Allocative Efficiency among Fadama Fluted Pumkin Farmers in Imo State, Nigeria

Nwachukwu, Ifeanyi N. and Onyenweaku, Chris E.

Michael Okpara University of Agriculture Umudike, Abia State, Nigeria

9 December 2009

ALLOCATIVE EFFICIENCY AMONG FADAMA FLUTED PUMPKIN FARMERS IN IMO STATE NIGERIA

Nwachukwu, I.N.[1] and C.E. Onyenweaku[2]

[1]Department of Agribusiness & Management
[2]Department of Agricultural Economics
Michael Okpara University of Agriculture,
Umudike – Umuahia,
Abia State, Nigeria

ABSTRACT

The study investigated the allocative efficiency among Fadama Fluted pumpkin farmers in Imo State, Nigeria. It specifically sought to analyze the Farmers' socio-economic profile; estimate their allocative efficiency as well as its determinants. A multistage random sample of 120 Fadama Fluted Pumpkin farmers drawn from the three agricultural zones of the state was employed. A structured questionnaire was used to obtain information on socio-economic characteristics and other relevant variables. Allocative efficiency was deduced from the quotient between economic efficiency and technical efficiency scores and regressed against farm specific factors. The t-test statistic was employed in testing determinants of allocative efficiency. The descriptive statistical results showed that majority of the farmers are active small holders and literate with many years of farming experience. The enterprise was female dominated while household was large. The maximum likelihood estimation of the translog model revealed that allocative efficiency was influenced by education, farming experience, extension contact, credit access and household size. Given the mean allocative efficiency of 0.62, about 51.67% of the respondents are frontier farmers. Also, the average Fadama Fluted pumpkin farmer would require a cost savings of 37.37% in order to attain the status of the most allocative efficient producer. As more opportunities exist for improvement of allocative efficiency by the Fadama Farmers, the need to intensify the current family planning programme in Nigeria as well as eliminate extended bureaucratic processes associated with credit access cannot be over emphasized.

INTRODUCTION

Fluted Pumpkin otherwise known as *Telfairia occidentalis* is one of the commonest, popular cut vegetable grown in southern Nigeria. It is a very useful addition to the diet when others are in short supply and the high nutritious seeds can be stored in the fluted gourds until required (Nwachukwu, 2006). The crop is a perennial climber grown for its leaves and seeds; belongs to the cucurbitaceae family and originates from West Africa. It is found throughout the former forested area from Sierra Leone to Angola and up to Uganda in the east.

The most common productive method in traditional faming system is as mixed crop together with a staple food, particularly yams or less frequently, with other vegetables. Some farmers utilize the stakes provided for yam to support fluted Pumpkin. Of late, pure stands are becoming more common in Nigeria for market gardening especially during the Fadama season. During the dry season, irrigation is required every three days (Schippers, 2000).

Fadama refers to a seasonally flooded area used for farming during the dry season. The name, Fadama is an Hausa word for irrigable land and defined as alluvial, lowland formed by erosional and depositional actions of the rivers and streams (Ingawa *et al*, 2004; Qureshi, 1989). Fadama lands are regarded as very rich agricultural areas and cover about 4.9 million hectares in Nigeria. When Fadamas spread out over a large area, they are often called 'Wetlands'. Wetlands are recognized by the Ramsar convention of 1971 (Ramsar is a place in Iran where the convention was signed), as of worldwide significance, because of the biodiversity they support. Nigeria is a signatory to this convention (Blench and Ingawa, 2004).

In the early days Fadama cultivation, the major crops grown were vegetables, wheat and rice with initial bias for vegetables. Vegetables, which are sources of vitamins, minerals, carbohydrates, protein and dietary fibres are important to the human diet. Balanced diet should contain 250-325g of vegetables and the average human requirement for vegetable is 285g/person/day for a balanced diet (Attavar, 2000).

Increases in yields can result from the development and adoption of new technologies and improvement in the economic efficiency of farming operations. The economic efficiency consists of two components (i) technical efficiency, which reflects the ability of a farm to obtain maximum output from a given set of inputs and available technology; and (ii) allocative efficiency, which reflects its ability to use the inputs in optimal proportion, given their respective prices (Farrell, 1957; Coelli, 1995a). Efforts designed to improve efficiency as a means of increasing agricultural output are more cost-effective than introducing new technology if farmers are not making efficient use of existing technology (Belbase and Grabowski, 1985; Shapiro, 1983; Dey *et al*, 2000). If farmers are reasonably efficient, the increases in productivity would require new inputs and technology to shift the production frontier upwards (Ali and Byerlee, 1991).

