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Profit Efficiency among Sesame Farmers in Nasarawa State, Nigeria

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Abstract: The study was carried out in Nasarawa State. The study analyzed Productive efficiency among sesame farmers in Nasarawa State of Nigeria. The constraint to sesame production was determine and the Cobb-Douglas stochastic frontiers production analysis was applied to determine the technical, allocative and economic efficiency among sesame farmers in Nasarawa State. A purposive sampling technique was used to collect data from 194 sesame farmers. The analysis of technical efficiency revealed that farm size and chemical were not significantly related to technical efficiency while seed, labour and fertilizer were statistically significant to technical efficiency while the gamma (γ) ratio indicates the relative magnitude of the variance σ^2, associated with technical inefficiency effects. The estimated allocative efficiency is 41.9% and seed, fertilizer, laabour, chemical and transport were all statistically significant to allocative efficiency while the inefficiency model revealed factors such as farming experience, educational status and access to credit were all positively and significantly related to allocative efficiency. The mean economic efficiency was 94.5% and the minimum and maximum were 10.0 and 91.5%, respectively. The study recommends that Government should facilitate the availability of credit to sesame farmers through promotion of credit cooperatives. Further more, government should make fertilizer readily available and in a subsidized rate, government should also look into the inherent potential and harness them both for foreign exchange earning and for industrial usage.

Keywords: Efficiency, farmers, Nasarawa, Nigeria, profit, sesame

INTRODUCTION

Sesame (*Sesamum indicum*) belongs to the plant family *Pedaliacea* commonly called beniseed in Nigeria. It is an important oilseed crop believed to have originated from tropical Africa, where you have the greatest genetic diversity. It was later taken at a very early date to India where a secondary centre of diversity developed (Purseglove, 1996). Oplinger *et al*. (1990) indicated it to be highly prized oilseed crop in Babylon and Assyria about 4,000 years ago. The name sesame is used in Literature worldwide. It is also known as "simsim" in East Africa, "Till" in India and "Gingely" in Sri-Lanka. The Hausa, Ibo, Yoruba, major tribes of Nigeria call it "Ridi", "Ekuku" and "Isasa", respectively. Other tribes in Nigeria also have names for it.

Sesame is an important crop to Nigerian agriculture, it is quite extensively cultivated, it yields in relatively poor climatic conditions and widely used within Nigeria and is an important component of Nigeria's agricultural exports. As a small holder crop, often intercropped with others, the extent of cultivation is poorly known and there is little information on yields or productivity. For the most part the surplus crop is commercialized bulked up and exported with minimal processing limited to drying and cleaning (RMRDC, 2004).

The total world crop area under sesame is about 6 million ha. Sixty-six percent of this is concentrated is Asia. Twenty five percent of world sesame is planted in Africa (mainly Nigeria, Ethiopia and Sudan) and 8% in America, Venezuela, Mexico, Guatemala and Columbia) (FIIR, 1990). The leading world producer's are India, China, Mexico and Sudan in Africa. Total annual consumption is about 65% for oil extraction and 35% for food. The food segment includes about 42% roasted, 12% grounded, 36% washed and processed and 10% roasted and salted (RMRDC, 2004).

Sesame is an annual self pollinating plant with an erect pubescent, branching stem. It is between 0.60 to 1.30 m tall. The leaves are ovale to lanceolate or oblong. While the lower leaves are tri-lobed, the upper leaves are undivided, irregularly serrated and pointed. The older cultivators have smooth cupped leaves with leaf like out growth on their lower surfaces. Some cultivators have many branches while others are relatively unbranched. The flowers are tabular, pendulant, bell shaped and two lipped with a pale purple or rose to white colour and are 1.9 to 2.5 cm (0.75 to 1 inch) long. In addition, the flowers are borne on short glandular pedicles. One flower is produced at

