Allocative Efficiency of Small-Holder Cocoyam Farmers in Anambra State, Nigeria

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ABSTRACT

This study employed a stochastic frontier translog cost and production functions to measure the level of allocative efficiency and it's determinants in small-holder cocoyam production in Anambra state, Nigeria. A multi-stage random sampling technique was used to select 120 cocoyam farmers in the state in 2005 from whom input-output data and their prices were obtained using the cost-route approach. The parameters of the stochastic frontier cost function were estimated using the maximum likelihood method. The result of the analysis shows that individual farm level allocative efficiency was about 65%. The study found age and education to be negatively and significantly related to allocative efficiency at 1.0%. Farm size coefficient also had a negative relationship with allocative efficiency and was significant at 5.0%. Fertilizer use and credit access was significant and directly related to allocative efficiency at 5.0% as well as farm experience at 10.0% level of probability. No significant relationship was found between allocative efficiency and extension visit, family size and membership of cooperative societies.

Key words: Translog Stochastic Frontier Production Function, Technical Efficiency, Economic Efficiency and Allocative Efficiency.

INTRODUCTION

Nigeria is the world's largest producer of cocoyam in the world. The average production figure for Nigeria is 5, 068,000mt which accounts for about 37% of total world output of cocoyam (FAO, 2006). It is an important staple food crop commonly grown by women in Nigeria.

Cocoyams are an important carbohydrate staple food particularly in the Southern and Middle belt areas of the country. Nutritionally cocoyam is superior to cassava and yam in the possession of higher protein, mineral and vitamin contents in addition to having a more digestible starch (Parkinson, 1984, Splitstoesser *et al.*, 1973).

Production of cocoyam has not been given priority attention in many countries probably because of its inability to earn foreign exchange and its unacceptability by the high income countries for both consumption and other purposes (Onyenweaku and Ezeh, 1987). Most of what is produced is consumed locally (Mbanaso and Enyinnaya, 1989). The production is labour intensive with most operations carried out manually at the traditional level.

Farm efficiency, and the question of how to measure it, is an important subject in developing countries' agriculture (Shah, M. K, 1995; Hazarika and Subramanian, 1999). There are four major approaches to measure and estimated efficiency (Coelli *et al*., 1998). These are the non-parametric programming approach (Charnes *et al*., 1978), the parametric programming approach (Aigner and Chu, 1968; Ali and Chaudry, 1990), the deterministic statistical approach (Afriat, 1972; Schippers, 2000; Fleming *et al*, 2004)] and the stochastic frontier production function approach (Aigner *et al*., 1977; Kirkley *et al*., 1995). Among these, the stochastic frontier production function and non-parametric programming, known as data envelopment analysis (DEA), are the most popular approaches. The stochastic frontier approach is preferred for assessing efficiency in agriculture because of the inherent stochasticity involved (Ezeh, 2004 and Coelli,1994).

The objective of this study is to measure the level of allocative efficiency and its determinants in cocoyam production in Anambra State, Nigeria using stochastic frontier translog cost and production functions. Allocative efficiency is the ratio between total cost of producing one unit of output using actual factor proportions in a technically efficient manner and total cost of producing one unit using optimal factor proportions in a technically efficient manner (Ohajianya and Onyenweaku, 2001). A production process may be allocatively inefficient in the sense that the marginal revenue product of input might not be equal to the marginal cost of that input; allocative inefficiency results in utilization of inputs in the wrong proportions, given input prices

METHODOLOGY

(a) The Theoretical Model: The stochastic frontier cost function is defined by:

$C = F(Wi, Yi; \alpha) \exp e_i \quad i = 1,2 \ldots n$ -- (1)

Where,

C = Represents the minimum cost associated with cocoyam production

W= Vector of input prices

Y = Cocoyam output

α = Vector of parameters

ei = Composite error term

Using Sheppard's Lemma we obtain

$\frac{\partial C}{\partial P_i} = X_i (W, Y; \alpha)$ -- (2)

