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Determinants of Profitability of Organic Farming Technologies among Vegetable Farmers: Evidence from South-South Zone Nigeria

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Abstract: This study was carried out to examine the determinants of profitability of organic farming technologies among vegetable farmers: Evidence from South-South zone Nigeria. Despite all the studies in organic system of vegetable production none of these studies was able to state the determinants of profitability of organic farming among vegetable farmers in South- South zone of Nigeria. A multi-stage sampling technique was employed for selection of location and respondents. The data were collected from 480 small scale organic vegetable farmers with structured questionnaire. The specific objectives were to: determine the factors affecting profit realized by the farmers. Data obtained was examined with the profit function regression. Findings indicated that age of the farmers, cost of labour, cost of organic materials, cost of transportation, cost of planting materials, farm size and variation in produce prices exerted significant effects on profit while farming experience, trainings attended, target market, climate irregularities and variations in prices of inputs exerted weak influences on profit.

Key words: Organic Farming technologies · Profitability · Small Scale farmers · Vegetable

INTRODUCTION

Food production for the growing population has taken step for increase in food security through change and sustainable farming systems [1]. To ensure increased food productivity in Africa for the growing population a change towards sustainable farming system is increasingly being pursued. Furthermore, Organic Farming is one of the alternative systems of achieving the increase and improving food security [2]. Organic farming is the natural production of quality crops, vegetables and animals without hurting the environment [3]. It is an integrated production management that enhances agro-ecosystem, biological cycle and soil biological activity with the use of natural inputs such as minerals and products from plants [4]. Foods managed under organic practices are more nutritious, safe and of high quality [5]. According to [6], organically grown food offers improved food security and an array of economic, environmental, health and social advantages. To ensure an adequate food supply for future use, an integrated farming system that enables a high level of longevity and sustainability of organic technologies must be engaged [7]. International Federation of Organic Agriculture Movement (IFOAM, 2013[a]) stated that organic foods are more important in ensuring human health compared to foods grown under conventional methods. In Nigeria vegetable production is mostly practiced on a small scale. Many of these farmers are resources poor and faced with several constraints in the use of modern technology due to its expensive nature. Therefore, the utilization of agricultural technologies is usually very low [8]. Despite the importance of profitability of organic farming in vegetable none of these studies have stated the determinants of profitability of organic farming technologies among small scale fluted pumpkin farmers in south-south zone of Nigeria. It is this gap that this study seeks to fill by focusing on the determinants of

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profitability of organic farming technology among small scale fluted pumpkin farmers in South-South zone of Nigeria.

Thus, the specific objective of the study was to: determine the factors affecting profit realized by the farmers in the study area.

Null Hypothesis (Ho): There is no significant relationship between organic farming technologies and profit of organic farmers of fluted pumpkin production in the study area.

MATERIALS AND METHODS

The study was carried out in south- south zone, Nigeria. The major part of this zone is dominated by the Niger Delta Region. The zone is made up of six states and was Akwa-Ibom, Bayelsa, Cross River, Delta, Edo and Rivers States. The states in the zone are usually identified as the oil producing states. The region has been known as the topmost economic resources contributor to Nigeria when crude oil was first discovered in large quantity, at Oloibiri in Bayelsa state. An estimate of over USD 300 billion dollars has been generated for Federal Republic of Nigeria from crude oil sales for over forty years. However, approximately 90 per cent of Nigeria's export values are accounted to oil produced from the Niger Delta which is part of South-South geo-political zone (Nigeria Institute of Social and Economic Research, 2017). The region has potential for large opportunities in agriculture and tourism. It has average annual rainfall of 2000mm to 2500mm. The temperature varies between 20°C and 34°C.

Sampling Procedure and Sample Size: The research employed a multistage random sampling technique and the participating states were grouped into agricultural zones, local government areas, communities and respondents.

In the First stage, three states were randomly selected in the south –south zone.

In the second stage, two agricultural zones each were randomly selected from each of the selected states, giving a total of 6 agricultural zones that were selected.

In the third stage, four LGAs from each of the selected agricultural zones were randomly selected, giving a total of 24 LGAs.

In the fourth stage, five communities each were randomly selected from each of the selected agricultural zones, giving a total of 120 communities.

In the fifth stage, from each of the selected communities, 5 respondents each were randomly selected giving a total of 480 respondents that were selected for the study.

Method of Data Analysis: Data was achieved using the profit function multiple regression analysis.

