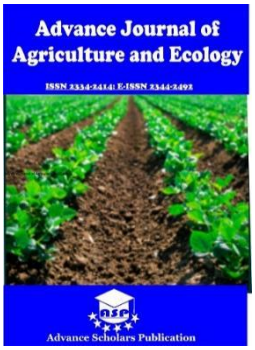
**Advance Journal of Agriculture and Ecology**
Adv. J. Agric. & Eco.
Volume: 8; Issue: 7
July-2023
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



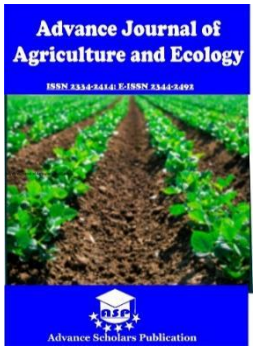

# DETERMINANTS OF TECHNICAL EFFICIENCY OF RICE FARMERS IN WUKARI LOCAL GOVERNMENT AREA OF TARABA STATE, NIGERIA

**[1]Bulus, G., [1]Onogwu G.O., and [2]Obeleagu, J.**
[1]Department of Agricultural Economics and Extension, Federal University Wukari, Taraba State, Nigeria
[2]No. 1 New World Estate, Oba, Idemili South Local Government Area, Anambra State
**Corresponding Author's E-mail:** godiyabulusdd@gmail.com **Tel.: +2348165659536**

**Keywords**:
Efficiency, Farmers, Rice, Technical, Wukari.

**ABSTRACT**
This study examined the technical efficiency of rice production in Wukari Local Government Area, Taraba state, Nigeria. A multi-stage sampling technique was used to randomly select 84 rice farmers for the study. Data were collected on socioeconomic characteristics, inputs and output using a structured questionnaire. Data was analysed using descriptive statistics, gross margin analysis and stochastic frontier production function. Gross margin analysis revealed a mean gross revenue of ₦453,000, mean variable costs of ₦173, 000 and a mean gross margin of ₦280, 000 per hectare. Four factors were significant in determining technical efficiency. These were Farm size (0.85), labour (0.29) and agrochemicals (0.03) at P≤0.01. Fertiliser (0.01) was significant at P≤0.05. This implied that one more unit increase in farm size, labour, agrochemicals and fertiliser would result in an increase in output by 85%, 29%, 3% and 0.01%, respectively. Mean technical efficiency for rice farmers studied was 81%, with a minimum of 29.5% and a maximum of 89.5%. three factors were significant in determining technical inefficiency. These were farming experience (-0.35), household size (-35.18) and level of education (-4.48), all significant at P≤0.01. The result showed that high cost of labour ranked 1st, high costs of fertilisers and high costs of herbicides both ranked 2nd followed by farm credit unavailability which ranked 3rd among the constraints to rice farming. It was concluded that rice farming was a profitable business, requiring improvements in technical efficiency of the farmers and tackling of the challenges for optimum output and greater revenue. It was recommended that facilitating access to adequate and affordable inputs will improve farmers' technical efficiency.

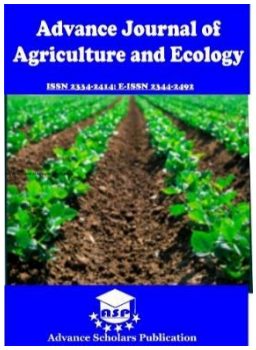
**Advance Journal of Agriculture and Ecology**
Adv. J. Agric. & Eco.
Volume: 8; Issue: 7
July-2023
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index




