Organic Farming and Environmental Sustainability: The Experience of Smallholder Farmers in Eastern Senatorial District of Kogi State, Nigeria

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ABSTRACT

This study focused on the potentials of organic farming as a means of sustaining the environment with greater emphasis on smallholder farmers in the eastern senatorial district of Kogi State, Nigeria. A total of 125 rural farmers were drawn from the 9 local government areas (LGAs) that make up the district through stratified random sampling. Structured interview schedule was administered to the respondents for data collection. Data generated was analyzed through the use of descriptive statistics such as frequency distribution, percentages, mean scores and ranking order. The results obtained showed that most (61.6%) of the farmers were males with the mean farm size of 2.9 hectares. Deforestation (60.8%), arable land use (56.8%), and indiscriminate use of agro-chemicals such as fertilizers, herbicides, etc. (54.4%) were identified as some of the major causes of soil/environmental degradation. While poor crop yield (52.8%), flooding of farmlands (51.2%) and infestation of pests and diseases (41.6%) were some of the effects of ecological degradation/problems. In a swift response to these problems, farmers in the district adopted some organic farming strategies such as mulching (65.6%), mixed cropping (62.4%) and bush fallowing (55.2%) among others to sustain the environment. It was recommended that adoption of organic farming practices should be sustained in the study area and Nigeria at large in other to improve soil productivity and continuous cropping and weather information and forecast by meteorological unit be held sacrosanct. And awareness creation and education of rural farmers on the need to adopt environmentally-friendly agronomic practices be strengthened.

Keywords: Environmental degradation, Climate change, Organic farming and weather forecast.

INTRODUCTION

Agriculture has been the basic source of subsistence for man over thousands of years. It provides a livelihood to half of the world population (Palaniappan and Annadurai, 2010). The natural environment with all its ecosystem services

comprises of the entire basis of life on earth, and there is a strong link between the state of the environment and food production (Nwachukwu and Onwuka, 2011). For crops, the state of the environment directly influences soil nutrient availability, surface and ground water for irrigation, rainfall and growth season, availability of insects for pollination and the effects of pests and diseases, the author continued. With the increase in human population and the need to meet their daily food needs, increase in agricultural production has to be doubled. This then calls for a change in the existing methodologies in food production. Hence, the need for high-yielding crop and animal varieties, higher fertilizer dosages, intensification in irrigation schemes and intensive cropping by bringing large areas of land under cropping among others. The adoption of these green revolution requirements has resulted in the elimination of thousands of traditional plants and animals with the concurrent loss of genetic resources and environmental degradation (Palaniappan and Annadurai, 2010).

Corroborating the above, UNEP/GRID in Palaniappan and Annadurai (2010) contended that, due to the increase in world population, environmental degradation arose as a result of unsustainable human agricultural practices and activities which now seriously endangers the entire food production platform of the planet especially in Africa. Soil/environmental degradation is a major environmental problem causing wide spread and serious impacts on water quality, biodiversity and emission of greenhouse gases such as carbon dioxide, methane, sulphur-dioxide etc. The chemical and physical ecological deterioration have major implications for agricultural productivity. A study conducted by International Food Policy Research Institute (IFPRI, 2001) revealed that nearly 40% of the world's agricultural land experiences adverse impacts of environmental degradation or climate change. It is as a result of these negative effects of environmental degradation that smallholder farmers in eastern senatorial district of Kogi State, Nigeria adopted some forms of organic farming strategies to mitigate the effects.

The concept of organic farming/agriculture has been perceived differently by different people. To some, it implies the use of organic manures and natural methods of plant production and protection instead of using synthetic agro-chemicals like fertilizers, herbicides etc. The definition given by Lampkin (1990) appears to be the most comprehensive covering all essential features. He described organic farming as a production system which avoids or largely excludes the use of synthetic fertilizers, pesticides, growth regulators and livestock additives. Organic agriculture (OA) is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account the regional conditions require locally adapted systems. This is accomplished by using, where possible, cultural,

biological and mechanical methods as opposed to using synthetic materials, to fulfill any specific function within the system. An organic production system is designed to: enhance biological diversity within the whole system, increase soil biological activity, maintain long term soil fertility, recycle wastes of plants and animal origin in order to return nutrients to the land, thus minimizing the use of nonrenewable resources, rely on renewable resources in locally organized agricultural systems, and promote the healthy use of soil, water and air as well as minimize all forms of pollution thereto that may result from agricultural practices (Food and Agriculture Organization: FAO, 2007).