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each leaf axil and the lower flowers usually bloom 2 to 3 months after planting with continuous blooming until the upper most flowers are opened. The fruit is an oblong, mucronate, pubescent capsule containing numerous small, oval and yellow, white, red, brown or black seeds. The seeds are pear-shaped, (with colours ranging as stated above from yellow-black), small slightly flattened and thinner towards the helium (RMRDC, 2004). Sesame production in Nigeria was stimulated by the great demand for oilseed in Europe after the world war II in 1947, the West African oilseeds mission was mandated to investigate the possibility of the production of groundnut and other oil seeds in Nigeria. Ever since then, they had been considerable growth in the cultivation of sesame beyond the traditional producing areas in the country. Sesame therefore became one of the major agricultural commodities that attracted foreign exchange prior to independence. It was expected to the tune 15,000 Mt in 1960 and 27,000 Mt in 1961 (FIIR, 1990). In 1976, Nigeria was rated sixth producing 3.6% of the world output, with Benue state accounting for 97% of the National Export Grading (FIIR, 1990). However with the rise in demand and production of soyabeans, sesame production declined significantly. This was mainly due to low yield per unit area and subsequent shift towards the production of soyabeans for higher economic consideration by the farmers in the production areas of Benue, Kwara, Kogi, Niger and Kaduna state. But, with increased domestic awareness of the potential of the crop as a valuable raw materials and the efforts of various stake holders including the Raw Materials Research and Developing Council (RMRDC, 2004) through its crop boosting program and research efforts of the National Cereal Research Institute (NCRI) Badeggi, production figure rose to 64,000 metric tones in 1996 (RMRDC, 2004) and this is still on the increase. It has been estimated and that production will increase from 70,000 metric tonnes in 1998 in 1998 to 139,000 metric tonnes by the year 2010. The broad objective of the study was to analyse the resource use efficiency in sesame farming in Nasarawa State while the specific objectives of the study were to: identify constraints in sesame production and determine the technical, allocative and economic efficiency in sesame production

MATERIALS AND METHODS

This study was conducted in Nasarawa State with capital at Lafia. The state is made up of thirteen local government areas. The state lies between latitude 7º and 9º North and longitude 7 and 10º East (Nasarawa State Government, 2006). Nasarawa State covers an area of 27,117 km^2 with estimated population of 1,863,275 people (NPC, 2006). It has a mean temperature range from 25º C in October to about 36º C in March while rainfall varies from 13.73 mm in some places to 145 mm in other places. Alluvial soils are found along the Benue trough and their flood plains. The forest soils which are rich in humus and literates are found in most part of the State. There are also sandy soils in some parts of the State. Solid minerals notable are salt and bauxite.

The state is an agrarian state with large percentage of the populace engaged in farming and agro-allied activities. The soil texture is sandy loam and very fertile for crops like sorghum, cowpea, cassava, rice among others that are cultivated in the study area. Purposive sampling technique was used to select two Local government areas namely, Doma and Lafia ocal Government Areas due to their high level of involvement in sesame production. Five villages were further selected from each of the two Local government areas given a total of 10 villages. And in each village selected 10 sesame farmers were selected given a total of 200 sesame farmers used for the study.

The data for this research were collected from both primary and secondary sources. The primary data for the study were generated from the sesame farmers in Doma and Lafia Local government area of Nasarawa State using a well structured questionnaire. The secondary data were collected from NADP, Federal, State and Local Government Ministry of Agriculture, Federal and State Office of Statistics as well as journals, seminar papers, World Bank reports, thesis, internet and other relevant published and unpublished materials.

The data collected for this study was analyzed using both descriptive statistics for objective i and the Cobb-Douglas and transcended logarithmic (translog) stochastic frontier Analysis was use to analyze data on objective ii The stochastic frontier production function was used to estimate the productivity and technical efficiency of sesame farmers. The production technology of sesame farmers in Nasarawa State, Nigeria was assumed to be specified by the Cobb-Douglas frontier production function. This according to (Ogundari and Ojo, 2006) has been used by many empirical studies, particularly those relating to developing countries' agriculture and also that the functional form meet the requirement of being self-dual (allowing an examination of Economic Efficiency):

$$LnY = \beta_o+\beta_1 LnX_{1i}+\beta_{2i}X_{2i}+\beta_3 LnX_{3i}+\beta_4 LnX_{4i} +\beta_5 LnX_{5i}+(V_i-U) \quad (1)$$

where,
Ln = Logarithm to base
Y = Sesame output (kg)
X_i = Farm size (ha)
X_2 = Labour used in sesame production (man days)
X_3 = Seed (#)
X_4 = Chemical in litres (#)
X_5 = Fertilizer (#)
X_5 = Fertilizer (#)
β_o = Constant term
$\beta_{1,}\ \beta_2$ …………… β_5 = Regression coefficients

