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ENVIRONMENTAL ADULT EDUCATION PROGRAMMES FOR PROMOTION OF SUSTAINABLE AGRICULTURAL METHODS/PRACTICES AMONG CROP FARMERS IN AKWA IBOM STATE OF NIGERIA: AN EMPIRICAL STUDY

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ABSTRACT: *Unsustainable agricultural/farming methods/practices (such as slash-and-burn, felling of trees and shrubs and application of chemical fertilizers and insecticides) by crop farmers in the Southern Region of Nigeria are known to have been doing a lot of harm to the soil, the environment and even the health of the farmers themselves. The purpose of this study was to identify, through an empirical/participatory process, the unsustainable methods/practices mostly adopted by the farmers (with focus on those from Abak and Etinan Local Government Areas (LGAs) of Akwa Ibom State), as well as the Environmental Adult Education (EAE) programmes that would make the farmers adopt sustainable methods/practices which would increase their occupational outputs as well as protect their environment and personal health. Four Research Questions and one Null Hypothesis guided the study. 222 (40%) of the 554 registered crop farmers in the two LGAs were selected for the study through proportionate random sampling. Percentages, means, standard deviation and the T-test were the statistical methods used to analyze the data obtained through a structured Questionnaire developed by the researchers. Based on the responses of the farmers, a number of EAE programmes were identified for achieving the purpose stated above. The researchers have strongly recommended implementation of the programmes as well as guidelines for effecting the implementation.*

KEYWORDS: crop farming, unsustainable, sustainable agriculture, farming methods, environmental adult education, programme.

INTRODUCTION

Before the discovery of oil (petroleum) in Nigeria in the mid-1950s and up to the late 1980s and early 1990s, agriculture was the backbone of the country's economy and the main provider of employment and source of livelihood for the populace. Oluigbo (2012) has also noted that agriculture used to account for over 90% of the food consumed locally, while contributing up to 41.5% of the Gross Domestic Product (GDP) of Nigeria during the periods referenced above. The National Bureau of Statistics, Nigeria (2008) has equally reported that agriculture contributed about 42.2% of Nigeria's GDP in 2008. Agriculture in Nigeria involves, but is not limited to the practice of farming which, itself, includes cultivation of the soil and breeding of livestock, It has provided the teeming population of Nigerians with varieties of food crops such as vegetables, groundnut, beans, cassava and maize (Amparo, 2016).

Specifically, crop farming has, over time, provided the Nigerian populace with varieties of food crops through the undeniable efforts of crop farmers across the various geographical regions in

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Nigeria, This is even truer of the South-South Region of the country which is characterized by good soil and conducive humid weather conditions resulting from its location within the equatorial rain forest zone. Akwa Ibom is one of the States in Nigeria's South-South Region blessed with abundance of food crops which are locally produced by crop farmers in the State. These farmers adopt the age-old traditional pattern of land preparation which involves felling of trees, stumping, burning of slashed grasses, application of inorganic fertilizers and so on. In the particular cases of Abak and Etinan Local Government Areas (LGAs) of Akwa Ibom State on which this study focuses, most of the crop farming households engage in subsistence farming to produce food crops for their families. Very little (if any) is usually left for sale in the market. Gradually, however, some of the crop farmers have begun to produce cash crops in a more enlarged scale of farming.

Farming practice in the study area has been following the usual conventional/traditional trend of land preparation highlighted above in the cultivation and production of various food and cash crops, including cassava, yam, cocoyam, maize (corn), cowpea, melon, plantain, vegetables, coconut, raffia palm, melon, kolanut, bananas, pineapple, and so on. However, these traditional agricultural methods/practices have been found to be the major factors for ecological imbalance, environmental deterioration and the persistent syndrome of generally low economic returns from occupational endeavours experienced by rural inhabitants in Nigeria (Eheazu, 2017). Again, Ogbonna, Idiong and Ndifon (2007) have observed that the said agricultural practices, especially farming patterns for food crops, have been associated with erosion hazards in the study area over time.

Crop farmers in Abak and Etinan LGAs make ample use of inorganic fertilizers to boost their farm inputs due to the continuous slash-and-burn, deforestation and other practices which have degraded and/or destroyed the micro-nutrients in the soil. Jamala, Boni, Abraham & Teru (2012) have particularly noted that bush burning (slash-and-burn) has series of effects on the environment; such as emission of nitrogen dioxide, sulphur dioxide, carbon dioxide and other Green House Gases (GHGs) which have destructive effects on the ozone layer and cause uncomfortable changes in weather, climate and the ecosystem as well. The use of such unhealthy methods by the crop farmers tends to result from a number of factors, including lack of awareness and functional environmental knowledge of the correct methods, techniques, approaches and strategies among the farmers. The focus of this study therefore was on determining through an empirical process the environmental adult education programmes which would help the crop farmers to adopt sustainable and environmentally-friendly methods/practices to enhance their productivity, preserve their environment and protect their personal health.