This is a system of minimum cost input demand equations (Bravo – Ureta and Evenson, 1994; Xu and Jeffrey, 1995 and Bravo- Ureta and Pinheiro, 1997). Substituting a farm's input prices and quantity of output in equation (2) yields the economically efficient input vector $X_{c..}$ With observed levels of output given, the corresponding technically and economically efficient costs of production will be equal to X_{ii} P and X_{ie}, respectively. While the actual operating input combination of the farm is X_i P. The three cost measures can then be used to compute the technical (TE) and economic efficiency (EE) indices as follows;

$TE = (X_{it}.P) / (X_i.P)$ --(3)

$EE = (X_{ie}.P) / (X_i.P)$ --(4)

The combinations of equations (3) and (4) is used to obtain the allocative efficiency (AE) index following Farell (1957)

$AE = EE / TE = (X_{ie}.P) / (X_i.P)$ --- (5)

The efficient production is represented by an index value of 1.0 while the lower values indicate a greater degree of inefficiency. Using the method by Bravo-Ureta and Pinheiro (1997) which was based on the work of Jondrow *et al* (1982), efficiency can then be measured using the adjusted output as shown in equation (6)

$Y^* = f(X_i; \beta) - u$ --- (6)

Where U can be estimated as

$$E(u_i / \varepsilon_i) = \frac{б\lambda}{1+\lambda^2}\left[\frac{f^*(\varepsilon_i \lambda / б)}{1 - f^*(\varepsilon_i \lambda)} - \Sigma i \lambda\right] \quad \text{-- (7)}$$

Where

f* (.) and f* (.) are normal density and cumulative distribution functions respectively,

$\lambda = б_u / б_v$

$\varepsilon = Vi - Ui$ and

Y* is the observed output adjusted for statistical noise

When εi, б and λ estimates, are replaced in equations (5) and (6), it will provide estimates for U and V. The term V is a symmetric error, which accounts for random variations in output due to factors beyond the control of the farmer e.g. weather, disease outbreaks, measurements errors, etc. The term U is non negative random variables representing inefficiency in production relative to the stochastic frontier. The random error Vi is assumed to be independently and identically distributed as $N(o, \sigma_v^2)$ random variables independent of the Uis which are assumed to be non negative truncation of the $N(o,\sigma_u^2)$ distribution (i.e. half-normal distribution) or have exponential distribution.

(b) The Empirical Model: In this study, the economic efficiency was measured using stochastic translog cost frontier function for cocoyam production. The function is specified as follows:

$Ln\ C_i = \alpha_0 + \alpha_1 Ln\ W_1 + \alpha_2 Ln\ W_2 + \alpha_3 Ln\ W_3 + \alpha_4 Ln\ W_4 + \alpha_5 Ln\ W_5 + \alpha_6 Ln\ W_6 + \alpha_7 In\ Y_7 + 0.5\alpha_8 In\ W_1^2 + 0.5\alpha_9 In\ W_2^2 + 0.5\alpha_{10} In\ W_3^2 + 0.5\ \alpha_{11} In\ W_4^2 + 0.5\alpha_{12} Ln\ W_5^2 + 0.5\ \alpha_{13} Ln\ W_6^2 + 0.5\ \alpha_{14} Ln\ Y_7^2 + \alpha_{15} Ln\ W_1 In\ W_2 + \alpha_{16} Ln\ W_1 Ln\ W_3 + \alpha_{17} In\ W_1 Ln\ W_4 + \alpha_{18} Ln\ W_1 Ln\ W_5 + \alpha_{19} Ln\ W_1 In\ W_6 + \alpha_{20} Ln\ W_1 Ln\ Y_7 + \alpha_{21} Ln\ W_2 Ln\ W_3 + \alpha_{22} Ln\ W_2 Ln\ W_4 + \alpha_{23} Ln\ W_2 Ln\ W_5 + \alpha_{24} Ln\ W_2 Ln\ W_6 + \alpha_{25} Ln\ W_2 Ln\ Y_7 + \alpha_{26} Ln\ W_3 Ln\ W_4 + \alpha_{27} Ln\ W_3 Ln\ W_5 + \alpha_{28} Ln\ W_3 Ln\ W_6 + \alpha_{29} Ln\ W_3 Ln\ Y_7 + \alpha_{30} Ln\ W_4 Ln\ W_5 + \alpha_{31} Ln\ W_4 Ln\ W_6 + \alpha_{32} Ln\ W_4 Ln\ Y_7 + \alpha_{33} Ln\ {}_5W\ Ln\ W_6 + \alpha_{34} Ln\ {}_5W\ Ln\ W_6$

