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ASSESSING RESOURCE USE EFFICIENCY AND INVESTMENT IN SMALL-SCALE OKRA PRODUCTION IN OSUN STATE, NIGERIA

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Abstract. Okra (*Abelmoschus esculentus* L. Moench) yield is characterized by low productivity but may be increased through the adoption of new technology or the efficient allocation of existing resources. In addition, improving the level of resource allocation is important for improving productivity. This study investigated resource use efficiency in small-scale okra production. A multi-stage sampling procedure was used to select 100 respondents. The primary data generated through the survey of 100 okra farmers were analyzed using descriptive statistics, the ordinary least squares regression model, and marginal value analysis. The average age of the respondents was 45 years, with 7 members in the household, and 2.8ha being farmed. The ordinary least squares regression estimate indicated age, labor, farm size, and herbicide and insecticide use that influenced okra production. Returns to scale was 2.09; resource use efficiency indicated the following values: farm size 0.343, herbicide application 0.857, insecticide application 0.75, and labor 4.80. The high cost of inputs (1.93), low numbers of extension contact with farmers (1.82), high incidence of pests and disease (1.49), non-access to credit (1.39), difficulty in obtaining labor (1.23), drought (1.15), and marketing problems (1.09) are constraints negatively affecting okra production. Although the positive and statistically significant effect of pesticides, farm size, and labor indicate these inputs can effectively improve okra production, small-scale okra production is inefficient because farmers use too many pesticides and farmland and less labor than is needed. The marginal product of inputs is not enough to offset the corresponding marginal cost. Therefore, small-scale farmers should operate on smaller farms than they currently do, apply pesticides at recommended rates, and spend more on labor. So, training should be organized through extension workers and agricultural research stations to improve scientific knowledge of farmers for efficient use of productive resources.

Keywords: resource use, efficiency, okra, production, Osun State

INTRODUCTION

Vegetables are a staple food whose production has continued to increase in most countries of the world, including Nigeria. The major vegetables in Nigeria include onion, tomato, okra, pepper, *amaranthus*, carrot, melon, *Corchorus olitorus* (ewedu), *Hibiscus sabdariffa* (sobo), and *Adansonia digtata* (baobab leaves) etc. Okra (*Abelmoschus esculentus* L. Moench) was domesticated in West and Central Africa but is now widely cultivated throughout the tropics, primarily for local consumption (Schipper, 2000). It ranks third in Nigeria after tomato and pepper in terms of consumption and production area. The economic importance of okra cannot be overemphasized. It contains carbohydrates, proteins, and vitamin C, as well as amino acids in large quantities (Law-Ogbomo et al., 2013; Ijoyah and Dzer, 2012). Hence, it plays a vital role in the human diet (Farinde et al., 2007). In addition, okra has attributes that are used for other purposes. Its leaves, buds, and flowers are edible. Also, its seeds, when dried, can be used to produce oil, vegetable curd, and coffee additives or substitutes, among other things (Adeboye et al., 2009).

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Despite the nutritive value of okra and the continuous demand for it for various purposes, its production has fluctuated in Nigeria. Though okra production in Nigeria recorded an increase from 6 tons per hectare in 2003 to 8 tons per hectare in 2013 (Adedeji, 2004; Egwu et al., 2013), the growth rate declined tremendously from an average of 33.7% between 2004-2008 to 4.9% in 2009–2013 (Ume et al., 2016). Currently, okra production is less than 1.8 tons per hectare (Ume et al., 2018a). The declining trend in okra production has been traced to low resource productivity from inefficient use of resources (Ume et al., 2018a). Inefficiency in resource use on okra farms in terms of pesticides, herbicides, simple implements, and labor has been an important factor affecting okra output in Nigeria. Unfortunately, okra production depends on the economic potential of smallholder farmers who lack the ability to be efficient in resource allocation, which limits the ability to use the crop in economic development (Evensteil, 2009; Egwu et al., 2013). And regrettably, very few efforts have been made to increase its production, while various programmes have focused on improving the production of other vegetables, such as tomatoes. This, however, limits the ability of the crop to perform its traditional role in economic development (Evensteil, 2009; Egwu et al., 2013).

