Analysis of the Determinants of Total Factor Productivity among Small-Holder Cassava Farmers in Ohafia L.G.A of Abia State.

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Abstract

The study analysed the determinants of total factor productivity by the use of OLS regression technique among small-holder cassava farmers in Ohafia Local Government Area of Abia State. The study data was collected through a multi-stage random sampling technique from 90 farmers in 2009. The coefficients for education and extension were negative and significantly related to total factor productivity (TFP) at 10%level of probability. The coefficients for age, fertilizer and access to credit were positive and significant at 1% level of probability. The coefficients for gender and household size were negative and significant at 1% level of probability. The results calls for policies aimed at provision of inputs especially fertilizer and credit targeted mostly on women farmers. Policies on increased education and extension contacts and birth control should be advocated for

Keywords: Total Factor Productivity and Cassava

Introduction

Cassava (*Mainhot esculenta)* is an important staple food in several tropical African countries especially Nigeria where it plays a principle role in the food economy (Agwu and Anyaeche, 2007). Its comparative production advantage over other staples serves to encourage its cultivation especially by the resource poor farmers. It is a staple food crop in South-Eastern Nigeria and it contributes about 15% of the daily energy intake of most Nigerians and supplies about 70% of the total calorie intake of about 60 million people in Nigeria (Ezulike *et al.,* 2006).

According to FAOSTAT (2007), Nigeria is the world largest producer of cassava, with about 38.4 million metric tones and ranks second after yam in extent of production among the root and tuber crops of economic values in Nigeria. Data from the collaborative study of cassava in African (COSCA) show that 80% Nigerians in the rural areas eat a cassava meal at least once weekly (Nweke *et al.* 2002). Cassava farmers in Nigeria are small-holders characterized by very low productivity (Bamidele et al., 2008). The problem of declining crop productivity in Nigeria is important, despite all human and material resources devoted to agriculture, the productivity for most cassava crops are still low (FACU, 1992; FDA, 1993 and 1995).

Empirical evidence that abound in economic literature on factors that affect productivity include technology, labour employment (Piana, 2001), education and training of farm operators (Stefanon and Saxena, 1988), agro-environmental conditions (Gorton and Davidona, 2004), security of land ownership rights (Chistiou, 2001), land, labour, fertilizer and education (Bamidele *et al*., 2008) and funding which determines the maximal physical quantity of output that can be reached as well as the number and quantity of inputs required (Huffman and Svenson, 2003).

Given the various cassava programmes and policies implemented over the years by government to raise farmers' efficiency and productivity in cassava production, it has become imperative to empirically analyze the relationship of total factor productivity and socioeconomic variables of cassava farmers. This will further guide policy makers in making policy for the improvement of the welfare of cassava farmers, which will give room for the expansion of their cassava production.

Methodology

The study area is Ohafia Local Government Area. A multi-stage random sampling technique was used for the study. The farmer participatory research involved 90 farmers. In the first stage 3 communities were randomly selected from the LGA, while in the second stage, 30 farmers were randomly selected from each community. Primary data was collected with the aid of a well structured questionnaire and included such variables as gender, age, household size, marital status, farm size, extension contact, capital and labour.

Analytical Procedures

The Total Factor Productivity (TFP) analysis was used to estimate the productivity of cassava farmers in the study area while the OLS regression method was used to analyse the effects of various factors (variables) on productivity. Total Factor Productivity (TFP) estimation: Following (Key and Mcbride, 2003). TFP can be measured as the inverse of unit variable cost. This is so since TFP is the ratio of the output to the Total Variable Cost (TVC) as shown in Eq. 1.

$$TFP = \frac{Y}{\Sigma PiXi} \quad \text{---------- (1)}$$

Where,

Y = quantity of cassava in kg and

TVC = Total Variable Cost in naira (N)

P = unit price of ith variable input and i

X = quantity of ith variable input.

This methodology ignores the role of Total Fixed Cost (TFC) as this does not affect both the profit maximization and the resource-use efficiency conditions. Besides, it is fixed and as such a constant (Bamidele *et al*., 2008).

Total Factor Productivity (TFP) analysis was employed to analyse the data for the study. From cost theory;

$$AVC = \frac{TVC}{Y} \quad \text{---------- (2)}$$

Where AVC = Average variable cost in naira (N).

Therefore,

$$TFP = \frac{Y}{TVC} = \frac{1}{AVC} \quad \text{---------- (3)}$$

As such TFP is the inverse of the AVC

The Ordinary Least Square regression method using diverse econometric specifications, namely, the Cobb-Douglas, semi-log, quadratic and the exponential functional forms. The model that gave the best fit was selected as the best equation. The model is described thus:

$$\frac{Y}{TVC} = F(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12}) \text{ ---- (4)}$$

Where

Y = Quantity of cassava in kg

TVC = Total Variable Cost

X_1 = Farm size in hectare

X_2 = Labour (mandays)

X_3 = Capital input (naira) (made up depreciation of fixed assets)

X_4 = Age of the farmers in years

X_5 = Credit access (1= access, 0= non access)

X_6 = Educational attainment (years)

X_7 = Farmer experience (number of the years of farming)

X_8 = Household size of the farmer family

X_9 = Gender (male = 1, female = 0)

X_{10} = Number of extension contacts

X_{11} = Income earned from product (naira)

X_{12} = Use of fertilizer (Use = 1, 0= non use)

Results and Discussions

Table 1: Average Statistic Cassava farmers in Ohafia Local Government Area of Abia State, Nigeria.

