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ECONOMICS OF SESAME PRODUCTION IN MISAU LOCAL GOVERNMENT AREA OF BAUCHI STATE, NIGERIA

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ABSTRACT
The study was undertaken to examine economics of sesame production in Misau Local Government Area of Bauchi State, Nigeria. Data used for the study were obtained using structured questionnaire administered to 133 randomly selected small scale sesame farmers in the two districts within 16 village areas in the local government area in 2012 farming season. Data were analyzed using descriptive statistics, gross margin analysis and stochastic frontier production function. The result from the gross margin analysis revealed that, farm labour was the most important cost item accounting for 77.42% of the total cost of sesame production. The gross margin of ₦40,226.62/ha was obtained. Findings from the stochastic frontier revealed that technical efficiency of the farmers varied from 0.82 to 0.99 with mean value of 0.91 indicating room for farm efficiency improvement by 9.0%. The major contributing factors to inefficiency were age and extension contact. Based on the findings of this work, it is recommends that the amount of farm labour should be increased even at higher price, farm size should be increased at reduced price and fertilizer should be increased at prevailing market price so as to increase the efficiency status of the sesame producers.

Keywords: Gross returns Productivity, Sesame, Small scale, Socio-economic variables

INTRODUCTION
Sesame (*Sesamum indicum* **L.**) is an important oil seed crop being cultivated in the tropics and the temperate zone of the world (Biabani and Pakniyat, 2008). It is one of the oldest oil crops that are widely cultivated in Asia and Africa (Ali *et al*., 2007). It was a highly prized oil crop of Babylon and Assyria at least 400 years ago (Ross, 2005). It is called with different names around the world such as *Ridi* in Bauchi State, sesame at the international level, beniseed in West Africa; *simsim* in East Africa and *Till* in India (Aboje, 2011).

It was observed that there is an increasing number of individual farmers participating in the cultivation of sesame crop in Misau local government area in particular and Bauchi State in general. Sesame being a cash crop is capable of improving the economy of farmers engaged in its production. It is therefore, important to carry out research in sesame production so as to provide useful information that could assist farmers to improve in their overall sesame productivity.

The original area of domestication of sesame is not specific, but it seems likely to have first been brought into cultivation in Asia (Chemonics, 2002). According to Food and Agriculture Organization (FAO, 2010) the major top five sesame seed producing countries in the World are Myanmer with 722,900 metric tons, India with 623,000 metric tons, China with 587,947 metric tons, Ethiopia with 314,000 metric tons and Sudan with 248,000 metric tons of sesame. FAO (2013) reported that, the total quantity of sesame seeds produced in the World was 4,847921.00 tons, African production was 2,177441.00 tons (44.92% of the world production) and Nigerian total production was 165,000.00 tons (3.40% of the world total production and 7.58% 0f African total production). A total land area of 9,416369.00 ha was cultivated in the world, 4,793131.00 ha in Africa and a total land area of 340,000.00 was cultivated for sesame production in Nigeria (FAO, 2013)

The plant *sesame indicum* is an important edible oil seed crop. It is commonly called "the queen of the oil seeds" by virtue of the excellent quality of oil it produces. Sesame is widely grown in northern and central Nigeria. The production areas are located between 7^0-14^0N and have a dry season which last about 4-5 months, an annual rainfall of about 1000-1500mm, a vegetation of open savannah woodland and a top soil of loamy sand (Van Rheene, 1973).

The major states producing sesame in Nigeria are Adamawa, Bauchi, Benue, Borno, FCT Abuja, Gombe, Jigawa, Kano, Katsina, Kebbi, Kogi, Nasarawa, Plateau, Taraba and Yobe (Chemonics/USAID, 2002).

Traditionally, agriculture has been regarded as the mainstay of the Nigeria economy. Agricultural products had contributed greatly to national income, foreign exchange earnings and employment. Agricultural sector was the major source of foreign exchange earnings and contributor to the Gross Domestic Product (GDP) and it employs about 70% of the rural working population (Joshua, 1991). However, after the discovery of crude oil in the early 1970s, there has been a declining performance of agricultural sector in spite of its potentials.