There have been many research studies to assess the relative efficiency of farmers in recent years (eg. Onyenweaku and Fabiyi, 1991; Dey *et al*, 2000; Ike and Inoni, 2004; Rahman, 2002; Wadud and white, 2000; Tzouvelekas *et al*, 2001), only a few have delved into allocative efficiency. The present study sets out to analyze the farmers' socio-economic background; estimate their allocative efficiency and its determinants using the stochastic frontier approach. A single-stage estimation procedure is used to examine the determinants of allocative efficiency. By implication, the socio-economic variables were incorporated directly into the estimation of the production frontier model because such variables may have a direct influence on efficiency. The principal solution to increasing food production lies in raising the productivity of land by closing the existing yield gaps and developing varieties with higher yield potential (Rahman, 2002).

ANALYTICAL FRAMEWORK

Following the pioneering but independent works by Aigner *et al* (1977) and Battese and Corra (1977), serious consideration has been given to the possibility of estimating the frontier production, in an effort to bridge the gap between theory and empirical work. The stochastic frontier production function can be written as

$Y_I = F(X_i;\beta) \exp(Vi-Ui)$ $\quad i = 1,2 \ldots\ldots n$……………………………………………………..(1)

Where Y_i is the production of the ith farm, X_i is a vector input used by the ith farm, β is a vector of unknown parameters, V_i is a random variable which is assumed to be N (O, σ_v^2) and independent of the U_i which are non-negative random variables assumed to account for technical efficiency in production. Allocative or price efficiency traditionally rests on an index of marginal product of opportunity costs. If among all inputs, the ratios of marginal products to opportunity costs are equal to one, a firm is price efficient. This efficiency measure has to do with the extent to which farmers make efficient decision by using inputs up to the level at which their marginal contribution to production value is equal to the factor. If a firm is allocatively inefficient, it operates off its least cost path (Ajani and Olayemi, 2001).

The allocative efficiency can be derived from the stochastic frontier cost function and thus defined by:

$C = F(W_i, Y_{ij} \propto) \exp \varepsilon_i$ $\quad i = 1,2, \ldots\ldots n$…………………………………………………(2)

Where

C = Minimum cost associated with Fadama fluted pumpkin production

W= Vector of input prices

Y = Fadama fluted pumpkin output

$\propto$ = Vector of parameters

ε_i = Composite error term $(V_i - U_i)$

Applying Lemma Sheppard, we obtain

$\frac{\partial C}{\partial P_i} = X_i (W, Y; \propto)$ ……………………………….…………………………………….(3)

Substituting a farm's input prices and quantity of output in equation (iii) yields the economically efficienct input vector X_i. With observed levels of outputs given, the corresponding technically and economically efficient costs of production will be equal to X_{ii} P and X_{ie}, respectively while actual operating input combination of the farm is X_iP. The three cost measures can then be used to compute the technical (TE) and economic efficiency (EE) indices as follows:

$TE = (X_{ii}P)/(X_iP)$ ……………………………………………………………………..(4)

$EE = (X_{ie}.P)/(X_iP)$ ……………………………….. ………………………………….(5)

The combinations of equation (4) and (5) are employed to obtain the allocative efficiency (AE) index is consistent with Farrell (1957).

$AE = EE/TE = (X_{ie}P)/(X_iP)$ ……………………………..…………………….………………(6)

Allocative efficiency value ranges from 0 to 1

METHDOLOGY

The study area was Imo State, which is one of the five states in southeastern Nigeria. It lies between latitude $5^0 10^1$ and $6^0 35^1$ North of equator and longitude $6^0 35^1$ and $7^0 31^1$ east of the Greenwich Meridian. It is wherefore in the tropical rain forest zone. The wet season lasts from April to September while remaining months are dry (Fadama period) when the Fadama cultivation takes place.