## 1.0 INTRODUCTION

The agricultural sector is considered to be one of the pillars of the Nigerian economy not only when it was the main stay of the economy, but beyond the period of the discovery of oil. Some 70% of households in Nigeria participate in crop farming activities, while about 41% own or raise livestock (Varrella 2020). Rice is one of the world's major stable food crops, consumed by more than half of the world's population along with crops such as wheat, maize and potato; over 90% of the World's rice production areas and consumption are recorded in Asia (Ajala & Gana, 2015). Nigeria occupies eminence in rice production as the largest producer of rice in west Africa producing over 40% of the regional total production as of 2013 (Nwaobiala & Adesope, 2013). In pre- and post-independence period, rice was not a staple food in Nigeria as many people were more into production and consumption of other cereals such as sorghum, millet, and root and tuber crops. A few years after independence, however, rice consumption gained prominence among Nigerians. The per capita consumption of rice has grown from 3 kg in the 1960s to an estimated 37.5 kg in 2014 and is expected to increase (UARK, 2015 as cited in Ugalahi *et al.*, 2016). What could have been responsible for this? Oikeh *et al.,* (Undated) opined that urbanization, changes in employment patterns, income levels, and rapid population growth have significantly contributed in widening the gap between supply and demand for rice in Nigeria. Rice was seen, and is still regarded as food consumed by people of high class and thus everybody wanted to belong. While food demand was on the increase, rice inclusive, self-sufficiency in food and indeed rice was on the declined as what was produced continually failed to meet the demand for it. Nigeria has the potential to be self-sufficient in rice production, both for food and industrial raw material needs and for export. However, a number of constraints may by limiting rice production efforts by farmers. Technical efficiency has been identified as an important factor in the process of production, and it is imperative that the technical efficiency of rice farmers is studied and determined with a view to improving it, particularly where rice farming is in the hands of farmers with highly limited resources. Efficiency is a very important aspect of productivity growth especially in developing agriculture where resources are scrimpy and opportunities for developing and opting for better technologies have lately started dwindling (Onyenweaku and Effiong, 2005). Technical efficiency is the ability of a farmer to employ the "best practice" in the production process so that not more than the necessary amount of a given set of inputs is used in producing the best level of output (Ataboh *et al.* (2014). In the production of rice, efficiency has been of longstanding interest to the economists and policymakers because of the existence of a strong relationship between rice production and food security. Nevertheless, to improve the farmers' productivity, it is required that their resources must be used more efficiently with attention paid on attaining production goal without waste (Ume and Nwaobiala, 2012). Technical efficiency also measures the differences in technical efficiency which may exist between firms and the variations in technical efficiency of producers may also be

**Advance Journal of Agriculture and Ecology**
Adv. J. Agric. & Eco.
Volume: 8; Issue: 7
July-2023
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index




due to management decisions and farm specific characteristics that may affect the ability of the producer to use the existing technology adequately (Abba and Abu, 2015). It is on this premise that this study is set to examine the technical efficiency in rice production in Wukari Local Government Area of Taraba State, Nigeria. The specific objectives were to describe the socio-economic characteristic of rice farmers, examine the profitability of rice production in the study area, determine the factors affecting technical efficiency of rice production in the study area, determine the farm specific technical efficiency of rice production in the study area and identify the constraints associated with rice production in the study area.

## 2.0 MATERIALS AND METHODS

### 2.1 The Study Area

Wukari is a Local Government Area in Taraba State, Nigeria. Its headquarters are in the town of Wukari on the highway. The Wukari River flows through the area and the Benue River forms a boundary with Nasarawa State to the northwest. The town is the base of the Wukari Federation, a traditional state. It is the home of the great Jukun people. The Area lies between longitude $10^0 11^1$ East of the Greenwich Meridian and longitude $12^0 13^1$ North of the equator. Wukari covers an area of approximately 4,308 square kilometers and has a total population of 241,506 with 10 wards (NPC, 2006) and estimated population of 337,163.09 from a growth rate of 2.6% by 2019. It has an average annual rainfall of 1,200-1,800mm with an average temperature of $20^0$c and shares boundary with Ibi Local Government Area to the North, Gassol Local Government Area to the East, Donga Local Government Area to the south, Benue state to the west and Nassarawa sate to North-west. Wukari Local Government Area include is dominated by Jukuns ethnic group whose main occupation is farming, the major crops grown in the area are yam, cassava, groundnut, maize, sorghum, millet, rice, tree crops livestock production.

### 2.2 Sampling Procedure and Sample Size

Several samples can be taken from the population without exhausting the population of rice farmers in Wukari LGA, (we assume the population of the rice farmers to be infinite) and the actual number of the rice farmers in Wukari LGA is unknown, the Cochran's method for sample size determination was used to determine the sample size for this study.

