Economic Efficiency and its Determinants: A Case Study of Cowpea Production in the Western Agricultural Zone of Nasarawa State, Nigeria

Abstract
Most farmers in Nigeria, cowpea farmers inclusive, practice subsistence farming with low productivity and consequent inefficiencies. Cowpea related researches have however, focused more on the technical efficiency and the enterprise profitability with little or no research on economic efficiencies, particularly in the study area. It is consequent upon this gap that this study estimated the economic efficiency level and assessed the influencing factors among cowpea farmers in the western agricultural zone of Nasarawa state, Nigeria. A sample size of 160 cowpea farmers was selected using multi-stage sampling technique. The data used was collected for the 2017 farming season using structured questionnaire and was analysed using the data envelopment analysis (DEA) and tobit regression model. The study revealed that cowpea farmers in the study area operated on a small scale, at an average of 1.0 ha/farmer. Findings also indicated that, the mean technical (TE), allocative (AE) and economic efficiencies (EE) were: 0.31, 0.18 and 0.06 respectively. The implication of these results is that an average farmer in the study area has the scope for increasing TE by 69% in the short run under the existing technology. An average farmer in the study area also has the scope of increasing their allocative and economic efficiencies by 82% and 94% respectively in the short run under the existing technology. The economic efficiency was only influenced significantly by the farm size. Education, farming experience, and extension visits were not significant determinants of the economic efficiency. The study recommends for policies of government at all levels and those of all the stakeholders to discourage land fragmentation and promote efforts that encourage farmers to form strong cooperatives so that they can pool their resources together to increase their scale of operations and by so doing improve their cowpea production efficiency.

Key words: Cowpea, production, economic efficiency, determinants, farmers

Introduction

Cowpea (simply known as 'beans' in Nigeria) is one of the most economically important indigenous African legume and most versatile African crop which feeds the people, their livestock, the soil and other crops[1]. Botanically, it is called *Vigna unguiculata* L. Walp and is mostly grown in the semi-arid tropics which cover Asia, East and West Africa, Central and South America. Cowpea has its root in Africa most especially South, West and East Africa but the name cowpea probably emerged when it got to the United States of America and was used as an important feed for the Cows[2]. Most cowpeas are grown on the African continent, particularly in Nigeria and Niger which account for over 55% of world cowpea production[3]. It can be intercropped with large taller plants such as maize, millet, or sorghum particularly in high rainfall areas because of its exceptional shade tolerance as reported by the Savana Agricultural Research Institute (SARI), Kenya[4]. There is a high level of morphological diversity found within the cowpea species with large variations in the size, shape and the structure of the plant. Cowpeas can be erect, trailing or climbing. The seeds also vary in size, shape, colour and the number of seeds per pod.

Niger is the main exporter of cowpea and Nigeria is the main importer and the leading cowpea producer[3]. Outside Africa, the major production areas are Asia, Central America and South America. United States of America is the most substantial producer and exporter of cowpea in the developed world[5]. In terms of the land area for cowpea production, Niger

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has the largest area (5.2 million hectares) which is over 36% of the world total land area for cowpea production but due to their lower yield per hectare (383Kg), they are the second world producers after Nigeria that has3.6 million hectares, about 25% of the world total land area and 852Kg/ha productivity[3].

In some traditional cropping methods in Nigeria, the yield could be as low as 100 kg/ha[6]. The low productivity of cowpea in Nigeria is mostly attributed to high level of illiteracy, high cost of inputs, physical and biotic constraints, lack of high yielding seeds coupled with the use of primitive and crude tools, such as hoes, cutlasses, axes etc. However, Savana soils are also said to be inherently low in nutrients particularly nitrogen and phosphorus. Phosphorus (P) is among the most needed elements for crop production in many tropical soils. Phosphorus is critical to cowpea yield because it is reported to stimulate growth, initiate nodule formation as well as influence the efficiency of the rhizobium-legume symbiosis[7].

