

Full Length Research Paper

Assessment of Organic Fertilizer usage by vegetable farmers in Ondo State South West, Nigeria

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The study analysed the assessment of organic fertilizer usage by vegetable farmers in Ondo State South West, Nigeria. Primary data were collected from one hundred randomly selected vegetable farmers through a multistage sampling procedure in the study area. Data were analysed using descriptive statistics, budgetary analysis and probit regression analysis. Findings of the study revealed that larger percentage (77.0%) of the vegetable farmers fall between age (31-50) years with mean age 43. About 59% of the respondents were female with majority (79.0%) having access to credit. Majority (63.0%) of the respondents suffer from high pest infestation. The budgetary analysis revealed that vegetable production has a high return on investment. The probit analysis showed that gender, age and farm size decreased farmer's adoption of organic fertilizer while marital status, education and farming experience increased adoption of organic fertilizer in the study area. The study recommended that farmers should keep reasonable farm size that can easily be managed in other to improve adoption of organic fertilizer and they should be encouraged by government to participate in adult education and training that will improve their skill in the use of organic fertilizer in other to increase the productivity of vegetable production.

Key words: Organic, fertilizer, farm size, budgetary analysis.

INTRODUCTION

The cultivation of vegetable serves as a means of livelihood for thousands of household both in the rural and urban communities. Most vegetables farmers in the rural community grow vegetable for commercial purpose in other to generate income while some in the urban centre cultivate vegetable for the purpose of nutritional and medicinal value. This view is supported by Ayethan et al. (1995); Baral et al. (2011) and Alegbejo (2013) who

observed that vegetable has been reported to possess both nutritional and pharmacological properties.

The vegetables generally cultivated in Africa, most especially the tropics includes: Amaranthus (Amaranthus), Celosia (Celosia), Cucumis (Cucumis), Hibiscus (Hibiscus), Talinum (*Talinum fruticosum*) Corchorus (*Corchorus olitorius*), Onion (*Allium cepa*), Tomato (*Solanum lycopersicum*), Okro (*Abelmoschus esculentus*),

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Pepper (*Capsicum annum* Group), Carrot (*Daucus carota* subsp. *Sativus*), Melon (*Cucumis melo*), Jute (*Corchorus capsularis*)

Amaranthus, Celosia, Cucumis, Hibiscus, Talinum, Solanum and Corchorus with onion, tomato, okra, pepper, carrot, melon, and Jute (Tindall, 1983; Ibeawuchi et al., 2015). Though the cultivation of vegetables supports rural and urban population in terms of subsistence and income generation, its cultivation still presents some challenges which however can be reduced with the use of organic fertilizers (Aderinoye-Abdulwahab and Salami, 2017). The application of organic and inorganic fertilizer to the soil is a good agricultural practice that improves the fertility of the soil and plant quality (Mofunanya et al., 2015). Both fertilizers supply plants with the nutrients needed for optimum performance, ensuring soil amendments that guarantee the minimum percentages of Nitrogen, Phosphate and Potash (Aderinoye-Abdulwahab and Salami, 2017). Its advantages also include; increasing crop yield, improving soil texture, quality of the land and faster growth of crops (EPA, 2013). Organic fertilizers have been used for centuries whereas chemically synthesized inorganic fertilizers were only widely developed during the industrial revolution. Inorganic fertilizer has significantly supported global population growth, it has been estimated that almost half the people on the earth are currently fed as a result of artificial nitrogen fertilizer use (Erisman et al., 2008).

Despite this advantage, the use of organic fertilizer is being advocated for because of its soil conservation property and its eco-friendliness over the inorganic fertilizer. It is a sustainable farming system that produces healthy crops and livestock without damaging the environment. It avoids the use of artificial chemical fertilizers and pesticides. It is mainly the cheapest sources adopted by vegetable farmers to supply nutrients for their vegetables to enhance growth and yield (Verena et al., 2012; Fawzy et al., 2016). It is on these bases that, this study tends to assess organic fertilizer usage by vegetable farmers in Ondo State, Nigeria. The specific objectives are to;

- (i) describe the socio-economics characteristics of vegetable farmers in the study area
- (ii) determine the profitability of vegetable farming in the study area
- (iii) determine the factors influencing adoption of organic fertilizer usage in vegetable production in the study area.

