IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 8, Issue 7 Ver. III (July. 2015), PP 15-23
www.iosrjournals.org

Gross Margin Analysis and Resource Use Efficiency in Sesame Production among Small- Scale Farmers in Benue State, Nigeria

*[1]Z.T. Nyiatagher and [2]A. Ocholi
1. *Department of Agricultural Economics, University of Agriculture, Makurdi, Benue State, Nigeria*
2. *Department of Agribusiness, University of Agriculture, Makurdi, Benue State, Nigeria*

Abstract: *The study was an analysis of gross margin and resource use efficiency in Sesame production among small-scale farmers in Benue State, Nigeria during the 2013/2014 farming season. The primary data used for the investigation were obtained using an interview schedule and purposively collected from 200 respondents. Descriptive statistics, gross margin analysis, t-test and stochastic production frontier were used for the data analysis. The mean gross margin per hectare was ₦168,808.52, the mean total revenue was ₦317,500.00 and the mean total variable cost was ₦148,691.48 while labour cost was the highest cost incurred by the respondents. The mean outputs obtained by the respondents were 2280.0 kilogrammes. The technical efficiency index estimated for sesame farmers was 0.55 which indicated inefficiency in current production practices. The efficiency indices for allocative and overall economic efficiencies were estimated to be 0.37 and 0.25 respectively. Farm size, seed and hired labour significant influenced technical efficiency ($p<0.01$). The socio-economic factors associated with higher technical efficiency of the farmers included age, access to credit and fertilizer use ($p<0.10$); frequency of extension visit ($p<0.10$). The study concluded that high level of inefficiency exists under the present production practices and therefore recommended that extension workers and other relevant organizations should provide training for farmers on the best way of combining the various inputs used in sesame production and resources such as fertilizer, tractor services and credit should be made available to farmers for improved sesame productivity and increased foreign earnings.*

Key Words: *Gross margin, Resources use efficiency, Sesame production, Small-scale farmers, Benue State, Nigeria.*

I. Introduction

Sesame seeds (sesamum or beniseed) are the seeds of the tropical annual "Sesamum indicum". The species has a long history of cultivation, mostly for its yield of oil. The area of domestication of sesame is obscure but is likely to have first been brought into cultivation in Asia or India (Chemomics, 2002). The Hausa, Ibo, Yoruba and Tiv call it "Ridi", "Ekuku", "Isasa" and "Ishwa" respectively. Sesame production in Nigeria probably began in the Middle Belt (North –Central) region of the country and later spread out between latitudes 6^0 N and 10^0N. Sesame is commonly grown by small holder farmers in Nigeria. The major producing areas in order of priority are Nasarawa, Benue and Jigawa State (NCRI, 2002).

Sesame is grown for its seeds, and the primary use of the sesame seeds is a source of oil for cooking. The young leaves may also be eaten in stews, and the dried stems may be burnt as fuel with the ash used for local soap making, but such uses are entirely subordinate to seed production (RMRDC, 2004). The oil is used as raw material for production of paints, margarine and varnishes (Akintude and Tunde-Akintunde, 2004).

Sesame seed has over 15% margin in terms of value added compared to other cash crops such as sheanuts and palm kernels. Sesame seed yields on farmers' fields in Nigeria are between 500kg – 750kg per ha (RMRDC,2004) which is low compared with yields of 1000kg and above per hectare recorded in the United States of America (USA), India and other countries. Strategies have to be developed so as to increase sesame seed production in Benue State, Nigeria. One of the strategies is through efficient use of resources.

Stochastic approach is preferred in measuring efficiency because it deals with the stochastic noise and degree of inefficiency (Sharma, Pingsun and Zaleski, 1999). The measurement of efficiency is important in developing countries such as Nigeria because resources are meager and there is low level of technological know-how (Ashaolu, Momoh , Ayinde and Ugalahi, 2010). The objective of this study therefore was to analyze the gross margin and resource use efficiency in sesame seed production among small-scale farmers in Benue State, Nigeria.