Cowpea's high protein content, its adaptability to different types of soil and inter-cropping systems, its resistance to drought, and its ability to improve soil fertility and prevent erosion, make it an important economic crop in Nigeria. The sale of the dry stalks and leaves (haulms) and also the husks (the dry outer covering of the seeds) as animal feed during the dry season provides a vital income for the farmers. Cowpea plays several key roles in the nutrition and economic life of many people in Nigeria and the world over. According to Usman and Fatima; cowpea has a protein content of about 23% making it a good source of plant protein. It was further reported that it has an implication in its ability to cover a gap created by inadequacy of animal protein in the diet of common people in poor countries including Nigeria[8]. Cowpea is gradually attaining its economic importance all over Nigeria even though the bulk of the production is done in the semi-arid zone of the northern part of the country[9]. The increasing socio-economic importance of cowpea may be due to its food value to both humans and livestock and ability to improve the fertility and cover for the soil against erosion. Its high protein content comparable only to that of the animals makes it a good supplementary source of protein[10]. Apart from having much protein content than the cereals, cowpea is also a good source of dietary fibre and starch, minerals and vitamins.

Most Nigerian farmers, including cowpea farmers practice subsistence farming with low productivity and consequent inefficiencies. This is mostly attributed to both technical and allocative inefficiencies resulting from the farmers' lack of access to appropriate inputs and relevant information that could guide them to higher and efficient productions. Production of the crop under unfavourable conditions like; little use of inputs, marginal farmlands and intercropping with competitive crops in some cases which mostly leads to inefficient production and consequently low economic efficiency are also common knowledge in Nigeria and most developing countries. For an economic efficiency of cowpea production to be achieved, efficiency at both allocative and technical must be achieved since economic efficiency is the totality of both technical and allocative efficiencies [11].That is to say that; economic efficiency is the result of the product of both technical and allocative efficiencies. Cowpea- related research in Nigeria has focused more on the technical efficiency and the enterprise profitability with little or no research on economic efficiencies particularly in the study area. It is consequent upon this gap that this study empirically investigated the economic efficiency and its determinants of the cowpea production in the Western Agricultural Zone of Nasarawa State Nigeria as the general objective while the specific objectives are to determine the technical, allocative and economic efficiency of the cowpea production and the attributes of the farmers that influence the economic efficiency of cowpea production in the study area. The inclusion of the investigation of the technical and allocative efficiencies is imperative since economic efficiency is the totality of both the technical and

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allocative efficiencies. This is necessary for effective analysis, informed decisions and recommendations to all the stakeholders on efficient cowpea production or otherwise not only in the study area but beyond.

Concepts of Efficiency

Based on Koopmans' and Debreu's work on the measure of efficiency [12-13], Farrell proposed that the efficiency of a firm consisted of three components; technical, allocative and economic efficiencies[11]. Technical efficiency is defined as the ability to produce a given level of output with a minimum quantity of inputs under certain technology. Allocative efficiency on the other hand refers to the ability to choose optimum input levels for a given factor prices to produce maximum output. While economic efficiency is the product of both technical and the allocative efficiencies. Thus, economic efficiency refers to the choice of the best combination of inputs for a particular level of output which is determined by both input and output prices[14]. The concept of economic efficiency in the production of cowpea is therefore associated to the criterion of value. Thus, any change that is inclined to the increase of productivity, performance of the inputs, quality and quantity of the output and higher profitability and return on investment on the one hand, and of the reduction of the total production costs on the other hand is considered to be economically efficient cowpea production and economically inefficient when it is in the contrary.

Efficiency Estimation Methods

Parametric or stochastic frontier production approach and the non-parametric or data envelopment analysis approach are the two basic approaches to efficiency estimations [15]. The stochastic frontier approach assumes a functional relationship between outputs and inputs and uses statistical techniques to estimate parameters for the function. It incorporates an error term composed of two additive components: a symmetric component that accounts for statistical noise associated with data measurement errors and a non-negative component that measures inefficiency in production [15].The disadvantage of stochastic frontier approach is that it imposes specific assumptions on both the functional form of the frontier and the distribution of the error term. In contrast, the non- parametric or data envelopment analysis (DEA) that is used in this study uses linear programming methods to construct a piecewise frontier of the data. Because it is non-parametric, data envelopment analysis does not require any assumptions to be made about functional form or distribution type. It is thus less sensitive to mis-specification relative to stochastic frontier approach. However, the deterministic nature of data envelopment analysis means that all deviations from the frontier are attributed to inefficiency.

