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Determinants of Technology Changes in Commercialization of Crops among Small-holder Farmers in South-East Nigeria

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ABSTRACT

The study examined the determinants of technologY changes in the commercialization of crops by smallholder farmers in South-East Nigeria. Multi-stage, purposive, proportionate and random sampling techniques were utilized in the selection of Agricultural zones, Local Government Areas, Communities and 408 registered farmers. Data were collected on indices for technologies available and socio-economic factors. The data were analyzed using descriptive statistics and multiple regression analyses. The major determinants are farm experience, education, extension visit, market distance and labor. There is a need for a participatory development approach involving family or group-based extension programs to facilitate the fabrication of indigenous technologies. This would enhance commercialization through increased processing of the farmer's product.

1.0 Introduction

In southeast Nigeria, crops have been subjected to yield-enhancing technologies. These have generated surpluses in agricultural produce. This requires postharvest management to minimize losses.

A major challenge becomes how to check post-harvest losses and improve the value-addition capabilities of the crops. Adequate and appropriate technologies are needed to facilitate the use of increased input and transformation of produce generated into competitive forms for the market. The farm household becomes better integrated into the input and output market.

Agricultural commercialization is based on the technological progress of small-scale farm production by incorporating value-addition effects that would transform produce into competitive forms for the markets (Hagos and Geta 2016). This facilitates the generation and adoption of new technologies and paves way for higher specialization and productivity (Asfaw, Shifera and Simtowe 2010). According to Pingali, Khwaja and Meijer, 2005), commercialization based on technological progress leads to sustainable increase in income and employment with the long-run goal of enhancing food security. The changes in technology provide increased sophisticated processing techniques that add value to products, increase market alternatives and

reduce production costs (Moti, Gebermedin and Hoekstra 2009). Agriculture in the area is dominated by smallholder farmers. It, therefore, becomes imperative to investigate the determinants of technology changes in commercialization of crops by the farmers for needed policy intervention.

2.0 Materials and methods

The study was carried out in Abia, Enugu and Ebonyi States in South-East Nigeria. The area is typically a rainforest region endowed with fertile lands suitable for the cultivation of cassava, maize, rice, yam, potatoes and vegetables in varied proportions.

Multi-stage, purposive, proportionate and random sampling techniques were employed in sample selection. The purposive sampling technique was used in the first three stages to select three states, one agricultural zone from each state and three Local Government Areas (LGAs) in each zone giving a total of nine (9) LGAs. In the fourth and fifth stages, four communities and one village in each community were randomly selected from the LGA. This gave a total number of 36 communities and 36 villages respectively. From the list of registered farmers, proportionate and random sampling techniques were used to select a sample size of 408 farmers. This comprises 32 farmers from Abia State, 72 farmers from Ebonyi State and 307 farmers from Enugu State.

Primary data were collected through the use of an interview schedule based on a structured questionnaire. Data were collected on socio-economic variables and indices for technology change. The determinants of the level of technology were analyzed using multiple regression analysis. It implicitly stated thus:

$Y = (X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12}, e)$

where Y = Level of technology (No. of Farmers using the technology)

X_1 = Age of farmers (years)
X_2 = Farming experience (years)
X_3 = Gender (1 male, 0 female)
X_4 = Education (Number of years spent in school)
X_5 = Extension contact (Number of visits)
X_6 = Farm size (Hectare)
X_7 = Credit (Naira)
X_8 = Farm Produce (Naira)
X_9 = Farm Product (Naira)
X_{10} = Market Distance (Km)
X_{11} = Labour (Mandays)
X_{12} = HCI (Household commercialization index
e = error term

The household commercialization index was captured using the formular defined by Strasberg et al 1999.

HCl = (Gross value of crop sales per household per year ÷ Gross value of crop production per household per year)X 100/1

Values closer to 100 depicts high commercialization

3.0 Results and discussion

3.1. Indices for technology change and commercialization**.**

The study examined the perception of farmers on the incentives that would enhance level of technology utilized and commercialization.

