IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 14, Issue 9 Ser. III (September 2021), PP 35-42
www.iosrjournals.org

An investigation of small-scale rice production in Nigeria: Total and Marginal Productivity Approach

Sanusi, S. O[1*], Madaki, M. J[1], David, H. S[1] and Adole, S.O[2]
[1]*Department of Agricultural Economics and Extension,*
Faculty of Agriculture, Federal University Gashua.
P.M.B 1005, Gashua. Yobe State, Nigeria.
[2]*Department of Agricultural Economics,*
Faculty of Agriculture, University of Abuja.
P.M.B 117 Gwagwalada-Abuja, Federal Capital Territory, Abuja, Nigeria

Abstract
The paper analyzed small-scale rice production in Nigeria. Primary data were collected using well-structured questionnaire for the study. Multi-stage random sampling technique was used to collected data from three hundred and forty-nine (320) rice farmers used for the study. Total productivity index, resource-use efficiency index and principal component analysis (PCA) were used to analyzed the data. The result of the total productivity index revealed that majority of the farmers (62.18%) were sub-optimal (<1.00). The result of resource-use efficiency further revealed that farm size (0.19), fertilizers (0.43), agrochemicals (0.37), seeds (0.69) were over-utilized, while labour (1.64) was under-utilized. This implies sub-optimal allocation of production resources by rice farmers in the study area. The result of the principal component analysis model established that the critical constraints faced by the farmers were farmers and herdsmen clashes, inadequate capital and bureaucratic procedures in accessing credits. The research concluded that production factors were not optimally utilized in rice production. The study recommends that agricultural extension officers should be employed to train, guide and boost the capacity of the rice farmers in the allocation and utilization of inputs. Also, security apparatus in the farming communities should be fortified through synergy and collaboration among the key stakeholders in the rice industry.

Keywords:*small-scale, rice production, productivity, resource-use, Nigeria*

Date of Submission: 30-09-2021 Date of Acceptance: 14-10-2021

I. Introduction

Rice (*Oryza sativa*) is grown in almost all the agro-ecological zones of Nigeria from the forests belt to the savannah in the dry North (Akande, 2003). Nigeria has about 84 million hectares of arable land with about 33 million hectares under cultivation and a potential 5 million hectares that spreads across all the ecological zones that is suitable for rice cultivation (Abdul-Azeez, Omotesho, Adekola, and Adekunle, 2014; AfDB, 2013). Despite the recent strides in domestic production of rice, Nigeria currently lags behind in supply (Oyakhilomen and Rekwot, 2014). As a staple food in the diet of most Nigerians, there is a high demand for rice which has resulted in a huge disparity between the supply and demand for rice because of the fact that as the human population is increasing at a geometric rate, the production capacity is increasing in an arithmetic progression (Ugalahi, Adeoye, and Agbonlahor, 2016).

Nigeria's rice consumption stood at 7.9 million tons, while the production rate increased to 5.8 million tons per annum from a previous 5.5 million tons due to the Federal Government's local production policy (Agricultural Promotion Policy, 2016). Rice production is faced with numerous problems from cultivation to consumption. Among the challenges facing rice production include productivity, resource-use efficiency, a gradual yet consistent loss in labour due to various factors ranging from migration to communal clashes, as well as the aging farming population attributed to migration of youth to urban centres due to their decline interest in farming. Others challenges are low yield attributed to sub-optimal water management, inadequate weed management, pest and disease pressure as well as low or minimal adoption of modern rice varieties.

The need to close rice demand-supply gap has led scholars to pursue research on how to address productivity and resource-use efficiency of the small-scale farmers. Productivity and resource use efficiency are two vital frameworks that must be considered as Nigeria contend with the need to be self-sufficient in rice production.

