



Production Efficiencies of the Nigerian Agricultural Insurance Corporation (NAIC) Insured and Non-NAIC Insured Livestock Farmers in Kwara State, Nigeria

Ojetunde Babatunde Stephen^{1,a}, Odum Egbodo Boheje Emmanuel^{2,b,*}, Adewumi Olaniyi Matthew^{3,c}

¹Department of Economics, Federal University, Lokoja, Kogi State, Nigeria

²Department of Agricultural Economics and Extension Service, University of Benin, Benin City, Nigeria

³Department of Agricultural Economics and Farm Management, Faculty of Agriculture, University of Ilorin, Ilorin, Nigeria

*Corresponding author

ARTICLE INFO

ABSTRACT

Research Article

Received : 13/06/2020

Accepted : 29/11/2020

Keywords:

Production efficiency

NAIC

Livestock farmers

Beneficiaries

Non-Beneficiaries

This study used structured questionnaire to randomly collect data from livestock farmers insured under the NAIC scheme and their counterparts not under the NAIC scheme in Kwara State. The study comparatively examined their socio-economic characteristics and production efficiencies using The Stochastic Frontier Analysis and t-test. Results from the study showed that not enough youths participate in livestock production in the study area and it is a male dominated activity. A lot of non-beneficiaries of the NAIC intervention scheme are not members of cooperatives and losing out in the benefits of cooperative membership. The insured farmers are more efficient compared to those that were not insured with both having potentials for increasing their efficiency of production at the moment. The study therefore recommend that youths of ages 35years and below be encourage and provided some incentives to participate in livestock farming as well as women to check the gender imbalance of male dominance. Awareness of NAIC intervention schemes is created for livestock farmers who are not registered for the scheme while beneficiaries are made ambassadors of the scheme to have it promoted to non-beneficiaries. Livestock farmers that do not belong to any cooperative are recommended to form or belong to one so as to access the benefits of belonging to a cooperative group. The study also recommends that stakeholders in the Nigerian Agricultural insurance subsector develop strategies that will encourage much participation in their insurance interventions and also create more awareness among farming households to encourage participation in the program.

^a stephen_dunmola2002@gmail.com ^b <https://orcid.org/0000-0003-2675-9114> ^c matolade@yahoo.co.uk ^d <https://orcid.org/0000-0002-5740-5207> ^e <https://orcid.org/0000-0002-4286-7548>



This work is licensed under Creative Commons Attribution 4.0 International License

Introduction

A major challenge with livestock production is sudden death occasioned by certain disease outbreak which causes terrible losses to the farmer (Epetimehin, 2010). This loss can be reduced to the barest minimum through sufficient feeding, provision of veterinary services, quarantine and culling of infected animal to stop the further spread of transmittable diseases. However, irrespective of a farmers' preparedness, he may still suffer some losses, hence the need to have his livestock insured so as to get some form of compensation in the event of any disease outbreak (Nnadi et al., 2013). However, one way to ascertain that a livestock farmer is productive is how efficient he is utilizing the available resources in his possession for maximum profit. With limited or no access to insurance and financial services but with maximum exposure to

diseases and other natural hazards and with little ability to manage weather risks on their own (Syroka and Wilcox, 2006), livestock farmers are still productive (Pelling, 2007). We may thus define their productivity as a measure of the efficiency with which they employs land, labour, capital and other resources to produce outputs that feed the animal protein value chain.

Farell (1957) identified two types of efficiency to be technical/production and allocative efficiencies. They based the measurement of a farm specific production efficiency on deviations of observed output from the best rational combination of inputs or efficient production frontier. Conversely they defined production efficiency as the ability of a farm to produce a give level of output with a minimum quantity of inputs under a given technology.