Vi = Are random variables which are assumed to be independent of Ui, identical and normally distributed with zero mean and constant V variance $N(0, \sigma^2{}_v))]$

Ui = Which are non-negative random variables which are assumed to account for technical inefficiency in production and are often assumed to be independent of Vi such that U is the non-negative truncated (at zero) U of half normal distribution with [N (0, $\sigma^2{}_\mu)$].

The inefficiency of production, Ui was modelled in terms of the factors that are assumed to affect the efficiency of production of farmers. Such factors are related to the socio-economic and management variables of the farmers. The determinants of technical inefficiency is defined by:

$$Ui = \delta_0+\delta_1 Z+\delta_2 Z_2 +\delta_3 Z_3+ \delta_8 Z_8 \quad (2)$$

where,
Ui = Technical inefficiency
Z_1 = Farmers' age (years)
Z_2 = Farming experience (years)
Z_3 = Off-sesame farm income (Naira)
Z_4 = Education (years)
Z_5 = Household size
Z_6 = Training
Z_7 = Access to credit
Z_8 = Occupational status
δ_0-δ_8 = Parameters

These variables are assumed to influence technical efficiency of the sesame farmers. The gamma ($\gamma = \sigma^2{}_\mu /(\sigma^2{}_\mu + \sigma^2{}_v)$ which is the ratio of the variance of U ($\sigma^2{}_\mu)$ to the sigma squared (σ^2) which is a summation of variances u and v of U and V ($\sigma^2 = \sigma^2{}_\mu + \sigma^2{}_v$) were also determined. The Maximum Likelihood Estimates Method using the computer FRONTIER version 4.1 was used to estimate the parameters of the SFPF simultaneously.

The technical efficiency of an individual farm was expressed as:

$$TE_i = Q_i/Q_i^* \quad (3)$$

where,
TE_i = Technical efficiency
Q_i = Observed output
Q_i^* = Frontier output

Allocative (cost) efficiency: The allocative (cost) efficiency function is derived analytically and defined as follows:

$$LnY = \beta_o+\beta_1 Ln\ {}_i+\beta_{2i}X_{2i}+\beta_3 LnX_{3i} +\beta_4 LnX_{4i}+\beta_5 LnX_{5i}+(V_i\text{-}U) \quad (4)$$

where,
Ln = Logarithm to base
Y = Sesame output (kg/#)
X_i = Cost of seeds (#)
X_2 = Cost of Fertilizer (#)
X_3 = Cost of Labour (#)
X_4 = Cost of Chemical (#)
X_5 = Cost of Transport (#)
β_o = Constant term (#)

$\beta_{1,}\ \beta_2$ …………… β_5 = Regression coefficients

$$Ui = \delta_0+\delta_1 Z+\delta_2 Z_2 +\delta_3 Z_3+ \delta_8 Z_8 \quad (5)$$

where,
Ui = Allocative inefficiency
Z_1 = Farmers' age (years)
Z_2 = Farming experience (years)
Z_3 = Off-sesame farm income (Naira)
Z_4 = Education (years)
Z_5 = Household size
Z_6 = Training
Z_7 = Access to credit
Z_8 = Occupational status
δ_0-δ_8 = Inefficiency parameters

Specific allocative efficiency was computed as:

$$AE_i = AE_i = Q_i^*/Q_i^m \quad (6)$$

where,
AE_i = Allocative efficiency
Q_i^* = Frontier output
Q_i^m = Optimum output

Farm specific Economic Efficiency (EE) was estimated as the product of the technical and allocative efficiencies. That is:

$$EE = TE .AE \tag{7}$$

It is assumed that the efficiency effects are independently distributed and U_{ji} arises by truncation (at zero) of the normal distribution with mean U_{ji} and v

RESULTS AND DISCUSSION

Production constraints of sesame in Nasarawa state: The result in Table 1 summarized factors that constrain the production of sesame. The major problems encountered were as follows:

Inadequate funds: Inadequate fund or capital was the most commonly expressed problem of sesame production by the formers in the study area. The study revealed that 92.3% of the farmers were faced with this problem. The implication of this result is that the acquisition of inputs such as improved seeds, fertilizer, agro-chemical, labour and farm expansion might be difficult by farmers.