Nigeria is a major rice grower in West Africa and was rated the region's largest rice consumer and producer (Ekpe and Alimba, 2013). Rice is a strategic commodity in the development of the economy of the

country in terms of production and consumption. The government has therefore intervened to boost its production in the last thirty years in many ways but the efforts has nor really yielded the desired result. This is because most of the intervention programmes has not adequately address problems associated with production in the area of productivity, resource-use efficiency, and other recent challenges related directly to rice enterprise (Ajoma, Ezihe, and Odoemenem, 2016; Abid, Ashfaq, Hassan, and Fatima, 2011; Omotesho, Lawal, and Yusuf, 2010). Rice production in Nigeria is mainly in the hands of small-scale farmers who are using unimproved farming techniques and as such, actual yields of rice differ significantly from potential yields and this has been attributed to low productivity (Akintayo and Rahji, 2016). The identified problems are at the nucleus of efficiency and productivity at which farmers uses of resources on the farms are questionable. It also borders on how various factors that explain efficiency and productivity in the rice systems can be examined so as to improve rice production in the country. According to Adeshina (2014) paying more attention to rice production to become commercialize will in no small measure improve food security. It is also believed that economic growth and poverty alleviation in Nigeria will depend to a large extent on the ability of the country to improve on her agricultural production through rice intensification. It is based on this aforementioned that this research was set to investigate the small-scale rice production in Federal Capital Territory, Nigeria. The specific objectives were to

(i) examine the productivity of rice farmers in the study area
(ii) determine the resource-use efficiency of the rice farmers.
(iii) identify and describe the constraints faced by rice farmers in the study area.

II. Conceptual Framework

2.1 Concept of Productivity

By definition, agricultural productivity refers to the output produced by a given level of input(s) in the agricultural sector of a given economy (Akerele, Odojukan, Yangomodou, Olugbemi, Solana, Ilori, and Fadipe, 2019). More formally, it can be defined as "the ratio of the value of total farm outputs to the value of total inputs used in farm production" (Dabara, Lawal, Chiwuzie, Omotehinshe, and Soladoye 2019). Agricultural productivity is measured as the ratio of the final output, in appropriate units, to some measure of inputs. However, measures of productivity can be divided into partial or total measures depending on the number of inputs under consideration. Total output as a ratio of some measure of labour quantity, usual man-days in developing countries, is called labour productivity (LP) and provides some notion of output per worker; while output per area of land planted island productivity (Wiebe, Soule, Narrod, and Brenneman, 2003; Zepeda, 2001). The two previously mentioned measures are examples of single-factor productivity (SFP), defined as the ratio of a measure of output quantity to the quantity of a single input used (Diewert and Nakamura, 2005). Partial measures of productivity can be misleading because they ignore the role of other inputs in any observed output changes (Zepeda, 2001). As a result of this shortcoming, a total measure of productivity was developed. Total factor productivity (TFP) is defined as the ratio of a measure of total output quantity to a measure of the quantity of total input (Wiebe *et al*., 2003; Zepeda, 2001).

Agriculture plays a major role in the economy of many developing countries, as it is a significant source of nourishment for citizens and a means of livelihood for the most vulnerable members of these countries. As a consequence, raising agricultural productivity is an important policy goal for concerned governments and development agencies. Increasing agricultural productivity requires one or more of the following: an increase in output and input with output increasing proportionately more than inputs; an increase in output while inputs remain the same; a decrease in both output and input with input decreasing more; or decreasing input while output remains the same (Oni, Pender, Phillips, and Kato, 2009; Adewuyi 2006). Increasing inputs to expand output involves raising both the quality and quantity of inputs, examples of which would include the mechanization of agricultural processes, use of high yield varieties, use of fertilizers, irrigation in areas where rainfall is inadequate, and the use of agrochemicals such as herbicides and pesticides. Though all of the aforementioned activities have the potential for productivity enhancement, smallholder farmers, who account for the vast majority of farmers in developing countries, often cannot afford these investments due to their limited resources and restricted access to credit.