II. Methodology

This study was conducted in Benue State with capital at Makurdi. The State is made up of 23 Local Government Areas. The States lies between latitude $6½^0$ N to $8½^0$N and longitudes $7½^0$ E to 10^0E. The State shares boundaries with five other States, namely: Nasarawa to the North, Taraba to the East, Cross River to the South-East, Enugu to the South-West and Kogi to the West. The South - East part of the State also shares

boundary with the Republic of Cameroon. The State is also bordered on the North by 280km of River Benue and is traversed by 202 km of River Katsina-Ala in the inland areas (BNARDA, 1999).

Benue State has a total area of about 30, 955 square kilometres. According to the 2006 Census results, Benue State has a population of about 4.2 million. There are two main ethic groups in Benue State, namely Tiv, who represents about 72 percent of the total population and Idoma who constitutes slightly over 21 percent of the population. The Igede tribe represents 6 percent of the population. Smaller communities: Hausa, Fulani, Jukun, Abakwa, Nyifon, Etulo and Igbo traders account for the remaining one percent of the population (NPC, 2006).

About 75 percent of the population live in rural areas and their main occupation is farming. Benue State has a tropical climate which manifests two seasons. The rainy season is from April to October while the dry season is from November to March. Annual average rainfall varies from 1750mm on the Southern part of the State to 1250 mm in the North. In the mountain regions of Turan and Ikyurav-ya in Kwande Local Government Area, average rainfall rises up to 4000mm. The hot season comes in mid-April with temperatures between 32^0C and 39^0C with high humidity (BNARDA, 1999).

The State stretches across the transition belt between the forest and savanna vegetations. Much of the area consists of undulating hills or grassy open space on the North and derived Savanna in the South. The State is referred to as the "Food Basket of the Nation" because of the abundance of its agricultural resources. About 80 percent of the State population is estimated to be involved directly in subsistence agriculture. The State is a major producer of food and cash crops like yam, cassava, rice, sesame (beniseed) and maize. Others include sweet potatoes, millet, groundnut, sorghum and wide range of other crops like soyabeans, sugar cane, oil palm, mango, citrus and banana. Irrigation farming along the bank of Rivers Benue and Katsina-Ala is becoming a common feature. The State also boasts of a great deal of livestock resources like goats, pigs, cattle and poultry which are traditionally reared on free range by small holder farmers. The strategic location of Benue State between the Southern forest regions and the Northern semi and grassland regions of the country makes it to have fertile land for agriculture with the estimated arable land constituting about 60 percent of the total area. Average farm size is 1.5 to 2.0 hectares (BNARDA, 1999).

While sesame can be grown across the State, some local government areas like Guma, Gwer West, Katsina-Ala and Ukum are well known because of their reputation for sesame production. These local government areas have additional advantages: proximity to market and ease of transportation as well as intensity of production, hence the emphasis on these four local government areas.

The population for this study comprised all sesame farmers in Benue State. Purposive sampling techniques was used to select four Local Government Areas namely: Guma, Katsina-Ala, Ukum and Gwer West. Furthermore, one important sesame - producing village was purposively selected in each of the four Local Government Areas respectively based on its proximity and intensity of sesame production. The villages were Udei (Guma), Tor Donga (Katsina-Ala), Kyado (Ukum) and Agagbe (Gwer-West). The technique of simple random sampling was then used to select 50, 40, 70 and 40 farmers from the list of sesame farmers in each village respectively at 20 percent proportion (Table 1). This gave a total of 200 farmers for the study during the 2013/2014 cropping season.

Table 1: Proportion Of Sesame Farmers Selected From Sampled Village

LGA	**Village**	**Estimated sesame farmers**	**20% of estimated sesame farmers**
Guma	Udei	250	50
Katsina-Ala	Tor-Donga	202	40
Ukum	Kyado	351	70
Gwer West	Agagbe	198	40
Total		**1001**	**200**

The data for this research were collected mainly from primary sources. The primary data for the study were generated from the sesame farmers in Guma, Gwer West, Katsina-Ala and Ukum Local Government of Benue State using an interview schedule. The interview schedule was administered with the assistance of Extension Workers from Benue State Agricultural and Rural Development Authority (BNARDA). The secondary data were collected from BNARDA, Federal, State and Local Government Ministry of Agriculture, Federal and State Office of Statistics as well as journals, seminar papers, World Bank reports; internet and other relevant published and unpublished materials.