However, if farmers are efficient in the use of the scarce resources at their disposal, then okra output and yield will increase. In other words, one of the ways to address the situation is through efficient use of the resources available to farmers (Ramaila et al., 2011; Ash, 2011; Terwase, 2013). It is, however, necessary to investigate whether farmers are making maximum use of the resources available to them. Although, numerous research works have focused their attention on okra production, marketing, processing, and utilization (Ngbede et al., 2014; Law-Ogbomo et al., 2013; Nwaobiala and Ogbonna, 2014), very few have addressed the issues of resource use efficiency. Nevertheless, it is necessary for farmers to maximize efficiency in the use of scarce resources (Ume et al., 2018b). This work was undertaken to determine how efficient smallholder okra farmers are in their use of resources. Consequently, the study analyses the resource use efficiency of small-scale okra production in Osun State. Specifically, it describes the socioeconomic characteristics of okra farmers, determines the factors affecting okra production, determines the resource use efficiency of okra production, and identifies the constraints affecting okra production. This study provides consolidated insight into the reasons for resource use efficiency in small-scale okra production. It also gives an insight into policies that can be implemented to improve resource use efficiency in small-scale okra production. This evidence is useful to policy makers as well as other parties involved in the okra value chain.

RESEARCH METHODOLOGY

Studied area

The study was conducted in Osun State, Nigeria (Fig. 1). The State lies between latitude 7°30´N of the equator and longitude 4°30'E of the Greenwich meridian on a land area of about 9,251km². The State shares boundaries with Kwara State in the North, Oyo State in the West, Ogun State in the South, and Ondo and Ekiti States in the East. It comprises 30 local government areas. According to the 2006 census reports, the population of Osun State stood at about 4.14 million, consisting of the Yoruba ethnic group. The State has 2 distinct climatic seasons, namely the dry season and the wet season. The natural vegetation comprises moist evergreen and semi-evergreen forest and secondary forest, with mean annual rainfall ranging between 1400 and 2000mm. The mean annual temperature ranges between 26°C and 27°C. Over 90% of the rural populace are involved in farming. Crops produced in the State include cash crops such as cocoa, palm oil, and kola, and food crops such

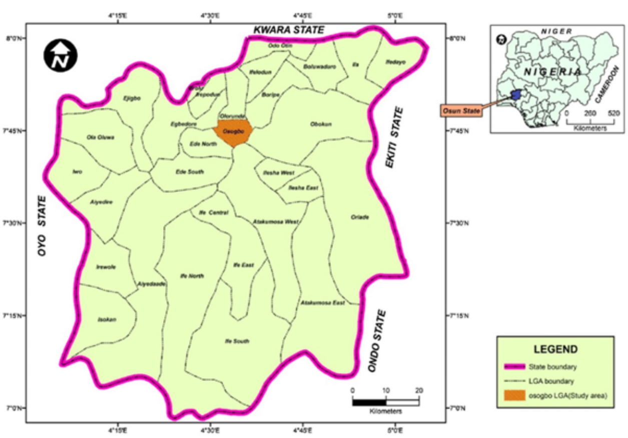

Fig. 1. Map of Osun State
Source: Google map, 2019 Accessed from https://www.google.com/search?client=firefox-b-d&q=map+of+osun+state+#imgrc=86HT7vJXxFkXQM

as cassava, yam, maize, and some fruits and vegetables. Major fruits produced in the State include orange, grape, lemon, tangerine, plantain/banana, mango, pineapple, pawpaw, walnut, and albidium (agbalumo). Major vegetables include pepper, tomato, amaranthus (tete), okra, melon (*Celocynthis citrulus*), water leaf (*Talinum triangulare*), bitter leaf, Eggplant fluted pumpkin (*Telfaria occidentalis*), sokoyokoto (*Celostia argenta*), and ewedu (*Corchorus olitorus*). Some of these farmers plant okra as a mixed crop with the other crops stated above.

Sampling technique and sample size

A multi-stage sampling procedure was employed to obtain the data for the study. The first stage was purposive selection of four major Local Government Areas (LGAs) in Osun State based on the predominance of okra farmers in the selected areas. The second stage involved random selection of four villages from the selected LGAs. The third stage involved random selection of twenty-five okra farmers from selected villages. In all, a total of 100 okra farmers were selected for the study.

Analytical techniques and model specification

The data collected were analyzed using descriptive statistics, the ordinary least squares regression model, and marginal value analysis using STATA software (ver. 15, College Station, TX). Descriptive statistics were used to describe the socioeconomic characteristics of the okra farmers.