Low productivity in Nigeria over years compared to countries like Malaysia, Thailand, Indonesia and Brazil has been largely due to low fertilizer and improved seeds utilization and inadequate Government expenditure and inability to compete with others. Average fertilizer use in Nigeria is 13kg/hectare in comparison to the world average of 100kg/hectare and150kg/hectare for Asia. Only 5% of the farmers could access the improved seeds and operates with only 10 tractors per 100hectares compare to 241 tractors per 100 hectares in Indonesia, (Federal Ministry of Agriculture and Rural Development FMARD, 2011).

MATERIALS AND METHODS

The Study Area

Misau Local Government Area (LGA) is one the 20 LGAs of Bauchi State. The Local Government has two districts, namely, Chiroma and Hardawa. There are sixteen villages that constituted the two districts namely Zadawa, Zadawa B, Beti, Beti North, Akuyam, Ajili, Gugulin, Hardawa, Jarkasa, Tofu, Sirko, Sarma, kukadi A, Kukadi B, Gundari and Gwaram takari. The people of Misau are mostly Fulani, Kanuri, Hausa and Kare-kare by tribe. Some other inhabitants in the study area are Igbo's and Yoruba's.

Misau LGA is situated between latitude 11° 18' 49.32" N and longitude: 10° 27' 59.90" E $9^0$30''of Greenwich meridian. The LGA is bordered by Katagun LGA to the North, Dambam LGA to the East, Darazo LGA to the South and Giade LGA to the West. Bauchi State political Map, Misau has an average altitude of 600m above sea level. The temperature ranges from a minimum of 10^0C-15^0C in December/January, to a maximum of 35^0C-40^0C between April and May. The annual rainfall is about 700mm. Misau LGA has a population of 263,487 (NPC, 2006) and a land mass of 1,226km^2 representing 2.4% of the state. It has 75-85% of its land area as cultivable for farming with about 27,150ha suitable for *Fadama* (irrigation) farming.

Misau environment is favourable for cultivation of both rainfed and dry season crops. It has vast resources like rivers, agriculturally potential land, able youths, economic trees and livestock products. Agriculture is the backbone of the economy of the living populace of the area.

Sampling Procedure

All the sesame producers in Misau Local Government Area constituted the target population. The list of all registered sesame producers in each village was collected from the ADP Area office in Misau, which formed the sampling frame. Misau LGA has two districts constituted by sixteen village areas as a whole. From the list of registered farmers in each of the sixteen villages, twenty percent (20%) of the farmers were randomly selected to have a total of 133 respondents that were used for the study.

Method of Data Collection

The data were collected with the aid of structured questionnaires administered by the researcher to the respondents in the study area. The data generated covered, socio-economic variables such as age, sex, household size, educational status, farming experience, extension contact, access to credit and method of land acquisition. The input-output data of the sesame farmers for both the production and cost function analysis were also collected. The output data includes both quantities in (kg) value in Naira (₦) of sesame produced by adding cash receipts from selling farm products while the input data included land size (ha), labour (man-days), quantity of seeds (kg), and quantity of fertilizers (kg). Only information for the 2011/2012 cropping season were used for the study.

Method of Data Analysis

To achieve the objectives for this study, the following tools of analysis were employed:

i. Descriptive Statistics
ii. Gross Margin Analysis
iii. Stochastic frontier production functions

Descriptive statistics

Descriptive statistics was used to determine the socio-economic characteristics and constraints of the respondents. This involved the use of percentages, means and frequency distribution to group the farmers into a number of classes with respect to socio-economic characteristics.

Gross margin analysis

Gross margin analysis (also called farm budgeting technique) was used to achieve the objective of profitability of the respondents. Gross margin is the difference between the gross farm income and the total variable cost (Olukosi and Erhabor, 1988).

$$GM = GI - TVC \qquad \ldots(i)$$

$$GR = GI/TVC$$

where;

GM = gross margin per hectare in Naira
GI = gross farm income in Naira per hectare.
TVC = total variable cost of production in Naira per hectare.
GR = gross ratio.

Stochastic frontier production function

The stochastic frontier production function was used to achieve objective 3 and 4. The model in its implicit form is as follows:

$$Yi = f(X_i\,\beta) + e_i \qquad \ldots(2)$$

$e_i = V_i - U_i$ …(3)

where;

Y_i = quantity of output of the i^{th} farm.