Review of Some Major Concepts used in the Study Report

Sustainable Farming Practices

The conventional/traditional methods of farming practices had been the dominant trend, especially in developing countries, until the idea of sustainable development was introduced in the late 1970s. With subsequent emphasis on sustainability in development literature, many scholars and organizations have attempted to relate the phenomenon to all spheres of life. Accordingly, there are now such concepts as sustainable environment, sustainable community, sustainable societies, sustainable economy and sustainable agriculture. The idea behind this is that every socio-economic activity is supposed to have the capacity to meet the needs of the present generation and that of the future ones. Sustainable agriculture is not an exception. The

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idea is that agricultural methods/practices should have an inbuilt capacity to satisfy the needs of both the present and future generations by, among other things, ensuring the preservation/conservation of the environment and its ecosystem (including man). The concern of societies over the environmental problems caused by unsustainable conventional/traditional farming in the agricultural sector has led to the emergence of alternative farming systems in recent years. Alademerin & Adedeji (2010) have noted that the goal of achieving and maintaining sustainable farming systems is rapidly becoming a top priority of agricultural and environmental protection policies in most developing countries.

According to Sullivan (2003), farming is sustainable if it meets certain environmental, economic and social sustainability indices as follows:

a) ***Economic sustainability***

The indicators here include:

- The family savings or net income is consistently going up;
- The family debt is consistently going down;
- The farm enterprises are consistently profitable from year to year;
- Need to purchase off-farm feed and fertilizer is decreasing;
- Reliance on government assistance is decreasing.

b) Social sustainability

With the following among other possible indicators:

- The farm supports other businesses and families in the community;
- Money circulates within the local community;
- The number of rural family holdings is going up steadily;
- Young people take over their parents' farms and continue farming;
- College graduates return to the community after graduation.

c*) Environmental sustainability*

With such indices as:

- Absence of bare ground (the ecosystem is balanced);
- Clean (unpolluted) water flowing in the farm's ditches and streams;
- Presence of abundant wildlife;
- The farm landscape has diverse vegetation.
- Growing of complementary crops and animals together in appropriate sequences;
- Keeping the soil covered with growing crops and mulches, including legumes to maintain the productivity of the farm;
- Maintenance of ecological relationships through reduced use of chemical inputs such as pesticides and fertilizers to solve problems.

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Unsustainable Farming Practices

These are practices that are not economically, socially or environmentally sustainable, unlike the sustainable practices highlighted above. The major unsustainable farming practices among crop farmers in Nigeria include:

a) ***Slash-and-burn*** – a traditional method of land clearing that involves cutting and burning of grass and other plants in preparation of a piece of land for crop planting. This practice is an integral part of the traditional/conventional farming system in the southern part of Nigeria (including Akwa Ibom State). The adverse consequence of the slash-and-burn method has been succinctly described by Ubuoh, Ejekwolu & Onuigbo (2017:923), citing Wendi (2011) as follows:

> When the soil is burnt, its nutrients are destroyed and the soil is exhausted. And, when the grass is burnt, it releases carbon dioxide into the atmosphere thus contributing to the depletion of ozone layer and to climate change. Slash and burn farming techniques are bad for both local agriculture and the environment.

b) ***Use of Inorganic (Chemical) Fertilizers***

Ayeni, Ademiluyi & Shittu (2016) have observed that depletion of soil manure caused by deforestation and other unsustainable farming practices has led to the application of inorganic fertilizers by farmers to enhance production of most food crops. Ogbodo (2013) has also noted that the acidification and depletion of nutrients from these soils is a product of both the application of inorganic fertilizers and the farmers' unsustainable agricultural practices in general. In their own contribution, Morakinyo, Adeboye & Awogbuyi (2013) have lamented that many of the farmers are ignorant of incidences of health challenges being posed by use of chemicals in farming. In recent years, the use of chemical fertilizers has increased exponentially and has had equally tremendous negative effects on the environment and the lives of its human inhabitants. As plants absorb the fertilizers through the soil, the chemical contents can enter the food chain. According to Savci (2012:77), use of chemical fertilizers "leads to water, soil and air pollution". Chemical fertilizer navigates its way to the water environment through drainage, leaching and flow. Generally speaking, the use of chemical fertilizers has a very negative effect on surface and ground water, causes pollution and leads to deterioration of soil fertility and soil degradation. These toxic substances also in turn accumulate within the vegetables, causing negative effects on the health of humans and animals that feed on such plants.

c***) Use of Pesticides***

The use of pesticides is another unsustainable practice by crop farmers. Pesticides include herbicides, insecticides, rodenticides, fungicides, molluscides and so on which are used to protect crops from pests and improve the yield of such crops as corn, vegetables, potatoes and cotton. Despite the benefits of pesticides to improve productivity in the short run, there are also numerous negative effects in the long run. For instance, Ikpesu & Ariyo (2013) assert that the utilisation of pesticides has resulted in loss of biodiversity and destruction of natural habitat. The overall

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adverse effect of pesticides on humans globally and on developing countries, particularly, has been summarized by Ojo (2016:983), citing Jeyaratnam (1990) as follows:

> It has been reported that, globally, as estimated 1 million to 5 million cases of pesticides poisoning occur every year, resulting in 20, 000 fatalities among agricultural workers. It is a sobering fact that although developing countries use only 25% of the world's production of pesticides, they experience 99% of the deaths.

In Nigeria. Asogwa & Dongo (2009) have reported that the use of pesticides has been estimated to amount to about 125,000-130,000 metric tons. annually. This, obviously, is a dangerous trend, especially in view of the hazards highlighted above. The situation indeed begs the conduct of the present research study.