METHODOLOGY

The study was conducted in Akure South Local Government Area of Ondo State, South West Nigeria (Figure 1). Data for the research work was from primary source. The primary data was collected via the administration of structured questionnaire to cassava producing farmers in the study area. A multistage sampling technique was employed in the selection of respondents. The first stage involved

the selection of five villages/farming communities in the selected Local Government Areas (LGAs) using simple random sampling. The second stage involved a purposive selection of twenty-two households who are vegetable farmers in each of the farming communities, making a total of two hundred respondents. Only 100 questionnaires were properly administered and returned. Data collected were analysed using descriptive statistics such as frequency distribution, percentages, budgetary and Probit regression analysis. Budgetary analysis was used to determine the profitability of vegetable farmers in the study area (Olukosi et al., 2006; Abdullahi, 2012). The relationship is expressed as:

$$NFI = GI - TVC - IFC \quad (1)$$

Where NFI = Net farm income
GI = Gross income (Total revenue)
TVC = Total variable cost
TFC = Total fixed cost

Test of difference of mean was used to determine the significant difference between the profits of vegetable farmers who have access to organic fertilizers and those without access to organic fertilizer.

$$T = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

Source: Shukla (2017).

Where: \bar{X}_1 = profit of vegetable farmers with access to organic fertilizer

\bar{X}_2 = profit of vegetable farmers without access to organic fertilizer

S_1^2 = sample variance of vegetable farmers with access to organic fertilizer

S_2^2 = sample variance of vegetable farmers without access to organic fertilizer

n_1 = number of vegetable farmers with access to organic fertilizer

n_2 = number of vegetable farmers without access to organic fertilizer

Probit regression model

Probit Regression model in SHAZAM software was used to analyse factors influencing adoption of organic fertilizer usage by vegetable farmers in the study area. The model is implicitly stated as shown below (Nagler, 2002; Seboptji and Belete, 2009):

$$Y_i = \beta_i Z_i + \epsilon_i \quad (2)$$

Where:

(Y = 1 if farmers access organic fertilizer and 0 if there is no access).

Z_i = Exogenous variables (Z_1 - Z_6).

Z_1 = Gender Age Z_2 = Age (years)

Z_3 = Marital Status

Z_4 = Education (Number of Years)

Z_5 = Experience (years)

Z_6 = Farm size (ha)

β_i = Parameters to be estimated

ϵ_i = Error terms.