Ordinary least squares regression model

Following Adeyemo et al. (2020) and Kehinde (2021), the ordinary least squares regression model was employed to determine the factors affecting small-scale okra production. The conventional model of household economic behavior under constrained utility maximization was used to relate output directly to exogenous variables describing the social and economic environment in which decisions are made. The OLS model was used to model the exogenous relationship between output and socio-economic variables.

This model is implicitly expressed as follows:

$$Y = f(X_1, X_2, X_3, \dots X_n; e) \quad (1)$$

where: Y – dependent variable; X_1–X_n – independent variables; E – stochastic error

In the model, different functional forms were used. They include linear, semi-log, double-log, and exponential functions. The choice of the best functional form (lead equation) was based on statistical and econometric criteria (T-test, F-statistics, and R^2), number of significant variables, and the *a priori* expectation of the signs of the coefficients.

The linear form is given as follows:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + U_i \quad (2)$$

The exponential form is specified as follows:

$$\text{Log}Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + U_i \quad (3)$$

The semi-log form is specified as follows:

$$Y = \beta_0 + \beta_1\text{Log}X_1 + \beta_2\text{Log}X_2 + \beta_3\text{Log}X_3 + \beta_4\text{Log}X_4 + \beta_5\text{Log}X_5 + \beta_6\text{Log}X_6 + \beta_7\text{Log}X_7 + \beta_8\text{Log}X_8 + U_i \quad (4)$$

The double-log form is given as follows:

Table 1. Sampling procedure for the study

State	LGAs	Villages		Okra farmers	
		proportion used	number of villages	proportion used	number of registered farmers
Osun	Aiyedaade	5	11	25	43
	Aiyedire	5	14	25	46
	Egbedore	5	17	25	51
	Isokan	5	18	25	55
Total	4	20	60	100	195

Source: own elaboration.

$$\mathrm{Log}Y = \beta_0 + \beta_1\mathrm{Log}X_1 + \beta_2\mathrm{Log}X_2 + \beta_3\mathrm{Log}X_3 + \beta_4\mathrm{Log}X_4 + \beta_5\mathrm{Log}X_5 + \beta_6\mathrm{Log}X_6 + \beta_7\mathrm{Log}X_7 + \beta_8\mathrm{Log}X_8 + U_i \quad (5)$$

where: Y – output (kg)

The explanatory variables are: X_1 – age (years); X_2 – Farming experience (years); X_3 – farm size (hectares); X_4 – herbicide spray (liters); X_5 – pesticide spray (liters); X_6 – cost of cutlass (N); X_7 – cost of hoe (₦); X_8 – labor (man-hours); U_i – the error term.

Marginal value and resource use efficiency analysis

The resource use efficiency of the smallholder okra farmers was estimated based on the coefficient of each resource and the efficiency of resource use using marginal value analysis. Returns to scale was used to measure the degree of responsiveness of the output for a given unit change in the inputs.

$$Ep = \frac{b.x}{y} \quad (6)$$

where: b – coefficient of individual inputs; x – mean of input; y – mean of output

When all factors of production are increased, it implies a change in the scale of operations.

This can lead to one of the following situations:

- For constant returns to scale, $\beta_1 + \beta_2 + \beta_3 \ldots + \beta_n = 1$, that is, if all the inputs are increased by a factor of n, then the output also increases by a factor of n.
- For increasing returns to scale, $\beta_1 + \beta_2 + \beta_3 \ldots + \beta_n > 1$, if all the inputs are increased by a factor of n, then the output increases by an amount greater than n.
- For decreasing returns to scale, $\beta_1 + \beta_2 + \beta_3 \ldots + \beta_n < 1$, if all the inputs are increased by a factor of n, then output increases by an amount less than n.

The marginal value product (MVP) is also estimated based on the coefficient of each resource, and it is given by:

$$\mathrm{MVP} = \beta_i \times X_i \quad (7)$$

where: β_i – is the estimate of input i; X_i – is input i

The efficiency of resource use, r, was calculated as:

$$r = \frac{\mathrm{MVP}}{\mathrm{MFC}} \quad (8)$$

where:

MVP – product of marginal physical product and unit price of output

MFC – cost of one unit of a particular resource

r – efficiency ratio.