III. Methodology

3.1 The Study Area

This study was conducted in the Federal Capital Territory, Nigeria. The Federal Capital Territory is located in the centre of Nigeria and has a land area of 8,000 Square Kilometres **(**Jaiyeola, 2016**)**. It is bounded to the North by Kaduna State, to the West by Niger State, to the East and South-East by Nasarawa State and to the South-West by Kogi State. It falls within the coordinates of Latitudes 9° 4' 20.1504" North and Longitudes 7° 29' 28.6872" East. The Federal Capital Territory has rich soil for agriculture and enjoys an equable climate that is neither too hot nor too cold all year round. Crops grown in the Federal Capital Territory, Nigeria are rice,

millet, cowpea, groundnut, eggplant among others. The major occupation of the inhabitant of Federal Capital Territory is farming, trading and few are gainfully employed as civil servant. At the 2006 census the Federal Capital Territory had a population of 776, 298 people (NPC, 2006). Currently the population is about 3,095,000 people which is about 6.03% increase from 2018 (Macrotrend, 2020).

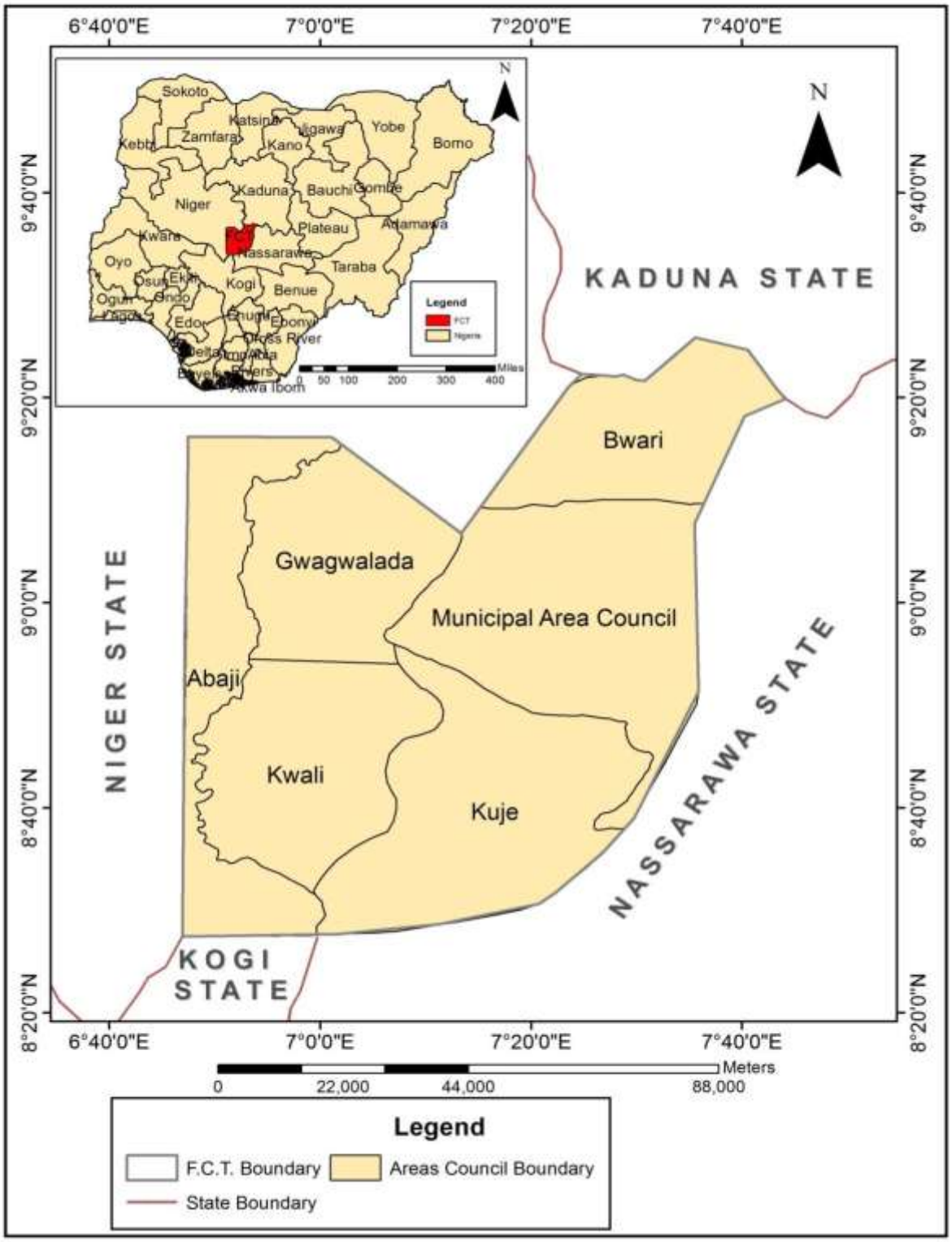

Figure 3.1: Map of the Federal Capital Territory, Nigeria Showing the Study Area
Source: Jaiyeola (2016)