Model Specification

Profit Function Multiple Regression Model: The profit function multiple regression was used to determine the factors affecting the profit realized by organic fluted pumpkin farmers. The four functional forms of the model are explicitly specified as:

- Linear form:

$$y = bo + b_1X_1 + b_2X_2 + b_3X_3 + b_{13}X_{13} + ei$$

- Semi-log:

$$y = bo + b_1\ logX_1 + b_2logX_2 + b_3logX_3 + ... + b_{13}\ logX_{13} + ei$$

- Double-log;

$$logy = b_o + b_1logX_1 + b_2logX_2 + b_3logX_3 + ... + b_{13}\ logX_{13}\ logX_{13} + ei$$

- Exponential form:

$$logy = b_o + b_1X_1 + b_2X_2 + b_3X_3 + ... + b_{13}X_{13}X_{13} + ei$$

RESULTS AND DISCUSSIONS

Determinants of Profit Realized by the Organic Vegetable Farmers: Results of Multiple Regression analysis on the determinants of profit of Vegetable production using organic farming technologies is shown in Table 1.

Four functional forms namely linear, semi-log, double-log and exponential functions were fitted to the data. In the linear model three explanatory variables were statistically significant at 5%level of probability. Similarly, both the semi-log and exponential models produced three statistically explanatory variables each. The double log model on the other hand produced seven explanatory variables that are statistically significant at 5% level of probability. The Coefficient of Multiple determination for linear was (0.472), Semi-log (0.584), Double-log (0.611) and Exponential function (0.486). This shows that the double log gave a better fit of the data (0.611).

Table 1: Factors affecting the profits of organic fluted pumpkin farmers in the area

Variable	Linear	Double log	Semi log	Exponential
Constant	413538.910*	6.813	-829410.538	12.516
	(2.431)	(6.823)	(-3.323)	(18.364)
Age of the farmer (years)	2799.087	0.649**	0.019	0.126***
	(1.477)	(2.339)	(0.427)	(2.835)
Farming Experience	2162.868	0.071	0.068	0.03
	(1.059)	(0.782)	(1.627)	(0.739)
Trainings Attended	15090.797**	0.167	0.06	0.089**
	(1.973)	(1.531)	(1.305)	(2.192)
Target Market	-91417.281**	0.046	-893.016	-0.058
	(-1.909)	(0.139)	(0.011)	(-1.599)
Cost of labour	0.629***	0.142***	0.123***	0.098***
	(3.791)	(-2.657)	(2.695)	(2.678)
Cost of organic material	0.182	0.074 **	0.086	0.047
	(0.890)	(-2.269)	(1.791)	(1.199)
Cost of transportation	-1.009	-0.113**	-0.068	-0.035
	(-1.131)	(-2.312	(-1.586)	(-0.926)
Cost of planting material	1.669***	0.170***	0.263***	0.17
	(5.403)	(-4.348)	(5.965)	(4.011)
Farm size	9905.888	0.213 **	0.094 **	0.025
	(0.802)	(2.219)	(2.241)	(0.613)
Climate Irregularities	-121867.476	-0.573	-0.011	-0.051
	(-0.916)	(-0.731)	(-0.296)	(-1.403)
Input price Variation	-112627.46	-0.508	-0.037	-0.086
	(-1.386)	(-1.093)	-0.63	(-1.451)
Output price Variation	-25980.516	0.262 **	52.943	0.018
	(-0.379)	(2.658)	(0.001)	(0.303)
R^2	0.472	0.611	0.422	0.486
F-Ratio	0.617***	0.753	0.584	0.672

= significant at 5% and *= significant at 1%|

Therefore, based on the number of statistically significant explanatory variables and the magnitude of the coefficient of multiple determinations (R^2), the double log was chosen as the lead equation and was used for further discussions. An evaluation of determinants of profit of fluted pumpkin in organic technology lead model showed that, it performed relatively well based on the values of R^2 and F- Ratio, (0.611 and 0.753) respectively. The double-log function merged with profit function identified the coefficient of multiple determination (R^2) value of 0.611 (Table 1) indicating that 61 percent of the variation of farmer's profit is explained by the independent variables while the remaining 39 percent could be accounted by error term.

Out of the 12 predictors, seven including age, cost of labour, cost of organic material, cost of transportation, cost of planting material, farm size and variation in output price, exerted significant influences on profit while the remaining five (farming experience, trainings attended, target market, climate irregularities and input price variation) were not significant. The parameter estimates indicated that age of the farmer was positively correlated with profitability and significant at 5% probability level showing that older farmers made more profit than the younger ones. This result agreed with the findings of [9] that older or aged farmers' embraced organic farming technology and they obtained a higher gross margin.