The study employed multistage random sampling technique where 40 Fadama Fluted Pumpkin farmers were selected from each of the three agricultural zones of the state, Owerri, Orlu and Okigwe. In the first stage, 2 local government areas were chosen from each of the zones viz Ihitte/Uboma and Ehime Mbano (Okigwe zone); Oguta and Ohaji/Egbema (Orlu zone) and Owerri-North and Aboh - Mbaise (Owerri zone). The last stage was the random selection of 10 Fadama fluted pumpkin farmers from each of the 12 communities selected from the zones, giving a total sample size of 120 farmers.

Data were collected by means of structured questionnaire on the socio-economic profile of the farmers and their production activities in terms of inputs, output and their prices for the year 2005.

MODEL SPECIFICATION

Technical Efficiency: This was measured using stochastic translog production frontier function for Fadama Fluted Pumpkin production. The functional form is specified as follows:

$\text{Ln } Y_i = \beta_0 + \beta_1 \text{ Ln } X_1 + \beta_2 \text{ Ln } X_2 + \beta_3 \text{ Ln } X_3 + \beta_4 \text{ Ln } X_4 + \beta_5 \text{ Ln } X_5 + 0.5\, \beta_{11} \text{ Ln } (X_1)^2 + 0.5\, \beta_{22} \text{ Ln } (X_2)^2 + 0.5\, \beta_{33} \text{ Ln } (X_3)^2 + 0.5\, \beta_{44} \text{ Ln } (X_4)^2 + 0.5\, \beta_{55} \text{ Ln } (X_5)^2 + \beta_{12} (X_1) \text{ Ln } (X_2) + \beta_{13} \text{ Ln } (X_1) \text{ Ln } (X_3) + \beta_{14} \text{ Ln } (X_1) \text{ Ln } (X_4) + \beta_{15} \text{ Ln } (X_1) \text{ Ln } (X_5) + \beta_{23} \text{ Ln } (X_2) \text{ Ln } (X_3) + \beta_{24} \text{ Ln } (X_2) \text{ Ln } (X_4) + \beta_{25} \text{ Ln } (X_2) \text{ Ln } (X_5) + \beta_{34} \text{ Ln } (X_3) \text{ Ln } (X_4) + \beta_{35} \text{ Ln } (X_3) \text{ Ln } (X_5) + \beta_{45} \text{ Ln } (X_4) (X_5) + V_i - U_i$ ……. ………………………………………………………………………………………(7)

Where Y_i is Fadama fluted pumpkin output in Kg, X_1 is farm size in hectares, X_2 is quantity of seeds in Kg, X_3 is labour input in mandays, X_4 is fertilizer input in Kg, X_5 is depreciation on implements in Naira, β_1-β_{55} are parameters to be estimated, β_0 is intercept, V_i is error term not under the control of farmers while U_i is error term under the control of farmers.

Economic Efficiency

Economic efficiency was measured using a stochastic translog cost frontier function specified as:

$\text{Ln } C = \alpha_{0} + \alpha_1 \text{ Ln } q_1 + \alpha_2 \text{ Ln } q_2 + \alpha_3 \text{ Ln } q_3 + \alpha_4 \text{ Ln } q_5 + 0.5\, \alpha_{11} \text{ Ln } (q_1)^2 + 0.5\, \alpha_{22} \text{ Ln } (q_2)^2 + 0.5\, \alpha_{33} \text{ Ln } (q_3)^2 + 0.5\, \alpha_{44} \text{ Ln } (q_4)^2 + 0.5\, \alpha_{55} \text{ Ln } (q_5)^2 + \alpha_{12} \text{ Ln } (q_1) \text{ Ln } (q_5) + \alpha_{13} \text{ Ln } (q_1) \text{ In } (q_3) + \alpha_{14} \text{ Ln } (q_1) + \alpha_{15} \text{ Ln } (q_1) \text{ Ln } (q_5) + \alpha_{23} \text{ Ln } (q_2) \text{ Ln } (q_3) + \alpha_{24} \text{ Ln } (q_2) \text{ Ln } (q_4) + \alpha_{25} \text{ Ln } (q_5) + \alpha_{34} \text{ Ln } (q_3) \text{ Ln } (q_4) + \alpha_{35} \text{ Ln } (q_3) \text{ Ln } (q_5) + \alpha_{45} \text{ Ln } (q_4) \text{ Ln}(q_5) + V_i - U_i$ ……………… ………………………...…………………………………………………………….……………(8)

Where C is total input cost of the i-th farm, q_1 is price of seeds in naira per Kg, q_2 price of fertilizer in naira per Kg, $q_3$is average wage rate in naira per Manday, q_4 is land rent in naira per hectare, q_5 is depreciation on implements in naira, α_0 is intercept while V_i and U_i are earlier defined.