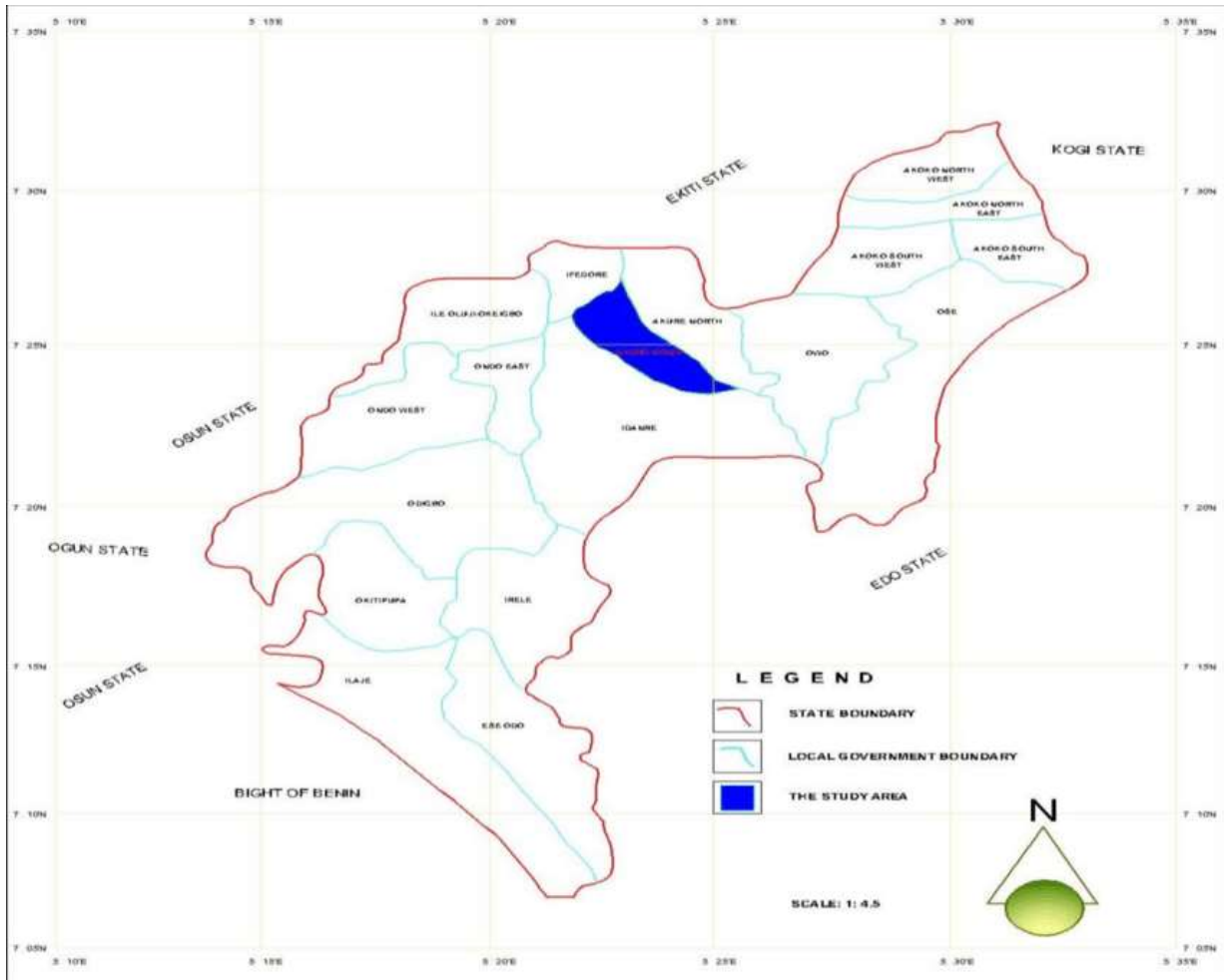


Figure 1. Map of Ondo State, Showing Akure South Local Government Area.
Source: Ondo State Ministry.

RESULTS AND DISCUSSION

Personal characteristic of respondents

Table 1, presents the descriptive analysis of socio-economics characteristics of vegetable farmers in the study area. Larger percentage (77.0%) of the vegetable farmers fall between age (31-50) years with mean age 42.62. The mean age shows that majority of the sampled farmers are young and agile, which is an asset to adoption of organic farming innovation in the study area. This result agrees with the finding of Adeola and Adetunbi (2015) which shown that most farmers in South-Western Nigeria are still in their active age which falls between ages 31-40 years. About 59.0% of the respondents were female with majority (85.0%) married. The reason while female respondents dominated the total population sample for the study was that, vegetable production is considered as a farming activity left alone mostly for house wives in the rural communities. Similar

result was reported by Aderinoye-Abdulwahab and Salami (2017) that female farmers dominated vegetable production in Asa Local government area of Kwara State, Nigeria. About (50.0%) of the vegetable farmers were predominantly educated to the tune of secondary school. The implication is that, most of the farmers with no formal or primary education that constitute about (49.0%) of the total respondents will not be able to efficiently adopt new agricultural innovation and technology in organic vegetable farming (Table 1).

Distribution of respondents by farm characteristics

Most (39.0%) of the respondents had between (4- 6) years of experience with mean household size of 5 persons per household. This implies that more family labour will be readily available on the farm to support vegetable production. Oyedele et al. (2018) reported similar result that, the larger the household size the more

Table 1. Showing the socio- economics characteristics of respondents.

Description	Frequency	Percentage
Age group (Years)	Mean age 42.62	
≤30	7	7.0
31 – 50	77	77.0
≥50	16	16.0
Gender		
Male	41	41.0
Female	59	59.0
Marital status		
Married	85	85.0
Single	11	11.0
Divorce	4	4.0
Education		
No formal Education	23	23.0
Primary Education	26	26.0
Secondary Education	50	50.0
Tertiary education	1	1.0

Source: Field Survey (2018).

the available labour supply on the farm. Most (69.0%) of the vegetable farmers cultivated between 2-3 ha of farm land with mean farm size of 2.30. This indicated that most of the respondents in the study area operated small scale vegetable farming. Ibrahim et al. (2019) reported similar finding that majority of the maize-based crop farmers in Niger State cultivated as low as 1.88 ha.

Majority (63.0%) of the farmers surveyed for the study reported high occurrences of pest infestation in vegetable production while (37.0%) of the respondents reported that organic fertilizer was not readily available for their usage. The Table also revealed that most (48.0%) of the respondents had an income of between 21,000 and 30,000. A larger percentage (79.0%) of the farmers had access to credit facilities while only (21%) does not access credit during the 2018 production season (Table 2). A hypothesis was tested on the relationship between the income of vegetable farmers who applied organic fertilizer and the income of vegetable farmers who do not apply organic fertilizer in the study area. The result as shown in Table 3 revealed that there is a significant difference between the income of the two set of farmers. Therefore, the null hypothesis is rejected. This showed that vegetable farmers that apply organic fertilizer realized more income compare to their counterpart who do not use organic fertilizer in vegetable production in terms of return on investment.

Budgetary analysis

The result of the budgetary analysis shows the cost and

return analysis for an average vegetable farmer in the study area. The result is shown in the Table 4. The table revealed that vegetable production is a profitable venture. This was measured by the rate of returned on investment and the net farm income. Returned on investment was approximately 1.67 while net farm income was greater than the cost of production. This is in agreement with the findings of Yisa et al. (2018), who reported that maize/sorghum enterprise was a profitable business on the bases of its gross ratio of 0.44 and an operating ratio of 0.40 in Niger State of Nigeria.