3.2 Sampling Techniques and Sample Size

Federal Capital Territory was purposively selected because of the presence of rice farmers in the villages. Multi-stage sampling method was used for selecting the respondents. In the first stage, four (4) Area Councils were randomly selected using raffle-draw ballot-box method. In the second stage, four (4) wards were randomly selected each in Abaji, Bwari, Gwagwalada, and Kwali Area Councils respectively using raffle-draw ballot-box method. In the third stage, two (2) villages were randomly selected using raffle-draw ballot-box method from each of the 16 sampled wards making total of 32 villages. Fourth and the final stage, using a proportionate – random sampling was used to select a total sample size of three hundred and twenty (320) smallholder rice farmers.

3.3 Sources and Method of Data Collection

Primary data were used for this study. Primary data were collected from rice farmers in the study area. Trained enumerators from Agricultural Development Project (ADP) were employed for data collection using well-structured questionnaires. The questionnaire was sectioned appropriately to cover all the specific objectives stated such as costs and returns analysis on rice production, productivity and technical efficiency of the rice farmers.

3.3. Methods of Data Analysis

Total factor productivity index, resource-use efficiency index and principal component analysis (PCA) were used for the research work. The total factor productivity (TFP) index approach used is given as

$$TFP = \frac{Y}{TVC} \quad \ldots\ldots\ldots\ldots\ldots\ldots(3.1)$$

$$TFP = \frac{Y}{\sum P_i X_i} \ldots\ldots\ldots\ldots\ldots\ldots(3.2)$$

Where,
Y = Output of rice (Kg),
TVC = Total Variable Cost (₦),
P_i = Unit Price of i^{th} Variable Input (₦), and
X_i = Quantity of i^{th} Variable Input (Kg).
Total fixed cost is constant as it is fixed.
From Cost Theory:

$$AVC = \frac{TVC}{Y} \ldots\ldots\ldots\ldots\ldots\ldots(3.3)$$

Where, AVC = Average Variable Cost in naira (₦)
Therefore, the transpose of AVC will be TFP

$$TFP = \frac{Y}{TVC} = \frac{1}{AVC} \ldots\ldots\ldots\ldots\ldots\ldots(3.4)$$

As such, TFP is the inverse of the AVC. The partial productivity estimate is the marginal products (MP) given as

$$MP = \frac{\Delta TFP}{\Delta X} \ldots\ldots\ldots\ldots\ldots\ldots(3.5)$$

Resource-use Efficiency of the farmers were derived from the ratio of marginal value product (MVP) to that of marginal factor cost (MFC). Further analysis to derive the Marginal Value Products (MVPs) of the production inputs was carried out using coefficients of the inputs from the estimated Cobb-Douglas production function which was derived from first stage of the stochastic production frontier model. The MVP was computed as follows:

$$MVP = b_i \times \frac{\bar{Y}}{\bar{X}} \times P_y \ldots\ldots\ldots\ldots\ldots\ldots(3.6)$$

Where,
MVP and bi are as defined earlier
$\bar{Y}$= Mean of Output (Kg),
$\bar{X}$= Mean of Input (Kg), and
P_y = Per Unit Price of Output (₦).