The data collected for this study was analyzed using both descriptive and inferential statistics. The descriptive statistics such as mean, standard deviation, frequency and percentages was employed to analyze the socio-economic characteristics of sesame farmers in the study area; gross margin analysis was used to determine the mean gross margin per hectare, the mean total revenue per hectare, the mean total variable cost per hectare, the highest cost incurred by the respondents as well as the mean output obtained by the respondents. Efficiency

and its determinants were estimated using the Stochastic Production Frontier (SPF) following Chavas and Roln (2005) in a two stage estimation approach.

Gross Margin Analysis: Gross margin which is the difference between the gross returns and the total variable cost is a useful planning tool in situations where fixed capital known as overhead cost do not vary with the level of output and consist of cash expenses (on repairs and maintenance, interest on long-term loan etc.) and non-cash adjustment (depreciation on farm tools equipment and machinery) (Olukosi and Erhabor, 1988).

The Gross Margin (GM) analysis of sesame in Benue State was expressed as:
GM= TR – TVC - - - - - - (1)
Where GM = Gross margin per hectare
TR = Total revenue per hectare
TVC=Total variable cost per hectare

The estimation of GM served as a profit index of sesame producers in the study area. The higher the GM the more likely a farm was considered to be profitable and the smaller the GM, the lesser the profit possibility.

Stochastic Production Frontier: Efficiency and its determinants were estimated using the Stochastic Production Frontier (SPF) following Chavas and Roln (2005) in a two stage estimation approach. This method involves the specification of the following SPF:

$LnY_i = ß_0 + ß_1 LnX_1 + ß_2 LnX_2 + ß_3 LnX_3 + ß_4 LnX_4 + ß_5 LnX_5 + ß_6 LnX_6 + U_i - V_i$ - - - - - - (2)

Where:

Y_i = sesame seed output of the i^{th} farmer in kg
X_1 = farm size in ha
X_2 = household labour in mandays
X_3 = hired labour in mandays
X_4 = quantity of seed planted in kg
X_5 = quantity of fertilizer used in kg
X_6 = cost of herbicides in Naira
ß = vector of production function parameters to be estimated.
V_i = random variable which is assumed to be independently and identically distributed (iid) $N(O, ð^2v)$ and independent of U_i.
U_i = Non-negative random variable associated with technical inefficiency in production, and is assumed to be identically and independently distributed half normal (iid) $N(µ, ð^2u)$.

The SPF specified in equation 2 was first estimated using the limdep econometric software, as a first stage problem. The process generated the values of inefficiency term Ui, in addition to the parameters of the SPF. The inefficiency term was then used to estimate the technical efficiency index, which also formed the basis for computing the allocative as well as the overall economic efficiency indices.

Computation of production efficiency indices: Having estimated the SPF (2) and the one sided error term (U_i) in stage 1, the index of technical, allocative and overall economic efficiency for each farmer were estimated following Chavas and Roln (2005) as follows:

$TE_i = \exp(-u_i)$ - - - (3)

$AE_i = \dfrac{P_i \times Y_i}{TE_i \not{R^*}}$ - - - (4)

$EE_i = TE_i \times AE_i$ - - - - (5)

Where:

TE_i = index of technical efficiency of the i^{th} farm
AE_i = index of allocative efficiency of the i^{th} farm
EE_i = index of overall economic efficiency of the i^{th} farm
P_i = average price of sesame seed (N/kg) produced on the i^{th} farm
Y_i = yield of sesame seed of the i^{th} farm (Kg/ha)
R* = highest revenue recorded per hectare on the farms in the sample

Second Stage-Production Efficiency Model

The influences of various socio-economic factors on each of the indicators of production efficiency were examined by specifying and estimating the following second-stage production efficiency equations:

EFF_j

Where:

EFF; = the vector of the jth efficiency index (j=1 for TE, 2 for AE and 3 for EE).