Estimation of Allocative Efficiency

Allocative efficiency scores were elicited from the quotient between Economic efficiency and Technical efficiency estimates. The allocative efficiency scores deduced from TE {equations (4)} and EE {(5)} were then regressed against the farm specific factors to obtain the determinants for allocative efficiency following Kalirajan (1991)

$\text{Exp.}(-U_i) = a_0 + a_1Z_1 + a_2Z_2 + a_3Z_3 + a_4Z_4 + a_5Z_5 + a_6Z_6 + a_7Z_7 + a_8Z_8 + a_9Z_9 + \varepsilon i$ ……………………………………..(9)

Where Exp. $(-U_i)$ is the allocative efficiency of the farmer, Z_1 is the age of the farmer in years, Z_2 is farmers' level of education in years, Z_3 is gender of farmer, Z_4 is farming experience in years, Z_5 is farm size in hectares, Z_6 is number of extension contents made by the farmers, Z_7 is credit access (dummy), Z_8 is membership of cooperative societies/farmers associations (dummy), Z_9 is household size, ε_i is error term, a_0 is intercept while a_1-a_9 are regression parameters to be estimated. The expectation is that a_2, a_4, a_5, a_6, a_7, a_8 be positive while a_1 and a_9 be negative.
The estimate was by the method of maximum likelihood using the computer program, Frontier 4.1 (Coelli, 1994).

RESULTS AND DISCUSSION

Socioeconomic characteristics

The distribution of respondents according to age, education level, farming experience, farm size, household size and gender participation was shown in Table 1. The mean age of the farmers was about 40 years. Sixty percent of them fell within the age bracket of 30 and 49, which implied that they are still very active. The middle aged accounted for about 12% while about 9% of them are the older farmers. Given the laborious nature of Fadama cultivation, a high proportion of active Fadama fluted pumpkin farmers have huge positive implications for vegetable production all year round in Nigeria. Apart from increase in labour supply, respondents within the productive age bracket are likely to adopt innovation more than the aged farmers (Onyenweaku and Okoye, 2007).

With respect to education, 33.33% of the farmers had primary education while 42.5% received secondary education. Out of 91.67% that had formal education, 15.84% possessed tertiary qualifications. By implication, the study area is grossly dominated by literate farmers. The level of education attained by a farmer not only increases his farm productivity but also enhances his ability to understand and evaluate new production technologies (Obasi, 1991).

About 80% of the farmers have over 5 years of farming experience in Fadama vegetable cultivation and 18.33% of the respondents have been in the production business for 5 years or less. Table 1 further showed that 52.50% of the respondents have farming experience of over 10 years. With average farming experience of about 12 years, it implies that Fadama fluted pumpkin producers have wealth of farming experience and as such, have the capacity to maximize their output and profit at minimum cost. It thus, corroborated empirical evidence that farming experience enhances efficiency of scarce resource by small holders in Nigeria (Njoku and Odii, 1991).

About 80% of the respondents have Fadama fluted pumpkin farm size that is greater than one hectare. Though 8.33% have farm sizes of above 2.5 hectares, the implication is that majority of the Fadama fluted pumpkin producers in Imo State are generally smallholder farmers probably because of the limited availability of Fadama land and constraints imposed by land fragmentation. The result consolidated the findings of Mbanasor and Obioha (2003), which attributed small Fadama land holdings to the small size of Fadama land area relative to the total cultivable land. Household size data showed that the majority of the Fadama farmers, which accounted for 57.50% have household size of between 6 and 15 persons. Also, 18.33% maintained household size of 5 or less while 10.00% had 21 persons and above. The mean household size was 6 persons, which reflect current statistics of an average traditional rural farming family size in Nigeria. Gender participation as depicted by same table 1 show that 55% were female while 45% were male. This result disagreed with Blench and Ingawa (2004) who asserted that Fadama cultivation was new and tended to be primarily a male activity.