A given resource was optimally allocated when there is no divergence between its MVP and its acquisition cost i.e., marginal factor cost (MFC). The MFC is the opportunity cost / market price of each input in a competitive market. A rice farmer maximizes its profit with respect to an input if the ratio of its MVP to its MFC is unity. A ratio less than unity shows over utilization of that resource and profit would be increased by decreasing the quantity used of that input. Resource underutilization is indicated by a ratio greater than one and profit would be increased by increase in the rate of its use. Mathematically If,

$\frac{MVP}{MFC} = 1,$ use of the resource is at optimum (optimum utilization)

$\frac{MVP}{MFC} < 1$, use of the resource is above optimum (over-utilization)
$\frac{MVP}{MFC} > 1$, use of the resource is below optimum (under-utilization)
Rice farmers were asked to rate their perceptions of each problem on a Four- point Likert scale. The response options and values assigned were as follows: Always Encountered = 4; Seldom Encountered = 3; Rarely Encountered = 2 and Not Encountered = 1. The constraints faced by rice farmers were then subjected to principal component analysis (PCA). The method of principal component analysis (PCA) is stated thus:

$$r = r_1, r_2, r_3, \dots, r_p \dots \dots (3.7)$$

$$\partial_k = \partial_{1k1}, \partial_2 K, \partial_3 k, \dots, \propto pk \dots \dots (3.8)$$

$$\partial_K^T r = \sum_{j=1}^{p} \partial_{Kjrj} \dots \dots (3.9)$$

$$\partial_K^T Var = [\partial_K^T R] \ is \ Maximum \dots \dots (3.10)$$

Subject to

$$\partial_K = 1 \dots \dots (3.11)$$

and Cov= $[\partial_1^T \partial - \partial_2^T \partial] = 0 \dots \dots (3.12)$

The Variance of each of the Principal Component are:

$$Var[\partial_k R] = \lambda_k \dots \dots (3.13)$$

$$S = \frac{1}{n-1}(R - \bar{R})(R - \bar{R})^T \dots \dots (3.14)$$

$$S_i = \frac{1}{n-1}\sum_{i=1}^{n}(R_i - \bar{R}_i)\,(R_I - \bar{R}_i) \dots \dots (3.15)$$

Where,
R = Vector of 'P' Random Variables,
∂_k = Vector of 'P' Constraints,
λ_k= Eigen Value,
T = Transpose, and
S = Sample Covariance Matrix.

IV. Results And Discussion

4.1 Analysis of productivity of rice production in the Study Area

The result of the total factor productivity in Table 4.1 shows that most (62.18%) of the smallholder rice farmers had TFP index less than one which means that the productivity is sub-optimal. Also, 19.2% of the respondents had TFP index greater than 1.10 which is in the super-optimal range, while 18.62% had TFP index within the optimal range of 1.00 and 1.09. This implies that most of the respondents performed less than the optimal level, meaning that there are low utilizations of production factors among the smallholder rice farmers. This result agrees with the findings of Ebe, Obike, Ugboaja, and Ezelu (2018) who posited that for the average total factors productivity to attained optimal level among arable crop production, farmers must be efficient and effective in the allocation of inputs.

Table 4.1: Total Factor Productivity (TFP) index of small-scale rice farmers in the Study Area

TFP Index	Frequency	Percentage
Sub-Optimal (< 1.00)	217	62.18
Optimal (1.00–1.09)	65	18.62
Super-Optimal (≥ 1.10)	67	19.2
Total	**349**	**100**
Mean	0.52	
Minimum	0.001	
Maximum	5.17	
Standard Deviation	0.91	

Source: Computed Field Data, 2020

4.2 Analysis of resource-use efficiency of rice production

The result of the resource-use efficiency of rice production presented in Table 4.2 reveals the estimates of resource use efficiency for farm size, labour, fertilizer, agrochemicals, and seeds. The r-value of the farmers was measured from the ratio of the MVP of each input to the MFC. The r-value of farm size is 0.19, which implies that farm size was over-utilized by rice farmers in the study area. Over-utilization of farm size by farmers shows that they need to manage the farmlands properly, rather than increasing farm size. Proper management of the farmlands they already have will lead to increase in rice output.

The r-value of labour is 1.64 which shows that it is under-utilized by farmers. Under-utilization of labour shows that increasing labourmandays will increase level of rice output in production and hence revenue if more of labour is used. This result is in consonance with the findings of Abiola, Mad, Alias, and Ismail (2016). The result further shows the fertilizer is over-utilized with an r-value of 0.43. This means that decreasing the quantity of fertilizers used in production will increase rice output in the study area. The result is in line with the findings of Kadiri, Eze, Orebiyi,.and Onyeagocha (2014) but differs with results of Ishiaku. Haruna, Danwanka, and Suleiman (2017).