Environment & Environmental Adult Education (EAE)

The term *environment* usually conjures up several mental images, ranging from surrounding flora and fauna to more complex imaginations regarding forces and factors which influence man's actions and thinking; including the type and variety of his intentions, economic activities, as well as his beliefs, attitudes, hopes and visions. Germane to the topic of this study, Eheazu (2016:2) has eclectically defined the term as referring to:

> a complex of objects, circumstances and conditions which encircle/surround an organism (including man) with an intricate system of physical, chemical, social, biotic and abiotic factors acting upon the organism (or even an ecological community) within an ecosystem and ultimately influencing life and living conditions.

Environmental adult education (EAE) is that form of environmental education that has its specific focus on the adults. The focus of EAE on *Adults* has arisen from statistical inferences from global demographic dynamics, such as those contained in CIA World Fact Book (2012) and Wikipedia (2011), whereby it has been established that adults (no matter the criteria by which they are identified in time and in space) are, invariably, the largest groups of humans to impact on the environment through their socio-economic activities (such as farming, road construction, building of estates, use of fossil fuels for transportation and industrial activities) which could bring about tremendous anthropogenic (manmade) environmental degradation phenomena like deforestation, disequilibration of the ecosystem, land degradation, environmental pollution, global warming and so on. According to Sumner (2003:39), Environmental Adult Education is recognized as a "hybrid outgrowth of the environmental movement and adult education, combining an ecological orientation with a learning paradigm to provide a vigorous educational approach to environmental concerns". In his own view, Eheazu (2013:24), sees Environmental Adult Education as "a product of the blend of the principles and goals of environmental education with those of adult education" and as a process in which adult individuals gain awareness of their environment and acquire the knowledge, values, skills, experience and determination which will enable them to act individually and collectively in harmony with the forces and elements that surround them, as they engage in their daily activities for survival. In the same vein UNESCO

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(1977) has aptly defined EAE as a learning process which increases people's (adults') knowledge and awareness about the environment and associated challenges, develops the necessary skills and expertise to address the challenges, and fosters the right attitudes, motivations and commitments to make informed decisions and take responsible action. In general, environmental adult education programmes operate within the three basic forms of education; namely, formal, non-formal and informal.

In the specific case of crop farmers and in the light of the discuss above on the various aspects of economic, social and environmental sustainability of farming methods/practices, as well as what constitutes unsustainability of the process, EAE pogrammes relevant to the topic of this study would include, but not necessarily limited to desirable aspects of:

i) Agricultural Extension Education.
ii) Environmental Literacy Education;
iii) Farm Trash (biomass) Management Education (Conservation Agriculture);
iv) Sustainable Farming Methods Education;
v) Climate Change Education, and
vi) Vocational Farming Education.

Problem of the Study

Consistent with the established educational profile of rural farmers in Nigeria (Eheazu & Akpabio, 2013), crop farmers in Abak and Etinan local government areas, are mostly illiterate and ignorant of the negative impacts of some of their farming methods which are unsustainable. Those who are literate are not environmentally conscious when it comes to choosing their farming methods. They are principally guided by their quest for immediate higher output and profitability, not minding the long-term effects of the methods they adopt on the environment. They even engage in some farming methods that do not promote sustainability of their livelihood as the methods pollute the environment, pose threat to human health and do not guarantee the long-term use of land resources and the capability of the soil to continue to produce bountifully. For the farmers to continue enjoying good harvest in the long run, they need to understand the effects of their present farming practices which make their occupation unsustainable. Accordingly, they need to be properly educated on the modes of production that are sustainable. Given its purpose and objectives discussed earlier here, Environmental Adult Education would provide the farmers with appropriate knowledge and skills to enable them adopt the requisite sustainable methods and practices. The question, however, is: which environmental adult education programmes would promote sustainable agricultural practices among the crop farmers in Abak and Etinan Local Government Areas of Akwa Ibom State? To provide the answer to this question is the problem of this study.

Area of Study

The study area spans Abak and Etinan Local Government Areas (LGAs) of Akwa Ibom State which is located within the South-South Geopolitical Region of Nigeria.As noted earlier in this Report, Akwa Ibom State is also geographically located within the equatorial zone with abundant rainfall, favourable temperatures and arable soil conducive to crop farming. Abak local government area lies on the South West of Akwa Ibom State and has a landmass of 304 square kilometers. Abak is known for its importance in agricultural development. It has so many agro-based and agro-allied industries located within it. It is known that the State Government is also planning to build a university of agriculture in the area. Etinan LGA, on the other hand, is located within the SouthSouth part of Akwa Ibom State. Although Etinan is one of the local government areas in the oil-rich part of Akwa Ibom State, it is better known for its agricultural, arts and craft

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products. The main occupations of the people centre on farming and petty trading. Crops cultivated include yams, cassava, cocoyam, maize and vegetables.
Etinan is also known for its huge oil palm produce.

Purpose and Objectives of the Study

The purpose of this study was to identify, through an empirical/participatory process, the environmental adult education programmes that would promote adoption of sustainable agricultural practices by crop farmers in Abak and Etinan Local Government Areas of Akwa Ibom State. Specifically, the objectives were to:

i) ascertain the types and spread of the unsustainable methods/practices adopted by crop farmers in the area of study,
ii) find out what factors led to the crop farmers' adoption of the unsustainable methods;
iii) identify, with the assistance of the farmers, the various environmental adult education programmes that would enable them to adopt sustainable farming methods/practices which would ultimately lead to sustainable crop farming with its attendant benefits in Abak and Etinan LGAs.

