ECONOMIC STUDY OF THE USE OF ORGANIC MANURE IN RED PEPPER (*Capsicum annuum*) PRODUCTION IN OMALA LOCAL GOVERNMENT AREA OF KOGI STATE, NIGERIA

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ABSTRACT

The study was carried out on the Economic study of organic manure in red pepper production in Omala Local Government Area of Kogi State. Primary data was used in the study and multi-stage sampling technique was adopted to select a sample size of 100 pepper farmers. Data for the study was analyzed using descriptive and multiple regression analysis. Result of the Socio-economic characteristics of red pepper farmers showed that most (69%) were female with a mean age of 46 years, 99% are married, 66% obtained secondary school education, net income from red pepper production is ₦108, 000. Result on TVC showed mean of TVC = ₦15,085 and TR= ₦76, 307 and positive mean GM= ₦61, 222 indicating that red pepper under organic manure is profitable. Multiple regression results on factors affecting profitability of red pepper production showed R^2 of 0.498 which implies that 49.8% of the variation in profitability is explained by the explanatory variables with seed cost, labour and storage having significant level of influence in factors affecting red pepper production. The major constraints faced in use of organic manure in red pepper production are low output and slow effectiveness. The study concluded that red pepper production in the study area is profitable. Based on the findings, the study recommended that; Government, Research institute and other relevant agricultural organizations should devise ways of improving the slow efficiency associated with organic manure.

Keywords: Organic Farming, Organic Manure, Red Pepper Production

INTRODUCTION

Organic farming represents a deliberate attempt to make the best use of local natural resources and it is an environment friendly system of farming. It relies much on ecosystem management which excludes external input, especially the synthetic ones. Anderson *et al.,* (2005) stated that organic farming is a crop production system that excludes the use of synthetically manufactured inorganic manure, pesticides, growth regulators and livestock feed additives. The system lies on crop rotation, crop residues, animal manures, and legumes, green manures, off farm organic wastes, minimum mechanical cultivation and aspects of biological pest control to maintain soil nutrients.

It became obvious that organic management affects soil macro biological and chemical properties by increasing soil nutrient availability, microbial biomass and microbial activity which represent a set of sensitive indicators of soil quality (Marinari *et al.,*2006). The bacterial biomass that perform soil function and resist environmental stress occurring under organic farming is of great importance than in other farming system (Mulder *el al.,* 2003). Organic farming improves ecological health because it helps farmer maintain nutrient balances in soil through locally available organic materials or recycled farm waste (Park *et al.,* 2008; Hynes, 2009).

The use of organic manure to meet the agricultural needs would be an inevitable practice in the years to come for sustainable agriculture since organic manure generally improves the soil physical, chemical and biological properties along with conserving the moisture holding capacity of the soil and thus resulting in enhanced crop productivity, along with maintaining the quality of crops produced (Maheswarappa, *et al,* 1999). Although organic manure contains plant nutrients in small quantities as compared to the inorganic manure, the presence of growth promoting principles like enzymes and hormones, besides plant nutrients make them essential for improvement of soil fertility and productivity. From the foregoing, the overwhelming interest in the use of organic manure as against inorganic manures has been observed but a gap still exists about the cost and returns associated with its use among the various food crop farmers. Hence this work reveals the cost and benefit paradigm of organic manure use by red pepper farmers in Omala LGA of Kogi State. Organic manure covers manures made from cattle dung, excreta of other animals, rural andurban composts, other animal wastes, crop residues and last but not the least green manures. Organic manure is time tested materials for improving the fertility and productivity of soils.

Pepper (*Capsicum spp)* is an important vegetable in most societies and plays a significant role in our everyday food. Today, peppers are grown widely in many countries, Nigeria inclusive and it forms an integral part of local cuisine. It adds flavour, colour and pungency to several delicacies. The interest in pepper extends to its nutritional and medicinal values in that peppers are recognized sources of vitamins C and E and are high in antioxidants. These compounds are associated with prevention of cardiovascular disorders, cancers and cataracts. In addition, it can be used for preservation of cowpea against weevil attack. The varieties of pepper prevalently grown in Nigeria include: Cayenne pepper or red pepper – 'Sombo' (*Capsicum frutescence)* and 'Atarodo' (*Capsicum annum*).