Organic farming system relies on crop residues, animal manures, legumes, green manures, off-farming organic wastes and aspect of biological pest control to maintain soil fertility and tilt, to supply plant nutrient and control insects, weeds and other pests (Lampkin, 1990). The practice does not imply the simple replacement of synthetic fertilizers and other agro-chemical inputs with organic inputs and biologically active formulations. Instead, it envisages a comprehensive management approach to improve the health of underlying productivity of the soil. Palaniappan and Annadurai (2010) asserted that, in a healthy soil, the biotic and abiotic components covering organic matter, including soil life, mineral particles, soil air and water exist in a state of dynamic equilibrium and regulate the ecosystem processes in mutual harmony by complementing each other. The state of soil life and the associated organic transformation will enhance the regenerative capacity of the soil and make it resilient to absorb the effects of ecological or climate vicissitudes (unexpected changes) and occasional failures in agronomic management. The success of agronomic agriculture depends to a great extent on the efficiency of agronomic management adopted to stimulate and augment the underlying productivity of soil resource. Organic agriculture (OA) avoids nutrient exploitation and increases soil organic matter content. In consequence, soils under OA capture and store more water than soils under conventional cultivation (Niggli, Fliessbach, Hepperly and Scialabba, 2008). Production in OA system is thus less prone to extreme weather conditions such as drought, flooding and water logging. OA is a low-risk farming strategy with reduced input costs and, therefore, lower risks with partial or total crop failure due to extreme weather events or changed conditions in the wake of climate change and variability (El-Hage and Hattan, 2002; Eyhorn, 2007).

The essential features of organic farming are: maximal but sustainable use of local resources; minimal use of purchased farm inputs (only as complementary to local resources); ensuring the basic biological functions of soil-water-nutrients continuum; maintaining a diversity of plant and animal species as a basis for ecological balance and economic stability; creating an attractive landscape which gives satisfaction to the local people; and increasing crop and animal diversity in

the forms of polycultures, agro-forestry system, integrated crop/livestock systems etc. to minimize risk (Palaniappan and Annadurai, 2010). In view the above, certain research questions are therefore asked. What are the perception of farmers on the causes of environmental/soil degradation? What are the percieved effects of this soil degradation on man and his farm operations? And what are the various organic farming strategies adopted by farmers to mitigate soil degradation?

This study therefore assessed the potentials of organic farming for environmental sustainability with special focus on the smallholder farmers in the eastern senatorial district of Kogi State, Nigeria. Specifically, the study was designed to:

describe the socio-economic variables of the farmers,

identify the perceived causes of soil/environmental degradation,

ascertain the effects of soil/environmental degradation by the respondents, and

determine the various organic farming strategies adopted by the farmers to mitigate soil/environmental degradation.

Methodology

The study was carried in the eastern senatorial district of Kogi State, Nigeria. The district is majorly inhabited by the Igala speaking extract of the state. The area is made up of 9 local government areas (LGAs) namely: Ankpa, Bassa, Dekina, Ibaji, Igalamela/Odolu, Olamaboro, and Omalla. The area lies between Latitudes 6^0 30" and 8^0 40" north and Longitudes 6^0 40" east with a total land area of 13,655sq/km. The district is bounded on the north by Benue and Nassarawa states, on the south by Anambra state, on the east by Enugu state and on the west by River Niger. Majority of the people are farmers growing both cash and food crops such as cashew, oil palm, citrus, cassava, yam maize, beans among others. The entire smallholder farmers constituted the target population for the study. A multi-stage sampling technique was adopted to select the respondents for data collection. From the 9 LGAs, 5 LGAs were purposively selected due their high level of organic farming. From each of the 5 LGAs selected, 2 villages were randomly selected to have a total of 10 villages, from each of the villages, 25 farmers were randomly selected thus making a total of 125 respondents for the study. Structured interview schedule was administered to these farmers to acquire the necessary information. Data collected were analyzed using descriptive statistics such as frequency distribution, percentages, mean scores and ranking order.

