67		74.4	55	78.6	
1.0-2.0	17		18.9 0.93	15	21.4	0.89
>2.0	6		6.7	-	-	
Total	**90**		**100**	**70**	**100**	

Table 1: Socio-economic Characteristics of Cassava and Maize Farmers
Source: Computed from survey data, 2014

3.2. Budgetary Analysis of Cassava and Maize Farmers

The cost-return structure of the cassava and maize farmers is presented in Table 2. The variable cost constituted the largest percentage of the total production cost. The total revenue, gross margin and net farm income for the improved technology adopters areN353,085, N224,069.13 and N195,239.75 respectively. On the other hand, the total revenue, gross margin and net farm income for the traditional technology adopters are N260,795,N190,127.75 and 163,083.75 respectively. These figures suggest that the improved technology adopters perform better in terms of margin between total revenue and total cost. The t-test of difference of mean attests to this and showed that a significant difference exists between the net farm income of the two categories of farmers at 1 percent Nweke (2002).

Adopter	Improved Technology		Adopters Traditional Technology	
	% of Total Cost		% of Total Cost	
Revenue from Maize	112,313.00		93,115.00	
Revenue from Cassava	240,772.00		167,680.00	
Total Revenue	353,085.00		260,795.00	
Variable Cost Items				
Labour	53,517.50	33.91	52,466.25	53.70
Fertilizer	39,105.00	24.77	-	-
Planting Materials	21,415.00	13.57	18,201.00	18.63
Herbicides	4,765.87	3.02	-	-
Tractor Services	10,212.50	6.49	-	-
Total Variable Cost	129,015.878	1.74	70,667.25	72.32
Fixed Cost Items				
Land	22,875.00	14.49	21,825	22.34
Depreciation	5,954.38		3.77 5,219	5.34
Total Fixed Cost	28,829.38	18.26	27,044	27.68
Total Cost	157,845.25	100.00	97,711.25	100.00
Gross Margin	224,069.13		190,127.75	
Net Farm Income	195,239.75		163,083.75	

Table 2: Cost-Return Structure of the Cassava and Maize Farmers
Source: Computed from survey data, 2014

3.3. Effect of Technology on the Income of Cassava and Maize Farmers

The multiple regression result on the effect of technology on the income of farmer's is presented in Table 3. The adjusted R-square value showed that 86 percent of the variation in the net farm income of the farmers is jointly explained by the set of the independent variables. The F-value is significant at 1 percent which indicates that the model is of good fit. The result showed that all the variables examined conform with a prior expectation. The farm size (X1), labour (X2), cost of planting materials (X5) and technology use (X6) have significant effect on the income of the farmers. These variables were significant at 1 percent, 5 percent,1 percent and 5 percent respectively. This implies that one percent increase in farm size, and labour input will lead to increase in net farm income of the farmers by 0.69 and 0.334. On the other hand, one percent increase in cost of planting materials will decrease the farm income by 0.02. This implies that the farmers over-utilized the planting materials. The finding revealed that farmers under improved technology adopters will have income of 0.0366 more than the traditional technology adopters for every unit of input used in production. Thus technology has a significant positive effect on the net farm income of the farmers Paul (2008).

Variables	Coefficient	Standard Error	T-ratio
Constant	9.63***	0.72	13.36
Farm Size (X1)	0.69***	0.12	5.85
Labour (X2)	0.334**	0.16	2.14
Fertilizer (X3)	0.005	0.029	0.19
Herbicide (X4)	0.013	0.036	0.36
Cost of Planting Materials (X5)	-0.02***	0.0042	4.66
Technology Use (X6)	0.0366**	0.015	2.4
R-square	0.89		
Adjusted R-square	0.86		
F-value	106***		

Table 3: Multiple Regression Results
Source: Computed from survey data, 2014

4. Conclusion and Recommendation

This study revealed that the improved technology adopters are more educated and cultivated more land than the traditional technology adopters. Education may increase the level of awareness of the farmers on the importance of agricultural technology. On average, the traditional technology adopters are older than the improved technology adopters. Also, the improved technology adopters earned more income than the traditional technology adopters. The multiple regression result showed that increase in farm size and labour input will lead to increase in net farm income while additional unit cost of planting material will decrease the net farm income. Policy option requires the traditional technology users to embrace the improved agricultural technologies in order to increase their earning per unit of land cultivated. Lastly, there is need for improvement in the education of the traditional technology adopters as a panacea for adopting improved technology.

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