X_i = vector of the inputs used by the i^{th} farm.

β = vector of the parameters to be estimated of the farm.

e_i = composed error term.

v_i = random error outside producers' control.

u_i = technical inefficiency effects.

$f(x_i, \beta)$ = appropriate functional form of the vector.

The stochastic frontier model for sesame farm is specified by the Cobb-Douglas frontier production function:

$\text{In}Y_i = \beta_o + \beta_1 \text{In}x_{1i} + \beta_2 \text{In}x_{2i} + \beta_3 \text{In}x_{3i} + \beta_4 \text{In}x_{4i} + \beta_5 \text{In}x_5 + v_i - u_i$ …(4)

where;

Y_i = Output of sesame (kg).

β_o = constant or intercept.

$\beta_1 - \beta_5$ = unknown scalar parameters to be estimated.

X_1 = quantity of seeds (kg).

X_2 = farm size (ha).

X_3 = quantity of fertilizers used (kg).

X_4 = labour used (man days).

V_i = random errors.

u_i = Technical inefficiency effects predicted by the model subscript i indicates the i^{th} farmer in the sample.

The stochastic cost function which is the basis for estimating the allocative efficiency of the farm is specified as follows:

$C_i = g\,(p_i, \alpha)\,\exp\,(v_i - u_i)$ …(5)

where;

C_i = represents the total input cost of the i^{th} farms.

g = suitable functional form.

p_i = represents input prices employed by the i^{th} farm.

α = parameters to be estimated

v_i and u_i = random error terms.

The cob-Douglas cost frontier function for the sesame farm is specified as follows:

$\text{Inc} = \alpha_0 + \alpha_1 \ln P_1 + \alpha_2 \ln P_2 + \alpha_3 \ln P_3 + \alpha_4 \ln P_4 + \alpha_5 \ln P_5 + V_i - U_i$ … (6)

where;

C = total input cost of production of the sesame farms (₦).

α_0 = intercepts or constant

$\alpha_1 - \alpha_5$ = parameters to base e

ln = logarithm to base e

P_1 = cost of labour (₦)

P_2 = average cost of seeds (₦)

P_3 = average cost of fertilizers (₦)

The technical and allocative inefficiency effects Ui is affected by

$U_i = \alpha_0 + \alpha_1 Z_1 + \alpha_2 Z_2 + \alpha_3 Z_3 + \alpha_4 Z_4 + \alpha_5 Z_5 + \alpha_5 Z_5 + \alpha_6 Z_6 + \alpha_7 Z_7 + \alpha_8 Z_8 + \alpha_9 Z_9 + \alpha_n Z_n$ …(7)

where;

Z_1 = age of the farmers in years

Z_2 = years of farming experience
Z_3 = educational level of farmers in years of formal education
Z_4 = household size
Z_5 = sex of the farmer (dummy: 1 = male, 0 = female),
Z_6 = number of times visited by an extension agent in a production cycle.
Z_7 = access to credit (dummy: 1= yes, 0= no
Z_8 = farm size in hectares
Z_9 = marital status
Technical and allocative efficiencies of the farmers α_o = constant or intercept. The α_1-α_9 is the scalar parameters to be estimated.

RESULTS AND DISCUSSION

Socio-economic Characteristics of the Respondents

The socio-economic characteristics of the respondents considered in the study includes their ages, educational status, farming experience, household size, method of farm land acquisition, and farm size. Age is the number of years attained in life by a respondent. Age is a very important factor that affects agricultural activities of individuals. The distribution of farmers in the study area according to age is presented in Table 1. The Table shows that most sesame farmers (51.9) had ages between 40 to 49 years implying that sesame farmers are in their economically active years. This agrees with Ochi *et al.* (2015) who stated that the age range of most farmers in Nasarawa State (53.89%) fall between 26-45 years of age, implying that in Nasarawa State, cassava production is done by active and energetic people. These conform to the findings of Abang *et al.* (2001). The level of education of a farmer is an important factor that determines his ability to understand policies or programmes that affects farming, accept and adopt agricultural innovations, make decisions on production, sales, enterprise selection and access formal credit.