Table 1: Distribution of socioeconomic profile of Fadama Fluted Pumpkin Farmers in Imo state

Age (in years)	Frequency	Percentage (%)
20 – 29	23	19.16
30 - 39	40	33.33
40 - 49	32	26.67
50 - 59	14	11.67
60 and above	11	9.17
Total	120	100
Mean	40.35	
Education Level (Years)		
No formal education	10	8.33
Primary	40	33.33
Secondary	51	42.50
Tertiary	19	15.84
Total	120	100
Farming Experience (Years)		
1 – 5	22	18.33
6 – 10	35	29.17
11 -15	34	28.33
16 -20	17	14.17
21 and above	12	10.00
Total	120	100
Farm size (ha)		
0.1 – 1.0	25	20.83
1.1 – 1.5	39	32.50
1.6 – 2.0	35	29.17
2.1 – 2.5	11	9.17
2.6 and above	10	8.33
Total	120	100
Mean	1.54	
Household size		
1 – 5	22	18.33
6 – 10	35	29.17
11 -15	34	28.33
16 -20	17	14.17
21 and above	12	10.00
Total	120	100
Gender Participation		
Male	54	45.00
Female	66	55.00
Total	120	100

Source: Field Survey, 2005

Estimates of Cost and Production Functions

The maximum likelihood estimates of the cost frontier for Fadama fluted pumpkin production in Imo state indicated that the variance ratio (Y = 0.999) and total variance (σ^2) are statistically significant at 1% risk level [Table 3]. Total variance estimates goodness of fit and the correctness of the specified distributional assumption of the composite error term. The variance ratio of 0.999 implies that 99.9% of disturbance in the system is due to inefficiency, one-sided error and therefore 0.10% is due to stochastic disturbance with two-sided error, supported by a high t-value. This agreed with Flemming *et a*l (2004).

Since total cost as well as the dependent variables are in natural logarithms and have been normalized, the first order coefficients are interpretable as cost elasticities evaluated at the sample median. All the first order exogenous variables have the expected positive signs except for depreciation. Fertilizer and wage rate are statistically significant with elasticities of 8.663 and 3.915 respectively. This shows that the farmers operate in stage one of the classical production function and thus increased procurement of fertilizer and labour demand should be encouraged since the factors are under utilized. Apart from high significance of farm size, it has a coefficient of 1.212, which implies that a 1.0% increase in the factor will increase total cost by 1.212%.The second order terms which show possible non-linear changes of the effects over time revealed that all the coefficients of the square term (own interactions) are statistically significant at different levels of significance. The cross interactions also maintained strong statistically significance except for wage rate/farm size, wage rate/depreciation and farm size/depreciation variables that were not. The own second derivatives establish direct relationship with total cost while the cross second derivatives while the cross second derivatives show indirect relationships with total cost.

With respect to the translog stochastic frontier production results, almost all the first order coefficients are significant while majority of the second order coefficients are not significant. The coefficient of seed is statistically significant at 10.0% level of probability but has a negative sign, indicating that increased quantity of seeds would lead to decrease in technical efficiency. Both fertilizer and labour inputs have negative coefficients (-6.637 and -33.419 respectively) are highly significant. This implies that a 1.0% increase in fertilizer and labour input would lead to decrease in technical efficiency to the tune of 6.637% and 33.419 respectively. The diagnostic statistics have coefficients that are all statistically significant at 1.0% risk level. The coefficient of total variance (σ^2) is 0.452 (table 2) while the variance ratio is 0.666, which is the ratio of the variance of farm specific technical efficiency to the total variance. This would mean that 66.6% of the variation in output among the Fadama farms is due to the disparities in technical efficiency.

Table 2: Maximum Likelihood Estimates of the Stochastic Translog Production Function