Materials and Methods

The study was conducted in the Western Agricultural Zone of Nasarawa State, Nigeria, where cowpea production is prevalent. Nasarawa state is made up of 13 local government areas (LGAs) divided into three agricultural zones by the Nasarawa Agricultural Development Programme (NADP). The Western zone consists of four LGAs namely; Karu, Nasarawa, Keffi and Toto, with its zonal headquarters in Keffi. The agricultural zone lies within the guinea savannah climatic zone of the state with annual rainfall ranging between 1000mm and 1500mm.The zone has tropical climate marked by distinct dry and wet seasons with annual mean temperature ranging from 23^0C–37^0C. The natural vegetation in the area is of the savannah type, featuring dense tropical woodland with shrubs and grasses.

The population of interest was all the cowpea farmers of the Western Agricultural Zone of Nasarawa State while the sampling unit was the cowpea farming household. From the reconnaissance conducted in the study area, a total of 600 cowpea farmers were identified in the zone [16].This number serves as the sampling frame for the study. Using a multi-stage sampling technique, 160 sample size was generated for the study. In the first stage of sampling, 2 local government areas (Karu and Keffi) were purposively selected out of the 4 local government areas in the zone due to the prevalence of cowpea production in the two areas. The selection of 10 cowpea farmers from each of the 16 villages selected was however done through simple random sampling. The study employed primary data in its analysis and the Data collection was through the administration of a structured questionnaire in the study area for the 2017 cowpea cropping season. Information collected includes; family and hired labour input (man-days), capital input- rent on land (₦), output (Kg), input prices (₦), seeds (Kg), agro-chemicals (L).

The statistical tool used for the analysis of the primary data generated was the data envelopment analysis (DEA) production frontier model at constant rate to scale (CRS) and using the DEA Computer program software by Coalli (DEAP version 2.1) to estimate the technical, allocative and economic efficiencies of the cowpea farmers in the study area and the use of tobit regression model. Here, constant rate to scale (CRS) means that, the output changes in proportion to changes in all inputs. Data envelopment analysis (DEA) is one of the several techniques that can be used to calculate the best practiced production frontier [17]. The DEA approach provides an analytical tool for determining effective and ineffective performances of the decision making units(DMUs), in this case the cowpea farmers of the study area. While tobit regression model, which is also known as censored regression model is designed to estimate linear relationships between variables when there is a left and/or a right censoring in the dependent variables. The economic efficiencies generated through the DEA analysis are the dependent variables that were regressed against the socio-economic attributes of the cowpea farmers and some institutional-support factors like extension contacts. A two limit (left and right censored) tobit model was applied in this study because efficiency scores are bounded between zero and one (0 and 1).

Data Envelopment Analysis (DEA) Model Specifications

Data envelopment analysis (DEA) is one of the several techniques that can be used to calculate the best practiced production frontier [17].The Farrell input-oriented measure of efficiencies will be used in this study as a measure of efficiency since farms tend to have a greater control over their inputs than over their outputs. Farrell proposed that the efficiency of a firm consists of three components[11]; (1) technical efficiency, which reflects the ability of a firm to obtain maximum output from a given set of inputs; and (2) allocative efficiency, which reflects the ability of a firm to use the inputs in optimal proportions, given their respective prices and the production technology. These two measures are then combined to provide a measure of economic efficiency (also referred to as cost efficiency). The Farrell measure equals 1 for farms on the efficiency frontier, and then decreases with inefficiency as low as 0. The DEA model constructed will be based on the assumption that each cowpea farm produces a quantity of (yi,) using multiple inputs (xi,) and that each farm (i) is allowed to set its own set of weights for both inputs and output. The data for all farms are denoted by the *K* x N input matrix (X) and *M* x N output matrix (Y).): Using the DEA model specification, the TE score can be calculated for the i^{th} farm as the solution to linear programming (LP) problem below:

$$TE_n = Min_{i\theta\lambda}\theta_n \quad (1)$$

Subject to; $Y\lambda - yi \geq 0$

$\theta Xi - X\lambda \geq 0$

$\lambda \geq 0$

Where, TE is the technical efficiency, θ is the technical efficiency score having a value of $0 \leq \theta \leq 1$. If the value is = 1, the farm is on the frontier. The vector λ is an N x 1 vector of weights that define the linear combination of the peers of the i^{th} farm. The input based minimum cost for the i^{th} farm can be obtained by solving the following linear programme problem;

$$MC_i = \text{Min}_{\lambda x*i} W^T{}_i X*_I \quad (2)$$

Subject to; $Y\lambda - y_i \geq 0$

$X*_i - X\lambda \geq 0$

$\lambda \geq 0$

Where; MC_i is the minimum total cost for the i^{th} farm, W_i is a vector of an input prices for the i^{th} cowpea farm; subscript T is the transpose function; $X*_i$ is the cost minimising vector of input quantities for the i^{th} cowpea farm calculated by the linear programming, given the input prices W_i and output level yi; and λ is an Nx1constatnt vector. Equations 1 and 2 represent the cost minimisation under the constant return to scale (CRS) technology. Here, constant to scale means that, the output changes in proportion to changes in all inputs. The cost efficiency $(CE_i)_{(CRS)}$ of the i^{th} farmer can then be calculated thus;

$CE_{i(CRS)} = W^T iX*_i/W^T X_i$ which is also = the EE in terms of price of the input or = to the revenue efficiency in terms of the revenue of the output

That is; $CE_{i(CRS})$ = the ratio of the minimum cost to the observed cost given input prices and Constant Rate of Scale(CRS) technology[18].Despite having the cost efficiency or revenue efficiency being equal to the economic efficiency of a firm, the overall efficiency of a firm is still the product of the TE and the AE[19].That is; EE = TE x AE (3)

The allocative efficiency (AE) is calculated residually from equation 3 as follows:

$AE_{CRS} = EE/TE$

Tobit Regression Model Specifications

The economic efficiency estimates that are obtained through the DEA method described above were regressed on some farm and household specific attributes using the Tobit model. This approach has been used widely in efficiency literature [15].The farm and household specific factors to be regressed here include; age, school years, farming experience of the farmer, farm size and the number of extension contact a farmer had during the period.

The tobit model is specified as follows:

$U*_i = \beta o + \Sigma^k{}_{j=1}\beta_j Z_{ij} + Ui$

U_i^* = latent variable representing the economic efficiency score for the i^{th} farm;

β_0 and β_j = parameters to be estimated;

$Ui = 1$, if $U*i \geq 1$

$Ui = U*i$, if $0 < U*i < 1$

$Ui = 0$, if $U*i \leq 0$

Zij = hypothesized determinants of efficiency scores or latent variable, namely: age (years/No), household size (No), level of education (years/No) and cowpea farming experience (years/No) etc. The latent variable (U_i^*) is generated from the observed variable U_i through DEA estimation, which ranges from zero to one (0-1).

Z_1= age (years/No)

Z_2 = extension contacts (No)

Z_3 = school years (yrs/No)

Z_4 = farming experience (yrs/No)

Z_5 = farm size (ha)

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Results and Discussion

Efficiency of Cowpea Production

As shown in Table 1, the mean technical, allocative and economic efficiencies were at; 0.31, 0.18 and 0.06 in the study area, respectively. This shows that the cowpea farmers in the study area are more technically efficient than they are allocative and generally lower in terms of the economic efficiency. Meanwhile With the standard deviation (SD) of the TE, AE and EE at 0.23, 0.21 and 0.09 respectively, it shows that the variability of the results around the mean is more in TE than in AE and lower in EE. However, the coefficient of variation (CV) is higher in the EE followed by that of the AE and lowest with the TE. The smaller the CV, the more consistent the data is and the better for predictability due to lower dispersion of the results.