$+\alpha_{35}Ln_5WLnY_7+V_i–U_i$ -- (6)
Where LnC_i represents total input cost of the i-th farm, W_1 is average daily wage rate per manday, W_2 is price of fertilizer per kg, W_3 is land rent in naira per hectare, W_4 is price of planting materials in naira per kg, W_5 is price of other inputs in naira. W_6 is capital input in naira made up of depreciation charges on farm tools and equipment, interest on borrowed capital and rent on land, Y is output of cocoyam in kg adjusted for statistical noise, α_0 α_1 α_2 ….. α_{27} are regression parameters to be estimated while Vi and Ui are as defined earlier.

(c) Technical Efficiency: This was measured using a stochastic translog production function specified as follows:

$$\ln Q = b_o+b_1\ln X_1+b_2\ln X_2+B_3\ln X_3+b_4\ln X_4+b_5\ln X_5+b_6\ln X_6+1/2b_7(\ln X_1)^2+ 1/2b_8(\ln X_2)^2 + 1/2b_9(\ln X_3)^2 +1/2b_{10}(\ln X_4)^2+1/2b_{11}(\ln X_5)^2 +1/2b_{12}(\ln X_6)^2 + b_{13}\ln X_1\ln X_2 +b_{14}\ln X_1\ln X_3 + b_{15}\ln X_1\ln X_4 + b_{16}\ln X_1\ln X_5 +b_{17}\ln X_1\ln X_6 +b_{18}\ln X_2\ln X_3 +b_{19}\ln X_2\ln X_4 + b_{20}\ln X_2\ln X_5 + b_{21}\ln X_2\ln X_6 +b_{22}\ln X_3\ln X_4 +b_{23}\ln X_3\ln X_5 +b_{24}\ln X_3\ln X_6+b_{25}\ln X_4\ln X_5+b_{26}\ln X_4\ln X_6+b_{27}\ln X_5\ln X_6+Vi–Ui \quad \text{(7)}$$

Where Q is output of cocoyam in kg., X_1 is farm size in hectares, X_2 is labour input in mandays, X_3 is fertilizer input in kg, X_4 is cocoyam setts planted in kg, X_5 is capital input in naira made up of depreciation charges on farm tools and equipment, interest on borrowed capital and rent on land, X_6 is other inputs in Naira, b_0,b_1,b_2 ….. b_{27} are regression parameters to be estimated while Vi and Ui are as defined earlier. In addition, Ui is assumed in this study to follow a half normal distribution as is done in most frontier production literature.

(d) Allocative Efficiency: This was measured as follows:
AE = EE / TE
Where AE = Allocative Efficiency
EE = Economic Efficiency
TE = Technical Efficiency

(e) Determinants of Allocative Efficiency: Allocative Efficiency scores from (eqs) 3 and 4 were then regressed against the set of farm specific factors to obtain the determinants for allocative efficiency following Kalirajan (1991).

$$Exp.(-Ui) = ao+a_1Z_1+a_2Z_2+a_3Z_3+a_4Z_4+a_5Z_5+a_6Z_6+a_7Z_7+a_8Z_8+a_9Z_9 \quad \text{(7)}$$