Z_k = the vector of the efficiency changing variables (k=1,2 ------ 12)

Z_1 = Age (years)

Z_2 = Gender (male=0, female =1

Z_3 = Educational background (years of formal education)

Z_4 = Farm size in hectares

Z_5 = Dummy variable for source of land (1 if leased and 0 if otherwise)

Z_6 = Dummy variable for cropping pattern (0 if sole, 1 if mixed)

Z_7 = Dummy variable for type of seed panted (0 if local variety and 1 if improved variety)

Z_8 = Dummy variable for mode of land preparation (1 if tractor was used and 0 if otherwise).

Z_9 = Dummy variable on use of fertilizer (1 if used and 0 if otherwise).

Z_{10} = Dummy variable on use of herbicide (1 if used and0 if otherwise).

Z_{11} = Amount of credit accessed in Naira.

Z_{12} = Frequency of extension visits (number of times during production period).

Equation 6 was estimated by the Tobit regression procedure with the predicted production efficiency indices restricted to lie between 0 and 1. The need for this form of censored regression arises because efficiency estimates can only take on values between zero and one.

III. Results And Discussion

Socio-economic Characteristics of Small-Scale Sesame Farmers in Benue State

The socio-economic characteristics of small-scale sesame farmers in Benue State are presented in Table 2. Most of the farmers in the study area (78.0%) were male with average of 43 years. As expected with most economic activities, majority (92.0%) of the farmers were between less than or equal to 60 years with a modal age group of 41-60 years, to which almost one-half (49.0%) of the sampled farmers belong. This implies that most of the farmers fall within the farming age bracket. This result agrees with the findings of Yusuf (2005) that most farmers are within their active years and can make positive contribution to agricultural production. The result also implies that sesame production is still dominated by men in Benue State.

The result also revealed that 70.5% of the respondents were married. The high proportion of the respondents who are married is an indication that family labour could be available for sesame farmers in the study area. Majority (52.0%) of the sesame seed farmers were full time farmers. Given that most of sesame seed farmers are expectedly involved in its production on full time basis, they are expected to have enough time for tendering their crops which will likely enhance their efficiency.

Education plays a significant role in skill acquisition and knowledge transfer (Ogundele, 2003), and can influence output and production efficiency. The result shows that the proportion of sesame farmers who were literate (55.0%) in the study area was slightly higher than illiterate (45.0%).

Analysis of farm size shows 78.5% of the sesame farmer had farm size of between 1.1 – 3.0 hectares with the mean of 2.1 hectares. This implies that majority of the sesame farmers had small farm holdings. Imoh and Essien (2005) found that farm size affects adoption of technology and that determine whether the farmer will use improved seed. Farm size is a parameter which has revealed significant influence on efficiency (Johansson, 2005). Theoretically, where economy of size exists in a production process, cultivation of larger farm size may enable farmers to produce more output at lower average costs, thus enhancing production efficiency. The average year of experience in sesame seed farming in the study area was 26.7 years. This suggests that an average farmer involved in sesame seed production in the study area has been growing sesame seed for over 25 years thus is sufficiently experienced in sesame farming. This depicts good signal for high productivity.

During the 2013/2014 production period, majority (61.0%) of the respondents never received any training on sesame production. This depicts low level of information about sesame production and may likely result to inefficiency in production. In a similar vein, majority (68.0%) of the respondents had no access to formal sources of credit. The implication is that the size of sesame production will be low and other inputs will be affected since capital is not available to enhance production.

The result of the sesame farmers' household size shows that majority (79.0%) of the respondents had a household size of six (6) people and above. This implies that family labour would be readily available when needed for sesame farming.

It was found that average off-farm income of sesame farmers from other activities was ₦14,400.00. This could enable the resource poor farmers to purchase input that will enhance effective production. Conversely, the situation may have negative effect on proper supervision of farm activities. The result of the study also indicated that most (60.0%) of the respondents used hired labour for their farm operations: therefore the average labour was 104.5 mandays.

