

Utilization of Organic Farming Technologies among Small-Scale Farmers in Anambra State, Nigeria

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Abstract – This study examined the utilization of organic farming technologies among small-scale farmers in Anambra State, Nigeria. Specifically, the paper described the organic farming techniques, benefits derived from the technologies, adoption levels, and constraints to organic farming practices. Structured interview instruments were used to collect data from 120 respondents selected by convenience sampling method. Statistical tools such as frequencies, percentages, means and factor analysis were used in analyzing the data. The result showed the major organic farming technologies in the area to include mixed cropping (98.33%), crop rotation (96.67%), planting of legumes (83.33%), use of animal manure (81.67%), planting of indigenous crop varieties (76.67%). Major benefits derived from organic farming practices were improved productivity ($m=3.83$), increased level of income ($m=3.77$), reduced inputs cost ($m=3.73$), and better quality produce ($m=3.35$). The adoption level was highest for mixed cropping ($m=2.77$), use of animal manure ($m=2.65$), planting of indigenous crop varieties ($m=2.59$) and lowest for use of crop residue ($m=1.63$). Overall adoption index was 0.45, implying that farmers in the area adopted only 45% of the organic farming technologies. Broadening extension education and demonstration will allow the farmers access to the technologies and knowledge of appropriate management skills. This will ensure increased productivity, food security and poverty alleviation.

Keywords – Organic Farming, Technologies, Adoption, Constraints, Anambra State, Nigeria.

I. INTRODUCTION

Organic farming is a production system that excludes the use of chemical fertilizers, pesticides, growth regulators, and livestock feed additives [1]. International Federation of Organic Movement (IFOAM) [2] describes organic agriculture as a holistic agricultural system that combines traditional innovation and science to benefit the shared environment and promote fair relationship and good quality of life for all involved. It is based on minimal use of off-farm inputs and management practices that restore, maintain and enhance ecological harmony. Mohammed and Abdu 2004 in [1] observed that organic agriculture offers an environmental friendly alternative method for the natural recycling of organic matter to minimize nutrient losses and reduce accumulation of wastes. The system promotes crop yield and crop quality through such techniques as biological pest control, intercropping, cover cropping, improving water holding capacity and cation exchange capacity of the soil, natural weeds and soil erosion control measures.

Modern high-input agriculture has produced great increases in crop yields but social and environmental costs

have been high. Over the past decades, sustainability has become more and more a guiding principle in agriculture. Organic farming becomes recognized by farmers, policy makers and consumers as one of the possibilities for farmers to farm in a more sustainable way [3]. It is a form of farming that has benefited greatly from a re-orientation of society's goals where it has gone from being an extremely small fringe activity to a much more accepted and supported form of farming. Organic agriculture has developed rapidly worldwide during the last few years and is now practiced in approximately 120 countries of the world. Its share of agricultural land and farms continues to grow. Furthermore, it can be reasonably assumed that uncertified organic farming is practiced in even more countries [4], [5].

Organic farming began in Central Europe and India. Today, many countries are known for growing organic crops as organic farming is gaining ground throughout the world. All over the world, organic food accounts for approximately one or two percent gross food sales. So many premiums are attracted to organic products. For instance, in Austria, organic farmers have been receiving some incentives [6]. Okoh [7] also reported that in Germany, almost all baby foods are completely organic and in some places, up to a third of all breads are baked using organic ingredients. Italy has even gone further to ensure that the children eat organic food. Its government has legislated as at 2005 that all food prepared in school lunch programme must be organic food.

Kareem (2010) observed that the contribution of organic agriculture to the Gross Domestic product (GDP) of countries practicing organic agriculture is very high. He further reported that currently, some other African countries (Ghana, Kenya, and Tanzania) export organic agriculture commodities to Europe and America. Also Oyeniran (2011) opined that African countries (Uganda, Kenya, Tanzania, South Africa, Cameroon and Ghana) have gone far ahead of Nigeria in production of certified organic food. It is therefore necessary for Nigerians, especially the small-scale farmers in different communities to embrace with full force the practice of organic farming, in order to fully maximize the profits from agricultural exports in the world market.

Okoh (2010) asserted that market for organic products has been on the increase in the world, growing at the rate of 20 percent per annum since 1990 to reach \$46 billion in 2007 and was expected to hit \$70.2 billion in 2010. Clearly, the world is going organic and several countries are really far ahead of Nigeria in promoting organic eating and providing incentives to organic farmers. The demand for organic products is high in Europe and North America,

with an increase of 10-25 percent yearly and it is the fastest growing food market segment, with an increasing import from developing countries [7].