It is expressed mathematically as;

$$n_0 = \frac{z^2 pq}{e^2} \quad \text{.....} \quad (1)$$

Where;

$n_0$= Sample size,

$z$ = is the selected critical value of desired confidence level,

$p$ = is the estimated proportion of an attribute that is present in the population,

$q = 1 - p$ and

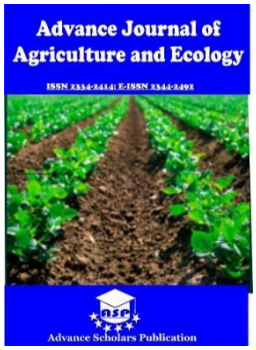
$e$ = desired level of precision.

$p = q = 0.5$

$e = 0.09$

$z = 1.65$

**Advance Journal of Agriculture and Ecology**
Adv. J. Agric. & Eco.
Volume: 8; Issue: 7
July-2023
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index




$$n_0 = \frac{1.65^2 \times 0.5 \times 0.5}{0.09^2} = 84.02778$$

Therefore, the sample size for the study was 84. A total of four communities were randomly selected from the 55 communities that make up Wukari LGA through the method of equal allocation. It was from each of the selected communities that 18% of the rice farmers were randomly sampled, totaling eighty-four. The number of samples assigned to each of the community is presented in the table below;

Table 1: Sample Frame

| Community | Rice Farmers | Sample (18%) |
|---|---|---|
| Arufu | 67 | 12 |
| Wukari | 173 | 32 |
| Kente | 81 | 15 |
| Rafin Kada | 138 | 25 |
| **Total** | **459** | **84** |

Source: Field Survey, 2022

## 2.3 Analytical Techniques

Descriptive statistics such as frequency distribution, percentages and means were used to describe the socio-economic characteristics of agricultural loan beneficiaries spread of loan amount on operations.

*2.3.1 Gross Margin Analysis*

This indicates the amount of profit made after paying off the cost of production involved in the production of goods or services. Gross margin is the difference between the gross farm income (GI) and the Total Variable Cost (TVC), that is,

GM = GFI – TVC ..... (2)

Where:

*GM* = Gross Margin (Naira/hectare).

*GFI* = Gross Farm Income (Naira/hectare)

*TVC* = Total Variable Cost (Naira/hectare)

*2.3.2 Stochastic Frontier Production Function*

This study fit the data into Cobb-Douglas. The model was specified as follows:

$\ln Y_i = \beta_0 + \sum \beta_i \ln(X_i) + (V_i - U_i)$ .....(3)

Stochastic frontier production model that was used in this study is specified in a translog functional form. Hence, the variables that were included in the *rice* production function model were:

$\ln Y = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + V - U$..... (4)

Where:

ln = natural logarithms operator

$Y_i$ = value of output of rice per ha (Kg)

$X_1$ = total area of land used in rice production (hectares)

$X_2$ = Seed quantity (Kg)

$X_3$ = fertiliser quantity (Kg)

$X_4$ = total value of agrochemicals (Litres)

$X_5$ = total labor used in rice production (Man-days)

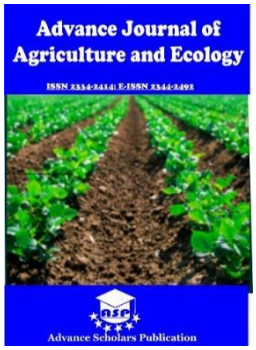
$\beta$ = parameters to be estimated

## 3.0 RESULTS AND DISCUSSION

### 3.1 Socioeconomic Characteristics of Rice Farmers

The result for socioeconomic characteristics of rice farmers is presented in Table 2. The mean age was 43years. This finding is in line with that of Mustapha, et al. (2012) and Osanyinlusi and Adenegan (2016) who reported a mean age of 46 for rice farmers. The implication is that younger farmers have the tendency to be have the strength and agility required in realizing

**Advance Journal of Agriculture and Ecology**
Adv. J. Agric. & Eco.
Volume: 8; Issue: 7
July-2023
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index