Production Factor	Parameter	Coefficient	Standard Error	t-value
Constant term	β_0	116.359	0.982	118.489***
Farm size	β_1	1.073	0.987	1.087
Seeds	β_2	-1.676	0.921	-1.819
Labour Input	β_3	-33.419	0.860	-38.874***
Fertilizer	β_5	-6.637	0.941	-7.053***
Depreciation	β_5	1.423	0.834	1.706*
Farm size^2	β_{11}	0.258	0.541	0.477
Seeds^2	β_{22}	-0.034	0.116	-0.295
Labour inputs^2	β_{33}	5.860	0.702	8.350***
Fertilizer^2	β_{44}	0.250	0.108	2.310**
Depreciation^2	β_{55}	-0.084	0.131	-0.638
Farm size x Seeds	β_{12}	0.477	0.324	1.472
Farm size x Labour	β_{13}	-0.587	0.352	-1.667
Farm size x Fertilizer	β_{14}	-0.090	0.258	-0.349
Farm size x Depreciation	β_{15}	0.194	0.245	0.792
Seeds x Labour Input	β_{23}	-0.157	0.437	-0.358
Seeds x Fertilizer	β_{24}	0.080	0.117	0.686
Seeds x Depreciation	β_{25}	0.226	0.395	0.573
Labour x Fertilizer	β_{34}	0.728	0.223	3.262***
Labour Input x Dep.	β_{34}	-0.685	0.361	-1.898
Fertilizer x Depreciation	β_{45}	0.307	0.136	2.266**
Diagnostic Statistics				
Log – Likelihood function		-95.500		
Total Variance (σ^2)		0.452	0.128	3.530***
Variance Ratio (γ)		0.666	0.132	5.056***
LR Test		43.760		

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

Note: ***, ** indicates statistically significant at 1.0 and 5.0 percent respectively.

\

Table 3: Parameter Estimates For the Stochastic Translog Cost Function

Production Factor	Parameter	Coefficient	Standard Error	t-value
Constant term	β_0	-16.360	0.934	-17.518***
Price of seeds	β_1	0.250	0.484	0.516
Price of Fertilizer	β_2	8.663	0.242	35.798***
Wage Rate	β_3	3.951	0.491	8.046***
Farm size	β_4	1.212	0.460	2.633***
Depreciation	β_5	-0.533	0.568	-0.938
Price of seeds^2	β_{11}	-0.253	0.020	-12.884***
Price of Fertilizer^2	β_{22}	-1.122	0.055	-2.041**
Wage Rate^2	β_{33}	-0.120	0.112	-1.778
Farm size^2	β_{44}	1.736	0.161	10.761***
Depreciation^2	β_5	0.109	0.016	6.807***
P. of seeds x Fertilizer	β_{12}	0.198	0.019	11.737***
P. of seeds x Wage rate	β_{13}	0.206	0.061	3.381***
P. of seeds x Farm size	β_{14}	-1.524	0.078	-19.436***
P. of seed x Depreciation	β_{15}	0.108	0.016	6.940***
P. of Fertilizer x W/ rate	β_{23}	-1.148	0.073	-15.660***
P. of fertilizer x F/ size	β_{24}	0.688	0.198	3.485***
P. of fertilizer x Dep.	β_{25}	-0.040	0.017	-2.373**
Wage Rate x Farm size	β_{34}	-0.002	0.113	-0.022
Wage Rate x Dep.	β_{35}	-0.044	0.093	-0.468
Farm size x Dep.	β_{45}	0.002	0.043	0.054
Diagnostic Statistics				
Log – Likelihood function		69.093		
Total Variance (σ^2)		1.423	0.098	14.578***
Variance Ratio (γ)		0.999	0.0003	31516.515***
LR Test		74.873		

Source: Computed from Frontier 4.1 MLE/ Survey data, 2005
***, ** are significant levels at 1.0% and 5.0% respectively

Estimates of Allocative Efficiency

The allocative efficiency estimates were deduced from the quotient between the economic efficiency and the technical efficiency estimates as shown in tables 3 and 2 respectively. The result of the frequency distribution of allocative efficiency estimates in table 4 has shown that the estimates ranged form 0.07 to 0.99. The distribution seemed to be skewed toward the frontier. The minimum allocative efficiency was 0.07, which indicated gross misallocation of resources while the maximum allocation efficiency score was 0.99. By implications, the most efficient farmer operated almost on the frontier. Given the mean efficiency of 0.62, about 51.67% of the respondents are frontier farmers since their efficiency scores are above the mean; the average farmer needs a cost saving of 37.37% ie (1-0.62/0.99) 100 to attain the status of the most allocatively efficient farmer.

Table 4: Distribution of Allocative Efficiency for Fadama Fluted Pumpkin Producers

Allocative Efficiency Range	Frequency	Percentage (%)
0.00 – 0.20	7	5.83
0.21 – 0.40	17	14.17
0.41 – 0.60	32	26.67
0.61 – 0.80	31	25.83
0.81 – 1.00	33	27.50

Total		120	100
Maximum Allocative Efficiency	=	0.99	
Minimum Allocative Efficiency	=	0.07	
Mean Economic Efficiency	=	0.62	

Source: Computed from Field Survey, 2005

Note: Allocative efficiency scores in table 4 were deduced from the quotient between economic efficiency and technical efficiency estimates.