If $r = 1$, efficient use of resource is implied; if $r < 1$, inefficient use of resource is implied, i.e., resource is overutilized; if $r > 1$, inefficient use of resource is implied, i.e., resource is underutilized.

The mean score on the Likert scale was used to determine the constraints of small-scale okra production.

The constraint on okra production was determined as follows:

$$\mathrm{MeanScore} = \frac{3n_3 + 2n_2 + 1n_1}{N} \quad (9)$$

where:

n_1 – total number of respondents that answered moderate

n_2 – total number of respondents that answered severe

n_3 – total number of respondents that answered very severe

N – total number of respondents.

RESULTS AND DISCUSSION

Socio economic characteristics of okra farmers

The socioeconomic characteristics of the okra farmers are presented in Table 2. The mean age is approximately 46 years. This implies that the farmers are still in their active and productive age. This agrees with the findings

Table 2. Socio-economic characteristics of okra farmers

Variables	Okra farmers
Male (%)	71
Age (years)	45.92 (±10.97)
Married (%)	79
Household size (#)	6.88 (±2.01)
Formal education (%)	81
Farm size (ha)	2.8 (±1.08)

Source: estimations from survey data, 2017.

of Ibitoye et al. (2015). The majority of the respondents (71%) are male. This implies that okra production is dominated by men. This is in line with studies by Ibitoye et al. (2015) and Usman and Bakar (2013). The majority of the respondents (79%) are married. This implies that the okra farmers have a lot of responsibility that could warrant their commitment to okra production as a source of income to cater for the needs of their families. This agrees with the work of Farinde et al. (2007). In addition, a large percentage of the respondents (81%) can at the least read and write. This implies that literate farmers are involved in okra production. This agrees with the findings of Fakayode et al. (2012). The mean household size is approximately 7 members per household. It is expected that members of the household will serve as a source of labor on the farms. The mean farm size is approximately 3 hectares. This implies that okra production in the study area is still at the subsistence level. This confirms the results of a study carried out by Ibitoye et al. (2015).

Factors affecting okra production

The factors affecting okra production are presented in Table 3. The double log model was selected as the lead equation after running all the functional forms based on statistical and econometric criteria (T-test, F-statistics, and R^2), the number of significant variables, and the *a priori* expectation of the signs of the coefficients. The selection is based on the high R-square and minimum standard errors. This model was also selected because the relationship between the set of independent variables and the dependent variable is nonlinear in its parameters. In this situation, we believe that the double log model generates the desired linearity in the parameters. The F-value, 11.6, showed that the model is of good fit. The R^2 value of 0.505 implies that 50.5 % of the variation in the dependent variable is explained by the independent variables. From the table, age, herbicides, labor, farm size, and pesticides influenced okra production. Herbicides have a positive and significant effect on okra production, which implies that a percentage increase in the liters of herbicide spray used on okra farms might increase okra production by 34.4 percent. Labor has a positive and significant effect on okra production, which implies that a percentage increase in the man-days of labor used on okra farms might increase okra production by 63.4 percent. Farm size has a positive and significant effect on okra production, which implies that

Table 3. Factors affecting okra production

Variables	Linear form		Exponential form		Semi Log form		Double Log form	
	Coeff.	*t*-statistic	Coeff.	*t*-statistic	Coeff.	*t*-statistic	Coeff.	*t*-statistic
Constant	8.638**	2.46	3.274***	4.85	1.544**	2.33	1.584***	2.75
Age	–2.910	–0.47	–0.004	–0.32	94.827	0.36	–0.012**	–2.03
Farming exp.	44.415	1.00	0.015	0.17	68.786	0.58	0.035	0.18
Farm size	–7.903	–0.24	0.049	0.78	189.381*	1.91	0.426**	2.60
Herbicide spray	21.171	1.48	–0.005	–0.16	258.632*	1.97	0.344**	1.98
Pesticide spray	–7.704	–0.64	0.017	0.74	29.244	0.27	0.068**	2.38
Cost of cutlass	0.010	0.38	–0.000	–1.04	18.182	0.13	0.231	0.97
Cost of hoe	0.152***	4.77	0.000***	4.14	239.233**	1.97	0.387	1.93
Labour	8.891	1.43	0.028**	2.30	164.946	1.31	0.634***	3.05
R^2	0.621		0.426		0.549		0.505	
R^2(Adj.)	0.582		0.370		0.510		0.462	
F value	15.83***		7.18***		13.86***		11.61***	