Generally, efficiency analysis is associated with the possibility of farms producing a certain level of output from a given bundle of resources or certain level of output at least cost. Maximum efficiency is attained when it becomes impossible to reshuffle a given resource combination without decreasing the total output (Adebayo, 2006). Farm productivity is therefore measured as the ratio of final output (in appropriate units), to some measure of inputs. Increasing agricultural productivity requires an increase in the input and output with increasing proportionately more than inputs; an increase in output while inputs remain the same; a decrease in both the output and input with input decreasing more; or decreasing input while output remains the same (Oni et al., 2009).

One sure way of ensuring agricultural productivity and minimizing losses is the provision of an agricultural insurance for a farm chiefly because important problems faced by farmers and agricultural business enterprises is that agricultural activities are characterized by risk and uncertainties because of its predominant dependence on nature. Additionally, small farmers in many emergent nations worldwide including Nigeria are trapped in the 'vicious' cycle of poverty because their farm output and earnings are small leaving them with nearly no saving but in a vicious cycle of poverty (Ajakaiye and Adeyeye, 2001). To take small holders farmers out of the 'vicious' cycle of poverty, Aina and Omonona (2012), states Agricultural Insurance Scheme for farmers would ensure the stabilization of returns, employment, prices and supplies of products from agriculture through regular and deliberate savings and accumulation of funds in small installment by many farmers in favorable time periods, to protect some or few participants in bad time periods. Aliero & Mukhtar (2012), also stated that insurance schemes use combination of method by persuading a large number of individual to pool their risks into a large group to minimize overall risk. They further affirmed that insurance is needed in rising countries particularly among poor where vulnerability to risk is much greater and few opportunities available to pull through the loss.

With the identification of Agricultural insurance as a panacea to the doubt and attendant disenchantment expressed by credit institutions following the multifarious risks and uncertainties in agriculture, the Government of the Federal Republic of Nigeria, initiated her national Agricultural insurance scheme (NAIC, 2017). Nnadi et al. (2013), affirmed that the Nigerian government initiated and established the Nigerian Agricultural Insurance Scheme (NAIS) in 15th November 1987 and in 1988 incorporated the Nigeria Agricultural Insurance Company as a specialized Agricultural Insurance Company to offer insurance cover to farmers. The performance of the Scheme was vested on the Nigerian Agricultural Insurance Company Limited, but was later incorporated in June 1988 then turned into a Corporation in 1993. The mandate was to offer farmers protection to void natural disaster occurrence and ensures proper payment of proper compensation, sufficient enough to keep farmers in production after experiencing losses.

The NAIC model was two pronged: firstly, it provided the government with back-up and information on agricultural expansion in the country. Secondly, the scheme offers insurance for farmers in arable crops, crops,

and livestock or combination of all. However, the scheme broad intent is to save the Nigerian farmers from suffering from natural hazards by introducing several ways of prevention that will ensure a prompt disbursement of fitting compensation sufficient to uphold the farmers in business while going through severe loss. Despite the numerous benefits and value of Agricultural insurance, farmers have not wholly welcomed the idea of being insured (Zahedi, 2007). However, there seem to be a slow but gradual rise in awareness and embracing to Agricultural insurance plans locally in Nigeria (Nahvie et al., 2014). This may be due to the fact that insurance of agricultural products increases the farmers' skill to manage agricultural risk and allows that they can increase investment in agricultural (OECD, 2008; Romun and Yuanyony, 2008)

With recent uncertainties and disease outbreaks such Bird flu, fetal abortion, animal poxes and the like, farmers have began embracing agricultural insurance. Recent studies such as that of Asante et al. (2014) and Falola et al. (2013) have attested to the fact that farmers are embracing innovations and have had their production performance improved. Therefore, this study also seeks to provide answers to the questions of who are the livestock farmers insured by the Nigerian Agricultural Insurance Corporation, How have their insurance improved their production efficiency and what are the determinants of production efficiency in comparison with other livestock farmers that did not participate in the NAIC scheme in the study area. This study specifically examined the socio-economic characteristics, analyzed the production efficiency and identified the determinants of production efficiency of NAIC insured livestock farmers and compares it with that of non – NAIC insured in the study area.