Cost of labour was negatively correlated with profit and was significant at 1% level of probability level; implying that an increase in the amount spent on labour will lead to decrease in profit in organic fluted pumpkin production. The result implies that reduction in the cost of labour will increase the profit realized from organic fluted pumpkin production in the study area. Cost of transportation was negatively correlated with profit at 5% level and statistically significant too. As observed by [10], cost of labour and cost of transportation were negatively attached to the profit of organic vegetable production.

Cost of organic material was negatively correlated with profit and significant at 1% probability level. This implies that an increase in cost of planting material could reduce profit, suggesting that good use of improved planting materials may increase the profit of fluted pumpkin production. This result corroborates [11] that cost of labour, cost of organic material and cost of transportation pose negative and significant effect on farmers' income and thus profit level.

The coefficient of farm size was positive and significant at 5% probability level, indicating that an increase in farm size will lead to an increase in income. This also implies that farmers with large farm size are likely to generate more output and probably make more profit that those with small farm size. The result agrees with the report of [12] that farm size is one of the major determinants of profitability and efficiency of vegetable production. The result also agrees with the report of [5] that farm size was positively correlated with the farmers' profit at 1% probability level.

Output price variation was positively significant at 5% probability level. This indicates that output price variation affect income positively and could increase profitability of organic fluted pumpkin production. This is in line with the report of [6] that output price variation and capital inputs were main determinants of profitability in fluted pumpkin production.

Result of Test of Null Hypothesis: There is no significant relationship between organic farming technologies and profit of organic farmers of fluted pumpkin in the study area.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.269[a]	.073	.066	.96640936	1.813

a. Predictors: (Constant), Zscore: Weed, pest and diseases control organic technology, Zscore: Resource recycling organic technology, Zscore: Ecosystem management and crop diversity protection organic technology, Zscore: Soil nutrient management organic technology, Zscore: Energy/feed organic technology

b. Dependent Variable: Zscore: Profit

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	51.898	5	10.380	11.114	.000[b]
	Residual	663.102	710	.934		
	Total	715.000	715			

a. Dependent Variable: Zscore: Profit

b. Predictors: (Constant), Zscore: Weed, pest and diseases control organic technology, Zscore: Resource recycling organic technology, Zscore: Ecosystem management and crop diversity protection organic technology, Zscore: Soil nutrient management organic technology, Zscore: Energy/feed organic technology

Coefficients[a]

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	T	Sig.
1 (Constant)	-9.235E-5	.036		-.003	.998
Zscore: Soil nutrient management organic technology	.080	.039	.080	2.031	.043
Zscore: Ecosystem management and crop diversity protection organic technology	.086	.039	.086	2.190	.029
Zscore: Resource recycling organic technology	-.144	.039	-.144	-3.709	.000
Zscore: Energy/feed organic technology	.062	.040	.062	1.551	.121
Zscore: Weed, pest and diseases control organic technology	.179	.038	.178	4.720	.000

a. Dependent Variable: Zscore: Profit

First is the model summary in which the coefficient of multiple determination R^2 is 0.073 and adjusted R^2 is 0.066. This means that between 6.6% and 7.3% of variations in profit are accounted for by the organic farming technologies. The Regression ANOVA value was 11.114 with a p-value of 0.000 which is well below the 0.05 margin of error. This means that the correlation coefficient of 0.269 is significantly different from zero hence the data is a good fit on the model. Four out of the organic farming technology are significant at 0.05 margin of error. Energy/feed organic technology is not significant. This means that there is significant relationship between organic farming technologies and profit of organic farmers of fluted pumpkin production in the study area.

CONCLUSION

Profit realized by the farmers was more significantly determined by cost of planting materials and cost of labour, going by very high values of coefficients of their

parameter estimates. Findings on the determinants of profit realized by the organic fluted pumpkin farmers in the study area indicated that age of the farmers, cost of labour, cost of organic materials, cost of transportation, cost of planting materials, farm size and variation in produce prices exerted significant effects on profit while the rest five factors (farming experience, trainings attended, target market, climate irregularities and variations in prices of inputs exerted weak influences on profit.

Recommendations:

- Government should use the information units of the States' Ministry of Agriculture to create more awareness about the technologies and health benefits of organic fluted pumpkin to improve the farmers output, sales and profit.
- Non-governmental organizations/private interests should establish markets/shops for organic products to provide the farmers more access to markets for their products thereby minimizing post-harvest losses.

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