Variable	Mean	Std. Dev.	Minimum	Maximum
Age	48.65	10.11	27.00	70.00
Capital	1,960.21	10.12	1,939	1,982
Education	9.66	5.73	0	19
Labour	58.89	21.13	30.00	118.00
Farm Size	0.81	0.44	0.10	2.50
Farming Experience	17.44	10.09	2	43
Household Size	10.6	6.85	3.00	34.00
Number of Extension Contact	0.82	1.22	0.00	5.00
Fertilizer used	87.44	88.53	20.00	800.00
% Male	64.44			
% Credit Access	41.11			
Quantity of Cassava	7,081.97	3,481.65	2,730.00	25,900.00
TVC	45,101.91	21,175.23	15,020.00	108,090.00
Income	86,902.50	91,070.16	4,500.00	876,000.00
TFP	0.18	0.14	0.05	1.22

Source: Field Survey Data, 2009

The data in table 1 show the average statistics of cassava farmers in the LGA. On average, a typical farmer in the LGA is 48 years of age with 9years of education, about 17years of farming experience, household size of about 10persons, cultivated 0.81ha of land, made an average of one extension contact in the year, spent about N1,960.21 on capital inputs , employed 59mandays of labour and produced 7t of cassava annually. Most (64%) of the respondents were males who spent N45,101.91 on variable cost items, made an annual income of N86,902.5. about 41% had access to credit facilities and attained a TFP of 0.18.

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The data in table 2 show the result of the economic analysis for determinants of total factor productivity among small-holder cassava farmers in Ohafia Local Government Area of Abia State, Nigeria

Table 2. Cobb-Dougls Estimates of the OLS regression of the Determinants of Total Factor Productivity among Small-holder Cassava Farmers in the Study Area.

Explanatory variables	Coefficients	Standard error	T-values
Intercept	-8.0824	2.9113	-2.78**
X_1 farm size	-0.2253	0.1681	-1.34
X_2 labour	0.41445	0.3152	- 1.31
X_3 Depreciation	0.1426	0.1877	0.76
X_4 Age	2.0820	0.6387	3.26***
X_5 Education	0.3310	0.1473	2.25*
X_6 Experience	0.0585	0.0779	0.75
X_7 household size	-0.8017	0.2686	-2.98***
X_8 Extension contact	0.6944	0.3054	2.27*
X_9 Income	0.0594	0.0778	0.76
X_{10} Fertilizer	0.8166	0.1470	5.55***
X_{11} Credit	1.5121	0.4523	3.34***
X_{12} Gender	-0.0430	0.1160	-3.71***
R^2	0.8907		
R^2 ADJ	0.8521		
F	23.09		

Field Survey data, 2009. *, ** and * means significant at 10%, 5% and 1% respectively.**

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The coefficients for household size and gender were negative and highly significant at 1% level of probability. This implies that increase in household size and number of male farmers by 1% will reduce TFP of cassava by 0.8 and 0.04% respectively. Female cassava farmers tend to be more productive than their male counterparts. Farmers with large household sizes tend to dissipate most of their resources on the up bringing and education of their children. This follows the study of Okoye *et al* (2008) on cocoyam in Anambra State.

The coefficient for age, fertilizer and credit access were positive and highly significant at 1% level of probability. This implies that 1% increase in age, fertilizer and credit access will increase TFP productivity by 2.1%, 0.8% and 1.5% respectively. This is expected and contradicts the findings of Gul Unal (2008); Okoye *et al* (2008) and Masterson (2005) for age. Old age might pose a disadvantage to agricultural but older farmers most times are more experienced. Fertilizer is an important and improved technology which shifts the frontier upwards leading to higher productivity. This result is also consistent with Okoye and Onyenweaku (2007).

The coefficients for extension contact and education were also positive as expected and significant at 5% level of probability. This implies that any 1% increase in extension contact and education would lead to a 0.3% and 0.7% increase in TFP of cassava farmers in the

positive direction. Better education would lead to improved access to knowledge and tools that would enhance productivity (Gul Unal, 2002 and Okoye *et al.,* 2008). Increased extension contacts would lead to more knowledge on improved cassava technologies which have a strong influence in increased productivity

The coefficients for farm size was negative but not significant as well as labour, depreciation on capital inputs, farming experience and income which were all positive. The R^2 value of 0.8907 implies that 89% of the variations in total factor productively of small holder cassava farmers were explained by the included variables. The F-ratio was significant at 1% which implies that the data attests to the overall significant of the regression equation.

Conclusion

The study assessed the total factor productivity of cassava farmers in Ohafia LGA of Imo State. The findings revealed that significant factors related to total factor productivity were; age, household size, education, extension contact, fertilizer, access to credit and gender. The results therefore calls for policies aimed at provision of free education, extension services, fertilizer and accessibility of credit especially to women. Since age can be proxied for farming experience, farmers who are experienced should be encouraged to stay in production as well as birth control policies to enable them allocate resource inputs more efficiently.

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