Materials and Methods

Study Area, Source of Data, Sampling Procedures and Method of Data Analysis

The study area was Kwara state, Nigeria. Structured questionnaires were used to collect data from respondents by adopting a two-stage sampling technique. The first stage involved random selection of 80 livestock farmers from the list of insured farmers obtained from Nigeria Agricultural Insurance Corporation (NAIC) Ilorin Branch Office and Kwara Commercial Microfinance Banks (KCMB) that gives loans to the farmers in the state. The second stage involves the random selection of while 80 non-insured farmers selected across the state using snowball sampling technique by contacting the farmers individually to make a total of 160 respondents.

Descriptive statistics and inferential were tools used in analyzing data from this study. Frequency tables, percentages, and average were used to describe the socio-economic characteristics of livestock farmers who are beneficiaries and non-beneficiary of the NAIC scheme. The stochastic frontier model of Cobb-Douglas functional form was used to compare the level of production efficiency of the beneficiaries and the non-beneficiaries as well as identifying the determinant of production efficiency of the beneficiaries and non-beneficiaries. The Student's t – test of significance was used for comparing the technical efficiency and output of the respondents.

Model Specification

The stochastic Frontier Production

The Cobb-Douglas functional form was used because the functional form meets the condition of being self-dual, it allows examination of economic efficiency and it has been applied in many empirical studies (Coelli et al., 1998; Ambali et al., 2012) is specified as;

$$\ln Y_i = f(X_i; \beta) e^{(V_i - \mu_i)} \quad (1)$$

Where;

- $i = 1, 2, 3, \dots, n$ farms
- Y_i = Production of the i^{th} firm
- X_i = $k \times I$ vector of input quantities of the i^{th} firm
- β = Vector of unknown parameters
- V_i = Random variables which are assumed to be $(N(0, \sigma^2))$ and independent of μ_i
- μ_i = Non-negative random variables which are assumed

The Cobb-Douglas form of the frontier adopted for this research is written in explicit form as follows:

Cobb-Douglas frontier production function

$$\ln Y_i = \beta_0 + \beta_1 \ln X_1 + \dots + \beta_5 \ln X_5 + V_i - \mu_i \quad (2)$$

Where

- Y_i = Output
- X_1 = Number of heads
- X_2 = Feeds
- X_3 = Vaccines
- X_4 = Labour in Man day
- X_5 = Capital
- X_6 = Loan
- V_i = Random error due to stochastic noise.
- μ = Random error (technical inefficiency).
- $(V-\mu)$ = error term.
- β_0 = Intercept
- $\beta_1, \beta_2, \beta_3, \beta_4$ and β_5 are production function parameters to be estimated.

Inefficiency Model

$$\mu_i = \delta_0 + \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6 + \delta_7 Z_7 \quad (3)$$

Where:

- μ_i = Inefficiency effect
- Z_1 = Age (years)
- Z_2 = Household size
- Z_3 = Educational level (years)
- Z_4 = Membership of cooperative rated 1 if household head was a member and 0 if otherwise
- Z_5 = Sex (male = 1, female = 2)
- Z_6 = Farming experience
- Z_7 = Remittance (Naira)
- $\delta_1, \delta_2, \delta_3, \delta_4, \delta_5$ and δ_6 are model of inefficiency parameters to be estimated with the variance parameters δ^2 and γ .

The sigma square (δ^2) and the gamma (γ) coefficients are the analytical statistics that prove the relevance of stochastic production frontier function used and the correctness of the assumption made on the distribution form of the error term. The estimates of all the parameters

of the stochastic frontier production function and the inefficiency model were obtained at the same time using the Program FRONTIER version 4.1 (Coelli, 1995).

V_i = the random variability in the production that cannot be predisposed by the farmer. V_i s are understood to be independent and identically distributed random errors having normal $N(0, \sigma^2)$ distribution and independent of μ .