Source: estimations from survey data, 2017.
*** significant at 1%; ** significant at 5%; *significant at 10%.

a percentage increase in the size of okra farms might increase okra production by 42.6 percent. Pesticides have a positive and significant effect on okra production, which implies that a percentage increase in the liters of pesticide spray used on okra farms might increase okra production by 6.8 percent. This corroborates the findings of Farinde et al. (2007), Ibitoye et al. (2015), and Ume et al. (2018a, b). However, the coefficient of age had negative signs. This implies that a percentage increase in the age of the farmers might decrease okra production by 1.2 percent. This confirms the results of a study carried out by Ibitoye et al. (2015).

Production elasticity and return to scale

The value of returns to scale (RTS) indicates that small-scale okra production is at an increasing return to scale (Table 4). The summation of the output elasticities indicates an increasing return to scale for small-scale okra production, as shown by the value 2.09. It can therefore be inferred that small-scale okra growers are likely to earn more revenue by increasing their scale of operation (investment in okra production). However, the okra farmers are yet to attain an optimum level with the resources available and are only working at low levels of production. This implies that the respondents should optimize the resources devoted to production.

Table 4. Elasticity of production and returns to scale

Variables	Elasticity
Farm size	0.426
Herbicide spray	0.344
Pesticide spray	0.068
Cutlass	0.231
Hoe	0.387
Labour	0.634
RTS*	2.090

Source: field survey, 2017.

Resource use efficiency

The efficiency of resource use was estimated by comparing the Marginal Value Product (MVP) of a particular input with the Marginal Factor Cost (MFC) of that input in order to determine the financial implication of allocating each resource devoted to okra production and the scope of resource adjustment necessary to attain the economic optimum (Table 5). The okra farmers were assumed to operate in a purely competitive market. Thus, the price per unit of input was used as the marginal factor cost. The farm size and herbicide and insecticide use were over-utilized because marginal value products of inputs are not enough to offset the corresponding marginal cost. In simpler words, smallholder okra farmers used more units of land and pesticides than they needed to. This shows that it is not worth increasing the level of use of these resources. The possible reason for overutilization of farm size could be ascribed to the fact that small-scale farmers cultivate larger farm sizes with higher land prices and crude farming implements. Therefore, it would be better to operate on smaller farms than they currently do. Pesticides were also overutilized as their marginal value product is greater than the

Table 5. Resource use efficiency

Inputs	MPPx	Px	MVP	MFC	R	Status
Farm size	0.426	3 500	511.20	1 491.00	0.343	Over-utilized
Herbicide spray	0.344	1 400	412.80	481.60	0.857	Over-utilized
Pesticide spray	0.068	1 600	81.60	108.80	0.750	Over-utilized
Cutlass	0.231	2 000	277.20	462.00	0.600	Over-utilized
Hoe	0.387	1 200	464.40	464.40	1.000	Efficient
Labour	0.634	250	760.80	158.5	4.800	Underutilized

Pq = ₦ 1200. MPPx denotes Marginal Physical Product of the resource. Px denotes Price of the resources.
Source: estimations from field survey, 2017.

marginal factor cost. The possible reason for overutilization of pesticides may be due to the lower factor prices of the available pesticides leading to the unnecessary acquisition of too many liters of pesticides. Hence, they spray more liters of pesticides than is necessary for their okra farms such that the marginal product of pesticides is not enough to offset the corresponding marginal cost. Labor was underutilized as its marginal value product is less than its marginal factor cost. The possible reason for underutilization of labor could be that okra farmers make use of hired labor for farm operation, which is expensive, and the high wage rate of labor does not favor small farm owners. Thus, these findings are in line with the study of Ibitoye et al. (2015), which shows that pesticide sprays were overutilized and labor input was underutilized. Achievement of efficiency in all inputs depends on increasing all inputs that are underutilized and reducing those that are overutilized, which disagrees with Ume et al. (2018a, 2018b). Therefore, small-scale okra farmers should operate on smaller sized farms than they currently do, apply pesticides at recommended rates, and spend more on labor.