Research Questions (RQs

The research questions that guided the study were:

i) What unsustainable methods/practices of farming methods/practices were generally adopted by crop farmers in Abak and Etinan LGAs of Akwa Ibom State?
ii) Which of the methods/practices are most adopted by the farmers?
iii) What reasons did the farmers have for adopting the identified farming methods/practices?
iv) What environmental adult education programmes would predispose the farmers in the two LGAs to adopt sustainable farming methods/practices as defined in this study?

The Study Null Hypothesis (Ho)

The Ho for this study posited that there is no significant difference between the responses of crop farmers in Abak LGA and those of their counterparts in Etinan LGA regarding the EAE programmes that would make them adopt sustainable farming methods/practices.

Research Design

The descriptive survey design was adopted for this study as it was found relevant for ascertaining and interpreting the required data on existing conditions, including activities, opinions, attitudes and practices, so as to suggest better options relating to the crop farmers and their farming methods/practices in the area of study.

Population of the Study

The population of this study consisted of all the 554 crop farmers registered with various Multi-Purpose Co-operatives (MPCs) in the two Agricultural Development Programme (ADP) Zones of Abak and Etinan LGAs in Akwa Ibom State of Nigeria as shown in Table 1 below. As the table also reveals, Abak ADP Zone in Abak LGA had six (6) Multi-Purpose Co-operatives with 142 registered crop farmers. Etinan ADP Zone in Etinan LGA, on the other hand, had ten (10) Multi-Purpose Co-operatives with 412 registered crop famers. In effect, the total population of registered crop famers involved in the study was 554.

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Sample and Sampling Technique

In order to obtain a representative sample for the study, and in view of the relatively small population, a total of 222 registered crop farmers (representing 40% of their total population of 554) were selected for the study. A proportionate random sampling technique was adopted to ensure equal and unbiased representation of the said sample among the various 16 crop farmers' multi-purpose co-operatives. Table 1 below also shows the sample distribution in relation to the population of the study.

Table 1. Population and sample distributions of registered crop farmers involved in the Study

S/No.	AGRICULTURAL DEVELOPMENT PROGRAMME (ADP) ZONES	REGISTERED CROP FARMERS' MULTI-PURPOSE CO-ORPORATIVES (MPCs)	POPULATION OF REGISTERED CROP FARMERS	SAMPLE (40%)
1.	Abak Zone (Abak LGA)	1.Nka Uforo Iban	30	12
		2.Virtuous Women Multi-Purpose Corporative	10	4
		3. Nka Iban Etek Etoro MPC	26	11
		4. Nka Iberedem Iban MPC	35	14
		5.Nka Uwa Ayaubeghe Association	31	12
		6. Ikot Akpan Ikpong Group	10	4
	SUB-TOTAL	**6 CORPORATIVES**	**142**	**57**
2.	Etinan Zone (Etinan)	1. Ikot Itighe Farmers Multi-Purpose (MPC)	35	14
		2. Ndon Mbon Farmers MPC	46	18
		3. Akpan Atem Farmers MPC	24	10
		4. Mboho Mmong Farmers MPC	52	21
		5. Esa Abia Owo Farmers MPC	31	12
		6. Staff Multi-Purpose Corporative Society	58	23
		7. Akwa Efak Ndon Umoh MPC Society	40	16
		8. Odiok Onwong Farmers MPC Society.	37	15
		9. Ishiet Erong Farmers MPC Society	51	21
		10.Ikot Essien MPC Society	38	15
	SUB-TOTAL	**10 CORPORATIVES**	**412**	**165**
	GRAND TOTAL	16 **CORPORATIVES**	**554**	**222**

Source: AKADEP (Akwa Ibom Agricultural Development) Zonal Offices in Abak and Etinan (2018).

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Instrument

The instrument for data collection in this study was a structured questionnaire developed by the researchers. The questionnaire which was titled: "Environmental Adult Education Programmes for Sustainable Agricultural Practices among Crop Farmers Questionnaire (EAEPSAPACFQ)" was structured on a modified four point Likert ratio scale as follows:

a) Strongly Agree (SA) = 4 points; Agree (A) = 3 points); Disagree (D) = 2 points; Strongly Disagree (SD) = 1 point.

The questionnaire contained two sections, A and B. Section A focused on bio-data of the respondents, while Section B focused on questions meant to provide answers to the study research questions and for testing the null hypothesis. Reliability of the questionnaire was established using the test-retest method the result of which was correlated by applying the Pearson Product Moment Correlation Statistic (PPMCS). This yielded a correlation coefficient index (r) of 0.81, thus confirming the reliability of the instrument.