Where Exp. (-Ui), is the allocative efficiency of the i-th farmer, Z_1 is farmers age in years, Z_2 is farmers level of education in years, Z_3 is the number of extension contacts made by the farmer in the year, Z_4 is household size, Z_5 is farm size in hectares , Z_6 is farmer's farming experience in years, Z_7 is fertilizer use, a dummy variable which takes the value of unity for fertilizer use and zero otherwise, Z_8 is credit access, a dummy variable which takes the value of unity if the farmer has access to credit and zero otherwise, Z_9 is membership of farmers associations/cooperative societies, a dummy variable which takes the value of unity for members and zero otherwise while $a_0,a_1,a_2….a_9$ are regression parameters to be estimated. We expect a_2, a_3, a_5, a_6, a_7, a_8 and a_9 to be positive and a_1 and a_4 negative.

(f) The Data: Anambra State is located in the South Eastern region of Nigeria between longitude 6^0 36`E to $7^0$ 21` and latitude $5^0$38`N to $6^0$ 47`N. The State is bounded in the North by Kogi State, in the west by River Niger and Delta State, in the south by Imo State and on the east by Enugu State. It has twenty one (21) Local Government Areas with Awka as the State Capital. It was created in 1991 with a population figure of 4.182 million people (NPC, 2006) and a land mass of 4415.54 square kilometres, 70% of which is rich for agricultural production (Nkematu, 2000). The State for administrative purposes is divided into four agricultural zones of Aguata, Anambra, Awka and Onitsha. The zones are further delineated into 24 extension blocks and 120 circles. Farming is the predominant occupation of the people, majority of who are small holders. The major available crops are yam, cassava, rice, maize, cocoyam, cowpea, tomatoes and vegetables, while the livestock produced in the state include poultry, sheep, goats and to some extent pig.
Three out of the four agricultural zones were purposively selected on the basis of the intensity of cocoyam production. They are Aguata, Awka and Onitsha. Two extension blocks were randomly selected from each agricultural zone (Aguata and Nnewi North from Aguata zone, Awka North and Anaocha from Awka zone as well as Idemili North and Ihiala from Onitsha zone) and 2 circles from each block. Finally 10 farmers were randomly selected from each circle for detailed study, giving a total sample size of 120 farmers in the state. Data were collected by means of structured questionnaire on the socio-economic characteristics of the

farmers, and their production activities in terms of inputs, output, and their prices for the year 2005 using the cost-route approach.

RESULTS AND DISCUSSION

(a) **Average Statistics of Cocoyam Farmers:** The average statistics of the sampled cocoyam farmers are presented in Table 1. On the average, a typical cocoyam farmer in the state is 50 years old, with 4 years of education, 13 years of farming experience and an average household size of 12 persons. The average cocoyam farmer cultivated 0.27 ha, made an average of 2 extension contacts in the year, used about 21.74kg of fertilizer and 250kg of cocoyam setts, spent about ₦2405 on capital inputs, employed 41.8 mandays of labour and produced an output of 1691kg of cocoyam per annum. Cocoyam production in the state is a female dominated occupation as about 74% of the farmers were females.

Table 1: Average Statistics of Cocoyam Farmers in Anambra State, Nigeria, 2005

S/No	Variable	Mean Value	Maximum Value	Minimum Value
1	Farm size (ha)	0.27	1.50	0.01
2	Labour (mandays)	41.80	141.3	5.76
3	Fertilizer input (kg)	21.74	96.4	0.00
4	Cocoyam setts (kg)	250.25	2551.00	50.00
5	Capital input (₦)	2405.10	11300.00	176.00
6	Age (yrs)	50.00	75.00	24.00
7	Education (yrs)	4.00	10.00	0.00
8	Farming Experience (yrs)	13.00	50.00	3.00
9	Household size (No)	12.00	18.00	4.00
10	Output (kg)	1691.00	10907.00	68.00
11	Extension Contacts (No)	2.00	8.00	0.00
12	Other inputs (₦)	111.86	750.00	0.00
13	Female farmers (%)	74.00	_	_