Nigeria stands to be one of the major producers of red pepper in the world accounting for about 50% of the total African production with major areas of production in Northern Nigeria (Business day, 2007. Many research works have been done on the economic study of organic manure use in other areas like the work by Nwajiuba and Akinsanmi (2002)

focused on comparative analysis of inorganic and organic manure use, while Alimi *et al*. (2006), centered on economics of commercial organic manure use. However, there is dearth of empirical information on the economics of organic use in pepper production in Omala LGA of Kogi State. Specifically, the study: described the socio-economic characteristics of red pepper farmers in the study area; identified factors that motivate the use of organic manure by red pepper farmers; examined the cost and returns for organic manure use in red pepper production; determined factors that affects red pepper production; and examined the constraints faced by the farmers in accessing organic manure.

METHODOLOGY

This study was carried out in Omala Local Government Area of Kogi State, Nigeria. It is bounded in the north by the Benue River, to the west by Bassa LGA, to the southwest by Dekina LGA and to the east down to the south by Ankpa LGA. Its headquarters are in the town of Abejukolo (or Abajikolo) in the north of the area the LGA is located of latitude 7°43′N and longitude 7°33′E. It has an area of 1,667 km^2 (644 sq mi) and a population of 108,402 at the 2006 census. As of 2016, the population grew to 145,700 (NBS, 2017). Omala Local government area is comprised of eleven (11) council wards which are: Abejukolo, Echa, Bagaji, Bagana, Okpotala, Ibado, Icheke, Ogodu, Olla, Ojiji, and Agbanema.

Multi-stage sampling procedure was used to select from the pool of registered respondents of organic pepper farmers in the study. In the first stage, Omala Local Government Area was selected based on the intensity of pepper production in the area. In the second stage, five (5) council wards was purposely selected based on the predominance of pepper production in the area. In the third stage, two (2) communities/villages was selected from the council wards chosen. Finally, ten (10) farmers was selected from each of the communities making a total of one hundred (100) respondents.

Primary data were used for this study. The primary data was collected from randomly selected sampled farmers using structured questionnaire. The data collected were analyzed based on the objectives of the study. Objectives 1, 2 and 5 were analyzed using descriptive statistics such as frequency, percentage and mean while objective 3 and 4 were analyzed using gross margin analysis and multiple regression.

Multiple regression analysis

Multiple regression analysis was used to examine the influence of various socio-economic variables on pepper production in the study area.

The multiple regression equation is explained as:

$$Y = B0 + B1X1 + B2X2 + B3X3 + \ldots\ldots\ldots B7X7 + Ui$$

Where:
Y= Output of pepper (in kg)
X_1= Age of the farmer (in years)
X_2= Sex of the farmer (male =1) or female = 0
X_3= Educational level (in years)
X_4= Amount of hired labour (in Naira)
X_5= Family labour used (in mandays)
X_6= Farming experience (in years)
X_7 = Income of the farmer (in ₦)
B_0= Constant
B_1-B_7= Coefficients of independent variables to be estimated
U_i= Error term

Gross margin analysis

The gross margin analysis is used to determine the cost and returns associated with red pepper production among farmers in the study area. Gross Margin (GM) is the difference between the Gross Farm Income(GFI) and total variable costs (TVC) (Olukosi and Isitor, 2005).

The implicit form of the model is expressed as:
GM=GFI-TVC= Pyi-PxiXi
Where:
GM= Gross Margin (Naira/Ha)
GFI= Gross Farm Income (Naira)
TVC= Total Variable Cost (Naira /Ha)
Pyi= Unit price of product Y and of the ith respondent
Yi= Gross output (kg) of the ith respondent per hectare
Pxi= Price per unit of the variable input X of the ith respondent
Xi= Quantity of variable input X (where i=1,2,….M) to be used by the ith respondent per hectare.

RESULTS AND DISCUSSION

Socio-economic characteristics of the Respondents

The result on Table 1 revealed that most (74%) of the respondents fall between the ages of 41-60 which is the active economic or productive age of farmers and the mean age of 46 years which implies majority of the farmers are middle aged. This is in agreement with the research carried out by Ayodele *et al.,*(2018) which revealed that majority of pepper farmers are farmers in their productive active age.

The finding on the sex distribution of the respondents revealed that many (69%) of the respondents are female with male (31%) having less representation.