The r-value of agrochemicals is 0.37 which shows that the resource is over-utilized by rice farmers. This means that decreasing the quantity of agrochemicals used in production will increase rice output. This agrees with the results of Maikasuwa and Ala (2013). The result further shows that seed had an r-value of 0.69 which means that the resource was over-utilized by rice farmers. This shows that decreasing the quantity of seeds used in production will increase rice output. Therefore, farmers should reduce the quantity of seeds they use in production to maximize production. This finding agrees with the result of Danso-Abbeam, Dahamani, and Bawa, (2015).

The result further indicated that adjustment in MVPs is necessary for the optimal allocation of resources. Optimum allocation in the use of resources required labour to be adjusted by 38.86 percent adjustment. Conversely, farm size, fertilizers, agrochemicals and seeds were over-utilized and required approximately 434.24 percent, 133.22 percent, 170.27 percent and 45.18 percent reduction respectively.

It should be noted that MVPs of the inputs were not negative. This implies that the rice farmers used the resources within the economically rational level even though they were not optimally used. This result is in line with similar studies conducted by Alias and Ismail (2006) and Lira, Shamsudin, Radam, and Mohamed (2014) on rice production in Mada, Malaysia where rice farmers were found to be inefficient and there is need to increase herbicides and pesticides in order to improve paddy rice production.

Table 4.2: Resource-use efficiency of rice production

Variable	MVP	MFC	r	Decision	Efficiency Gap	Divergence%
Farm Size	4509.81	24093.37	0.19	Over-utilized	-19.58	434.24
Labour	1635.69	1000	1.64	Underutilized	635.69	38.86
Fertilizer	2778.92	6481.13	0.43	Over-utilized	-3702.21	133.22
Agrochemicals	507.05	1370.40	0.37	Over-utilized	-863.36	170.27
Seed	165.65	240.49	0.69	Over-utilized	-74.84	45.18

Source: Computed Field Data, 2020

4.3 Analysis of constraints faced by rice farmers in the Study Area

Principal component analysis (PCA) was used to analyzed the constraints faced by the respondents. PCA is a statistical technique that transfers a data set with many interrelated variables into one with smaller number of uncorrelated variables (Lake *et al*., 2000). From the results presented on Table 4.3, the number of principal components retained using the Kaiser criterion, is three that is where the Eigen Values are 1 and above. At this component, 63.95% of the variations in the constraints has been explained by the component captured in the model. The Kaiser-Meyer-Olkin measures of sampling adequacy (KMO) of 0.605 and Bartlett test of sphericity of 864.234 was significant at 1% level of probability and demonstrated the feasibility of employing the data set for factor analysis. This result is in line with Noor, Naziruddin, and Ilham (2015).

From the results, herdsmen and farmers-clashes was ranked 1st in the order of importance based on the perceptions of the rice farmers with 27.28% proportion. Inadequate funds and Bureaucracy in accessing credit were ranked 2ndand 3rd with 24.34% and 12.33% respectively in the order of importance based on the perceptions of the rice farmers. The results agree with the findings of Bashir, Zhu, Fu, and Hu (2018).

Table 4.3: Principal component analysis of constraints faced by rice farmers in the Study Area

Component Mean (Std Dev)	Eigen-Value	Difference	Proportion	Cumulative
Herdsmen's and farmer clashes	2.45521	0.264601	0.2728	0.2728
Inadequate funds	2.19061	1.08049	0.2434	0.5162
Bureaucracy in accessing credits	1.11012	0.181429	0.1233	0.6395
Inadequate fertilizer	0.928693	0.119789	0.1032	0.7427
Pest and diseases	0.808904	0.317603	0.0899	0.8326
Poor access to extension agent	0.491301	0.045794	0.0546	0.8872
Distance to the Market	0.445507	0.103818	0.0495	0.9367
High cost of Labour	0.341688	0.113723	0.038	0.9747
High cost of maintenance	0.227965	.	0.0253	1
Bartlett Test of Sphericity				