Source: Field Survey, 2005

(f) Estimated Cost and Production Functions

The Maximum Likelihood (ML) estimates of the stochastic frontier translog production and cost parameters for cocoyam are presented in Table 2 and 3 respectively. For the cost function, the sigma (σ^2 = 0.53) and the gamma (γ=0.98) are quite high and highly significant at 1.0% level of probability. The high and significant value of the sigma square (σ^2) indicate the goodness of fit and correctness of the specified assumption of the composite error terms distribution (Idiong, 2005). The gamma (γ = 0.99) shows that 99% of the variability in the output of cocoyam farmers that are unexplained by the function is due to allocative inefficiency. For the production function, the estimated variance (σ^2) is statistically significant at 5% indicating goodness of fit and the correctness of the specified distribution assumptions of the composite error term. Besides, the variance of the non negative farm effects is a small proportion of the total variance of cocoyam output. Gamma (γ) is estimated at 0.397 and is statistically significant at 5% indicating that only 39.7% of the total variation in cocoyam output is due to technical inefficiency.

(g) Estimation of Allocative Efficiency

The results of translog stochastic frontier cost and production function for cocoyam in Anambra State are shown in Table 2 and 3 respectively. The frequency distribution of allocative efficiency estimates are shown in table 5. The allocative efficiency estimates presented in Table 5. indicate that it ranged from 0.10 to 0.97 ; the mean allocative efficiency was 0.65. The result indicates that average cocoyam farmer in the state would enjoy cost saving of about 32.9 (1-0.65/0.97) percent if he or she attains the level of the most efficient farmer among the respondents. The most allocatively inefficient farmer will have an efficiency gain of 89.6 (1-0.10/0.97) percent in cocoyam production if he or she is to attain the efficiency level of most allocatively efficient farmer in the state.

Table 2: Estimated Translog Stochastic Frontier Cost Function for Cocoyam in Anambra State, Nigeria.

Production Factors	**Parameter**	**Coefficient**	**Standard Error**	**t-value**
Constant Term	w_o	150.4583	1.0100	148.957***
Wage rate	w_1	4.6431	0.1050	4.4419***
Price of fertilizer	w_2	0.3561	0.7651	0.4654
Land rent	w_3	4.3376	0.7644	5.6747***
Price of setts	w_4	4.8785.	1.2181	4.0048***
Price of other inputs	w_5	0.1613	0.9443	0.1708
Depreciation on tools	w_6	-1.7787	0.7978	9.7607***
Output (Y*)	w_7	0.0583	0.8363	0.0694
Wage rate^2	w_8	1.7252	0.2538	28.5622***
Price of fertilizer^2	w_9	-0.1040	0.4608	-0.2256
Land rent^2	w_{10}	-0.0765	0.0915	-0.8366
Price of setts^2	w_{11}	-0.5245	0.2892	-1.8137*
Price of other inputs^2	w_{12}	0.0633	0.1264	0.5010
Depreciation^2	w_{13}	0.0630	0.0999	-0.6309
Output(Y*)	w_{14}	-0.0886	0.1301	-0.6813
Wage rate x Price of fertilizer	w_{15}	0.0008	0.0005	0.1519
Wage rate x land rent	w_{16}	-0.5038	0.2668	-1.8880*
Wage rate x Price of other inputs	w_{17}	0.0753	0.2042	0.3688
Wage rate x Depreciation	w_{18}	1.2503	0.1607	7.7783***
Wage rate x Output (Y*)	w_{19}	0.0003	0.0003	0.0001
Price of fertilizer x land rent	w_{20}	-0.0764	0.0374	-2.0390**
Price of fertilizer x Price of setts	w_{21}	0.1845	0.0528	3.4927***
Price of fertilizer x Price of other inputs	w_{22}	-0.0725	0.0429	-1.6868*
Price of fertilizer x Depreciation	w_{23}	0.0767	0.0394	1.9442*
Price of fertilizer x Output (Y*)	w_{24}	-0.0661	0.0154	-4.2783***
Land rent x Price of setts	w_{25}	-0.2516	0.0942	-2.6702***
Land rent x Price of other inputs	w_{26}	0.1068	0.0713	1.4973
Land rent x Depreciation	w_{27}	0.0074	0.0915	0.0807
Land rent x Output (Y*)	w_{28}	0.0399	0.0540	0.7390
Wage rate x land rent	w_{29}	-0.4821	0.1334	-3.6126***
Price of setts x Price of other inputs	w_{30}	0.1039	0.1566	0.6555
Price of setts x Depreciation	w_{31}	0.0751	0.1261	0.5959
Price of setts x Output (Y*)	w_{32}	-0.0156	0.1116	-0.1398
Price of other inputs x Depreciation	w_{33}	-0.3009	0.0638	-4.7108***
Price of other inputs x output(Y*)	w_{34}	0.0242	0.0385	0.6272
Depreciation x output (Y*)	w_{35}	0.0787	0.0668	1.1810
Diagnostic statistics				
Log – likelihood function		-38.608		
Total Variance	(σ)	0.5382	0.1032	5.2142***
Variance Ratio	(γ)	0.9975	0.0017	587.066***
LR Test		102.66		