Table 1.0: Descriptive statistics of the Efficiencies

Statistics	Technical Efficiency (TE)	Allocative Efficiency (AE)	Economic Efficiency (EE)
Maximum	1.0	0.84	0.42
Minimum	0.03	0	0
Mean	0.31	0.18	0.06
Standard Deviation	0.23	0.21	0.09
Coefficient of Variation	74.2	117	150

Source: Field survey, 2018

Estimated Technical Efficiency of the Respondents

The frequency distribution of the technical efficiency levels of the respondents in the study area as presented in Figure 1 indicates that respondents whose technical efficiency ranged from; 0 – 0.13 constituted about 19% of the respondents, 0.14 – 0.27 (35%), 0.28 – 0.41(26%), 0.42 – 0.55(10%), 0.56 – 0.69(1.3%), 0.70 – 0.83(2%) and 0.84 – 1(6%) with the minimum and maximum efficiencies at 0.03 and 1 respectively. Meanwhile, the mean technical efficiency is at 0.31. This implies that majority (about 70%) of the respondents in the study area produced below the technical efficiency frontier(1) and that an average farmer in the study area has the scope for increasing TE by 0.69 in the short run under the existing technology. The results also showed that on the average, over 61% of the farmers in the study area were not able to obtain up to 50% technical efficiency level from a given mix of production inputs. These results are consistent with those of Sabiko and others[20], who reported mean technical efficiency of about 0.4 but inconsistent with those of Sofoluwe and others[21-24],who reported mean technical efficiency; 0.66, 0.87, 0.89, 0.76 respectively as against the 0.31 mean TE in the current study.

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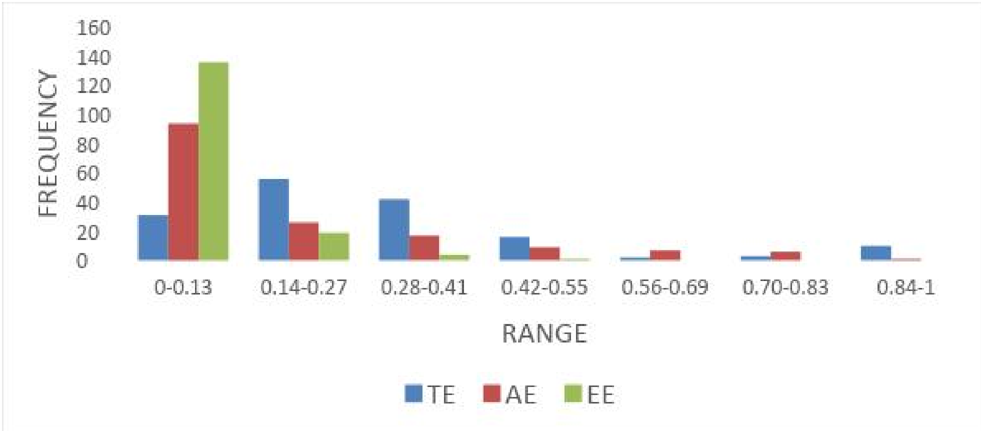

Figure 1.0: Frequency distribution of the TE, AE and the EE

Estimated Allocative Efficiency of the Respondents

The frequency distribution of the allocative efficiency of the respondents in the study area is shown in Figure 1. It shows that those within the range of 0 – 0.13 were in the majority (58.7%) while, the remaining ranges and percentages were as follows: 0.14 – 0.27(16.3%), 0.28 – 0.41(10.6%), 0.42 – 0.55(5.6%), 0.56 – 0.69(4.4%), 0.70 – 0.83(3.8%) and 0.84 – 1(0.63%). From the allocative efficiency ranges, no cowpea farmer reached the frontier (1) in the study area and over 85% of them could not even reach the 50% allocative efficiency level of 0.5. The mean AE was at 0.18. This indicates that an average farmer in the study area has the scope for increasing allocative efficiency by up to 82% in the short run under the existing management, prices of inputs and output to be able to reach the frontier(1). However, the result tend to agree with those reported by Kenneth and others[15], who had mean allocative efficiency in eastern Uganda to be around 0.2, but at variance with those of Jimjel and others[25], who reported the mean allocative efficiency to be at 0.66. These results generally imply that majority of the cowpea farmers were not able to apply the right combinations of available inputs given the current input prices in such a manner that could minimize their overall production costs and improve their allocative efficiencies (0.18).The implications of the low allocative efficiency result of the cowpea operations in the study area means that, the farmers were not able to equate the ratio of marginal product of inputs with the ratio of their prices[26].That is to say that, the prices of output were low while those of inputs were high and the allocations and distribution of both inputs and output were improper to the extent of making the whole process costly and therefore unprofitable. The low allocative efficiency had a direct effect on the economic efficiency of the farm since economic efficiency is the product of TE and AE.