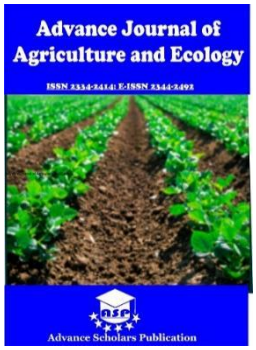

greater output than older farmers due to its high labour demand. The results showed that 48.8% of the respondents were male, while 51.2% were female, implying that more of females were into rice production than male respondents. This may not be unconnected with the notion in this part of the country that rice farming is a female enterprise. This is similar to the report of Ibitoye, *et al.,* (2012) who found out that there were more female rice farmers than males in the study area. Marital status revealed that 79.8% of the rice farmers studied were married with a mean household size of 6 persons per household. This was less than the mean of 6 persons per household reported by Osanyinlusi and Adenegan (2016). Large household sizes are common in rural communities as family labour is a major and cheaper source of labour for farming activities. What this implies is that with this large household size for rice farmers, they could be said to have advantage of making use of family labour for their rice production and, therefore, save some costs that may otherwise have been expended in payment for hired labour. The mean years spend in rice farming was 12 years. This was an indication that farmers have had enough experience in rice production to have acquired a good knowledge about its production. The distribution of the respondents by their level of education showed that 88.1% of the rice farmers studied had at least first school leaving certificated. This agrees with the result of Kadiri *et al.* (2014), that the level of education attained was 6 – 10 years. The literacy level of farmers is an important factor as it is likely to promote the farmers' ability to seek, understand and make good use of information on inputs.

**Table 2: Socioeconomic Characteristics of Rice Farmers**

| **Variable** | **Min.** | **Max.** | **Mean** | **Std. dev.** |
|---|---|---|---|---|
| Age (years) | 21 | 59 | 43 | 4 |
| Household size (number) | 2 | 9 | 6 | 1 |
| Years of experience in farming (years) | 1 | 23 | 12 | 2 |
| | **Frequency** | | **Percentage** | |
| **Level of education** | | | | |
| Non-formal | 10 | | 11.9 | |
| Primary | 10 | | 11.9 | |
| Secondary | 13 | | 15.5 | |
| Tertiary | 51 | | 60.7 | |
| **Sex** | | | | |
| Male | 41 | | 48.8 | |
| Female | 43 | | 51.2 | |
| **Marital Status** | | | | |
| Single | 2 | | 2.4 | |
| Married | 67 | | 79.8 | |
| Divorced | 3 | | 3.6 | |
| Widowed/Widower | 12 | | 14.3 | |

Source: Field Survey, 2022

**Advance Journal of Agriculture and Ecology**
Adv. J. Agric. & Eco.
Volume: 8; Issue: 7
July-2023
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index




### 3.2 Gross Margin Analysis of Rice Production

Table 3, shows the gross margin analysis of rice production. The study revealed that labour alone accounted for about 44.41% of the total variable cost. This result is an indication that the process of production adopted by the rice farmers was labour intensive. About 19% of the total variable cost is accounted for by the cost of seed acquired while the fertiliser and agro-chemicals accounted for 14.89% and 20.73%, respectively. A mean gross return of N453, 090.24 per hectare was recorded for the farmers studied, produced at a mean cost of N172, 598. 32 per hectare. The mean gross margin per hectare was ₦280,491.92. The mean gross margin was however less than what was reported by Kadiri *et al.,* (2014), that the average gross margin of rice enterprise was ₦319,046.84.

**Table 3: Average Costs and Returns of Rice Production per Hectare**

| Variable Cost | Value (₦) | Percentage of Total Cost |
|---|---|---|
| **Gross Return ($)** | **453,090.24** | **100** |
| Seed | 34,464.58 | 19.97 |
| Fertiliser | 25,692.66 | 14.89 |
| AgroChem. | 35,785.71 | 20.73 |
| Labour | 76,655.37 | 44.41 |
| **TVC (Δ)** | **172,598.32** | **100.00** |
| **Gross Margin ($-Δ)** | **280,491.92** | |