Source: Computed from frontier 4.1 MLE/Survey data, 2005
***, ** and *** = Significant at 10%, 5% and 1% respectively**

Table 3: Estimated Translog Stochastic Frontier Production Function for Cocoyam in Anambra State, Nigeria.

Variables	Parameters	Estimates	t-ratios
Constant term	b_0	18.259	17.627***
Farm size (InX_1)	b_1	4.518	15.382***
Labour input (InX_2)	b_2	-1.498	-1.688
Fertilizer (InX_3)	b_3	-0.377	-1.739
Cocoyam Sett (InX_4)	b_4	1.443	2.174**
Capital Input (InX_5)	b_5	-3.036	-5.604***
Other Inputs (InX_6)	b_6	-0.131	-0.707
½ $(InX_1)^2$	b_7	0.623	11.381***
½ $(InX_2)^2$	b_8	-0.419	-1.506
½ $(InX_3)^2$	b_9	-0.045	-1.702
½ $(InX_4)^2$	b_{10}	-0.246	-2.207**
½ $(InX_5)^2$	b_{11}	0.045	0.568
½ $(InX_6)^2$	b_{12}	0.007	0.443
InX_1 InX_2	b_{13}	-0.084	-0.818
InX_1 InX_3	b_{14}	-0.110	-4.543***
InX_1 InX_4	b_{15}	0.079	0.968
InX_1 InX_5	b_{16}	-0.528	-7.309***
InX_1 InX_6	b_{17}	0.024	0.944
InX_2 InX_3	b_{18}	-0.017	-0.447
InX_2 InX_4	b_{19}	-0.057	-0.444
InX_2 InX_5	b_{20}	0.563	5.521***
InX_2 InX_6	b_{21}	0.109	3.881***
InX_3 Inx_4	b_{22}	0.073	2.844***
InX_3 InX_5	b_{23}	0.013	0.444
InX_3 InX_6	b_{24}	-0.073	-1.164
InX_4 InX_5	b_{25}	0.033	0.467
InX_4 InX_6	b_{26}	0.002	0.110
InX_5 InX_6	b_{27}	-0.064	-3.341***
Log Likelihood Function	-35.032		
Sigma squared	σ^2	4.517	6.613***
Gamma	γ	0.397	3.390***
Sample size	n	120	

Source: Computed from frontier 4.1 MLE/Survey data, 2005
***, ** and *** = Significant at 10%, 5% and 1% respectively**

Table 5: Frequency Distribution of Allocative Efficiency Indices.