High cost of fertilizer: High cost of fertilizer was the second ranked problem faced by the farmers in the study area. (82.0%) of the respondents indicated that high cost of fertilizer is a constrain to sesame production. This implies that fertilizer was too expensive for the farmers to buy and if eventually gotten it will increase cost of production and therefore influenced on total variable cost and the profit in the production of sesame.

High cost of agro chemical: High cost of agrochemical was the third rank problem encountered by the farmers in the study area. The study revealed that 75.8% of the farmers were faced with this problem. This implies that some of the farmers were able to acquire chemical and the high cost of chemical affected the total variable cost.

Weed control problem: The result of the study indicated weed control problem as the fourth ranked problem encountered by the farmers in the study area. The result revealed that 73.7% of them were faced with this problem; this implies that weed is a challenge to sesame production and this had negative effect on production because it increased costs of labour and equally affected the performance of sesame production in the study area.

Maximum likelihood estimates of stochastic frontier production function: The maximum likelihood estimates of the Cobb-Douglas stochastic production frontier model are presented in Table 2. The result revealed the presence of technical inefficiency among sesame farmers in the study area. This was confirmed by the Likelihood Ratio (λ) and the significance of gamma (γ). Gamma (γ) estimates of 0.91 was statistically significant at 1%. This implies that the one sided random inefficiency component strongly dominates the measurement error and other random disturbance indicating that 91% of variation in actual output (production frontier) between farms mainly arose from differences in farmers' practices and management rather than random variability

Table 1: Constraints to sesame production in Nasarawa state

Constraint	Frequency	(%)	Rank
Inadequate fund	179	92.3	1
High cost of fertilizer	159	82.0	2
High cost of chemical	147	75.8	3
Weed control problem	143	73.7	4
Inadequate improved seed	134	69.1	5
Inadequate labour supply	112	57.7	6
High cost of seed	111	57.2	7
Inadequate extension contact	106	54.6	8

*: Multiple responses possible; Field survey (2009)

Table 2: Maximum likelihood estimates of the Cobb-Douglas stochastic production frontie

Variable	Parameters	Coefficient
Constant	β_0	5.85* (15.89)
Ln farm size (ha)	β_1	-0.11 (-0.85)
Ln labour (Man day)	β_2	0.117** (2.68)
Ln seed (kg)	β_3	0.44** (2.49)
Ln chemical (L)	β_4	-0.02 (-0.76)
Ln fertilizer (kg)	β_5	0.06** (2.72)
Inefficiency model		
Constant	Z_0	1.44 (1.40)
Ln age (years)	Z_1	-2.12* (-3.68)
Farmer experience	Z_2	1.17* (8.81)
Off sesame farm income	Z_3	-0.08*** (-1.96)
Education status	Z_4	0.10*** (1.22)
Household size	Z_5	-0.15 (-0.61)
Training	Z_6	-1.92* (-3.00)
Access to credit	Z_7	2.58* (4.10)
Occupational status	Z_8	-0.64 (-0.81)
Sigma squared	σ^2	3.27* (4.08)
Gamma	γ	0.91* (29.4)
Log likelihood function	-198.61	

*: t-test significant at 1%; **: t-test significant at 5%; ***: t-test significant at 10%; Values in parenthesis represent t-ratio; Data analysis (2009)

Elasticity and return to scale: The individual coefficients of the explanatory variable in Cobb-Douglas stochastic frontier model represent the elasticity of farm size, labour, seeds, chemical and fertilizer with respect to sesame output (Table 2). The sum of the coefficients of Cobb-Douglas production indicates the nature of return to scale (Koutsoyannis, 1977). The elasticity of the variables with respect to sesame output revealed that labour (0.117), quantity of

Table 3: Summary statistics and distribution of sesame farmers based on technical efficiency in Nasarawa state

T.E range	Frequency	(%)
<0.30	6	3.3
0.31-0.60	48	27.0
0.61-0.90	124	69.7
Total	178	100.0
Mean	0.6616	
Minimum	0.10	
Maximum	0.90	