Chi-Square	= 864.234 ***
Rho	= 1.0000
KMO	= 0.6050

Source: Computed Field Data, 2020

V. Conclusion and Recommendations

The study was set up to investigate rice production in Nigeria in order to address productivity, resource-use efficiency and constraints encountered by rice farmers. This is necessary to sustain and improve the development of rice production in the country. The research revealed that rice productivity was sub-optimal and resource-use efficiency of rice production shows that farm size, fertilizers, agrochemicals, seeds were over-utilized, while labour was under-utilized. The most critical constraints faced by rice farmers were herdsmen and farmers-clashes, inadequate capital and bureaucracy in accessing credit. To this end, the study recommends as follows:

(i). Extension officers should be employed, trained and deployed to farming communities to re-train and improve the capacity skills of the farmers in the appropriate utilization of resources such as fertilizer, quality seed, farm size and labour utilization. This will improve productivity and resource use efficiency of the farmers.

(ii). Security apparatus in the agrarian communities should be step up through strong synergy and collaboration between farming communities, herdsmen and security personnel.

(iii). Government agencies, international donors and private stakeholders in rice industry should make loans and credit more available and accessible in a simplify way to rice farmers. This will help in encouraging more investment in rice production.

Reference

[1]. Abdul-Azeez, M. L., Omotesho, K. F, Adekola, O. F & Adekunle, D. (2014). Assessment of Land Management Practices in Food Crops Production among Small Scale Farmers in Kwara State, Nigeria. *International Journal of Agricultural Management and Development, 4*(2): 105-116.

[2]. Adeshina, A. (2014). Agriculture revolution blueprint. Presentation of the Honourable Minister of Agriculture and Rural Development, Federal Republic of Nigeria. Proceedings in the 36th Session of the IFAD Governing Council.

[3]. Adewuyi, S. A. (2006). Resource Use Productivity in Food Crop Production in Kwara State, Nigeria. *Unpublished Ph. D Thesis*. Department of Agricultural Economics, University of Ibadan, Ibadan, Nigeria.

[4]. Akande, S. O. (2003). An Overview of Nigerian Rice Economy. 2003. *Available at: www. unep/etu/etp/events/agriculture/nigeria. pdf, (accessed 30 July 2020)*.

[5]. Akerele, E. O., Odojukan, D. M., Yangomodou, O. D., Olugbemi, M. T., Solana, O. I., Ilori, A. R., &Fadipe, M. O. (2019). Productivity and Technical Efficiency of Cassava Production in Ogun State, Nigeria. *Journal of Agriculture and Veterinary Science 12*(11), 33-40. Downloaded on 19th September, 2019. Available at www.iosrjournals.org.

[6]. Akintayo, O. J., &Rahji, M. A. Y. (2016). Technical efficiency in rice ecology of north central Nigeria: Implication for national self-sufficiency. *Uganda Journal of Agricultural Science,17*(1), 99-110.

[7]. Alias, R., & Ismail, L. (2006). Estimating Economic Efficiency in Paddy Farms: A Case of Northwest Selangor IADP. *Journal of Social Science. 4*(1), 77-82, ISSN: 0128-7702.

[8]. Agricultural Promotion Policy (2016). Federal Ministry of Agriculture and Rural Development working document, Abuja, Nigeria.

[9]. Bashir, S., Zhu, J., Fu, Q., & Hu, H. (2018). Comparing the adsorption mechanism of Cd by rice straw pristine and KOH-modified biochar. Environmental Science and Pollution Research. 25. 10.1007/s11356-018-1292-z

[10]. Dabara, D. I., Lawal, O. K., Chiwuzie, A., Omotehinshe, O. J., &Soladoye, J. O. (2019). Land tenure systems and agricultural productivity in Gombe Nigeria. *Madridge J Agric Environ Sci. 1*(2), 51-59.

[11]. Diewert, W. & Nakamura, A. (2005). Concepts and Measures of Productivity: An Introduction. *Services, Industries and the Knowledge Based Economy*. University of Calgary Press. 19-37.