Results and Discussion

Socio-economic Variables of the Respondents

The results presented in Table 1 shows that most (61.6%) of the farmers were males, the females constituted 38.4%. The table also indicated that, 60.8% of the farmers

were within the age range of between 31-40 years which is adjudged as the productive age. Majority (36.0%) of the respondents had primary education, while 30.4% had secondary education. The mean household size of the farmers was 9 persons, while the farmers' mean farm size and farming experience were 2.9 hectares and about 18 years respectively. According to Obiora and Onwubuya (2011), many years of farming experience could imply that these farmers could have designed better ways for coping with changes in ecology/climate and their adaptation strategies. The findings further revealed that 66.4% of the farmers had either primary or secondary education. High literacy level is a strong catalyst for adoption of climate/environmentally-friendly production strategies such as organic farm practices.

Table 1: Distribution of respondents based on their socio-economic variables

Variable	F	%	M
Sex			
Male	77	61.6	
Female	48	38.4	
Age (Years)			
< 31	45	36.0	32.4
31-40	73	58.4	
>40	7	5.6	
Educational level			
No formal education	32	25.6	
Primary education	45	36.0	
Secondary education	38	30.4	
Tertiary education	10	8.0	
Household size			
1-5	64	51.2	8.7
6-10	48	38.4	
>10	13	10.4	
Farm size (Ha.)			
1-2	63	50.4	2.9
3-4	36	28.8	
5-6	18	14.4	
>6	8	6.4	
Farming experience (Years)			
1-5	0	0.0	
6-10	6	4.8	
11-15	21	16.8	
> 15	98	78.4	

Source: Field Survey, 2016 M = Mean

Perceived Causes of Soil/Environmental Degradation

Data in Table 2 show the various causes of ecological degradation in the study area. The findings revealed that deforestation (60.8%), arable land use (56.8%), indiscriminate use of synthetic agro-chemicals (like fertilizers, insecticides,

herbicides etc.) (54.4%), soil erosion (46.4%) among others, were the major causes of environmental degradation and climate change. The Tide Online Newspapers of January 18th, 2011 quoted by Uguru, Baiyeri and Aba (2011) noted that there was massive deforestation going on in Nigeria, and that the phenomenon poses a lot of danger because forest acts as "*carbon sink"* and when the forest is destroyed the carbon is then release into the atmosphere. The report further stated that deforestation and gas flaring were the major contributors to carbon emission in Nigeria, and regretted that, the laws protecting the forests in Nigeria have weak mechanisms of enforcement. Salinization (16.0%) was not regarded as a serious cause of environmental degradation, this could be probably due to low irrigation practices in the district as most farmers relied on natural rains for their farm operations. Ranching or animal husbandry was practiced in a small-scale by the farmers. Most often, the few stock (mainly goats, sheep, cow) were tethered during cropping season, hence the effect of overgrazing was not felt or noticed, hence little or no laterization (hard pan) is found.

Table 2: Distributi on of respondents based on the causes of environmental degradation

Cause	*F	%
Indiscriminate use of synthetic agro-chemicals	68	54.4
Arable land use (continuous cropping)	71	56.8
Constructions (roads, houses, etc.)	42	33.6
Deforestation (logging, fossil fuel, bush burning etc.)	76	60.8
Smokes from automobiles (green house gases)	33	26.4
Desertification	18	14.4
Salinization (due to use of contaminated water)	20	16.0
Soil erosion	58	46.4
Overgrazing	16	12.8
Acid rains	8	6.4
Oil spillage	10	8.0

Source: Field Survey, 2016 *Multiple responses

Effects of Soil/Environmental Degradation

Results presented in Table 3 revealed the various effects of environmental degradation as contended by the farmers in the eastern senatorial district of Kogi State, Nigeria. Poor crop yields (52.8%) ranked first, while flooding of farmlands and residential homes (51.2%) ranked second. Other effects were pests and disease

infestation (41.6%), loss of biodiversity (41.6%), collapsed buildings (38.4%) and unproductiveness/death of livestock (28.8%) ranked 3rd, 4th, 5th and 6th respectively. The 2001 Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report revealed that poorest countries would be hardest hit by the effects of climate change or ecological degradation. The report further showed that there would be reduction in crop yields in most tropical and sub-tropical regions due to decreased water availability and new or change in insect pest incidence. Flooding of farmlands and residential homes is a common phenomenon in recent times. In Kogi State, over 150 homes were flooded and valuable properties were lost due to torrential rains and inundation between the months of August and September, 2012 (Captured from NTA 9 O'clock News update, Sept. 18th, 2012). The havoc which drew the attention of both state and federal governments, led to the visit of the nation's Senate President, Senator David Mark on 21st September, 2012 to have an on the spot assessment of the havoc.