The distribution of respondents according to their educational level is presented in Table 1. The results shows that, most sesame farmers in the study area (75.1%) had formal education while the remaining (25%) had no formal education The implication of this high percentage literates farmers is that, it determines the farmers quality and skills and resource allocation and how fast they understands and adopt innovations to improve their overall productivity. Ibitoye *et al.* (2015) found out that 50% of the respondents in Kogi State had no formal education while the remaining half have formal education at different levels.

Farming experience is the number of years spent by the respondent in sesame farming. The years of experience of a farmer in farming to a large extent affect his/her ability and decision in many farm operation. In addition it influences his perception and understanding of climatic factors that affect farming. The distribution of respondents according to their farming experience is shown in Table1. It is revealing from the Table that majority of the farmers (79.7%) had l to 5 years of experience in sesame production while only a few (20.3%) had 6 > 11 years of sesame farming experience. The implication is that farmers with more years of farming experience tend to be more efficient in their use of resources which could increase their output as well as income. Moreover, years of farming experience enables farmers to overcome some problems encounters' in sesame production. According to Ibitoye *et al.* (2015), high level of farming experience among Tomato farmers in Kogi State may increase their level of efficiency. Onubuogu *et al.* (2013) reported that farmers' with more experience would be more efficient, have better knowledge of climatic conditions, better knowledge of efficient allocation of resources and market situation and are thus, expected to run a more efficient and profitable enterprise.

Table 1: Socio-economic Characteristics of Sesame Farmers (n = 133)

Variables	Frequency	Percentage
Age (years)		
20-29	16.0	12.0
30-39	46.0	34.6
40-49	69.0	51.9
50 and above	2.0	0.02
Educational level		
Never been to school	1	0.1
Primary education	45	33.8
Secondary education	22	16.5
Tertiary education	33	24.8
Adult education	7	0.53
Quranic education	25	18.8
Years of farming experience		
1-5	106	79.7
6-10	18	13.5
11 above	9	6.8
Household size		
1-5	44	33.1
6-10	51	38.3
11-15	27	20.3
16-20	5	3.8
20 above	6	4.5
Method of land acquisition		
Inheritance	103	77.4
Gift	4	3.0
Purchased	16	12.0
Lease	3	2.3
Other	7	5.3
Farm size (ha)		
Less than 1	52	39.1
1.1-3	73	54.9
3.1-5	4	0.3
Above 5	4	0.3

Source; Field survey, 2012

Household size is the total number of the family members of the respondent. The family size is an important source of family labour which could be used to replace hired labour used by each farmer. This may bring about easy and cheaper cost of production. The distribution of respondents according to household size is shown in Table 1. The Table revealed that majority (54.9%) of the respondents had household size of between 1-10 members. Only 4.5% had a household size of above 20 people. Having large family size could enable a farmer to cultivate large farm with low cost of labour. This is in line with the work Onubuogu *et al.* (2013) and Esiobu *et al.* (2014) who reported that large household size compliment labour to enhance production and reduce the cost of hired labour.

Land is natural resource used in the production process. Farm land is very important because to a large extent it determines the output of a farmer. The supply of fertile land available for cultivation is subjected to fluctuations. Care is required to maintain the productive capacity of land. The two major aspects of land considered in this study are the mode of land acquisition and the size of farm land possessed by the farmer. The distribution of famers according to the method of acquiring land is shown in Table 1. The result shows that most of the farmers (77.4%) acquire their farm land through inheritance. Purchase is the next major means of acquiring farm land by the farmers by contributing 12%. The dominance of inheritance as a means of land ownership implies that farmers have small and fragmented farm lands in the study area. This small and fragmented farm lands will hinder large scale agricultural production.

The distribution of respondents based on farm size is presented in Table 1. The result shows that 96.2% of the farmers had less than 5 hectares. This confirms earlier research on small scale farmers land holding. Onumadu *et al.* (2014) reported that, large portion of total farm holding in Nigeria constituting about 82% are small scale holding below 5.0 hectares. He further added that farm size is a strong determinant of the expected output/yield. Ochi *et al.* (2015) reported 2.0 hectares and Ibitoye *et al.* (2015) reported 1.3ha in their separate studies. This implies that sesame production suffers a great set back owing to the area of land available to the small scale farmers.