The study also revealed that majority (99%) were married and this implies that more labour will be employed in pepper production This is in agreement with finding by Ugwoke(2010) which findings revealed that most pepper farmers are married as family is the major source of labour. The findings on the literacy level of the farmers revealed that 66% of the respondents had secondary school education, 25% had only primary school education, while 9% obtained tertiary education

It was further shown in Table 1 that 49% of pepper farmers have household size of 6-10 persons, 47% have between 11-15 persons in their household while 2% have between 1-5 persons in their household. This result shows that the household sizes of pepper farmers in the study area are relatively large. Nonetheless, the average household size is 8 persons. This is in line with findings by Okpeke and Adiagho *et al.,*(2018). The annual income as revealed by the study indicated that 71% of the respondents have an annual income of between ₦50001-60000. 25% of the respondents have between ₦40001-50000 as annual income with 4% of the sampled farmers having between ₦30001-40000 as their annual income. The average annual income was ₦53,730 in the study area.

Farming experience which is a vital component in agricultural productivity and the result showed that most (55%) of the respondents had between 11-15 years farming experience in pepper production. 27% of the respondents had farming experience of between 16-20 years, 16% of the respondents had experience ranging from 6-10 years while 2% had farming experience of between 21-25 years. The study showed that an average farmer had about 14 years' experience in pepper farming. This finding is in line with the research of Aderinoye-Abdulwahad *et al.,*(2017) who revealed that most pepper farmers had farming experience of at least 11years and Ugwoke(2010) who revealed farming experience of between 11-15 years for pepper farmers. The finding on the major occupation of the respondents is that majority (98%) had farming as their major occupation while only 2% were as civil servants. This observation is in accordance with numerous research which highlighted farming as a major occupation amongst rural households. Among research are Ayodele *et.al,*(2016) and Aderinoye-Abdulwahad *et al.,* (2017).

Table 1: Socio-Economic Characteristics of the Respondents

Variables	Frequency	Percentage	Mean
Age			
21-40	25	25.0	
41-60	74	74.0	
61-80	1	1.0	**46**
Sex			
Male	31	31.0	
Female	69	69.0	
Marital Status			
Married	99	99.0	
Single	1	1.0	
Educational Level			
Primary education	25	25.0	
Secondary education	66	66.0	
Tertiary education	9	9.0	
Household Size			
1-5	2	2.0	
6-10	49	49.0	
11-15	47	47.0	**9**
16-20	2	2.0	
Annual Income			
30001-40000	4	4.0	
40001-50000	25	25.0	
50001-60000	71	71.0	**53,730**
Farming Experience			
6-10	16	16.0	
11-15	55	55.0	
16-20	27	27.0	
21-25	2	2.0	**13.8**
Major occupation			
Farming	98	98.0	
Others	2	2.0	
Land ownership			
Inheritance	96	96.0	
Relative	3	3.0	
Others	1	1.0	
Farm size(hectare)			
0.1-0.5	7	7.0	
0.6-1.0	60	60.0	
1.1-1.5	2	2.0	
1.6-2.0	28	28.0	
≥ 2.1	3	3.0	**1.27**
Labour source			
Family	84	84.0	
Family and hired	16	16.0	

Source: Field survey, 2021

The study also revealed that a mean farm size of 1.3 hectares was cultivated by the respondents. This shows that pepper farming in the study area was mostly on small holdings. This may influence the adoption of technology, scale of production, output as well as revenue accruable to pepper farmers. Land ownership is vital in accessing the cost and returns in any farming enterprise as rent is paid for land if it is not personally owned. From the result of the study, it is revealed that 96% of the sampled farmers obtained farmland through inheritance with 3% of the respondents saying they obtained land for farming from relatives while 1% rented the land for pepper production.

Labour source is important in farming enterprise as labour cost occupy majority of the total variable costs in the cost and return analysis of farming enterprise. The labour source under this study showed that most (84%) of the respondents depended on family for their labour source while 16% of the respondents had a combination of both hired and family labour as their means of labour source. This is common in most rural settings as family labour is the main source of labour in farming activities. Okpeke and Adaigho *et al.,*(2018) in their various research agree with this facts.