Table 3: Distribution of respondents by the effects of environmental degradation

Effect	*F	%	Rank
Poor crop yields	66	52.8	1st
Flooding of farmlands	64	51.2	2nd
Infestation of pests and diseases	52	41.6	3rd
Loss of biodiversity	52	41.6	4th
Collapsed buildings	48	38.4	5th
Unproductiveness/death of livestock	36	28.8	6th
Bleaching of ozone layer	31	24.8	7th
Desertification	28	22.4	8th
Air and water pollution	25	20.0	9th
Acid rains	4	3.2	10th

Source: Field Survey, 2016 *Multiple responses

Organic Farming Strategies Adopted to Mitigate Ecological Degradation

Various organic farming strategies adopted by the farmers to mitigate ecological degradation are found in Table 4. These strategies commonly practiced were mulching (65.6%), mixed cropping (62.4%), bush fallowing (55.2%), change of planting dates (52.8%), agro-forestry (43.2%) and green manuring (41.6%) among others. One of the ways in which farmers can protect their soils is through the use of mulch (Farming Matters, 2012). When the soil is covered with a thick layer of organic matter, it is protected from extreme rain fall, winds or drought. Mulch also serves as a home for insects, helping to attract many species which significantly improve soil texture and soil fertility. A study conducted by Edoka, Adejo and Otitolaiye (2010) in Olamaboro local government area of kogi state, Nigeria revealed that, most (20.0%) of farmers in the LGA adopted bush fallowing

as their soil fertility management practice. The authors further revealed that, when fallow periods are long enough to permit full vegetation regeneration and soil fertility restoration, the cultivation system provides cost-effective means of sustainable agriculture in a depressed economy like that of Nigeria. Green manuring is another major strategy adopted by the farmers to mitigate their climatic problems. Crops grown for this purpose help to restore or increase the organic matter content of soils and increased productivity. Catch crops, shade crops, cover crops, forage crops, etc. are some of the strategies adopted to provide green manures. In green manuring, the crops could be grown *insitu* or brought from outside and incorporated into the soils.

Mixed/multiple cropping is a practice of planting two or more crops on a given piece of land at a time to ensure constant food production and to provide the vegetative cover to reduce run-off and serves as a security against crop failure (Edoka, 2008). This is majorly practiced in the eastern Nigeria where dearth of fertile land is a major hindrance to food production.

Table 4: Distribution of respondents by organic farming strategies adopted to mitigate ecological degradation

Organic farming strategy	*F	%
Mulching	82	65.6
Mixed farming	34	27.2
Crop rotation	46	36.8
Biological pest management	21	16.8
Green manuring	52	41.6
Crop diversification	48	38.4
Change of planting dates	66	52.8
Agro-forestry	54	43.2
Liming	15	12.0
Mixed cropping (multiple cropping)	78	62.4
Bush fallowing	69	55.2

Source: Field Survey, 2016 *Multiple responses

Conclusion and Recommendation

Soil and environmental degradation is a major global challenge, causing widespread and serious impacts on water quality, biodiversity and emission of climate changing green house gases. Land use by man has been singled out as a serious catalyst to ecological degradation. The negative effects of this phenomenon such as poor crop yield, flooding of both farmlands and residential homes, and loss

of biodiversity have led to the current food insecurity and deaths in most developing countries of the world. Though farmers in the study area (kogi east senatorial district) adopted some environmentally-friendly production strategies such as mulching, mixed cropping, bush fallowing, agro-forestry among others to mitigate the effects of the environmental havocs or change in climate.

Based on these findings, the following recommendations are therefore made;

Awareness and sensitization campaign should be strengthened by governments and non-governmental organizations on the need to adopt environmentally-friendly agricultural practices.

Agro-forestry policy has to be enacted by the government and improved tree seedlings be provided to farmers at a subsidized rate.

Government should also provide other farm inputs such as fertilizer, improved seed and animal stocks, etc. at a very low price.

Weather/meteorological unit should be cited close to rural people to provide farmers with relevant weather information and/or forecast to predict accurately possible occurrence of extreme weather events.

Channelized buildings should be discouraged or out-lawed by government. Town planning unit should be strengthened to give a good layout that allow free flow of running water without causing any havoc.

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