Source: Field Survey, 2022

### 3.3 Determinants of Technical Efficiency in Rice Production

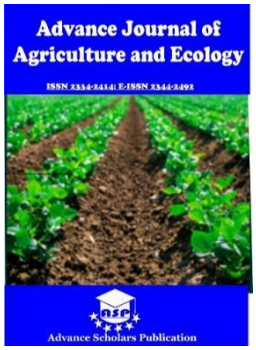
The result for factors determining technical efficiency of rice farmers in the study area is presented in Table 4. Four factors were significant in determining technical efficiency. These were Farm size (0.8485849), labour (0.2931796), fertilizer (.009) and agrochemicals (0.0269441) at P≤0.01. This implied that one more unit increase in farm size, labour, fertiliser and agrochemicals would result in an increase in output by 85%, 29%, 0.09% and 3%, respectively. This was similar to the reports of Ataboh *et al.,* (2014), Ismatul and Andriko (2013) and Chikezie *et al.,* (2020) who reported that farm size, labour, fertilisers and agrochemicals were significant factors in determining technical efficiency in rice farming. Seed quantity was not significant and this was in line with Chikezie *et al.,* (2020) who found out that seed quantity was not a significant factor influencing technical efficiency in rice farming.

**Table 4: Factors Determining Technical Efficiency in Rice Farming**

| Variables | Coef. | Std. Err. | z | P |
|---|---|---|---|---|
| Constant | 12.65617 | 2.284527 | 5.54 | 0.000*** |
| Farm size | .8485849 | .1161124 | 7.31 | 0.000*** |
| Labour | .2931796 | .1036232 | 2.83 | 0.005*** |
| Fertiliser | .0087031 | .0267742 | 0.33 | 0.035** |
| Agro chem | .0269441 | .199333 | 0.14 | 0.002*** |
| Seed | -.1813084 | .1331534 | -1.36 | $0.173^{NS}$ |

Source: Field Survey, 2022

**Advance Journal of Agriculture and Ecology**
Adv. J. Agric. & Eco.
Volume: 8; Issue: 7
July-2023
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index




### 3.4 Farm Specific Technical Efficiency

The results presented in Table 8, shows that 1.2% of rice farmers in the study area operated below 40% level of technical efficiency, 6.0% of the rice farmers attained efficiency level of between 40-59%, 26.2% were between 60.79% technical efficiency, and 66.6% of the rice farmers in the study area were operating within technical efficiency levels of 80-99%. The average technical efficiency of the rice farmers in the study area was 81%, with a minimum of 29.5% and a maximum of 89.5%. This mean technical efficiency of 81% was an indication that the farmers needed do more to improve on technical efficiency so as to attain greater output and by implication generate more revenue and make more profits. Thus, there is an opportunity for the farmers to improve their technical efficiency by about 19% on the average.

**Table 5: Farm Specific Technical Efficiency**

| Level of efficiency | Frequency | Percentages |
|---|---|---|
| 0.20-0.39 | 1 | 1.2 |
| 0.40-0.59 | 5 | 6.0 |
| 0.60-0.79 | 22 | 26.2 |
| 0.80-0.99 | 56 | 66.6 |
| Total | 84 | 100 |
| Mean | | 0.81 |
| Standard Deviation | | 0.13 |
| Minimum | | 0.295 |
| Maximum | | 0.895 |

Source: Field Survey, 2022

### 3.5 Determinants of Technical Inefficiency in Rice Production

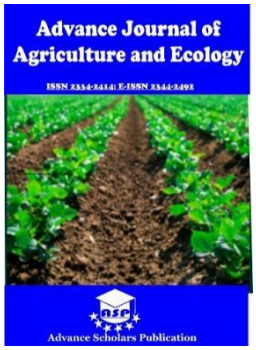
The result for the factors influencing technical inefficiency as presented in table 6 showed years of farming experience (-0.347751), household size (-35.1833) and level of education (-4.476146) were factors having significant effect on technical inefficiency of rice farmers in the study area. The three factors were all significant at P≤0.01. Coefficients estimated, prefixed by minus sign, for the three factors have negative impact on the technical inefficiency of the rice farmers. Thus increase in the significant factors the level of the technical inefficiency of the rice farmers will reduce. This implies that any one more unit addition of years of farming experience, household size and level of education will result in reduction in technical inefficiency of rice farmer by the corresponding coefficients. This is favourable as it would consequently result in improvement in technical efficiency of rice farmers. Age was not a significant factor in determining technical inefficiency of rice farmers in the study area, even though it had a negative coefficient.