Organic farmers use a range of techniques that help sustain ecosystems and reduce pollution. These techniques include; crop rotation, crop residue, animal manure, green manure, organic wastes, cover cropping, application of compost, legumes, mulching and mechanical cultivation [7]. In contrast to the relatively limited number of factors encouraging farmers to adopt organic methods, literatures identified a wide range of barriers and constraints to organic production and conversion, some of which are true for farming in general and some of which are particular to organic and they include; lack of knowledge about organic agriculture, lack of economic and political advocacy, population pressures, high cost of certification, low literacy levels, lack of trade liberalization which prevents development of exports, lack of institutional support, lack of information and extension services [10]. Others include; lack of scientific research on organic technologies, access to needed planting materials, animal breeds and plant protection inputs, sudden arrival of new pests and diseases, inaccessibility of organic markets [2].

Explaining the potential role of organic agriculture in sustainable food security, Kazeem (2010) stated that organic agriculture is something that should be given priority in Nigeria because it is demand-driven as the products are needed in advanced countries. The Nigerian farming system was perceived as “non-certified organic agriculture [11]. Ojo (2011) lament that it is a pity that while other African countries such as Uganda, Kenya, Tanzania, Ghana and South Africa are already making contributions to their Gross Domestic Products (GDP) through organic agriculture, Nigeria is yet in anyway taking her share of the global organic market.

What Nigeria needs now is to develop the process of certification of her products by the relevant authorities in the world market. Although, Nigeria is still in the primary or preparatory stage of certified organic agriculture, [13] believes that given the right focus on training and capacity building in primary production and in food processing, organic production creates employment, transfer knowledge and improves access to high value markets. Organic agriculture on the other hand, promotes the renewed uptake of nutrients from the soil which is what happens under the traditional farming and fallow systems.

Presently, most Nigerian farmers do not practice organic agriculture per excellence. They practice non-certified organic farming. It is worthy of note that there is growing markets for organic products among other products and farmers, the world over are shifting their production practices to meet these challenges. Considering the contribution of organic farming to GDP of nations practicing organic agriculture, Nigeria cannot afford to continually be an on-looker, hence the need to study the utilization of organic farming technologies in Anambra State, Nigeria. Specifically, the study was designed to: (1) describe the techniques of organic farming technologies and crops grown by the farmers, (2) identify the benefits derived from organic farming practices; (3) ascertain the

adoption level of organic farming technologies, and (4) identify the constraints to practicing organic farming by farmers in the area.

II. MATERIALS AND METHODS

The study was carried out in Anambra State, Nigeria. All the farmers in the area constituted the study population. The study area is made up of 21 Local Government Areas (LGAs). The major crops grown by the farmers include; yam, cassava, maize, rice, vegetables, melon, oil palm, cocoyam, cowpea/beans, plantain/banana, etc. A list of all the registered farmers was obtained from the Agricultural Development Programme of the State Ministry of Agriculture and Natural Resources. Using the convenience sampling method adopted by Nwabueze *et al* [14] and Nenna [15], 10 respondents were randomly selected from each of the four communities earlier selected from each of the three out of the 21 LGAs of the State to arrive at a sample size of 120 respondents for the study. This method of selection of respondents was adopted due to few farmers observed to be practicing organic farming in the area.

Data for the study were collected from primary sources. Primary data were collected using well-structured questionnaire. To ascertain organic farming technologies in the area, a list of available organic farming technologies was compiled and the respondents were asked to indicate the available organic technologies in use. To identify the benefits from the technologies, a list of possible benefits in organic farming was compiled and rated on 4-point Likert-type-scale with responses of strongly agree = 4, agree = 3, disagree = 2, and strongly disagree = 1. The values were added to obtain 10 and later divided by 4 to get a critical mean score of 2.50. Then, a mean score that was equal or higher than 2.50, meant that the technology was beneficial to the farmers while a mean score lower than 2.50 was perceived as not beneficial.