Table1: Farmer perception on indices fortechnology change and commercialization

Indices	Mean
Availability of improved technology	1.87
Adequate crop processing facilities	1.97
Adequate processing skills	1.59
Establishment of farm associations	2.79
Relevant policy formulation	2.60
Improvement in crop farming	2.82
Regular visit by extension staff	1.99
Funds are adequate	1.93

NB: mean value ≥2.5 is acceptable
Source: Survey Data, 2019

The prevalent indices as rated by the farmers are improvement in crop farming (2.82), relevant policy formation (2.60) and establishment of farm association (2.79). An enabling environment is a prerequisite for the enhancement of technology change and commercialization.

Therefore the shortfall in the other indices poses a major limiting factor. Such indices include inadequate funding, irregular visits by extension staff, lack of improved technology, inadequate crop processing facilities and requisite skills.

3.2. Factors affecting technology changes for commercialization.

The functional form that best explains the relationship between the endogenous and exogenous variable is a semi-log function with an R^2 of 0.565. This implies that 56% of the variations in the technology change is caused by variations in the independent variables included in the regression model

Table 2: Multiple Regression Result Showing The Determinants Of Technology Change In the Commercialization Of Crops By The Farmers.

Variables	Semi-log function	T value	P-value
Constant	91.463	-0.634	0.527
Age (X_1)	12.609	0.766	0.445
Farm experience (X_2)	15.922	2.658	0.009**
Gender (X_3)	2.964	0.246	0.806
Education (X_4)	18.885	2.054	0.042**
Extension contact (X_5)	41.656	4.423	0.000**
Farm size (X_6)	32.705	2.392	0.018*
Credit (X_7)	15.628	1.508	0.134
Farm produce (X_8)	2.779	0.537	0.592
Farm product (X_9)	-9.691	-2.566	0.011*
Market distance (X_{10})	11.893	2.596	0.010**
Manual labour (X_{11})	-16.686	-2.688	0.008**
HCI (X_{12})	-15.211	-0.948	0.345
R^2	0.555		
F-value	13.155		

**Significant at 1%
*Significant at 5%
Source: Survey Data, 2019.

The variables that are significant at 1% are; farm experience, education, extension contact, market distance and manual labor. Changes in any of the variables have a very significant effect on the technology utilized.

They are positively related to technology change. The implication is that, as the number of years of farming increases, the farmer has more opportunity to acquire increased knowledge of techniques involved in agricultural production and processing. Also, higher levels of education and frequent extension visits, predispose the farmer to more technology options for adoption, with subsequent increase in output.

Farm size is significant at 5% and positively related to technology change. This is probably because large farm size paves way for the use of specialized facilities to produce surplus for the market. This enhances market penetration. Kuwornu et al 2014, also reported that larger farm sizes are associated with smallholder farmer diversification into agro-processing activities. The output becomes better packaged for the market. Robut et al 2014 also reported a positive relationship between technology change utilized and market distance.

Farm product is significant at 5% but inversely related to technology change. This is probably because the farmers use more of production technology change. The implication is that the quantity of processed output is reduced. This also explains why HCI is negative and not significantly related to technology change. However, Oteh and Nwachukwu 2014, indicated a positive and significant relationship. Manual labor is highly significant at 1% but negatively related to technology change. As the level of technology change utilized increases, the need for physical labour drops. Other variables such as age, gender, credit and HCI do not have a significant effect on technology change.

4.0 Conclusion and recommendations

The technologies adopted by the farmers are mainly production oriented. Hence most of the farmers produce and sell with little or no value addition by processing. This has limited the extent of commercialization in the area. The determinants of technology change by farmers are; farm experience, education, extension contact farm size, farm output, market distance and labor.

Based on the findings, more efforts should be made to enhance the farmer's output by improvement in their level of processing. There is a need for extension education that would aid the fabrication of indigenous technologies that are cost-effective and easy to operate and maintain at the farm level. There should also be requisite personnel to disseminate the technologies and encourage farmers to join farm associations so as to facilitate access to funds and information.

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