Allocative Efficiency Index	Frequency	Percentage
<0.20	6	5
0.21-0.40	24	20
0.41-0.60	23	19.16
0.61-0.80	21	17.50
0.81-1.00	46	38.34
Total	120	100
Maximum Allocative Efficiency	0.97	
Minimum Allocative Efficiency	0.10	
Mean Allocative Efficienciency	0.65	

(c) Sources of Allocative Efficiency.

Table 6. shows the results of the factors influencing allocative efficiency of cocoyam farmers in Anambra State. The coefficient for age was negatively signed and significant at 5% probability level, this implies that increase in age will result in allocative inefficiency because most of the respondents were the aged and would tend to misallocate their resources. This was also reported by Idiong (2005) and Hussain *et al* (1984).

The coefficient for education and extension visit were negative. Education was statistically significant at 1.0% level of probability and extension visit even at 10.0% level was not significant. This implies that farmers, majority of who are aged rely on their long years of experience to allocate their resources efficiently. Most of the farmers (62.5%) had little or no education which implies that education is not costless but requires investment. Lack of education might not be regarded as a factor causing inefficiency. Only if it is costless could we say that it would contribute to improvement in farmer efficiency (Shah, 1995). This goes against the findings of Amaza and Olayemi (2000) who reported that increasing years of formal education increases a farmer's level of allocative efficiency. Farm experience was seen to be positively signed and significant at 10% level of probability.

Farm size had a negative coefficient and was highly significant at 1.0% level of probability. This implies that farmers with small farm holdings are allocatively efficient. This confirms Van Zyl, Joahn *et al* (1995) who found out that commercial farms could become significantly more efficient if they become smaller. Farmers in the study area have farm holdings which were less than 1.0ha.Family size coefficient had a positive magnitude but was not significant.

The coefficients for fertilizer use and credit access were positive and statistically significant at 5% probability level. Credit availability shifts the cash constraint outwards and enables farmers to make timely purchases of those inputs which they cannot provide from their own resources. Fertilizer use which in an input affected positively the allocative efficiency of the farmers which corroborates to credit. If a farmer fails to buy fertilizer for his crop, output loss may be irretrievable. Membership of cooperatives was negatively signed but not significant

Table 6: Maximum likelihood Estimates of the Determinants of Allocative Efficiency in Cocoyam Production.

Variable	Coefficient	Standard Error	t-value
Constant Term	1.0114	0.1346	7.5200***
Age	-0.0065	0.0027	-2.4100**
Education	-0.0180	0.0053	-3.4300***
Extension Visit	-0.0181	0.0126	-1.4400
Family size	0.0022	0.0072	0.3100
Farm Size	-0.5289	0.0004	-6.5800***
Farm Experience	0.0051	0.0030	1.6700*
Fertilizer Use	0.1018	0.0446	2.2400**
Credit Access	0.1035	0.0468	2.2100**
Membership if Crop	-0.0485	0.0465	1.0400

Source: Computed from frontier 4.1 MLE/Survey data, 2005

CONCLUSION

The study has indicated that cocoyam farmers in Anambra State are predominantly women who are not fully allocatively efficient. Individual levels of allocative efficiency range between 10.13% and 97.11% with a mean of 65.18%, which reveal substantial allocative inefficiencies hence considerable potential for enhanced profitability by reducing costs through improved efficiency. On average, by operating at full allocative efficiency levels cocoyam producers would be able to reduce their cost by 32.90% depending on the method employed.

Important factors indirectly related to allocative efficiency are age, education, farm size, farm experience, fertilizer use and credit access. These results call for policies aimed at encouraging new entrants especially the youths to cultivate cocoyam and the experienced ones to remain in farming. Women play a significant role in cocoyam production in the study area therefore free education programme especially is advocated as well as policies designed to improve women access to fertilizer and credit.

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