To determine adoption levels of the organic farming technologies by the respondents, a 5-point Likert-type-scale was used for each of the organic farming practices listed. The respondents were asked to indicate their adoption stages for the various practices using five-step (aware, interest, evaluation, trials and adoption) adoption model with values of 1, 2, 3, 4, and 5 respectively. The adoption indices of the respondents were calculated as follows; (a) computation of the total mean (m) adoption score. This was computed by dividing the total adoption scores by the number of respondents involved. (b) computation of the grand mean (m) adoption score was by adding all the mean adoption scores and dividing by the number of innovations considered. (c) computation of adoption index was carried out by dividing the grand mean (m) adoption score by 5 (ie the 5 stages of adoption).

To obtain a quantitative measure of the respondents' responses on the constraints to their full participation in organic farming practices, factor analysis was employed. The rule of thumb as was developed by Kessler (2006), factor loading of 0.30 and above was adopted in analyzing the data. A varimax rotated factor matrix was then

employed to identify the most important constraining factors to organic farming practices. Only variables with factor loading of 0.30 and above were used in naming the factors. This implies that variables with coefficient greater than 0.30 have high loading and are considered strong constraining factors while those with less than 0.30 are minor factors to organic farming technologies. Statistical tools such as frequency; percentages, means and factor analysis were used in analyzing the collected data.

III. RESULTS AND DISCUSSIONS

Organic farming technologies in the area

Distribution of the respondents according to organic farming technologies in the area is shown in Table 1. The result identified mixed cropping as the major organic farming practice with a score of 98.33%, followed by crop rotation (96.67%), planting of legumes (83.33%), use of animal manure (81.67%), planting of indigenous varieties (76.76%) and the least, use of green manure (38.33%). This result is in consonance with the finding of Nwachukwu (2010) who reported that farmers in Nigeria practice mixed cropping, crop rotation, planting of legumes among others with or without the knowledge and principles of organic agriculture.

Table 1: Distribution of respondents according to organic farming technologies

Technologies	Frequency	Percentage
Application of compost manure	73	60.83
Planting of indigenous crop varieties	92	76.67
Mulching of crops	61	50.83
Crop rotation	116	96.67
Mixed cropping	118	98.33
Use of animal manure	98	81.67
Planting of legumes	100	83.33
Use of green manure	46	38.33
Use of off-farm organic wastes	64	53.33
Minimum tillage	87	72.50

Note: Multiple responses recorded.

Major crops grown according the principles of organic agriculture

IFOAM (2004) observed that the philosophy of organic food production maintains certain principles such as biodiversity, ecological balance, sustainability natural plant fertilization, natural pest management, and soil integrity. Since farm vary in product and practice, there is also a wide variety on how these principles are applied. The result in table 2 indicates that vegetables (71.67%) and oil palm (60.00%) are the major crops grown in the area under the principles of organic farming production. The result gave credence to [18] that most farmers grow vegetables using organic fertilizer

Table 2: Distribution of the respondents according to crops grown, using organic principles

Crop grown	Frequency	Percentage
Cassava	63	52.50
Yam	60	50.00
Maize	58	48.33
Vegetable	86	71.67
Melon	62	51.67
Rice	18	15.00
Cocoyam	64	53.00
Cowpea/Beans	68	56.67
Plantain/Banana	70	58.33
Oil palm	72	60.00

Source: Field survey, 2013. Note: Multiple responses recorded.

Benefit of organic farming practices

Table 3 shows mean scores of benefits derived from organic farming practices. The major benefits derived include: improved productivity (m=3.83), increased level of income (m=3.77), reduced input costs (m = 3.73) and better quality of produce (m=3.35). This is in line with the observation of [12] that there are massive opportunities in organic agriculture, especially in areas of increased productivity and obtaining substantial income.

Table 3: Mean score of respondents according to benefits derived from organic farming technologies.

Benefit	Mean (m)	Interpretation	Rank
Improved productivity	3.83	Strongly agree	
Increased level of income	3.77	Strongly agree	
Reduced input costs	3.73	Strongly agree	
Better quality produce	3.35	Strongly agree	
Improvement in nutritional status	2.73	Agree	
Creates self-employment	2.65	Agree	
Promotes uptake of nutrients	2.63	Agree	
Reduces climate change	2.58	Agree	
Reduces environmental pollution	2.55	Agree	
More drought tolerant	2.52	Agree	
Decrease pest infestation	2.50	Agree	

Source: Field survey, 2013. Note: Multiple responses recorded.