Gross Margin Analysis of Sesame Production in Benue State

Cost and returns analysis was undertaken to determine the gross margin of sesame in Benue State. Table 3 revealed that the mean total revenue of sesame seed farmers was ₦317,500.00 per hectare and the mean total variable cost was ₦148,691.48 per hectare. The result also revealed a significant difference ($t=8.951$, $p<0.05$) between total revenue (TR) and total variable cost (TVC) in Table 4. This implies that the mean total revenue is greater than the mean total variable cost which indicates that there is cost efficiency in the use of inputs by the respondents in the study area. The result also showed that the mean gross margin was ₦168,808.52 per hectare and the mean labour cost of ₦82,376.08 was the highest among other costs. This shows that the farmers spent more on labour than other inputs. Furthermore, the maximum gross margin of ₦1638400.00 and minimum gross margin of -₦7600 per hectare implies that some farmers experience positive returns while some experienced negative returns from the mix inputs and outputs got from their farms. There is every need for the farmers to be educated on the required inputs needed to give the right gross margin to ensure the sustainability of the production. When the gross margin of ₦168,808.52 is compared with the total variable cost of ₦148691.48 per hectare, this suggests that there is a high probability of profit making from sesame enterprise in Benue State.

Table 5 summarized the result of the output of sesame produced by the respondents. The result revealed a mean output of 2280.0 kilogrammes of sesame produced by sesame farmers in the study area with minimum of 34 kilogrammes and a maximum of 16500 kilogrammes. This implies a moderately high output of sesame produced by sesame farmers in the study area. The result further revealed that 88.0 percent produced over 1000 kilogramme of sesame seed in the study area. This implies that farmers within that range are likely to make profit all other things being equal.

Estimates of the Stochastic Production Frontier and the Associated Technical Efficiency Indices

The results of the estimates of the stochastic production frontier in sesame seed production and the associated technical efficiency indices are presented in Table 6. The maximum likelihood estimates (MLE) of the stochastic production frontier revealed that output is significantly influenced by seed, farm size and hired labour, with one percent increase in farm size, hired labour and seed resulting in 0.49%, 0.02% and 0.26% increase in output respectively. Index of technical efficiency of the sampled sesame seed farmers ranged from 0.05 (<0.20) to 0.89(>0.6) with the mean technical efficiency index being 0.55 (Table 7). This implies that sesame output can be increased as much as 45% by improving technical efficiency in resource use by the farmers with no additional cost.

Table 2: Distribution Of Respondents By Their Socio-Economic Characteristics

Socio-economic Characteristics	**Frequency**	**Percentage**
Age (years)		
<20	5	2.5
21-40	81	40.5
41-60	98	49.0
>60	16	8.0
Total	200	100.0
Mean	43.0	
Sex		
Male	156	78.0
Female	44	22.0
Total	200	100.0
Marital status		
Married	141	70.5
Single	59	29.5
Total	200	100.0
Status of Farmer		
Full time	104	52.0
Part time	96	48.0
Total	200	100.0
Labour type		
Hired labour	120	60.0
Family labour	80	40.0
Total	200	100.0

Labour (Mandays)		
<100	108	54.0
101-200	76	38.0
>200	16	8.0
Total	200	100.0
Level of education		
No formal education	90	45.0
Primary	51	25.5
Secondary	41	20.5
Tertiary	18	9.0
Total	200	100.0
Farm size (hectares)		
<1.0	28	14.0
1.1-2.0	62	36.0
2.1-3.0	85	42.5
>3.0	25	7.5
Total	200	100.0
Mean	2.1	
Farming experience (years)		
1-10	13	6.5
11-30	42	21.0
21-30	75	37.5
31-40	48	24.0
Above 40	22	11.0
Total	200	100.0
Mean	26.7	
Household size		
1-5	42	21.0
6-10	58	29.0
11-15	66	33.0
Above 15	34	17.0
Total	200	100.0
Mean	10.3	
Training in sesame production		
Farmers trained	78	39.0
Farmers not trained	122	61.0
Total	200	100.0
Access to formal credit		
Access	64	32.0
No access	136	68.0
Total	200	100.0
Off sesame farm income (₦)		
<10,000	102	51.0
10,000 – 20,000	48	24.0
20,000-30,000	25	12.5
30,000-40,000	14	7.0
40,000-50,000	7	3.5
Above 50,000	4	2.0
Total	200	100.0
Mean	₦14,400	