**Table 6: Factors Influencing Technical Inefficiency in Rice Production**

| Variable | Coef. | Std. Err. | z | P |
|---|---|---|---|---|
| Constant | -89.08357 | 65.45525 | -1.36 | 0.174$^{NS}$ |
| Years of Farming Exp. | -.347751 | 1.132019 | -0.31 | 0.001*** |
| Household Size | -35.1833 | 26.34478 | 1.34 | 0.009*** |
| Age | -1.383888 | 2.140455 | -0.65 | 0.518$^{NS}$ |
| Education | -4.476146 | 9.469043 | 0.47 | 0.000*** |
| Sigma_u | .9419442 | .4250811 | 2.22 | 0.027 |
| Sigma_v | .496502 | .0429595 | 11.56 | 0.000 |

Source: Field Survey, 2022

**Advance Journal of Agriculture and Ecology**
Adv. J. Agric. & Eco.
Volume: 8; Issue: 7
July-2023
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index




### 3.6 Constraints Associated with Rice Production

Rice production, like in any other crop farming is affected by so many challenges. Table 7 present the result for the constraints to rice production in the study area. The result showed that high cost of labour (92.9%) ranked 1st among the constraints to rice production. Interestingly, high costs of fertilisers (86.9%) and high costs of herbicides (86.9%) which are both agrochemicals ranked 2nd followed by farm credit unavailability (82.1%) which ranked 3rd among the constraints. Others were inadequate extension services (77.4%), pest and disease incidence (60%), marketing problems (57.1%) and Shortage of fertile farmlands and high cost of rent (56%), ranking 4th, 5th, 6th and 7th, respectively. This implied that high costs of inputs were the major constraints to rice production in the study area. Tackling these identified challenges will promote improvement in output, attracting more revenue to rice farmers as well as increasing the level of profitability.

**Table 7: Constraints to Rice Production**

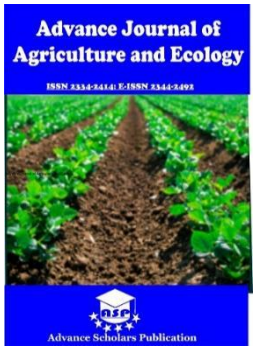
| Identified problems | Frequency | Percentage | Rank |
|---|---|---|---|
| Farm credit unavailability | 69 | 82.1 | 3 |
| High cost of labour | 78 | 92.9 | 1 |
| Shortage fertile farm land and high cost of rent | 47 | 56.0 | 7 |
| High costs of fertilisers | 73 | 86.9 | 2 |
| High costs of herbicides | 73 | 86.9 | 2 |
| Pest and disease incidence | 50 | 60.0 | 5 |
| Inadequate extension service | 65 | 77.4 | 4 |
| Marketing problems | 48 | 57.1 | 6 |

Source: Field Survey, 2022

### 4.1 CONCLUSION AND RECOMMENDATION

Based on the results of the findings it was concluded that farmers had socioeconomic charectiristics that could promote the attainment of maximum technical efficiency in rice production. Rice production was profitable, but farmers were not as technically efficient as they should and therefore need to improve. A number of factors were found to militate against rice production, tackling of which may yield better technical efficiency. It was recommended that farmers be provided with more educational opportunities and farm extension services to improve upon the technical efficiencies, necessary inputs should be made available and affordable to rice farmers to improve on their output and consequently generate more revenue from rice farming.

**Advance Journal of Agriculture and Ecology**
Adv. J. Agric. & Eco.
Volume: 8; Issue: 7
July-2023
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index




**REFERENCES**

Abba, M.W. & Abu, H.M.I., (2015). Technical Efficiency of Small Scale Rice Production in Adamawa State, Nigeria. International Conference on Chemical, Food and Environment Engineering (ICCFEE'15), Jan. 11-12, 2015 Dubai (UAE).