Sources of Allo\ative Efficiency

All the efficiency factors are statistically significant at 1% risk level except for coefficients for farm size and membership of cooperative [Table 5]. Education had a negative coefficient, which implies that it did not impact on their allocative efficiency. It rather shows that the farmers relied on their wealth of experience to allocate their resources efficiently (Bravo-Ureta and Pinheiro, 1993). The positive coefficient of farming experience and about 80% of the farmers who had experience of at least 5 years confirmed the above scenario. Though statistically significant as earlier stated, credit and household size possessed negative coefficients. Credit availability limits constraints emanating from timely purchases of inputs and engagement of farm resources. Inaccessibility to funds for farm operations was responsible for the result. As expected, the coefficient of household size is - 4.209. This indicates that larger households reduce level of allocative efficiency. The bid to attend to numerous family needs engenders reduction in the magnitude of resources allocated to farming activities (Nwachukwu and Onyenweaku, 2007). This result is in conflict with Mubarik *et al* (1989) who emphasized the usefulness of larger households in the farm as work force.

Table 5: Sources of Allocative Efficiency in Fadama Fluted Pumpkin Production

Variable	Parameter	Coefficient	Standard Error	t-value
Intercept	σ_0	34.642	1.048	33.051***
Age	σ_1	-0.100	0.175	-0.075
Education	σ_2	-5.504	0.289	-19.071***
Gender	σ_3	0.156	0.051	3.096***
Farming Exp.	σ_4	0.318	0.055	5.761***
Farm size	σ_5	-1.036E-02	0.012	-0.831
Extension Visit	σ_6	0.122	0.040	3.066***
Credit Access	σ_7	-0.116	-0.040	-2.884***
M/ship of Coop.	σ_8	-8.759E-04	0.001	-0.637
Household size	σ_9	-0.661	0.157	-4.209***

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

***, ** are significant levels at 1.0% and 5.0% respectively

CONCLUSION

The study has examined allocative efficiency among Fadama fluted Pumpkin farmers in Imo State Nigeria. For this purpose, the stochastic frontier cost model function using translog approach was estimated. The result of the analysis showed that Fadama pumpkin producers in Imo State are not operating at full allocative efficiency level. Large household needs and credit inaccessibility engenders misallocation of the farmers. Therefore, the current family planning programme should be intensified to address the issue of over bloated households. Given the enormous role credit plays in production, extended household bureacratic processes should be eliminated to ease accessibility and use by farmers.

REFERENCES

Aigner, D.J., Lovell, C.A.K. and P. Schmidt (1977) Formulation and Estimation of Stochastic Frontier Production Function Models. *Journal of Economics* 6:21-37.

Ajani, O.I. Y and J. K. Olayemi (2001) Relative Efficiency of Food Crop Farmers in Oyo North Area of Oyo State: A Profit Function Analysis. Paper Presented at the Annual Conference of the Nigerian Association of Agricultural Economics hold at Nsukka 11-13th June.

Ali, M and D. Byerlee (1991) Economic Efficiency of Small Farmers in a Changing World: A survey of Recent Evidence. *Journal of International Development*. 3:1-27

Bravo – Ureta, B.E. and R.E. Evenson (1993) Efficiency Analysis of Developing Country Agriculture: A Review of the Frontier Function Literature. *Agricultural and Resource economics Review* 22: 88- 101.

Attavar, M. (2000) Tool for Productivity Gain. *The Hindu Survey of Indian Agriculture.*

Battese, G.R. and G. S. Corra (1977) Estimation of a Production Frontier Models with Application to the Pastoral Zone of Eastern Australia. *Australian Journal of Agricultural Economics*. Vol. 21 No 3. pp. 169-179.

Belbase, K. and R. Grabowski (1985) Technical Efficiency in Nepalese Agriculture. *Journal of Development Areas*. 19:515-525.

Blench, R. M. and S. A. Ingawa (2004) A Practical Guide for National Fadama Development Project II on Conflict and Management. The World Bank PCF/Government of Nigeria PCU Fadama 11:1-19.