Constraints on okra production

Seven questions were answered by the respondents to identify the constraints on okra production. Table 6 shows that the high cost of inputs (1.93) is ranked the highest among the constraints on okra production, followed by poor extension visits (1.82), pests and disease (1.49). This is then followed by non-access to credit (1.39) and difficulty in obtaining labor (1.23). Drought (1.15) and marketing problems (1.09) are ranked the lowest among the constraints. The grand mean is 1.44 with standard deviation 0.70. Constraints with a mean greater than 2.14 (1.44+0.70) are classified as strong constraints, those with a mean lower than 0.74 (1.44–0.70) are classified as weak constraints, while those with a mean between 0.74 and 2.14 are moderate constraints. Therefore, all the constraints are moderate ones.

CONCLUSION

This study investigated the resource use efficiency of and investment in small-scale okra production in Osun State. A multi-stage sampling procedure was used to select respondents for this study. The study concluded that the majority of the okra farmers are in their active and productive age, the majority are male and married, almost all can read and write, the mean household size indicates that members may be expected to provide labor on the farm, and they are small holders. The findings of this study revealed that age, herbicide, labor, farm size, and pesticides influenced okra production. The underutilized farm inputs are household size, insecticides, and fungicides, while farm size and labor are overutilized. The results of the resource efficiency analysis showed that, out of the resources considered in the study, the okra farmers only achieve optimum allocative efficiency in the use of hoes. The farmers operate at an increasing return to scale, given an elasticity of production of 2.090. It was also found that the farmers are inefficient in the use of the resources at their disposal. Non-access to credit, pest and disease infestation, poor extension services, high costs of farm inputs and difficulty in obtaining labor, drought, and marketing problems were identified as major constraints on okra production.

Table 6. Constraints on okra production

S/N	Factors affecting okra production	Mean	Standard deviation	Rank
1	High cost of inputs	1.93	0.84	1st
2	Poor visit by extension agents	1.82	0.95	2nd
3	Challenge of pests and diseases	1.49	0.72	3rd
4	Access to credit	1.39	0.49	4th
5	Difficulty in obtaining labour at critical period	1.23	0.42	5th
6	The problem of drought	1.15	0.44	6th
7	Problem of marketing produce	1.09	0.35	7th

Source: estimations from survey data, 2017.

Although the positive and statistically significant effects of pesticides, farm size, and labor indicate that these inputs can effectively improve okra production, small-scale okra production is inefficient because farmers use too many pesticides, have inefficient farm sizes, and use less labor than is necessary. In addition, the marginal product of inputs is not enough to offset the corresponding marginal cost. Therefore, small-scale farmers should operate on smaller farms than they currently do, apply pesticides at recommended rates, and spend more on labor. So, training should be organized through extension workers and agricultural research stations to improve scientific knowledge of farmers for efficient use of productive resources. It is necessary to motivate the extension agents to be responsible to their functions by paying them allowances incurred in discharging their duties. This study was mainly carried out to investigate the resource use efficiency of small-scale production using okra production as a case study and has contributed to knowledge based on the findings therein. However, the author suggests further studies be carried out along the same lines but adopting a comparative method. This would add to the findings of this research. That is, instead of using only one vegetable, various types of vegetable, such as onion, tomato, okra, pepper, *amaranthus*, carrot, melon, *Corchorus olitorus* (ewedu), *Hibiscus sabdariffa* (sobo), and *Adansonia digtata* (baobab leaves) could be compared to find which type of vegetable small-scale farmers are growing in a resource efficient manner. In addition, not much can be deduced from this result as far as gender analysis is concerned. Future work in this area could explore the resource use efficiency of small-scale farmers along gender lines.

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REFERENCES

Adeboye, O.C., Awokoya J.O., Oluseyi, E. (2009). Effect of seasonal changes on growth and yield of okra (*Abelmoschs esculentus* L. Moench). Res. J. Agric. Biol. Sci., 5(9), 940–943.

Adedeji, T.O. (2004). Income risk and welfare status of rural households in Nigeria: Ekiti State as a test case. WIDER Research Paper no 2004/61.

Adeyemo, R., Kehinde, A.D., Oyenpemi, L.O. (2020). Assessing resource use efficiency and investment in cocoa enterprise: A case of Osun State, Nigeria. Agricultura, 113–114 (1–2), 260–269.

Ash, K. (2011). Risk management in agriculture in New Zealand, OECD Food and agricultural policy analyst. OECD Trade and Agriculture Directorate. New Zealand.