Adoption levels of the organic farming technologies

Results in Table 4 reveals adoption levels of the farmers on organic farming technologies. The highest adoption mean score of 2.92 was recorded for mixed cropping. This score was a little above the grand adoption mean for all the

organic farming practices (2.23), indicating that the farmers were still at the early stages on the 5-point adoption model. Furthermore, the adoption index of 0.45 for the organic farming practices implies that the farmers had only 45% adoption of all the organic farming technologies in the area. The low adoption observed could also be attributed to paucity of technical information on techniques of organic farming technologies. The result of the finding is not surprising as the position of extension

services is one of the major constraining factors in organic farming practices in the area (see Table 5). The low adoption level has implication for extension delivery in the area. Nenna [19] observed that extension services bear great potential for improving the productivity of natural resources, promoting the right attitude among natural resource managers. The service is recognized as an essential mechanism for information delivery and advice as input into modern resource management.

Table 4: Distribution of respondents on adoption level of organic framing technologies

Farming Technologies	Aware (1)	Interest (2)	Evaluation (3)	Trial (4)	Adoption (5)	Total adoption score	Adoption mean score	Grand mean score	Adoption index
Planting of indigenous crop varieties	30	41	15	16	18	311	2.59	2.23	0.45
Application of compost manure	44	30	20	19	7	275	2.29		
Mulching of crops	60	27	18	10	5	233	1.94		
Mixed cropping	29	25	23	13	30	350	2.92		
Use of crop residue	70	34	8	6	2	196	1.63		
Use of animal manure	34	29	22	15	20	318	2.65		
Planting of legumes	27	34	22	14	23	332	2.77		
Use of green manure	68	36	8	5	3	199	1.65		
Use of off-farm organic wastes	62	30	10	10	8	232	1.93		
Minimum tillage	29	33	29	14	13	303	2.53		

Source: Field survey, 2013.

Constraints to use of organic farming technologies

The results of the rotated component matrix showing the extracted factors, based on the responses of the organic farmers on possible constraints to organic farming practices were shown in Table 5. Based on the item loading of the factor analysis conducted, three critical factors were isolated and named; economic (factor 1), institutional (factor 2), and technical (factor 3). The three factors therefore represented the major problems that the farmers encountered in organic farming practices in the area.

Specifically, the item that loaded high under factor 1 (economic) include; lack of fund (0.816), high cost of labour (0.712), shortage of animal manure (0.684), poor market access (0.529), and lack of appropriate inputs (0.526). The result is in agreement with the findings of [13] in their perception to organic farming in Ekiti State, Nigeria.

The items that loaded high under factor 2 (institutional) include; lack of extension services (0.827), lack of institutional support (0.751), lack of awareness (0.716), high certification cost (0.584), and enabling policies (0.426). This supports the findings of [20] that lack of awareness of organic farming techniques, lack of institutional support, and high certification cost were among the major constraining factors to organic farming in Nigeria.

Similarly, the items that loaded high under factor 3 (technical) include; time consuming (0.802), offensive odour (0.714), lack of technical know-how (0.636), and slow organic matter decomposition (0.568). This finding gave credence to [21] who reported in their work that time consuming was the highest constraints in organic farming practices.

Table 5: Rotated component matrix based on the responses of the farmers on constraints to organic farming practices

Problem	Factor 1 (Economic)	Factor 2 (Institutional)	Factor 3 (Technical)
Lack of appropriate inputs	0.526	0.217	0.121
Low yield	0.342	0.069	0.036
Weed densities	0.384	0.102	0.134
Lack of technical know-how	0.108	0.127	0.686

High certification cost	0.296	0.584	0.283
Lack of institutional support	0.224	0.751	0.217
Enabling policies	0.112	0.426	0.109
Poor market access	0.629	0.295	0.211
Lack of extension services	0.105	0.827	0.207
Lack of fund	0.816	0.172	0.136
Lack of awareness	0.135	0.716	0.128
Offensive odour	0.114	0.158	0.714
High cost of labour	0.712	0.251	0.127
Time consuming	0.186	0.113	0.802
Shortage of animal manure	0.684	0.213	0.236
Slow organic matter decomposition	0.104	0.253	0.568

Source: Field survey, 2013.

IV. CONCLUSION

Farmers in the study area are gradually embracing organic agriculture. Organic farming technologies promote environmental stability and enhance income generation of the farmers, hence alleviating the poverty and food security situation in the country. The paper suggested formulation of suitable and adequate policies for promoting and enhancing the full practice of organic agriculture such as the establishment of Department of Organic Agriculture in tertiary institutions, demonstration farms and training of extension workers on organic agriculture.

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