Source: Field survey, 2014

Table 3: Summary Statistics Of Gross Margin Earned By Sesame Farmers In Benue State

Item	Mean	Standard deviation	Minimum	Maximum
Total revenue (₦)	317500	24312.48	140.0	1875000
Cost of fertilizer (₦)	30600	30841.79	0.0	192000
Cost of herbicides (₦)	17640	19845.32	0.0	84000
Cost of seeds (₦)	5772.18	6842.41	0.0	27600
Cost of labour (₦)	83929.30	82376.08	600.0	460000
Transport cost (₦)	9950	10127.25	0.0	93800
Sacks (₦)	800	674.15	200.0	26000
Total variable cost (₦)	148691.48	109635	0.0	575330
Gross margin (₦)	168808.52	194628	-7600.0	1638400
Average rate of return	2.14			

Source: Field survey, 2014

Table 4: Test of Difference Of Means Of Total Revenue, Total Variable Cost Per Hectares Of Sesame Obtained By Sesame Farmers In Benue State

Item	Mean	Standard deviation	Difference	T	Level of Significance
Total Revenue ((₦)	317500	243112.48	168808.52	8.951*	0.05
Total variable Cost (₦)	148691.48	109635			

Source: Data Analysis, 2014

*T-test significant at 5% level of significance.

Table 5: Output In Kilogramme Of Sesame Seed Produced By Sesame Farmers In Benue State

Output (kg)	Frequency	Percentage
<1000	24	12.0
1001-2000	66	33.0
2001-3000	100	50.0
>3000	10	5.0
Total	200	100.0
Mean	2280.0	
Minimum	34	
Maximum	16,500	
Standard deviation	2178.34	

Source: Field survey, 2014

Table 6: Estimates Of Stochastic Production Frontier And Technical Efficiency

Variables	**OLS estimates Parameter t-value**		**MLE estimates parameter t-value**	
Stochastic Production Frontier				
Constraint	4.8609	5.37	4.8187	6.82
Farm size	0.5492***	6.03	0.4876***	7.87
Hired labour	0.0236	1.21	0.0173**	2.11
House labour	0.1186***	2.65	0.0747	0.87
Fertilizer	0.0184	1.19	0.0159	1.06
Herbicide	-0.0341	-0.35	0.0507	0.64
Seed	0.2495	2.18	0.2568***	3.65
Technical Efficiency Estimate				
Constant			0.60662	8.67
Age			0.0018*	1.79
Gender			-0.0504	-1.23
Education			-0.0038	0.16
Farm size			-0.0154***	-2.65
Lease of land (dummy)			-0.0650**	2.12
Mixed cropping (dummy)			0.0109	0.27
Improved seed (dummy)			0.0748**	2.11
Tractor use (dummy)			-0.0152	-0.53
Use of fertilizer (dummy)			0.0556**	1.87
Use of herbicide (dummy)			0.0648*	-1.81
Amount of credit accessed			0.0572**	2.01
Frequency extension visit			-0.0121	-1.49
Diagnostic statistics				
Lambda			2.3171	4.85
Sigma square			0.7728	15.31
Log likelihood function			-146.16	
Sigma squared (v)			0.0905	
Sigma squared (u)			0.5382	

Note: * significant at 10%, ** significant at 5%, *** significant at 1%

Source: Computed from survey data (2014)

Table 7: Efficiency Distribution Estimate For Sampled Sesame Seed Farmers

evel of efficiency	Technical efficiency		Allocative efficiency		Economic efficiency	
	Frequency	percentage	Frequency	percentage	Frequency	percentage
≤0.20	21	10.5	4	2.0	76	38.0
0.21-0.40	27	13.5	135	67.5	100	50.0
0.41-0.60	38	19.0	49	24.5	20	10.0
>0.60	114	57.0	12	6.0	4	2.0
Total	200	100.0	200	100.0	200	100.0
Mean	0.55		0.37		0.25	

The technical efficiency estimate shows that increase in age (and experience) significantly enhances TE while increase in farm size as well as use of herbicides significantly lowers technical efficiency (Table 7). The decline in technical efficiency with respect to herbicides could be attributed to the fact that herbicides naturally affect crops because of its toxic content. This demands that herbicides can be used in the right quantity otherwise this can affect the crop stand per hectare resulting in low output while that of farm size could be attributed to diminishing returns to size. Increased access to credit, fertilizer use and planting improved variety of sesame seed were revealed to be significantly associated with higher technical efficiency, while farmers that cultivated leased land were found to be less technically efficient.