Computed from survey data (2009)

seed (0.44) and quantity of fertilizer (0.06) were statistically significant ($p \leq 0.05$). This implies that the resource allocation and use were in stage two of production (stage II). Furthermore, the result showed that the quantity of seed is the most important factor increasing the quantity of output of sesame as every percent increment in the quantity of seed used by sesame farmers increases the quantity of sesame output by 0.44%. The sum of the elasticity of the coefficient was less than unity (0.45) indicating positive decreasing return to scale and in stage II of production surface. However, the coefficient of farm size (-0.11) and chemical use (-0.02) were not significant. This result disagrees with that of (Ogundari and Ojo, 2006) that revealed farm size to be significantly related to technical efficient.

Technical efficiency: The individual technical efficiency of sesame farmers are presented in Table 3. The result showed a mean technical efficiency of 0.662. This means that majority of the respondents operated closer to their production frontier. The minimum technical efficiency is 0.10 and maximum technical efficiency is 0.90. This implies that on the average farmers are able to obtained 66.2% potential output from a given mix of production inputs. In the short-run, there is scope for increasing sesame output by 33.8% by adopting the techniques and technology employed by the best sesame farmers. The implication of the result is such that the average sesame farmer requires 27% i.e., {1-(0.662/0.90)100} cost savings to become the most efficient sesame farmer.

The frequency distribution of technical efficiencies obtained from the stochastic model are presented in Table 3. The result showed that less than 30.3% of sesame farmers operated below efficiency level of 60%. The greater majority of sesame farmers were technically efficient as 69.7% attained efficiency level greater than 60%.

Technical inefficiency: The estimated coefficients of the variables in the Cobb-Douglas stochastic frontier model for inefficiency effects are presented in the inefficiency section of Table 2. This section explains the relationship between farmers socio economic and management factors and their effects on inefficiency. The result showed that the signs and significance of the estimated coefficients had important implications on the technical efficiency of the farmers

Analysis of technical inefficiency effects for sesame farmers revealed a significant gamma (γ = 0.91, $p \leq 0.01$). This implies that presence of gamma (γ) decrease technical efficiency of sesame farmers. The coefficient of age of farmer (-2.12) was found to be negative and statistically significant ($p \leq 0.01$). This implies that increase in this factor increase technical efficiency and decrease technical inefficiency of sesame farmers. The result concerning the influence of farmer's age indicated that the older the farmer the higher his technical efficiency. This is expected because since the older the farmer, the higher the experience and as experience increases the more the farmer get used to farm production processes and techniques and hence increase technical efficiency.

The coefficient of farmer experience (1.17) and access to credit (2.58) were found to be positive and statistically significant ($p \leq 0.01$) while training (-1.92) was also found to be negative and statistically significant ($p \leq 0.01$). However, the positive and significant coefficient of farmer experience and access to credit on technical efficiency model imply that these factors decrease technical efficiency of sesame farmers. The result concerning the influence of farming experience indicated that the higher the farming experience the lower his technical efficiency and this is the same for access to credit, the more access to credit the lower the technical efficiency while the negative influence of training indicated that the more training the farmers receives the more technical efficient they becomes.

The result of the analysis also revealed that the coefficients of off-sesame farm income (-0.08) and education status (0.10) were statistically significant ($p \leq 0.10$). The result showed that the coefficient of off-sesame farm income had a negative influence on inefficiency of these farmers. This means that the higher amount of off sesame farm income reduce technical inefficiency of these farmers and this suggest that, farmers who are involved in other income generation activities are re-investing the proceeds of such activities into sesame farm. In addition, the positive impact of education status on inefficiency means that, the higher level of education reduces efficiency level. However, the coefficient of household size and occupational status were not significant at all significant levels.