Egwu, E.W., Nto, P.O., Mbanasor, J.A., Kalu, K.U. (2013). Technical efficiency of commercial vegetable production in AkwaIbom State, Nigeria. Nig. Agric. J., 41(2), 157–161.

Evensteil, K. (2009). Production practices and simple costs to produce furrow irrigation Okra. Econ. Bot., 44(1), 22–36.

Fakayode, S.B., Rahji, M.A.Y., Adeniyi, S.T. (2012). Economic analysis of risks in fruit and vegetable farming in Osun State, Nigeria. Bangl. J. Agric. Res., 37(3), 473–491.

Farinde, A.J., Owolarafe, O.K., Ogungbemi, O.I. (2007). Assessment of production, processing, marketing and utilization of okra in Egbedore local government area of Osun State, Nigeria. J. Agronom., 5, 342–349.

Ibitoye, S.J., Shaibu, U.M., Omole, B., (2015). Analysis of Resource Use Efficiency in Tomato (*Solanum lycopersicum*) Production in Kogi State, Nigeria. Asian J. Agric. Exten. Econ. Soc., 6(4), 220–229.

Ijoyah, M.O., Dzer, D.M (2012). Yield performance of pkra (*Abelmoscus esculentus* L. Moench and Maize (*Zea mays* L.) as affected by time of planting in Makurdi, Nigeria. J. Agronom., 1(7).

Kehinde, A.D. (2021). Does investment in poultry egg production yield any profit? Agricultura, 117–118 (1–2), 116–122.

Law-Ogbomo, K.E., Osaigbovo, A.U., Ewansiha, S.U. (2013). Responses of okra (*Abelmoscus Esculentus*) to various periods of weed interference in a humid tropical environment. Inter. J. Agric. Rural Dev., 16(1), 1368–1371.

Ngbede, S.O., Onyegbule, U.N., Ibekwe, H.N., Uwalaka, O.A., Okpara, S.C. (2014). Economic analysis of okra (*Abelmoschus esculentus* L. Moench) production under different rates of organic manure in Okigwe, Southern Nigeria. Asian J. Agric. Food Sci., 2(2), 96–99.

Nwaobiala, C.U., Ogbonna, M.O. (2014). Adoption determinants and profitability analysis of okra farming in Aninri Local Government Area of Enugu State, Nigeria. Dis. J. Agric. Food Sci., 2 (1), 1–10.

Ramaila, M., Mahlangu, S., Du Toit, D. (2011). Agricultural productivity in South Africa: Literature review. Report No. 1. University of Pretoria, Pretoria.

Schipper, R.R. (2000). African Indigenous Vegetables: An Overview of the Cultivated Species, Natural Resource Institute. E.U. Technical Centre of Agriculture and Rural Cooperation, Chathan, UK.

Terwase, S. (2013). Determination of resource use efficiency of rice farmers in Kaambe District of Guma Local Government Area of Benue State, Nigeria. World J. Agric. Res., 1(6), 143–148.

Ume, S.I., Arene, C.I., Okpukpara, B. (2005). Adoption of improved crop production technology in Anambra State, Nigeria: T & V system approach. Farm Management Association of Nigeria, 20th Annual National Conference held at Jos.

Ume, S.I., Ezeano, C.I., Agu, L.U., Emma-Ajah, I.J. (2016). Resource use efficiency among cocoyam farmers in Anambra State of Nigeria. Asian Res. J. Arts Soc. Sci., 1(3), 1–11.

Ume, S.I., Ezeano, C.I., Chukwuigwe, O., Gbughemobi, B.O. (2018a). Resource use and technical efficiency of okra production among female headed household: Implication for poverty alleviation in the rural areas of south east, Nigeria. Int. J. Adv. Res. Dev., 3(2), 1028–1040.

Ume, S.I., Nweke, J.C., Ucha, S.O., Idahosa, E.O. (2018b). Allocative efficiency in Okra (*Abelmoschus* spp.) production in Ayamelum Local Government Area of Anambra State, Nigeria. Arch. Curr. Res. Int., 15(1), 1–7.

Usman, J., Bakar, U.M. (2013). Profitability of small-scale dry season tomato (*Lycopersicon esculentum* Mill.) production in Adamawa States, Nigeria. J. Sci. Technol., 3(6), 25–39.