Estimated Economic Efficiency of the Respondents

Figure 1 also shows the frequency distribution and the ranges of the economic efficiency results obtained. The efficiency ranges and their equivalent percentages were as follows: 0 – 0.13 (85%), 0.14 – 0.27(11.9%), 0.28 – 0.41(2.5%), 0.42 – 0.55(0.63%), 0.56 – 0.69(0%), 0.7 – 0.83(0%) and 0.84 – 1(0%). None of the respondents reached the frontier production level of 1 and the best performing famers produced at 0.42 while the least was zero (0). The mean, highest and the least economic efficiency levels were at, 0.06, 0.42 and 0.0 respectively. These scores are quite low as it shows that cowpea farmers in the study area were producing inefficiently and therefore making insignificant profit from their operations. These results are at variance with that of Kenneth and others [15], who had higher economic efficiency of 0.60 in their studies. Meanwhile, at 0.06 mean economic efficiency, it means that majority of the

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respondents in the study area are yet to achieve their best in terms of reaching the frontier (1) and it also means that the average efficiency score for cowpea production in the study area was just 6%, meaning that they produced at 94% inefficiently. This indicates that the overall profitability of cowpea production in the study area is negatively affected since profitability is highly associated with economic efficiency of any agricultural production or any production for that matter. The low economic efficiency scores have been confirmed by the presence of both low technical and allocative efficiency results for their operations as shown in Figure 1. With the low EE therefore, it means that both the allocative and the technical efficiencies were both not high enough to support higher economic efficiency since economic efficiency is the product of the TE and AE. It is also evident from this study that economic efficiency (EE) of the cowpea farmers could be improved substantially and that low allocative efficiency constitutes a more serious problem than technical efficiency judging from the average technical and allocative efficiencies obtained in the study area; 0.31 and 0.18 respectively. Generally however, both the technical efficiency (0.31) and allocative efficiency (0.18) are serious problems to the cowpea production in the study area, vis-à-vis economic efficiency. It is worthy of note to mention that some cowpea farmers in the study area had zero (0) economic efficiency which means, though they harvested some products, they recorded a loss after all the analysis of inputs and output were carried out during the season under review(2017 cowpea cropping season). The mean economic efficiency was 0.06. For the average cowpea farmer here to reach the frontier (1), he or she must strive to improve on the economic efficiency performance by up to 0.94(94%). These results really show that cowpea production in the study area is very poor and virtually done at a loss. There is therefore urgent need for the attention, involvement and collaboration of all the stakeholders of the cowpea production in the study area in particular and Nigeria in general to arrest the situation before cowpea production is abandoned, since efficiency and by implications, profitability is the driving force behind every production.

Determinants of the Economic Efficiency

The results in Table 2 show the estimates of the two-limit tobit regression of selected socio-economic and institutional-support factors against farmer-specific economic efficiency scores. The explanatory variables chosen for the regression were; age, years spent in school, farming experience, farm size and extension visit. Among the selected variables, the farm size positively and significantly influenced the economic efficiency at 5% significance level. That is to say that increasing the farm size translates into increase in the economic efficiency of the farmers. This result is similar to what were observed in previous studies by different researchers [10,15,22-23.25,27-28].They observed that farm size was significant and positively affected the efficiency. However, it is at variance with the observations of Sofoluwe and others [21,24]; where plot size was not one of the positive influencing factors of the economic efficiency. The result of the efficiency model shows that the coefficient estimates for school years, farming experience and extension visit were not statistically significant. This implies that these characteristics did not contribute to economic efficiency in the cowpea production in the study area. The age however shows negative impact but not significant, which goes to show that increase in age of the cowpea farmers in the study area affects their economic efficiency negatively. This agrees with what Otitoju and Arene [29] have found out in their study, that; the age of farming household heads have an inverse relationship with productivity of farmers in Nigeria. They argued that this was understandable since it was expected that as a farming household head becomes older, the farmer's productivity would decline.