Data Collection and Analysis

The data were collected through the use of the questionnaire administered to the respondents with the help of four research assistants locally recruited and trained to explain in local dialects (where necessary) some items of the questionnaire to the subjects and to help reach out to crop farmers in remote areas. With the help of the research assistants, 222 copies of the questionnaire were administered to and retrieved from the respondents, but 2 copies from the Etinan respondents were not properly completed. Accordingly, the duly completed 220 copies (57 from Abak and 163 from Etinan), representing 99.09% of the selected sample, were used in the study. Statistical measures used to analyze the data in answer to the research questions were based on response frequencies and means, while the T-test statistic was used to test the null hypothesis. Since the items were rated on a four-point scale (modified Likert-type), the criterion mean of 2.5 was used in taking decisions. Thus, item responses that received a mean ($\bar{X}$) equal to or greater than 2.5 were considered to be positive, while items that scored below 2.5 were considered negative. The 2.5 criterion mean was arrived at by adding the weighted scale responses and dividing the total by 4 as in the example below:

$$\bar{X} \text{ of responses} = \frac{Total\ sum\ of\ weighted\ scales}{Total\ number\ of\ options}$$

$$\text{i.e.} \quad \frac{SA+A+D+SD}{4}$$

$$= \frac{4+3+2+1}{4} = \frac{10}{4}$$

$$= 2.5$$

FINDINGS/RESULTS

13.1 Research Question One (RQ1)

RQ1 was posed to ascertain the unsustainable methods/practices adopted by crop farmers in Abak and Etinan LGAs of Akwa Ibom State. Table 2 below contains the data used to answer this question. As table 2 shows, the mean scores for items 1-6, depicting various unsustainable farming methods/practices, were respectively greater than the criterion mean of 2.5; thus showing the farmers' agreement that they adopted all the methods. The pooled/aggregate mean **(p** $\bar{X}$) =

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3.08 further shows the famers' overall strong agreement that they adopted the various unsustainable methods/practices.

Research Question Two (RQ2)

RQ2 sought to find out which unsustainable methods/practices were most adopted by the farmers. Table 2 below also provides the data used to answer RQ2. The various methods adopted by the farmers (items 1-6) have been ranked in table 2 according to the mean responses showing their levels of adoption. As the table reveals, item 1 (felling of trees) with a $\bar{X}$ of 3.35 was the most adopted. This was followed by item 2 (slash-and-burn) with a $\bar{X}$ of 3.32.The third in the ranking was item 4 (use of chemical fertilizers) with a $\bar{X}$ of 3;27; the 4th, 5th and 6th in rank were respectively use of pesticides, killing of bush animals and practice of mono cropping.

Table 2. Mean Analysis of Responses from Crop Farmers indicating the Unsustainable Methods/Practices they adopted and their rankings.

Research Question Three (RQ3)

	ITEMS How much would you agree with the following statements concerning the methods/practices you adopt in crop farming?	**RESPONSES FROM CROP FARMERS** SA (4)	A (3)	D (2)	SD (1)	**TOTAL**	**MEAN** $\bar{X}$	**DECISION**	**RANKING OF METHODS/ PRACTICES ADOPTED**
1	To clear the bush for farming, I usually cut down trees and shrubs	103 (412)	96 (288)	17 (34)	4 (4)	220 (738)	3.35	Agree	1st
2	I also slash and burn the grasses and other trash on the land	89 (112)	112 (336)	19 (38)	- -	220 (730)	3.32	Agree	2nd
3	I use herbicides/pesticides and/or other chemicals to control weed and pests in my farm	64 (256)	97 (291)	39 (78)	20 (20)	220 (645)	2.93	Agree	4th
4	I make use of chemical fertilizers to grow plants/crops	97 (388)	98 (294)	13 (26)	12 (12)	220 (720)	3.27	Agree	3rd
5	In my community we happily kill for food any animals that run out during bush clearing and trash burning.	53 (212)	106 (318)	45 (90)	16 (16)	220 (636)	2.89	Agree	5th
6	We practice mono cropping in our community	44 (176)	91 (273)	67 (134	18 (18)	220 (601)	2.73	Agree	6th
	Pooled/aggregat mean (p X)						3.08	Agree	

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RQ3 was meant to ascertain the farmers' reasons for adopting each of the various unsustainable methods/practices. Table 3 below contains data used to answer RQ3.

Table 3. Mean Analysis of the Responses of the Crop Farmers on Their Reasons for Adopting the Unsustainable Farming Methods/Practices

S/N	ITEMS	RESPONSES FROM CROP FARMERS				TOTAL	MEAN ($\bar{X}$)	DECISION
	My reasons for adopting the farn methods/practices below are as	SA (4)	A (3)	D (2)	SD (1)			
1	I cut down trees before planting that helps to make the planting p faster and easier.	83 (332)	110 (330	21 (42)	6 (6)	220 (710)	3.23	Agree
2	Slash-and-burn method of farmi manure to the soil and delays gro of weed after planting.	76 (304)	99 (297	38 (76)	7 (7)	220 (684)	3.11	Agree
3	We kill bush animals for food an prevent them from coming back our crops.	82 (328)	87 (261	41 (82)	10 (10)	220 (681)	3.09	Agree
4	I use herbicides to kill weeds and prevent the weeds from coming	95 (380)	108 (324	15 (30)	2 (2)	220 (736)	3.35	Agree
5	I use chemical fertilizers because know of any other way of impro soil nutrients and get bountiful h	91 (364)	110 (330	14 (28)	5 (5)	220 (727)	3.30	Agree
6	I use pesticides in my farms beca I don't know any other way to p pests and rodents from destroyin	102 (408)	99 (297	16 (32)	3 (3)	220 (740)	3.36	Agree
	Pooled/Aggregate mean ($P\bar{X}$) =						3.24	Agree

As table 3 shows, apart from item 3 which had the lowest level of agreement ($\bar{X}$ = 3.09), the remaining five items had high levels of agreement ($\bar{X} \geq 3.11$). The Pooled mean ($P\bar{X}$) of 3.24 further confirms this overall high level of agreement with the reasons (items 1-6) given by the farmers for adopting the unsustainable methods/practices. A close study of the items in table 3 reveals that the reasons given were bordering first on ignorance and second on lack of awareness of the harm likely being done to the environment and the farmers' personal health through their adoption of the unsustainable methods/practices listed as items 1-6. More on this in the Discussion of Findings Section.