Maximum likelihood estimates for allocative efficiency model: The maximum likelihood estimates of the Cobb-Douglas Stochastic cost frontier models in sesame production is summarized in Table 4. The purpose of this exercise is to estimate how allocatively efficient sesame farmers are in the production of sesame. The result helped to identified and analysed the major factors that affect the allocative efficiencies of sesame with a view to narrowing the gap between the farmers' level and optimal frontier level. The performance of model in terms of γ and σ^2 are large and are significant at 1%. The significance of σ^2 shows the correctness of the estimated stochastic cost frontier models and that the conventional ordinary least square is not an adequate representation of data in all the models. Furthermore, the estimate of gamma (γ) (0.99) implies that 99% of the variation in the cost of sesame production was accounted for differences in farmers allocative efficiencies.

The maximum likelihood elasticity parameter estimates of the cost function of farmers are presented in Table 4. The elasticity parameters of quantity of sesame produced, cost of seed, cost of fertilizer, cost of labour, cost of chemical and cost of transport. The elasticity parameters of quantity of sesame produced (-0.02, $p \le 0.10$), cost of seed (0.211), cost of fertilizer (0.03), cost of labour (0.82) and cost of transport (0.01) were found to be positive and statistically significant at ($p \le 0.01$) while cost of chemical (0.01) was found to be positive and statistically significant at ($p \le 0.05$). This implies that cost seed, cost of fertilizer, cost of labour, cost of chemical and cost of transport exert significant positive influence on the cost of production of sesame in the study area. The significant influence of seed cost and labour cost is in agreement with the findings of Okoh (2009), similarly found seed and labour cost as determinant of allocative efficiency in the Fadama production of tomato in Benue State.

Allocative efficiency estimates of sesame farmers in Nasarawa state: The frequency distribution and 69.1% of sesame farmers operated at allocative efficiency level of ≤1.10 to 1.40 which is below the mean efficiencies while 30.9% of the sesame farmers descriptive statistic of allocative efficiency estimates obtained from the stochastic frontier cost model are presented in Table 5. The result shows that less than operated above the mean allocative efficiency level, they are within the range of 1.41 and above. The mean allocative efficiency for the sample is 1.419 with a from a given mix of cost inputs. This implies that if the average farmer in the sample was to achieve allocative

Table 4: Maximum likelihood estimates of the parameter in the Cobb-Douglas stochastic cost function model

Variable	Parameter	Coefficient
Constant	q_0	0.39** (3.90)
Output	Y	-0.02*** (-1.14)
Cost of seeds	q_1	0.211** (8.69)
Cost of fertilizer	q_2	0.03** (4.21)
Cost of labour	q3	0.82** (40.30)
Cost of chemical	q_4	0.01* (2.79)
Cost of transpor	q_5	0.01** (3.93)
Inefficiency model		
Constant	Z_0	-16.77** (-3.65)
Age	Z_1	3.28** (3.76)
Farmer experience	Z_2	0.36** (3.88)
Off sesame farm income	Z_3	-0.03* (-2.33)
Education status	Z_4	0.10* (2.16)
Household size	Z_5	-1.06** (-4.32)
Training	Z_6	0.16 (0.93)
Access to credit	Z_7	1.38** (3.03)
Occupational status	Z_8	-2.43** (-4.09)
Sigma squared	σ^2	2.04** (4.11)
Gamma	γ	0.99** (577.31
Log likelihood function	8.83	

: t-test significant at 1%; *: t-test significant at 5%; *: t-test significant at 10%; Values in parenthesis represent t-ratio; Data analysis (2009)

Table 5: Summary statistics and distribution of allocative efficiency of sesame farmers in Nasarawa state

A.E range	Frequency	(%)
<1.10	47.000	26.4
1.11-1.40	76.000	42.7
1.41-1.70	34.000	19.1
>1.71	21.000	11.8
Total	178.000	100.0
Mean	1.419	
Minimum	1.030	
Maximum	12.890	

Data analysis (2009)

minimum of 1.03. This implies that on the average farmers are able to obtained 1.419% potential output efficiency level of its most efficient counter part, then the average farmer could realize 89% cost saving i.e., {1-(1.419/12.89) x 100}. A similar calculation for the most allocative inefficient farmer reveals cost saving of 92.1% {i.e., 1-(1.03/12.89) x 100}.

Cost inefficiency: The parameter estimates of the influence of socio-economic, management and institutional factors on cost inefficiency of farmers are presented in the inefficiency section of Table 4. The signs and significance of the estimated coefficients in the inefficiency model have important implication on the cost efficiency of the farmers.