Ajala A. S. & Gana A., (2015). Analysis of Challenges Facing Rice Processing in Nigeria. *Journal of Food Processing*. 1-7

Ataboh, O.E., Umeh, J.C. and Tsue, P.T. (2014). Determinants of Technical Efficiency among Rice Farmers in Kogi State, Nigeria. *Journal of Agriculture and Sustainability*. **6(**1): 39-49

Chikezie, C., Benchendo, G. N., Ibeagwa, O. B, Oshaji, I. O. And Onuzulu O.A. (2020). Analysis of Technical Efficiency Among Rice Farmers in Ebonyi State of Nigeria: A Stochastic Frontier Approach. *Journal of agriculture and food* sciences, **18**(1): 40-49

Ibitoye, S.J., Orebiyi, J.S. and Shaibu, U. M (2012). Economic Effect of Inorganic Pesticide Use on Fadama II Rice Farming in Ibaji Local Government Area, Kogi State, Nigeria. *International Journal of Agric. and Rural Development*, SAAT, FUTO.Vol 15 (2): Pg. 1063 – 1070.

Ismatul H. & Andriko N. S. (2013). Economies of Scale and Allocative Efficiency of Rice Farming at West Seram Regency, Maluku Province, Indonesia. *Asian Economic and Financial Review*, **3**(5):624-634

Kadiri, F. A.; Eze C. C.; Orebiyi J.S.; and Onyeagocha S. U. O. (2014). Resource-Use and Allocative Efficiency of Paddy Rice Production in Niger Delta Region of Nigeria. *Global Journal of Agricultural Research*, **2(**4): 11-18

Mustapha, S. B, Undiandeye U.C., A. M. Sanusi, A. M. Bakari S. (2012): Analysis of adoption of improved rice production technologies in Jeer local government area of Borno state, Nigeria; *International Journal of Development and Sustainability*, Volume 1(3): Pages 1112-1120.

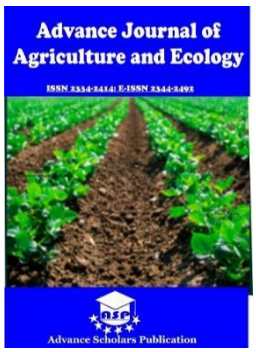
Nwaobiala CU, Adesope OM (2013). Economic analysis of small holder rice production systems in Ebonyi State South East, Nigeria. *Russian Journal of Agricultural and Socio-Economic Sciences* 23 (11),

Oikeh S.O., Nwilene F.E., Agunbiade T.A., Oladimeji O., Ajayi O., Semon M., Tsunematsu H. and H. Samejima (Undated). **Growing upland rice: a production handbook.** Africa Rice Centre (WARDA). IITA, Ibadan, Nigeria

Onyenweaku CE, Effiong EO (2005). Technical efficiency in pig production in Akwa Ibom State, Nigeria. *International Journal of Agriculture and Rural Development*, **6**(1): 51-57,

Osanyinlusi, O. I. and Adenegan, K. O. (2016). The Determinants of Rice Farmers' Productivity in Ekiti State, Nigeria. *Greener Journal of Agricultural Sciences*. **6**(2): 049-058, February 2016

**Advance Journal of Agriculture and Ecology**
Adv. J. Agric. & Eco.
Volume: 8; Issue: 7
July-2023
ISSN 2334-2414
E-ISSN 2344-2492
Impact Factor: 5.39
Advance Scholars Publication
Published by International Institute of Advance Scholars Development
https://aspjournals.org/Journals/index.php/ajae/index




Ugalahi U.B., Adeoye S.O. and Agbonlahor M.U. (2016). Irrigation potentials and rice self-sufficiency in Nigeria: A review. *African Journal of Agricultural Research*. 11(5): 298-309

Ume, S.I. & Nwaobiala, C.U. (2012). Economic efficiency of upland rice farmers across gender in Anambra agricultural zone of Anambra State, Nigeria. *Agricultural Journal*, **41**(2), 37-

Varrella S., (2020). Poverty headcount rate in Nigeria 2019, by state 2020. https://www.statista.com/statistics/1121438/poverty-headcount-rate-in-nigeria-by-state/ Accessed November 6, 2021.