Research Question Four (RQ4)

RQ4 was meant to establish the Environmental Adult Education (EAE) programmes which the crop farmers would find helpful for them to adopt sustainable farming methods/practices. Six

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EAE programmes were provided for the crop farmers to respond to. The programmes were thoroughly explained to the farmers with the help of the four Research Assistants employed for the research study as indicated earlier in this paper. Tables 4 and 5 below contain the data used to answer RQ4. While table 4 focuses on the responses of the 57 sample crop farmers from Abak LGA, table 5 provides the responses of the 163 sample crop farmers from Etinan LGA on the same enabling EAE programmes.

Table 4. Mean Analysis of the responses from Crop Farmers in Abak LGA on the EAE Programmes that would enable them to adopt sustainable Farming Methods/Practices.

S/N	**ITEMS**	**ABAK LGA CROP FARMERS RESPONSES (N = 57)**				**Total**	**MEAN (X)**	**DECISION**
	In view of your experience, what is your opinion about using the following programmes to help you modify/change your present farming methods/practices to improve your harvest and protect your environment and personal health?	SA (4)	A (3)	D (2)	SD (1)			
1.	Providing the crop farmers with an environmental awareness programme (including basic environmental literacy education) to make them understand the symbiotic relationship between them and the environment and the necessity of their protecting the environment for the success and sustainability of their farming occupation.	30 (120	26 (78)	1 (2)	0 (0)	57 (200)	3.51	Agree
2.	Providing an awareness creation programme for crop farmers on the disadvantages of using chemicals (herbicides and pesticides) to control weeds and pests and what sustainable alternatives could be adopted.	27 (108	30 (90)	0 (0)	0 (0)	57 (198)	3.47	Agree
3.	Providing crop farmers with an education programme that will teach them how to cope with/mitigate the effects of climate change on their crops.	35 (140	22 (66)	0 (0)	0 (0)	57 (206)	3.61	Agree
4.	Providing the crop farmers with conservation agriculture education to avoid their destruction of the ecosystem (flora and fauna) and losing its advantages through slash-	18 (72)	32 (96)	5 (10)	2 (2)	57 (168)	2.95	Agree

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	and-burn method of preparing farm land for cropping.							
5.	Conducing workshops/seminars for crop farmers on the disadvantages of application of chemical fertilizers and how to improve soil nutrients through their production and use of organic manure.	36 (144	21 (63)	0 (0)	0 (0)	57 (107)	3.63	Agree
6.	Providing crop farmers with Agricultural Extension Programmes, including demonstration farms to practically expose the farmers to the benefits and methods of multi-cropping and other sustainable farming methods.	42 (168	15 (45)	0 (0)	0 (0)	57 (213)	3.74	Agree
Pooled/Aggregate Mean (PX1) =						$\bar{X}$	3.49	Agree

Table 4 above shows that all the mean scores, including the pooled/aggregate mean ($\bar{X}$), are not only above the criterion mean of 2.50, but also reveal the general agreement of Abak LGA farmers with the use of the listed Environmental Adult Education Programmes (items 1-6) to modify/change their usual unsustainable farming methods/practices to sustainable ones. Four of the six items (items 1, 3, 4 and 5) received the strongest agreements from the farmers with means above 3.50.

Table 5. Mean Analysis of the responses from Crop Farmers in Etinan LGA on the EAE Programmes that would enable them to adopt sustainable Farming Methods/Practices.

S/N	ITEMS	ETINAN LGA CROP FARMERS RESPONSES (N = 163)				Total	MEAN ($\bar{X}$)	DECISION
	In view of your experience, what is your opinion about using the following programmes to help you modify/change your present farming methods/practices to improve your harvest and protect your environment and personal health?	SA (4)	A (3)	D (2)	SD (1)			
1.	Providing the crop farmers with an environmental awareness programme (including basic environmental literacy education) to make them understand the symbiotic relationship between them and the environment and the necessity of their protecting the environment for	41 (164	111 (333)	9 (18)	2 (2)	163 (517)	3.17	Agree