[12]. Danso-Abbeam,G., Dahamani, A. M. & Bawa, G. A. S. (2015). Resource-use-efficiency among smallholder groundnut farmers in Northern Region, Ghana. *American Journal of Experimental Agriculture,6* (5), 290-304.

[13]. Ebe, F. E., Obike, K. C., Ugboaja, C. I. &Ezelu, C. (2018). Effects of land tenure security on food productivity among arable crop farmers in Isuikwato local government area of Abia State, Nigeria. *Nigeria Agricultural Journal 49* (2), 211-217.

[14]. Ekpe and Alimba (2013). Economic of rice production in Ebonyi State, South East, Nigeria. International Journal of Food, Agriculture and Veterinary sciences.3(2).77-81. Accees on August 13th, 2021. Available at http://www.cibtech.org/jfav.htm.

[15]. Ishiaku, O. K., Haruna, U., Danwanka, H. A. & Suleiman, H. R. (2017). Resource use efficiency of fadama III small scale rice farmers in Nasarawa State, Nigeria. *International Journal of Agricultural Economics and Extension.5* (4), 284-294.

[16]. Jaiyeola, A. (2016). FCT Minister Harps on Development of Satelite Towns. Thisday Internet Edition. Downloaded on 19th September, 2019 [online, URL: www.thisdaylive.com/index.php/2016/03/29/fct-minister-harps-on-development-of-satellite-towns/]

[17]. Kadiri, F. A., Eze, C. C., Orebiyi, J. S. &Onyeagocha, S. U. O. (2014). Resouce-use and Allocative Efficiency of Paddy Rice Production in Niger Delta Region of Nigeria. *Global Journal of Agricultural Research, 2* (4), 11-18.

[18]. Lira, M., Shamsudin, M. N., Radam, A., & Mohamed, Z. (2014). Optimality of Input Used, Input Demand and Supply Response of Rice Production: Experience in MADA Malaysia. *Journal of Economics and Sustainable Development, 4* (18), 71-76.

[19]. Macrotrend (2020) Abuja, Nigeria Metro Area Population 1950-2020 retrieved from https://www.macrotrends.net/cities/21976/abuja/population on 8th May, 2020.

[20]. Maikasuwa, M. A. & Ala, A. L. (2013). Determination of profitability and resource-use efficiency of yam production by women in Bosso Local Government Area of Niger State, Nigeria. *European Scientific Journal.* 9 (16), 1857-7881.

[21]. National Population Commission (NPC), (2006). National Census Figure, National Population Commission, Nigeria.

[22]. Noor, U., Naziruddin, H., & Ilham, S. (2015). An Easy Approach to Exploratory Factor Analysis: Marketing Perspective, *Journal of Educational and Social Research* Vol. 6 No.1

[23]. Omotesho, O. A., Lawal, A. M., & Yusuf, Y. K. (2010). Economics of small-scale rice production in Patigi and Edu local government areas of Kwara State, Nigeria. *African Journal of Agricultural Research*, *5*(4), 1-7.
[24]. Oni, O., Pender, J., Phillips, D. & Kato. E. (2009). Trends and Drivers of Agricultural Productivity in Nigeria. *Nigeria Strategy Support Program (NSSP) Report 001: IFPRI*.
[25]. Oyakhilomen, O.&Rekwot, G. (2014). Agricultural Production and Economic Growth in Nigeria: Implication for Rural Poverty Alleviation. *Quarterly, Journal of International Agriculture* 53, 207 - 223.
[26]. 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.
[27]. Wiebe, K., Soule, M. J., Narrod, C. & Brenneman, V. E. (2003). Resource Quality and Agricultural Productivity: A Multi-country Comparison in Land Quality, Agricultural Productivity and Food Security: Biophysical Processes and Economic Choices at Local, Regional and Global Levels. Edward Elgar publishing, 2003.
[28]. Zepeda, L. (2001). Agricultural Investment, Production Capacity and Productivity. In Agricultural Investment and Productivity in Developing Countries: Food and Agriculture Organization (FAO): Rome.

Sanusi*et. al*. "An investigation of small-scale rice production in Nigeria: Total and Marginal Productivity Approach." *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS), 14*(9), 2021, pp. 35-42.