Factors Motivating the Use of Organic Manure by Red Pepper Farmers

The result of the motivating factors in the use of organic manure by red pepper farmers in the study area is presented in Table 2. The result revealed that all (100%) the respondents under study were motivated to use organic manure in their farming because it was cheap. This is in line with findings by Aderinoye-Abdulwahad *et al.*(2017) and Alimi *et al.,*(2006) in their study which revealed that most vegetable farmers make use of organic manure in their farming activity because of its cheap availability.

Easy transportation of the organic manure was another motivating factor as 90% of the respondents agree that it was easy to transport organic manure to their farmlands for use than inorganic manure. The farm income of most of the respondents was another motivating factor. This is so because most (89%) of the respondents said their farm income can allow them to afford enough quantity of organic manure for their farm work as against inorganic manure which is expensive while 11% was not in agreement with farm income as the motivating factor in organic manure usage.

Improve yield of pepper is another factor motivating the use of organic manure. All the respondents had one form or level of formal education and also a relative long farming experience which enabled them to know the importance of organic manure in improving the yield of their crops. 99% of the respondents agree to this fact with only 1% not in agreement that crop yield improvement was a motivating factor.

Majority (96%) of the respondents agree that they were motivated to use organic manure in their farming activity because organic manure improves the land under cultivation improving the nutrient level without causing any damage to the land.

Most (99%) of the respondents agree to another motivating factor which is the readily availability of organic manure for use in their farm. This is due to the facts that some the respondents rear farm animals and/or poultry or are close to those that rear them which are the main source of organic manure and so are readily available for use in farm. This is in accordance with the study by Alimi *et al.,*(2006) which revealed that proximity of organic manure source to farm is a factor that influence its usage. High cost of inorganic manure (fertilizer) is a major motivating factor as 78% of the respondents indicated that the high cost of inorganic manure is what motivates them to use organic manure as organic manure is very cheap.

Cultural background is another key motivating factor in organic manure usage as most (99%) respondents agree that the use of organic manure was a cultural learning from ancient times and as such were motivated to use it as it was passed down to them with the benefits being told them in using organic manure. Labour demand from organic manure usage was positive as 65% of the respondents agree that labour demand in the use of organic manure was a motivating factor while 35% were not in agreement.

Environmental implications of organic manure was also a motivating factor. 86% of the respondents were of the opinion that organic manure was not harmful to the environment and so their willingness to use it while 14% disagree with the factor. Other variable that motivated the use of organic manure was the easy application of organic manure by respondents which indicated a 96% agreement as a motivating factor.

Table 2: Factors that Motivate the Use of Organic Manure by red pepper farmers in the Study Area

Variables	Frequency(N= 100)	Percentage (100%)
Cheap	100	100
Easy transport	90	90
Farm income	89	89
Improve pepper yield	99	99
Improve land	96	96
Readily available	82	82
High fertilizer cost	78	78
Cultural background	99	99
Labour demand	65	65
Not toxic to environment	86	86
Easy application	96	96

Source: Field survey, 2021

Cost and Returns in Using Organic Manure

Result on the cost and returns in pepper farming under organic manure is presented in table 3. The finding showed that that the minimum total variable costs (TVC) incurred during production was ₦12,200 with transportation having the least cost of ₦400 while the maximum total variable costs incurred was ₦24,000 with a mean TVC of ₦15,085 during production. The total revenue (TR) obtained from the study revealed that the minimum revenue gotten from pepper production was ₦56,000 and the maximum total revenue stood at ₦108,000 with a mean total revenue of ₦76,307. Gross margin obtained showed that the minimum gross margin was ₦38,800 indicating that the farmers were not operating at a loss. The maximum gross margin for pepper production in the study area was ₦94,200 which shows that farmers are making sufficient profits. The results proves that pepper production under organic manure is a profitable venture.

Table 3: Gross Margin Analysis Result on Cost and Returns

VARIABLES	n	MINIMUM(₦)	MAXIMUM(₦)	MEAN(₦)	STD DEV.
LABOUR	100	6,800	17,300	10,221	1701.77
SEEDCOST	100	1,000	2,000	1,060	191.75
O. MANURE	100	800	2,400	1,223	307.43
HERBICIDE	100	1,300	2,300	1,512	157.17
STORAGE	100	500	1,000	5,340	108.45
TRANSPORT	100	400	1,000	5,350	104.81
TVC	100	12,200	24,000	15,085	2130.75
TOTAL REV.	100	56,000	108,000	76,307	10785.58
GROSS MARGIN	100	38800	94200	61,222	10270.94

Source: Field survey, 2021

Factors Affecting Red Pepper Production in the Study Area

Ordinary least square regression analysis results on the factors affecting red pepper production in the study area is presented in Table 4. The results revealed that the coefficient of determination (R^2) is 0.498 indicating that 49.8% of the variation in production of red pepper is explained by the explanatory variables which are seed costs, organic manure, herbicide, storage, transport and labour cost. The F-statistic is 5.064 and is significant at 1% level indicating overall significance of the explanatory variables.