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	the success and sustainability of their farming occupation.							
2.	Providing an awareness creation programme for crop farmers on the disadvantages of using chemicals (herbicides and pesticides) to control weeds and pests and what sustainable alternatives could be adopted.	130 (520	29 (87)	3 (6)	1 (1)	163 (614)	3.77	Agree
3.	Providing crop farmers with an education programme that will teach them how to cope with/mitigate the effects of climate change on their crops.	48 (192	110 (330)	3 (6)	2 (2)	163 (530)	3.25	Agree
4.	Providing the crop farmers with conservation agriculture education to avoid their destruction of the ecosystem (flora and fauna) and losing its advantages through slash-and-burn method of preparing farm land for cropping.	32 (128	120 (360)	8 (16)	3 (3)	163 (507)	3.11	Agree
5.	Conducting workshops/seminars for crop farmers on the disadvantages of application of chemical fertilizers and how to improve soil nutrients through their production and use of organic manure.	123 (492	39 (117)	1 (2)	0 (0)	163 (611)	3.75	Agree
6.	Providing crop farmers with Agricultural Extension Programmes, including demonstration farms to practically expose the farmers to the benefits and methods of multi-cropping and other sustainable farming methods.	110 (440	50 (150)	2 (4)	1 (1)	163 (595)	3.66	Agree
Pooled/Aggregate Mean (PX2) =						$\bar{}$	3.45	Agree

As table 5 shows, all the mean scores, including the pooled/aggregate mean (PX2), are higher than the criterion mean of 2.50 and thus show that the farmers from Etinan LGA agreed with the use of the six listed Environmental Adult Education Programmes to modify/change their unsustainable farming methods/practices to sustainable ones. It is also notable that the items 2, 5 and 6 received the strongest agreements with means exceeding 3.50.

Test of the Null Hypothesis (H_o)

The Ho for this study posits that there is no significant difference between the responses of crop farmers in Abak LGA and those of their counterparts in Etinan LGA regarding the EAE programmes that would make them adopt sustainable farming methods/practices. The respective

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mean responses of the two groups of farmers (including the pooled/aggregate means) in tables 4 and 5 above are used to test the Ho, using the T-test statistic.
Adopting the standard deviation formula,

$$SD = \sqrt{\frac{\bar{\sum}\ (\overline{xi} - PX1)^2}{N1}} \quad \text{(for table 4) and } \sqrt{\frac{\bar{\sum}\ (xi - PX2)^2}{N2}} \quad \text{(for table 5),}$$

i) The SD for table 4 data (SD1) = 0.0040
ii) The SD for table 5 data (SD2) = 0.00000061

Applying the SDs (1 and 2) for t-analysis of the difference in aggregate mean responses in tables 4 and 5 (PX1 = 3.49 and PX2 = 3.45) and using the formula,

$$t = \frac{\bar{PX1} - \bar{PX2}}{\sqrt{\left(\frac{N1SD1^2 + N2SD2^2}{N1 + N2 - 2}\right)\frac{N1+N2}{N1N2}}}$$

, where N1 = 57 and N2 = 163,

The T-test result is shown in table 6 below.

Table 6.

N1	N2	$\bar{PX1}$	$\bar{PX2}$	SD1	SD2	df	t-cal	t-crit	P	Decision
57	163	3.49	3.45	0.0040	0.00000061	218	6.154	1.960	0.05	Reject H_0

T-test of significance of the difference in aggregate mean responses of crop farmers in Abak and Etinan LGAs regarding the EAE Programmes that would make them adopt sustainable farming methods/practices.

As table 6 reveals, the calculated t (t-cal) = 6.154, while the table t(t-crit) = 1.960 with degree of freedom (df) = 218 and the probability level of significance (p) = 0.05. The Ho is thus rejected as the t-cal>t-crit ; i.e. there is significant difference between the responses of the two groups of crop farmers from Abak and Etinan LGAs regarding the environmental adult education (EAE) programmes that would make them adopt sustainable agricultural/farming methods/practices; even though the pooled/aggregate means of their responses in tables 4 and 5 (3.49 for Abak and 3.45 for Etinan) were literally quite close, with a difference of only 0.04.

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DISCUSSION OF FINDINGS/RESULTS

In view of the mass adoption of traditional/unsustainable farming methods/practices by crop farmers in the southern region of Nigeria (as cited earlier in this paper), this study was undertaken to establish, through an empirical/participatory process, the unsustainable agricultural methods/practices commonly adopted by crop farmers in Nigeria's Akwa Ibom State (with focus on Abak and Etinan LGAs) as well as the environmental adult education (EAE) programmes that would promote the adoption of sustainable agricultural/farming methods/practices by these Akwa Ibom crop farmers.

Unsustainable agricultural methods/practices commonly adopted by the crop farmers in Abak and Etinan LGAs

The 220 crop farmers who finally constituted the subjects of this study commonly adopted various unsustainable traditional methods/practices in their occupation. Table 2 lists six (6) of such methods/practices. In relation to RQ1, the table also shows that the farmers agreed they adopted these methods/practices as their respective mean responses to questions on the methods/practices (items 1-6), as well as the pooled/aggregate mean (PX) were above the criterion mean of 2.50. Again, in relation to RQ2, table 2 also shows that item 1 (felling of trees to prepare land for farming) with a mean of 3.35, was the most adopted method/practice. This was followed seriatim by slashing and burning of grass and other trash (item 2; X = 3.32) and use of chemical fertilizers (item 4; X = 3.27). Use of pesticides/herbicides (item 3) came 4th in the ranking (X = 2.93), while item 5 (killing of bush animals during bush clearing and trash burning) was 5th (X = 2.89). The 6th and last in the ranking was item 6 (practice of mono-cropping; X = 2.73). Put together in respect of RQs 1 and 2, these findings illustrate that in both variety and ranking, the farming methods/practices adopted by the crop farmers were not only gravely unsustainable, but also environmentally-unfriendly as defined in Section 2 of this research Report. This underscores the need to use environmental adult education programmes to acquaint the farmers (who are generally adults) with new and sustainable farming methods/practices.