Gross Margin and Cost Structure in Small Scale Sesame Production

Gross margin analysis was used to compute the returns to the farmer's management after accounting for all variable costs. The result of the budgeting analysis as shown in Table 2 indicated that labour accounted for 77.42% while fertilizer accounted for 18.71% of the total cost incurred in the sesame production in the study area. This is in line with Lawal *et al.* (2012) in his study of profitability and resource use efficiency among Ofada Rice farmers in Southwest, Nigeria where he revealed that labour cost accounted for 75.5% of the total variable cost in *ofada* rice production. The gross margin obtained was ₦40,226.623/ha; this indicates that sesame production is profitable in the study area. On the average, it cost ₦72,147.557 to cultivate one hectare of land in the study area and an average of ₦112,374.18 accrues to a farmer as revenue (gross income). The ratio of gross income to variable cost was 1.557; this is further showing that Sesame production is profitable in the study area for the ratio is greater than 1. This is confirmed by Umar *et al.* (2011) in the study of productivity analysis of Sesame (*sesame indicum* **L.**) production under organic and inorganic fertilizers application in Doma LGA, Nasarawa State where it was found that, the average gross returns per hectare by the application of organic fertilizer was ₦59,640.00 and ₦89,433.00 by application of inorganic fertilizer. Average total variable costs per hectare for organic and inorganic (fertilizers applied) by farmers were ₦22,855.00 and ₦27,682.00, respectively. The gross margins per hectare were ₦36,815.00 for organic fertilizer applied and ₦61,751.00 for the inorganic fertilizer applied.

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Table 2: Gross Margin and Cost Structure in Small Scale Sesame Production

Cost/return items	Values ₦/ha	Quantity (kg)	Ave. unit price(₦)	% of total cost
Seed (kg)/ha	1,170.000	6.5	180	1.622
Fertilizer(kg)	13,500.000	150	90	18.712
Labour (man hour)	55,857.557	193	289.4	77.421
Empty Bags	720.000	6.0	120	0.998
Transport	900.000	6.0	150	1.247
Total variable Cost	72,147.557			
Returns				
Average-yield (kg/ha)	624.301			
Average-price (₦/kg)	180.00			
Gross income (₦/ha)	112,374.18			
Gross margin (₦/ha)	40,226.623			
Gross Ratio(GR) GR=(GI/TVC)	1.557			

Source: Field survey, 2012

Technical Efficiency Effect

The result of the estimates of the parameters of the stochastic frontier and the inefficiency model are presented in Table 3. To determine the technical and allocative efficiency of resources used in sesame production, the stochastic frontier production function was utilized.

Table 3: Maximum Likelihood (MLE) Estimate of the Cobb-Douglas Frontier Production Function for Technical Efficiency Effect

Variable (Kg/Parameter)	Coeff.	Std. Error	t-ratio	Coeff/Std. Error
Constant (β_0)	3.674	1.147	3.202***	3.203139
Labour (β_1)	0.644	0.348	1.848**	1.850575
Seed (β_2) kg	0.064	0.130	0.493	0.492308
Farm size (β_3) ha	0.714	0.141	5.049***	5.06383
Fertilizer (β_4) kg	0.049	0.033	1.501	1.484848
Inefficiency Factors				
Age of farmer (Z_1)	0.020	0.009	2.357***	2.222222
Familyg size (Z_2)	-0.013	0.026	-0.474	
Years in school (Z_3)	0.004	0.020	0.198	
Farming experience (Z_4)	-0.055	0.038	-1.431	-1.44737
Extension contact (Z_5)	-0.208	0.115	-1.818**	-1.8087
Sigma-Squared δ^2	0.613	0.087	7.020***	7.045977
Gamma γ	0.164	0.151	1.089	1.086093
Log (likelihood)	- 150.890			
LR test	11.635			
Mean technical efficient	0.919			