Table 7 also shows that substantial allocative and overall economic inefficiencies exist in the operations of sesame seed farmers in the study area. Majority of the farmers had allocative efficiency (69.5%) and overall economic efficiency (88.0%) indices that were less than 0.4. The mean AE was 0.37 while the mean EE was barely 0.25. This suggests that sesame farmers in the study area have only been realizing about one quarter of the potential profit realizable from sesame seed production in the study area. This finding agrees with evidence in most sub-Saharan African agriculture. Gutierrez (2003), for instance observed that between 1994 and 1996 farm income realized in one year by an average farmer in low income country (including Nigeria) is barely what their peers in Netherlands realized in three days between 1994 and 1996.

Table 8: Estimates Of Tobit Model (Allocative And Overall Economic Efficiency)

Variables	Allocative efficiency		Economic efficiency	
	Parameter	t-value	Parameter	t-value
Constant	0.1452	3.27	0.1483	3.61
Age	0.0012	1.21	0.0014	1.53
Sex	-0.0679	-2.27	-0.0524**	-2.17
Education	-0.0016	-0.74	0.0038	0.29
Farm size	-0.0049	-0.19	-0.0066**	-1.92
Leased land	-0.0269	-1.39	-0.379**	-2.11
Mixed cropping	-0.0274	-0.99	-0.0092	-0.39
Seed type	0.0206	-0.91	-0.0079	-0.37
Tractor	0.0249	1.39	-0.0006	-0.07
Fertilizer	0.0815***	4.40	0.0561***	3.22
Herbicide use	-0.0198	-0.87	-0.0295	-1.42
Credit	0.0002	0.88	0.0003*	1.76
Extension visit	0.0126*	2.35	0.0048	0.69
Price	0.0014***	16.28	0.0004***	4.26
Diagnostic parameters				
Sigma	0.0987		0.091	
Log likelihood function	156.51		170.23	

Source: Computed Survey Data (2014)

Note: * significant at 10%, ** significant at 5%, *** significant at 1%

Factors Influencing Technical Inefficiency In Sesame Production In Benue State

The technical inefficiency result earlier presented in Table 6 shows that while increase in farm size, use of herbicides as well as tractor services are significantly and positively associated with increase in technical inefficiency, increase in age (and experience) significantly increases technical efficiency. This has to do with experience that the older the farmer the more experience they become which increase efficiency. The decline in technical efficiency with reference to tractor use however, contradicts a priori expectation This inefficiency may not be unconnected with delay sometimes experienced while trying to use tractor services of Benue Tractor Hiring Agency (BENTHA) available in the study area.

Factors Influencing Allocative And Economic Efficiency In Sesame Production In Benue State

Table 8 presents results of Tobit regression model of the factors influencing AE and EE in sesame seed production in the study area. The use of Tobit procedure was necessitated by the need to restrict efficiency estimates within the range of 0 and 1. The Tobit model shows that the influence of use of fertilizer, frequency of extension visit and price at which the farmers were able to sell their sesame seed are the variables that positively and significantly enhance allocative efficiency of the sesame seed farmers. Female farmers were not allocatively efficient compared to their male counterparts. Use of fertilizer and price at which farmers sold their produce were significant at 1% while gender of farmer and frequency of extension visit were significant at 5%.