Table 5 present the results of the estimated Probit model. The McFadden R^2 and the likelihood ratio value indicated a goodness of fit for the equation. The probit regression analysis result showed that adoption and use of organic fertilizer depend on the following variables; Gender, Age, Marital Status, Education, Farming Experience and Farm size. The coefficient of gender of vegetable farmers was negatively correlated with adoption and use of organic fertilizer and was statistically significant at $P < 0.01$ alpha level, suggesting that female farmers dominate the use of organic fertilizer in the study area. The coefficients of farmers age and farm size were negative and statistically significant at $P < 0.10$ alpha level respectively. This shows that increase in farmers age decreases the adoption and use of organic fertilizer while the larger the farm size that a vegetable farmer cultivated the less the probability of farmer's adoption and use of organic fertilizer. The coefficient of the variable of marital status was positively correlated with farmer's adoption of organic fertilizer. Coefficients of education and farming

Table 2. Showing the distribution of respondents by farm characteristics.

Description	Frequency	Percentage
Experience		
1 - 3	30	30.0
4 - 6	39	39.0
6	31	31.0
Household Size		
	Mean household size 4.45	
1 -2	7	7.0
3 - 4	43	43.0
5 - 6	47	47.0
>6	3	3.0
Farm Size		
	Mean farm size 2.30	
≤1	21	21.0
2 - 3	69	69.0
≥4	10	10.0
Constraints to use of organic fertilizer		
High occurrences of Pest	63	63.0
Scarcity of Organic Fertilizer	37	37.0
INCOME		
21,000-30,000	69	69.0
31,000-40,000	26	26.0
>41,000	5	5.0
Access to Credit		
YES	71	71.0
No	29	29.0

Source: Field Survey (2018).

Table 3. T-test of difference of mean between vegetable farmers who applied organic fertilizer and those who do not apply organic fertilizer.

Profit	Mean	Standard deviation	N	t-value	Decision
Used organic fertilizer	28857.99	75475.89	71	4.297	Reject H ₀
Do not use organic fertilizer	15293.10	23995.192	29		

experience were positive and statistically significant at $P < 0.05$ alpha level respectively, suggesting that farmer's education and farming experience increased adoption of organic fertilizer in the study area.

Conclusion

The study analysed the assessment of organic fertilizer usage by vegetable farmers in Ondo State South West, Nigeria. Based on the findings, the research concluded that vegetable production is a profitable venture as

revealed by the profitability analysis, though farmers reported to have faced the challenges of pest infestation due to organic fertilizer usage as well as scarcity in the availability of organic fertilizer. The probit regression analysis showed that gender, age and farm size decreased farmer's adoption of organic fertilizer while marital status, education and farming experience increased adoption of organic fertilizer in the study area. The study recommended that;

(1) Farmers should keep reasonable farm size that they can be able to manage in other to improve adoption of

Table 4. Cost structure analysis.

Item	Value (Naira)	Percentage
Variable cost		
Weeding	148400	4.528021
Land clearing	121000	3.691985
Planting	254450	7.763847
Organic application	234400	7.152076
Planting material	1140920	34.81206
Total variable cost	1899170	57.94799
Fixed cost		
Cost of Cutlass	233550	7.126141
Cost of Hoe	481500	14.69166
Cost of Bucket	120750	3.684357
Rain Booth	365000	11.13698
Watering Cane	177400	5.412877
Total depreciated fixed cost	1378200	42.05201
Total cost	3277370	
Total revenue	3332000	
Gross margin	1432830	
Net farm income	54630	
RORI =(NF/TC)100	1.666885	

Source: Field Survey (2018).

Table 5. Probit regression estimates of factors affecting adoption of organic fertilizer.

Explanatory variable	Estimated parameter coefficient	T - value
Gender	-1.9561***	-4.0102
Age	-0.0696*	-1.7114
Marital status	1.5618*	1.8493
Education	0.0980**	2.5807
Farming experience	0.1375**	2.0408
Farm size	-0.3606*	-1.9104
Constant	0.8541	0.6154
McFadden R. Square	0.31654	
Log- likelihood ratio test	38.1211	
% of right prediction	0.86000	

Source: Field Survey (2018).

organic fertilizer.

(2) Holding training courses for farmers of all ages to improve their skills to take advantage of modern agricultural technology to increase the productivity and national wealth of the great Nigeria

(3) Using the media to spread agricultural culture within the morning and evening programs to duplicate the benefits of organic farming and its positive effects on the individual, the environment, and society.

(4) Training farmers in modern methods of controlling agricultural pests using biological materials, as well as propagating and spreading natural enemies to reduce the

damage of insect pests and others in effective biological methods and materials against harmful insects and not polluting the environment and safe for human food

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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