** = Significant at 5% level, *** = Significant at 1% level.
Source: Field survey, 2012

The coefficient of labour (β_1) was significant at 5% level and had a positive sign. This shows that a unit increase in the amount of labour will bring about 0.64 increases in output of sesame. This means that there is a significant positive association between farm labour and technical efficiency in sesame production. This equally shows the importance of labour in sesame production in the study area. Onubuogu *et al.* (2014) found that the coefficient of labour was found to be positive and significant at 5% level in his study of smallholder cassava farmers in Owerri agricultural zone of Imo state. He further stated that this implies that increases in the labour input leads to increases in output in cassava production. Okike (2006) and Amodu *et al.* (2011) have shown the importance of labour in farming particularly in developing country where mechanization is rare on small scale farms. The coefficient of seed (β_2) was found to be positive but not significant. This is in line with Maikasuwa (2013) in the study of profitability and resource use efficiency of yam production by Women in Bosso LGA of Niger State where he also found that, the coefficient of sets (yam seeds) was positive and not significant. The coefficient of farm size (β_3) which was estimated at 0.715 was found to be positive and significant at 1% level. This result is in line with the finding of Ochi *et al.* (2015) in his study of resource use efficiency among small scale Cassava farmers in Nasarawa State, Nigeria where he reported farm size to be positive and significant at 1% level. The result could mean that for 1% increase in farm size, the output will increase by 0.715. As such, it is possible to expand farming activity in the study area which implies there is still some scope for increasing output per plot by expanding farm land. The coefficient of fertilizer application (β_4) was positive and not significant. In some previous studies, Maikasuwa (2013) in contrast, reported the coefficient of fertilizer application to be positive and significant at 1%level, whereas, Onubuogu *et al.* (2014) and Ochi *et al.* (2015) both reported that the coefficients of fertilizer application were found to be negative and significant 1% level.

The contribution of farmer's personal characteristics, e.g., age, family size, years in school, farming experience and extension contact to farm inefficiency was studied. The coefficient of age ($Z1_)$) was found (0.020) to be positive and significant at 1%. This implies that increase in age of the sesame farmers in the study area will lead to increase in technical inefficiency (i.e decrease in production) This means that the older the farmer is the more technically inefficient he is thereby decreasing the farmer's technical efficiency. This is in line with Ochi *et al.* (2015) who found that the coefficient of the age of the farmer was positive and significant at 10% level. Sulaiman *et al.* (2015) reported the coefficient of age to be positive and significant at 10% level. He further stated that, the older the sugarcane farmers the more technically inefficient they become. The coefficients of family size (Z_2) and farming experience (Z_4) were found to be negative and not significant; this implies that these variables do not contribute to the farm inefficiency. The coefficient of extension contact (Z_5) was found to be (-0.208) negative and significant at 5% level. This implies that extension contact had a positive effect on sesame production technical efficiency. As such, farmers who received more extension contacts were better and technically efficient in sesame production than those who received less extension contacts in the study area. The negative relationship between extension contact and the level of technical efficiency implies that farmers with more extension contacts are more technically efficient. This is in line with the findings of Sulaiman *et al.* (2015) in their study of resource use efficiency in sugarcane production in Kaduna State which revealed that, the coefficient of extension contact to be (-0.069) negative and statistically significant at 10% level. He added that, a 10% increase in extension contacts increases production by less than proportionate margin of 0.69%. The coefficient of years in school (Z_3) was found to be positive

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and not significant. The mean technical efficiency of the farmers varied from 0.82 to 0.99 with mean value of 0.91 indicating room for farm efficiency improvement by 9.0%. There existed some inefficiency among the sampled farmers. The major contributing factors to inefficiency were age and extension contact. The major contributing factors to efficiency were labour and farm size.

Allocative Efficiency Effect

The result of the maximum likelihood estimates (MLE) of the Cobb-Douglas frontier production function for allocative efficiency was also estimated and is presented in Table 4. The sigma square δ^2 (3.811) was found to be statistically significant at 1% level. This indicates a good fit and correctness of the specified distribution assumption of the composite error term. Also the variance defined as Gamma (γ) is estimated at 0.026, this means that the existence of allocative efficiency among the farmers accounts for about 2.6% of the variation in the total cost of production of the crops grown. The coefficient of labour cost was found to be positive and significant at 10% level. This implies that a unit increase in the amount spent on labour will lead to 1.75 increases in profit. The coefficient of cost of land (-0.735) was found to be negative and significant at 5% level. Cost of land can have significant influence in the availability of land to be put under cultivation particularly in the case of purchase and hire of land. The result from the table indicates that increase cost of land reduces the farmers' allocative efficiency.