Table 8 also shows that use of fertilizer, increased access to credit and ability of the farmers to produce sesame seed that commands higher prices are factors that significantly enhance overall economic efficiency in sesame seed production in the study area. This is in line with the work of Ashaolu, Momoh, Ayinde and Ugalahi (2010) who found that credit has a positive impact on efficiency in their study of sesame farmers in Nasarawa State, Nigeria. The results also show that female farmers achieved significantly lower economic

efficiency than their male counter parts. This is in consonance to the work of Ashaolu, Momoh, Ayinde and Ugalahi (2010) who also showed in their study that female farmers are not equally efficient as the male farmers. This suggests that areas where women are inefficient could be due to constraint by cultural factors from having more active roles and low levels of education and technical development. Farmers that cultivated leased land and larger farm sizes were also significantly less efficient than those that had property right on their land and cultivated smaller farm size respectively. The decline in efficiency on the side of farmers that lease their land could be that the land leased to them may not be productive and they may not be willing to spend their resources to improve on the land since they are not the rightful owners.

IV. Conclusion And Recommendations

It was found that significant economic inefficiencies (technical and allocative) exist in sesame seed production in the study area. These inefficiencies can be significantly reduced if the farmers are granted greater access to credit, more extensive contacts, access to better marketing channels with supportive technologies like storage and processing facilities and fertilizer use. Furthermore, issues relating to granting property rights to farmers on their farm land should be considered to enhance technical efficiency of sesame farmers in the study area. Finally extension services should be strengthened so that farmers would be made acquainted with the efficient use of the available resources.

References

[1]. Akintunde, B.O., Tunde-Akintunde, T.Y (2004), "Some physical properties of sesame seed", Journal of Biosystems Engineering, 88(1):127-129.

[2]. Ashaolu, O.F., Momoh, S. Ayinde, I.A. and Ugalahi, G.B. (2010) "Analysis of Resource-use efficiency in Beniseed Production in Obi and Doma Local Government Areas of Nasarawa State, Nigeria." Journal of Humanities, Social Sciences and Creative Arts UNAAB 5(1):79-90.

[3]. Benue State Agricultural and Rural development Authority (1999) Highlights of BNARDA's programmes, Makurdi, Pp 1-15.

[4]. Chavas, J.P., Roln, M. (2005). "Farm household production efficiency: evidence from Gambia". America Journal of Agricultural Economics, 87(1) 160-179.

[5]. Chemonics International Inc. (2002) Overview of the Nigerian Sesame industry, Washington DC, 20036, USAID/Nigeria, 34pp.

[6]. Gutierrez, L. (2003). "Why is agricultural labour productivity higher in some countries than others?" Agricultural Economic Review, 3(1)58-78.

[7]. Imo, A.N. and M.U. Essein (2005): Adoption of Improve Cassava Varieties among small- scale farmers in Ikot Ekpene Agricultural zone of Akwa Ibom State, Nigeria. Proceeding of the 39th Conference of the Agricultural Society of Nigeria. Benin City, October, 9-13.

[8]. Johansson, H. (2005) "Technical, allocative and economic efficiency in Swedish dairy farms: The Data Development analysis versus the Stochastic Frontier Approach" Paper presented at 11th International Congress of European Association of Agricultural Economists (EAAE,) Copenhagen, Denmark, August, 2005.

[9]. National Cereals Research Institute (2002) Guide to Beniseed (Sesame) Production, National Cereals Research Institute (NCRI), Baddegi, Pp 1-4.

[10]. NPC (2006) National Population Commission 2006 Figure.

[11]. Ogundele, O.O. (2003). Technology Differentials and Resource-use Efficiency in Rice Production in Kaduna State, Nigeria. An unpublished Ph.D. Thesis; Department of Agricultural Economics, University of Ibadan, Nigeria.

[12]. Olukosi, J.O. and Erhabor, P.O. (1988). Introduction to Farm Management Economics: Principles and Applications. Agitab Publishers Ltd., Nigeria, P.16.

[13]. Raw Materials Research and Development Council (RMRDC) (2004): Survey report of ten selected agro raw materials in Nigeria. BENISEED (Maiden Edition) 108pp.

[14]. Sharma, K.R., Pingsun, L.,H. Zaleski, M. (1999). "Technical Allocation and Economic efficiencies in swine production in Hawai. A comparison of parametric and non-parametric approaches". Agricultural Economics, 20:23-35

[15]. Yusuf, O. (2005). Economics Analysis of 'Eguisi' Melon Production in Okehi Local Government Area of Kogi State. M. Sc. Thesis. Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University, Zaria, pp.40-41.