μ : Deviation from the maximum potential output ascribed to technical inefficiency. The μ_i assumed to be non-negative truncation of the half-normal distribution $N(\mu, \sigma^2)$. In the concept of stochastic frontier production function, the technical efficiency (defined as the proportion of observed output to the equivalent frontier output trained on the levels of input used) of the individual farmer, modelled for the study is given as:

$$TE_i = \frac{Y_i}{Y^*} = \frac{f(X_i; \beta) \exp(V_i - \mu_i)}{f(X_i; \beta) \exp(V)} = \exp(-\mu_i) \quad (4)$$

Where;

- TE = Technical efficiency, ranges from 0 and 1.
- Y_i = Observed output from farm
- Y^* = Frontier output

Student's t-test of Significance

The Student's t – test is specified as:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2 + s_2^2}{n_1 + n_2}}} \quad (5)$$

Where,

- \bar{X}_1 = Mean of X_1 variable (non-beneficiaries)
- \bar{X}_2 = Mean of X_2 variable (beneficiaries)
- S_1^2 = Variance of X_1 variable
- S_2^2 = Variance of X_2 variable
- n_1 = Number of beneficiaries' respondents
- n_2 = Number of non-beneficiaries respondents

Results and discussion

Socio-Economic Characteristics of Livestock Farmers

The socio-economic characteristics of livestock who are beneficiaries and non-beneficiary of the NAIC scheme is presented in Table 1. The results in Table 1 show that livestock farming in Kwara state is a male dominated enterprise with about 82.5% and 85% males respectively for both beneficiaries and non-beneficiaries. The mean age of the beneficiaries and non-beneficiary was 45 years. The distribution of the farmers by their age suggests that majority of both the beneficiaries and non-beneficiaries were young and agile respectively which imply that most of the farmers in the study area are still in their productive and useful ages. These results are in conformity with the findings of Adekunle et al. (2009) and Muhammad-Lawal et al. (2009) that there is wide spread apathy for agriculture among young and growing people. 100% and 86.3% of the beneficiaries and non-beneficiaries respectively were married suggesting that livestock farming in the area is dominated by married people that uses farming as a means of catering for the family and the family serving as a source of farm labour in tandem with Falola, (2015).

Table 1. Distribution of the Livestock Farmers by their socio-economic characteristics (N=80, %)

Variable	B	NB
Gender		
Male	66 (82.5)	68 (85.0)
Female	14 (17.5)	12 (15.0)
Age (years)		
≤35	9(11.2)	19(23.8)
36 – 40	13(16.4)	9(11.2)
41 – 45	23(28.7)	17(21.2)
46 – 50	21(26.2)	12(15.0)
51 – 55	8(10.0)	15(18.8)
>55	6(7.5)	8(10.0)
Mean	45.28	45.08
Marital Status		
Single	0(0.0)	10(12.5)
Married	80(100.0)	69(86.3)
Widowed	0(0.0)	1(1.3)
Household Size		
≤5	29(36.3)	25(32.3)
6 – 9	44(55.0)	47(58.8)
10 – 13	5(6.3)	4(5.0)
>13	2(2.5)	4(5.0)
Mean	6.44	6.63
Level of Education		
No Formal Education	2(2.5)	4(5.0)
Formal Education	78 (97.5)	76 (95)
Farming Experience(years)		
≤5	9(11.3)	7(8.8)
6-10	39(48.8)	25(31.2)
11-15	22(27.5)	18(22.5)
16-20	5(6.3)	8(10.0)
21-25	3(3.8)	10(12.5)
>25	2(2.5)	12(15.0)
Mean	11.00	16.00
Mem. of Cooperative		
Yes	60 (75.0)	32 (40.0)
No	20 (25.0)	48 (60.0)
Benefits of Men of Coop.	N = 60	N = 32
Access to Credit	28(46.7)	10(31.3)
Input supply	5(8.3)	12(37.5)
Marketing of Produce	12(20.0)	8(25.0)
Technical Assistance	15(25.0)	2(6.2)