Seed cost has a positive coefficient of 27.174 and significant at 1% level which implies that an increase in the cost of seeds by 1% will lead to a decrease in pepper production by 27.17%. This is in line with the a priori expectation that, under *ceteris paribus,* increase in cost will result in a decrease in production level.

The coefficient for labour is also positive (2.608) and significant at 1% level which implies that a 1% increase in labour will lead to an increase in production by 2.608%. The coefficient for storage is negative (-39.410) but significant at 1% level which implies that a 1% decrease in storage availability will lead to a decrease in production by 39.4%.

Table 4: Regression Analysis Results on Determinants Factors Affecting Red Pepper Production in the Study Area

Variables	Coefficient	Std Error	T-stat.	Prob.
Constant	58820.71	11189.165	5.257	0.000
Seed cost	27.174	9.233	2.943	0.004***
Org. manure	-4.149	3.882	-1.069	0.288
Herbicide	-6.393	6.271	-1.019	0.311
Storage	-39.410	14.636	-2.693	0.008***
Transport	-4.082	16.046	-0.254	0.800
Labour	2.608	0.911	2.861	0.005***
R^2	0.498			
F. Statistic	5.064			

Source : Field survey, 2021

*** Significant at 1%

Constraints Faced by Red Pepper Farmers in Using Organic Manure

The result of the constraints faced by red pepper farmers in the study area is presented in Table 5. The result revealed that the major constraints faced by red pepper farmers in the study area include low output (3.10), slow effectiveness (2.99), doubtful efficiency (2.96), offensive odour (3.92) stress of composting (2.85), need for drying (2.82), transportation (2.76), weed infestation (2.68), not readily available (2.49) and storage(2.13). It was observed low output, doubtful efficiency and offensive odour were serious constraints faced by red pepper farmers in using organic manure this implies that if majors are not put in place to enable famers control the odour it may lead to discouragement of the use of manure. This result supports the findings of Aderinoye-Abdulwahab and Salami (2017) who identified offensive odour, difficulty in transporting, stress of composting, need for drying, doubtful efficiency among others as constraints faced by vegetable farmers in using organic manure.

Table 5: Constraints faced by red pepper farmers in using organic manure

S/N	Constraints	Mean	Std deviation	Rank
1	Offensive odour	2.92	0.419	4th
2	Transportation	2.76	0.495	7th
3	Weed infestation	2.68	0.566	8th
4	Slow effect	2.99	0.301	2nd
5	Doubtful efficiency	2.96	0.346	3rd
6	Stress of composting	2.85	0.435	5th
7	Need for drying	2.82	0.575	6th
8	Not readily available	2.49	0.577	9th
9	Low output	3.10	0.482	1st
10	Storage	2.13	0.506	10th

Source: Field survey, 2021

CONCLUSION AND RECOMMENDATIONS

The study found out that the overall total revenue from red pepper production is greater than the total variable cost and therefore making red pepper farming a profitable enterprise with a positive gross margin value. The study also revealed the coefficient of determination to be 49.6% proving that the explanatory variable in the study has significant influence in the production of red pepper in the study area. Finally, the constraints faced by red pepper farmers in the study area were low output, slow effect, doubtful efficiency and offensive odour the major constraints faced in using organic manure in red pepper farming.

Based on the findings of this study, the following recommendations are made;

1. Government through tax exemptions and subsidies among other things to invest in setting up composting sites as composting helps remove some of the constraints noted in the study for example odour, inadequate storage facilities and the need for drying up manure before application as this consumes time.
2. Extension agents should be more involved in meeting these farmers in training them on proper use and application of organic manure in red pepper production so as to ultimately increase the yield of farmers.
3. Research Institutes and other relevant agricultural organizations should also devise ways of improving the slow effectiveness associated with organic manure as well as the need for drying

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