Table 4: Maximum Likelihood Estimate (MLE) of the Cobb-Douglas Frontier Production Function for Allocative Efficiency

Variable (₦/Parameter)	Coefficient	Std. Error	T-value	Coeff/Std. Error
Constant (β_0)	1.631	1.242	1.313	
Lnlabour cost (β_1)	1.757	1.023	1.718*	
Lnseed cost (β_2)	0.616	1.169	0.527	
Lnland cost (β_3)	-0.735	0.331	- 2.219**	-2.22054
Ln fertilizer cost (β_4)	1.275	0.419	3.042***	
Socio-economic characteristics				
(Z_1) Age of farmer	-0.029	0.044	-0.681	-0.65909
Farm size (Z_2)	0.102	0.096	1.058	1.0625
Years in school (Z_3)	-0.040	0.102	-0.393	-0.39216
Farming experience (Z_4)	0.027	0.065	0.409	0.415385
Extension contacts (Z_5)	0.334	0.233	1.436	1.433476
Sigma-Square(δ^2)	3.811	0.537	7.094***	7.096834
Gamma (γ)	0.026	0.097	0.263	0.268041
Log (likelihood)	-276.381			
LR test of one sided error	14.107			
Mean efficiency	0.5326			

***,**,*are significant levels at 1, 5 and 10%, respectively.
Source: Field survey, 2012

As the land cost increases by 1 unit, profit decreases by 0.735 units. The coefficient of fertilizer cost (1.275) was found to be positive and significant at 1% level. This implies that cost of fertilizer has a significant positive relationship with allocative efficiency of the sesame farmers. This means that when the fertilizer cost increases by 1unit profit increases by 1.275 units. However, the coefficients of age of the farmer, family size, years in school, farming experience and extension contact were all not significant even though the coefficients of family size (Z_2), farming experience (Z_4) and extension contact (Z_5) were found to be positive. The mean profit efficiency was 0.5326. This means that the average farmer was 53.26% profit efficient 46.74 % profit left to be achieved. This shows that farmers operate at over 50% profit efficiency level.

Estimated Technical Efficiency Score foif the Respondents

This is presented in Table 5. The result shows that none of the farmers was operating below the technical efficiency level of 0.82 and none was operating at the optimum level of 1. This means that, farmers were operating close to the optimum technical efficiency. This shows that farmers could still improve in their technical efficiency level by enhancing the amount of labour and farm sizes utilized. More than 62% of the respondents were found to be more than 90% technically efficient. The implication of this is that 90% of the sesame farmers in the study area maximize in getting the possible output that can be obtained from a set of inputs on available alternative technologies. The most efficient farmers operated at 99% efficiency while the least efficient farmers were found to operate at 82% efficiency level. The sesame farmer performed at an average technical efficiency of 91% while the most frequent occurring efficiency score was 92%.

Table 5: Farm Specific Resource Efficiency Indices among Sesame Farms

Class intervals of efficiency indices	Frequency	Percentage
0.82 – 0.85	5	3.76
0.86 – 0.89	22	16.54
0. 90 – 0.93	61	45.87
0. 94 – 0.97	26	19.55
0.98 – 1.00	19	14.29
Total	133	100.01

Note: Mean efficiency = 0.91; Mode = 0.92; Minimum value = 0.82; maximum value = 0.99.
Source: Field survey, 2012

CONCLUSION AND RECOMMENDATIONS

Based on the outcome of the study, it could be concluded that production of sesame is profitable. Although farmers were not operating at technically and allocatively optimum levels, they were technically more efficient than they were allocatively. This shows the need for farmers to improve on their efficiency statuses. In order to improve the efficiency among farmers, this requires the attention government, research institutes and the individual farmers. The study recommends as follows:

1. Farmers financial position should be improved through the provision of credit promptly so as to acquire the needed input resources. This can make it easier for them to acquire more hectarage under sesame production

2. Government should ensure that the necessary farm inputs such as fertilizer and improved seeds are made available and affordable to farmers.
3. Government should intensify extension services through the use of extension agents to strengthen and to sensitize more farmers on the ways of improving productivity through proper training on use of improved varieties and other innovations to improve their overall productivity.
4. Government in collaboration with farmers' corporative society should improve land tenure polices towards land acquisition for small scale famers to be easily accessible and affordable.
5. Government should provide adequate fertilizer at a subsidized price to enable farmers' access it for higher productivity.

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