B: Beneficiaries, NB: Non-Beneficiary, Source: Field survey, 2016. Note: The values in parenthesis are percentages

Table 2. Technical efficiencies of NAIC beneficiaries and non-beneficiaries in Kwara State (N=80%)

Efficiency Range	B	NB
≤0.40	0(0.0)	26(32.5)
0.41 - 0.60	0(0.0)	31(38.8)
0.61 - 0.80	18(22.5)	10(12.5)
0.81+	62(77.5)	13(16.3)
Minimum	0.64	0.23
Maximum	1.00	1.00
Mean	0.87	0.54

B: Beneficiaries, NB: Non-Beneficiaries, Source: Field survey, 2016. Note: The values in parenthesis are percentages

The mean household size of the respondents ranged between 6-7 persons for both beneficiaries and non-beneficiaries respectively. On their level of education, 97.5% of beneficiaries had one form of formal education or

the other while 2.5% had no formal education at all whereas 95% of non beneficiaries were educated while 5% were not educated. This distribution may imply that some form of agricultural insurance intervention to cover all categories of farmers. Beneficiaries of NAIC scheme had a mean farming experience of 11year while non-beneficiaries had 16years mean farming experience. This is important as the farming experience of an individual could contribute to skills acquired over the years and determine their eligibility to participate in the NAIC scheme. Also about 75% and 40% of beneficiaries and non-beneficiaries respectively were members of Cooperative groups with benefits of membership to include access to credit, collective input supply, group marketing of produce and technical assistance and other extension services respectively.

Technical Efficiencies of Livestock Farmers

The result of analysis in Table 2 show that 77.5% of beneficiaries of the NAIC scheme had a production efficiency of 81% and above, while 22.5% of the livestock farmers have between 61 – 80 % efficiency. The mean technical efficiency score of the beneficiaries is 87% thus, there is still potential (about 13%) for increasing output at the given level of inputs being used to attain maximum efficiency. Also majority of non-beneficiaries 38.8% have production efficiency ranging from 41 – 60% with 32.5% have production efficiency ranging from 21 – 40% and 12.5% have technical efficiency score ranging from 61 – 80% while the remaining 16.3% have technical efficiency above of 81% and above. The mean efficiency score of the non-beneficiaries is 0.54 with a minimum value of 0.23 and a maximum value of 1.00. The mean efficiency score still show some inefficiency in livestock farming in Kwara State, thus the findings of Kareem et al. (2008) that majority (greater than 56%) of the Livestock farmers have technical efficiency score ranging from 0.8 – 0.9 is corroborated.

Comparison of The Technical Efficiency

The result from the Table 3 shows that the Production efficiency and the output level of both the beneficiaries and non-beneficiaries at 5% significance. The result from the table implies that those that are beneficiaries of NAIC have higher profit than those that are not beneficiaries and also looking at their efficiency levels; the beneficiaries are more efficient than those that are non-beneficiaries and in line with Falola et al. (2013). The result also agreed with Kara et al. (2015) on the comparative economic analysis of beneficiaries and non-beneficiaries of fadama II project in Sardauna Local Government Area of Taraba State, Nigeria.

Determinants of Production Efficiency

The maximum likelihood estimates shows the determinants of the production efficiency for the beneficiaries and non-beneficiaries of NAIC in Kwara state are presented in Table 4. The positive coefficient for Beneficiaries and Non-beneficiaries indicated that increasing those variables by one percent either individually or collectively holding other variables constant, would lead to increase in the output, respectively. The negative coefficient implies that a decrease in any of the variables by one percent, holding others constant, would reduce in the output by one percent.

Table 3. Production efficiency and the output of beneficiaries and non-beneficiaries.