Table 2.0: Tobit Regression Estimates of Factors Influencing Economic Efficiency.

Variable	Coefficient	Standard Error	T-Value
Constant	0.0038	0.0318	0.121
Age	- 0.002	0.0007	-0.121
School Years	0.001	0.0014	0.71
Farming Experience	0.0014	0.001	0.14
Farm Size	0.032	0.0095	3.33
Extension Visit	0.0025	0.0023	1.09

Source: Field survey, 2018

Conclusion

The main objective of this study was to estimate the economic efficiency level and to assess its determinants among cowpea farmers in the western agricultural zone of Nasarawa State, Nigeria. It was established that the mean economic efficiency was 0.06(6%) and therefore 94% production inefficiency. Although there was a large discrepancy between the most efficient and the least efficient farms, farmers having higher farm sizes showed a significantly higher efficiencies than those with smaller plots. These results generally imply that majority of the farmers were not able to apply the right combinations of available inputs or that the right inputs were not available in such a manner that could minimize their overall production costs and improve farm efficiency. The tobit regression model estimation revealed that economic efficiency was positively influenced by farm size alone (at 5% level); and negatively influenced by the age of the farmers at 10% level of significance. The average farm size was 1.0 ha indicating that farmers here operate at small scale. Since economic efficiency is the product of both technical and the allocative efficiencies, the two efficiencies were also determined and the following results were obtained; mean technical and allocative efficiencies were: 0.31 and 0.18 respectively. Judging from the economic efficiency scores obtained, cowpea production in the study area was highly produced inefficiently and this calls for urgent concern and attention from all the stakeholders, especially the policy side.

Recommendations

Since the economic efficiency is the product of both the technical and allocative efficiencies, efforts geared towards improving the economic efficiency of the cowpea farmers should be holistic and inclusive of both the technical and allocative efficiencies.

The government of Nigeria and the agricultural sector-oriented NGOs need to introduce policies and sensitize farmers against land fragmentation since this would help enhance economic efficiency.

There is also need for the government and non-governmental organizations in the agricultural sector to train farmers on entrepreneurship so that they can divest their farm profits into other income generating activities through which they will acquire the needed farming capital and better their efficiency significantly. This initiative will also reduce over-dependence on farm produce and provide alternative employment to the young people in the area.

Commitment and synergy between all the stakeholders in the area of promotion of efforts that encourage farmers to form strong cooperatives so that they can pool their resources together to increase their scale of operations, share information and to increase their communication levels so as to improve their cowpea production efficiency is also recommended.

Bearing in mind the role of cowpea in the socio-economic life of an average Nigerian cowpea farmer, consumers and the middle men, there is an urgent need for intervention through synergy of all the stakeholders; especially the policy makers, NGOs, researchers, the farmers themselves etc of the cowpea production in the study area in particular and Nigeria in general to arrest the problems of inefficiencies before cowpea production is abandoned, since efficiency and by implications, profitability is the driving force behind every production. In so doing, cowpea farmers in the study area will become more economically efficient in production and therefore make more profit from their operations.

Finally, there is need for further studies and collaboration between all the stakeholders, especially the government extension departments, agricultural sector related NGOs, researchers and the farmers themselves to look into the reasons behind why the levels of education of the farmers, extension contacts and the farming experience did not affect the economic efficiency which is generally against the a priori expectations, so as to ascertain the true position of their roles both in the study area and Nigeria in general. The outcome will help in adjustments or re-design of appropriate models that could help in cowpea production efficiency not only in the study area but Nigeria in general.

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