Coelli, T.J. (1994) A Guide to Frontier 4:1: A Computer Programme for Stochastic Frontier Production and Cost Function Estimation. Department of Economics, University of New England, Armidale, Australia.

Coelli, T.J. (1995a) Recent Development in Frontier Modeling and Efficiency Measurement. *Australian Journal of Agricultural Economics.* 39:215-245.

Dey, M.M., F.J. Paraguas and G.B. Bimbao (2000) Technical Efficiency of Tilapia Grow out Pond Operations in the Phillipines Aquaculture Economics and Management. 4(1/2): 33 – 47

Farrell, J.M. (1957) The Measurement of Productive Efficiency. *Journal of Rural Statistics Society*. Series A General Vol. 120 Part 111.

Fleming E. P., Fleming, P. Rodgers, H., Griffiten, G and D. Johnston (2004) Animal Efficiency in an Intensive Beef Production. Genetic Breeding Unit, University of New England, Armidele, NSW, Australia.

Greensill, T.M. (1968) Growing Better Vegetables. Evans Brothers Limited 1st Edition.

Ike, P.C. and O.E. Inoni (2004) Department of Yam Production and Economic Efficiency among Smallholder Farmers in Southeastern Nigeria. *Journal of Central European Agriculture* Vol. 7 No. 2 pp.337-342.

Ingawa, S. A., Oredipe, A.A., Idefor , K and C. Okafor (eds) (2004) Facilitators Project Implementation Manual. Second National Fadama Development Project (Fadama 2). Federal Ministry of Agric and Rural Devt. Abuja, Nigeria.

Mbanasor, J.A. and L.O. Obioha (2003) Resource Productivity Under Fadama Cropping System In Umuahia North Local Government Area of Abia State, Nigeria. *Tropical and Sub – tropical Agriculture* 2: 81 – 86.

Mubarik, A. and J.C. Flinn (1989) Profit Efficiency among Basmati Rice Producers in Pakistan Punjab. *American Journal of Agricultural Economics* 71: 303 – 310.

Njoku, J. E. and M.A. C. A. Odii (1991) Determinants of Loan Repayment under the Special Emergency Loan Scheme (SEALS) in Nigeria: A case study of Imo-State. *Africa Review of Money, Finance and Banking* 1:39-52.

Nwachukwu, I.N. and C.E. Onyenweaku (2007) Economic Efficiency of Fadama Telfairia Production in Imo State, Nigeria: A Translog Profit Function Approach. Journal of Agricultural Research and Policies, Nigeria. 2(4): 87 – 93.

Obasi, P.C. (1991) Resource Use Efficiency in Food Crop Production: A case of Owerri Agricultural Zone of Imo State. M.Sc. Thesis. University of Ibadan, Nigeria.

Onyenweaku, C.E and B.C. Okoye (2007) Technical Efficiency of Small holder Cocoyam farmers in Anambra State, Nigeria: A Translog Stochastic Frontier Production Function Approach. *International Journal of Agriculture and Rural Development*. Vol. 9:1-6.

Onyenweaku, C.E and Y. Fabiyi (1991) Relative Efficiency of Cooperative and Individual Farmers in Imo State. *AMSE Transactions* Vo. 8 No.4

Qureshi, M. (1989) Water Management in Fadama Crops. A Paper presented at the National Workshop on Fadama and Irrigation Development in Nigeria held at Zaranda Hotel, Bauchi, Nigeria.

Rahman, S. (2002) Profit Efficiency among Bangladesh Rice farmers. Discussion Paper Series 0203, School of Economics Studies, The University of Manchester, UK.

Schippers, R.R (2000) African Indigenous Vegetables: An Overview of the Cultivated Species Chathan UK: National Resources Institute/ACP –EU. Technical Centre for Agricultural and Rural Cooperation.

Shapiro, K.H (1983) efficiency Differentials in Peasant Agriculture and their Implications for Development Policies. *Journal of Development Studies*. 19: 179 – 190.

Tzouvelekas, V., Pantzios, C.J and C. Yotopoulos (2001) Technical Efficiency of Alternative Farming Systems: The case of Greek Organic and Conventional Olive – Growing Farms. *Food Policy*. 26: 549 – 569.

Wadud, A and B.A. White (2000) farm Household Efficiency in Bangladesh: A comparison of Stochastic Frontier and DEA Methods. *Applied Economics*. 32: 1665 – 1673.