Variable	Mean		Diff	t-value
	Control	Treated		
Profit (N)	180035.90	68332.26	111703.70	4.61**
Production efficiency(TE)	0.87	0.54	0.33	12.93**
Output (Kg)	6555.15	3732.19	2822.96	2.23**

Source: Field Survey, 2016. Note: ** represent significance at 5%

Table 4. Maximum Likelihood Estimates of the production frontier for the Beneficiary and Non-Beneficiary of NAIC in Kwara state

Variable	P	Beneficiaries	Non-beneficiaries
		Coefficient	Coefficient
Efficiency model			
Constant	β_0	2.7782**(24.1042)	3.7445**(26.9909)
No of herds	β_1	0.0001**(6.9887)	0.002**(8.0915)
Feeds	β_2	0.00005**(3.0491)	0.00004**(3.6053)
Vaccines	β_3	0.0605**(4.3417)	-0.0207(-1.9517)
Labour	β_4	0.0051(0.1734)	0.0212(0.7120)
Capital	β_5	0.000006(0.0245)	-0.000006(-1.5474)
Loan	β_6	0.00002**(6.2537)	0.00007**(4.4379)
Inefficiency model			
Constant	δ_0	0.4606**(4.0052)	0.8314**(2.8248)
Age	δ_1	-0.0038**(-2.3691)	0.0005(0.0903)
Household size	δ_2	0.0028(0.5453)	-0.0357(-1.5035)
Educational Status	δ_3	0.0010(0.3258)	0.0218**(2.3713)
Mem. of Cooperative	δ_4	0.0459(1.6417)	-0.3483**(-3.4039)
Sex	δ_5	0.0193(0.5920)	0.1355(1.0746)
Farming Experience	δ_6	-0.0262**(-4.0265)	-0.0136**(-2.0977)
Remittance	δ_7	0.00001**(2.0691)	0.000005(0.4477)
Sigma square	δ^2	0.0126**(6.3872)	0.1159**(4.8699)
Gamma	Γ	0.0768**(3.4430)	0.9999**(22.8218)
Log-likelihood ratio		0.0062	-15.9391
Log-likelihood test		0.0017	30.3132

Source: Field Survey, 2016. Note: ** represent significance at 5%. The values in parenthesis represent t-values.

As shown in the Table 4, four variables- number of herds, feeds, vaccines and loans- were significant in determining the output of the beneficiaries and non-beneficiaries. The coefficient of number of herd was positive and very highly significant at 5%, implying that it increases the beneficiaries and non-beneficiaries output by about 0.0001% and 0.002% respectively. The coefficient of feed was also positive and significant at 5%. This means that a unit increase in the feed fed to the livestock by both the beneficiaries and non-beneficiaries had the tendency of increasing their output by 0.00005% and 0.00004% respectively. This means that all the resources have been efficiently utilized by the farmers.

The coefficient of vaccines was also positive and significant at 5% for the beneficiaries while the coefficient of vaccines for the non-beneficiaries was negatively significant at 10% which implies that the vaccines used by both the beneficiaries and non-beneficiaries had the tendency of increasing their output by 6.5% and 2.1% respectively. The coefficient of Loan was positive for both the beneficiaries and non-beneficiaries and was significant at 5% which implies that the loans obtained by the beneficiaries and non-beneficiaries had tendency of increasing their output by 0.00002% and 0.00007% respectively and also implies that the loans acquired were efficiently used.

The table further shows that age, farming experience and remittance were the significant variables influencing technical efficiency of the beneficiaries while the significant variables

influencing technical efficiency of the non-beneficiaries were educational level, membership of cooperative/ADP and farming experience. The coefficient of farming experience for both beneficiaries and non-beneficiaries was significant at 5% respectively and positively related to the technical efficiency. This implies that the more years an individual has been in farming, the more the technical efficiency are likely to be vice versa. This could result from the fact that those who have much experience are much likely to have acquired relevant skills to have could improve their technical efficiency better than the experienced ones. This conforms to a priori belief and is in line with some previous findings (Amodu, et al, 2011; Aung 2012).