The result of the cost inefficiency effects revealed that the coefficients of age (3.28), farmers experience (0.36) and access to credit (1.38) were positive and statistically significant at ($p \le 0.01$). However, the positive and significant coefficients of farmers age, farmer experience and access to credit on allocative inefficiency model implies that these factors decreases allocative efficiency of sesame farmers. Further more, the analysis also revealed that off-sesame farm income

Table 6: Summary statistics of the efficiency of sesame production in Nasarawa state

Index	Mean	Standard deviation	Min	Max
Technical efficiency	0.6616	0.15611	0.10	0.90
Allocative efficiency	1.4194	0.96147	1.03	12.89
Economic efficiency	0.9450	0.70724	0.10	9.15

Min: Minimum; Max: Maximum; Analysis from survey data (2009)

(-0.03) was found to be negative and statistically significant at ($p\leq0.05$), while household size (-1.06) was also found to be negative and statistically significant at ($p\leq0.01$). The negative and significant of off-sesame farm income and household size indicate the higher levels at which these variables reduces allocative inefficiency of farmers. This result of off sesame farm income is in agreement with the findings of Huffman (1980) who reported that increase in non-farm work reduces financial constraints particularly for resource poor farmers and thus enable them to purchase productive enhancing inputs.

The positive and significant coefficient of education status of farmers (0.10, $p<0.05$) The result implies that, this factor led to increase in allocative inefficiency. In other words, decrease in allocative efficiency of sesame farmers in the study area generally. This is contrary to a priori expectation regarding the role of education because increase in the years of educational attainment is expected to positively translate to a better farm management decisions which include efficient use of inputs. This is because education enhances a farmer ability to seek and make good use of information about production inputs (Kepede, 2001). However, the coefficient of training was not significant at all conventional levels.

Descriptive statistic of economic efficiency sesame farmers in Nasarawa state: Economic efficiency is the product of technical and allocative efficiencies. Table 6 presents the descriptive statistics of the economic efficiency estimates of sesame production. Economic efficiency was estimated to determine how economically efficient sesame farmers are in the production of sesame.

The predicted Economic Efficiencies (EE) estimate as inverse of cost of efficiencies differs substantially among the farmers, ranging between 0.10 and 9.15 with a mean economic efficiency of 0.96 as presented in Table 5. This means that if the average farmer in the sample area were to reach the economic efficiency of its most efficient counterpart, then the average farmer could experience a cost saving of 89.7% (i.e., 1-(94.5915) x100). The same computation for the most economically inefficient farmer suggest a gain economic efficiency of 98.9% (i.e., 11-(0.10/9.15) x100).

CONCLUSION AND RECOMMENDATIONS

Based on the result of the study which analyzed the resource use efficiency among sesame farmers in Nasarawa state, with specific objectives of identifying the constraints in sesame production and determining the technical, allocative and economic efficiency in sesame production, The result revealed that Inadequate funds, high cost of fertilizer, high cost of chemical, weed control problem, inadequate improved seed, inadequate labour supply, high cost of seed and inadequate extension contact, with inadequate funds ranking highest as the most serious constraint faced by sesame farmers in the study area follow by high cost of fertilizer loosening the various constraints that sesame farmers face could possible enable them to achieve a high technical, allocative and economic efficiency. The mean technical efficiency of the farmers generally (pooled data) was 66.16 while the minimum and maximum are 10.0 and 90.0, respectively with the average farmer realizing 89.0% to achieve allocative efficient level of its most efficient counterpart. Analysis of allocative efficiency revealed that the mean allocative efficiency 141.9% with minimum and maximum at 103.0 and 1289.0%, respectively. The mean economic efficiency of the farmers generally (pooled data) was 94.5% while minimum and maximum are 10.0 and 915%, respective sesame farmers should therefore look for how to combined the various input to give them the best economic efficient level. Government should facilitates the availability of credit to sesame farmers through promotion of credit cooperative, this will reduce the constraint of inadequate funds faced by majority of the sesame farmers in the study area. Government should make fertilizer available in a subsides rate as that will reduce the constraint faced by sesame farmers. Government should look into the inherent potential in sesame business as that will increase foreign earning and local industries for processing sesame into industrial usage.

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