Also the coefficient of Age was also significant at 5% for the beneficiaries while it is not in the case of non-beneficiaries. The coefficient suggests that a unit increase in the age of the non- beneficiaries had the tendency of increasing the technical efficiency by 0.38%. However, the coefficient of the Age of the household heads of the non-beneficiaries was negative though it was not significant. This might result from the fact that aged farmers are likely less active and innovative to labour as such not necessarily be technically efficient (Ali et al, 2012). The coefficient of the membership of Cooperative was not significant for the beneficiaries but significant at 5% for non-beneficiaries. This implies that membership of cooperative has positive influence on the non-beneficiaries output and therefore implies that as the farmers are becoming members of cooperative, it has the tendency of increasing their

technical efficiency by 3.5%. It is noteworthy that despite the fact that the membership of cooperative/ADP was not significant in influencing the technical efficiency of the beneficiaries but has positively coefficient. Also, the coefficient of the remittance was significant at 5% for the beneficiaries and has tendency to increase the technical efficiency of the beneficiaries by 0.00001% which implies that the remittance gotten by the beneficiaries was efficiently utilized. On the contrary, remittance of the non-beneficiaries was not significant but has positive relationship with technical efficiency by increasing the technical efficiency of the non-beneficiaries.

Conclusion and Recommendations

Based on the findings of this study, we conclude that not enough youths participate in livestock production in the study area. Livestock production is a male dominated activity. A lot of non-beneficiaries of the NAIC intervention scheme are not members of cooperatives and hence losing out in the attendant benefits of cooperative membership. The insured farmers are more efficient compared to those that were not insured with both having potentials for increasing their efficiency to take care of some measure of inefficiency obtainable in their production at the moment.

The study therefore recommend that youths of ages 35years and below be encourage and provided some incentives to participate in livestock farming as well as women to check the gender balance of male dominance. Awareness of NAIC intervention schemes be created for livestock farmers who are not registered for the scheme while beneficiaries be made ambassadors of the scheme to have it promoted to non-beneficiaries. Livestock farmers that do not belong to any cooperative are recommended to form one so as to access the attendant benefits of belonging to a cooperative group. The study also recommends that stakeholders in the Nigerian Agricultural insurance subsector develop strategies that will encourage much participation in their insurance interventions and also create more awareness among farming households. This will motivate more farmers to partake in the program.

References

Adebayo EF. 2006. Resource use efficiency and multiple production objectives of dairy pastoralists in Adamawa state, Nigeria. Unpublished PhD thesis, University of Ibadan.

Adekunle OA, Adefalu LL, Oladipo FO, Adisa RS, Fatoye AD. 2009. Constraints to youths' involvement in agricultural production in Kwara State, Nigeria. *Journal of Agricultural Extension*, 1:102 – 108.

Ajakaiye DO, Adeyeye VA. 2001. "The Nature of Poverty in Nigeria. Technical Report, NISER, Ibadan

Aina OS, Omonona BT. 2012. Nigerian Agricultural Insurance Scheme (NAIS): Prospect, achievement and problems. *Global Adv Res J Agric. Sci*, 1(5): 97 – 103.

Aliero HM, Muktar S. 2012. The Prospects of Micro-Insurance in the Rural Areas of Nigeria. *European Scientific Journal*, 8(3): 66-76.

Ambali OI, Adegbite DA, Ayinde IA, Oyeyinka RA. 2012. Comparative analysis of technical efficiency of beneficiary and non-beneficiary food crop farmers of Bank of Agriculture in Ogun State, Nigeria. *ARNP Journal of Agricultural and Biological Science*, 7(12): 1038-1047.

Amodu MY, Owolabi JO, Adeola SS. 2011. Resource use efficiency in part-time food crop production. The stochastic frontier approach. *Nigerian Journal of Basic and Applied Science*, 19(1): 102-110.

Asante BO, Wiredu AN, Martey E, Sarpong DB, Mensah-Bonsu, A. 2014. NERICA Adoption and impacts on technical efficiency of rice producing households in Ghana: Implications for research development. *American Journal of Experimental Agriculture*, 4(3): 243-262.

Aung NM. 2012. Production and economic efficiency of farmers and millers in Myanmar rice industry. V.R.F Series, No. 427. [Online]. Available from: <http://www.ide.go.jp/English/Publish/Download/Vrf/pdf/471/.pdf>. [Accessed: 23 Feb. 2019].

Coelli TJ. 1995. Recent development in frontier modelling and efficiency measurement. *Australian journal of agricultural economics*, 39: 219-245

Coelli TJ, Rao DSP, Battese GE. 1998. An introduction to Efficiency and Productivity Analysis. Kluwer academic publishers, Boston, Dordrecht/London

Epetimehin FM, 2010. Agricultural insurance in Nigeria and the economic impact. [Online]. Available from <http://ssm.com/abstract=1602926>. [Accessed: 23 Feb. 2019]

Falola A, Ayinde OE, Agboola BO. 2013: Willingness to take agricultural insurance by cocoa farmers in Nigeria. *International Journal of Food and Agricultural Economics*, 1(1): 97-107.

Farrell M. 1957. The Measurement of Productive Efficiency. *Journal of the Royal Statistical Society. Series A (General)*, 120(3), 253-290. doi:10.2307/2343100

Kara HA, Aboki E, Adamu MM. 2015. Comparative Economic Analysis of Beneficiaries and Non- Beneficiaries of Fadama II Project in Sardauna Local Government Area of Taraba State, Nigeria. *International Journal of Innovative Research in Computer Science & Application*, 2(1)

Kareem RO, Dipeolu A, Aranmolaran AB, Akegbejo S. 2008. Analysis of technical, Allocative and Economic Efficiency of different pond systems in Ogun state. *J. of Agric. Econ. And farm Mgt*. 1: 2-5

Muhammad-Lawal A, Omotesho OA, Falola A. 2009. Technical efficiency of youth participation in agriculture: A case study of the Youth-in-Agriculture Programme in Ondo State, Southwestern Nigeria. *Nigeria Journal of Agriculture, Food and Environment*, 5(1): 20-26.

Nahvi A, Kohansal MR, Ghorbani M, Shahnoushi N. 2014. Factors affecting rice farmers to participate in agricultural insurance. *Journal of applied science and agriculture*, 9: 1525-1529.

NAIC. 2017. Nigerian agricultural insurance corporation, Underwriting manual for agricultural insurance (1)

Nnadi FN, Nnadi CD, Chikaire J, Umunnakwe PC, Ihenacho RA. 2013. Analysis of Rural Cassava Farmers' Participation in the Nigeria Agricultural Insurance Scheme in Imo State, Nigeria. *Global Journal of Science Frontier Research Agriculture and Veterinary* 13: Online ISSN: 2249-4626 & Print ISSN: 0975-5896.

OECD. 2001. The DAC Guidelines, Strategies for Sustainable Development of Risk Preferences and Technology." *The Review of Economics and Statistics* 78 (2): 329 – 335.

OECD. 2008. *Agricultural Policies in OECD Countries: Monitoring and Evaluation 2008*, OECD,Paris.

Oni O, Pender J, Philips D, Kato E. 2009. Trends and drivers of agricultural productivity in Nigeria. Nigeria Strategy Support Program (NSSP) report 001. Published and printed by IFPRI (USA).

Pelling M. 2007. The 2007 Prevention Forum: Making Disaster Reduction Work. Micropublishers: Dar es Salaam.

Romun I, Yuanyony L. 2008. Setting up Sustainable Agriculture Insurance: The Example of China. Swiss Reinsurance Company Ltd.

Syroka J, Wilcox R. 2006. Rethinking international disaster and finance. *J. Int Aff*, 55: 30 – 43.

Zahedi S. 2007. Sustainable Development. 1st print, SAMT Publication.