The farmers' reasons for adopting unsustainable Agricultural Methods/Practices

In relation to RQ3, six reasons were given by the farmers for adopting the above discussed unsustainable farming methods/practices. Table 3 lists the reasons as items 1to 6. Statistically, the six reasons were quite highly agreed to by the farmers as their mean responses were not only above the criterion mean of 2.50, but ranged from 3.09 to 3.36 (including the pooled/aggregate mean of 3.24). A close scrutiny of the reasons would reveal that they variously border on the farmers' intentions to

a) hasten the planting process (through three felling and slash-and-burn);
b) improve soil manure/fertility for bountiful harvest (with the ashes from slash-and-burn and chemical fertilizers);
c) delay weeds from coming up quickly (through use of herbicides);
d) prevent insects, pests and rodents from destroying crops (through use of pesticides);
e) prevent bush-animals from destroying crops (by killing them during bush clearing and slash-and-burn).

All in all, those intentions loudly reveal the crop farmers' ***ignorance*** of sustainable and environmentally-friendly ways of achieving the intentions, as well as their (farmers') serious ***lack***

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of awareness of the devastation they were causing the environment through the unsustainable methods/practices they had adopted.

Requisite Environmental Adult Education (EAE) Programmes for Promotion of Sustainable Agricultural Methods/Practices among the Crop Farmers

In answer to RQ4 and relevant to the topic of this study, 6 requisite EAE programmes were suggested for the farmers to express their opinions on them. Tables 4 and 5 show respectively the responses of the crop farmers from Abak and Etinan LGAs. As table 4 shows the 57 crop farmers from Abak LGA very much agreed with use of the listed EAE programmes (items 1 to 6) to modify/change their usual unsustainable farming methods/practices to help improve their harvest, their environment and personal health. The mean responses to the six EAE programmes were above the criterion mean of 2.50 and ranged between 2.95 and 3.74; while the pooled/aggregate mean (PX1) was 3.49. The 163 crop farmers from Etinan LGA (table 5) also very much agreed that the six EAE programmes would help to modify/change their present unsustainable methods/practices, improve their harvest and protect their environment and personal health. The mean responses were also above the criterion mean of 2.50 and ranged between 3.11 and 3.77 with the pooled/aggregate mean (PX2) of 3.45.

Succinctly put, both Abak and Etinan crop farmers very much agreed that the following EAE programmes would make their farming methods/practices sustainable as well as help to improve their harvests, environment and personal health:

a) Environmental awareness programmes (including basic environmental literacy);
b) Awareness creation programmes on the disadvantages of using herbicides and pesticides;
c) An education programme on how to cope with/mitigate the impact of climate change on crops;
d) Conservation agriculture;
e) Workshops and seminars on the disadvantages of using chemical/inorganic fertilizer, as well as the advantages of and how to produce organic manure;
f) Provision of Agricultural Extension Programmes (including demonstration farms) to practically demonstrate, multi-cropping and other beneficial sustainable and environmentally-friendly farming methods/practices.

Commonalty of the Views of Abak and Etinan Crop Farmers

To further ascertain the similarity levels of the views expressed by the two groups of crop farmers (from Abak and Etinan) on the EAE programmes that would revolutionize their farming methods/practices (tables 4 and 5), the researchers posited a relevant null hypothesis (Ho) that there is no significant difference (P = 0.05) between the responses of the groups of crop farmers regarding the EAE programmes that would make them adopt sustainable farming methods/practices. Using the data in tables 4 and 5 to arrive at those in table 6, the T-test was performed to ascertain the significance of the difference between the pooled/aggregate means (PX1 = 3.49; PX2 = 3.45) in tables 4 and 5. The t-cal (6.154) was found to be higher than the t-crit (1.960). Ho is therefore rejected at P = 0.05% level of significance (df = 218) as the result does not confirm the non-significance of the difference between the views of the two groups of farmers, in spite of the fact that the difference between the pooled/aggregate means of the views is just 0.04. This non commonalty could be explained with the vagaries of the differences in mean responses in tables 4 and 5 which were reflected in their standard deviations (SD1 = 0.0040 in table 4; SD2 = 0.00000061 in table 5). Be that as it may, the fact still remains that both Abak and Etinan crop farmers agreed that the EAE programmes listed above would modify/change their

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unsustainable farming methods/practices and help to improve their harvest, environment and personal health.

Summary and Conclusion

The various unsustainable agricultural methods/practices adopted by crop farmers in Akwa Ibom State (with particular reference to farmers in Abak and Etinan LGAs) as well as the farmers' reasons for adopting the methods/practices, have been clearly revealed by this study. The study has also shown the various environmental adult education programmes that would make the crop farmers (who are generally adults) adopt sustainable and environmentally-friendly methods/practices. With the farmers' confirmation of the potential efficacy of these EAE programmes, the researchers find it pertinent to conclude that if the programmes are properly implemented by relevant experts, they will surely meet the expectations of their helping to inculcate sustainable methods/practices in the crop farmers, improve their occupational output and protect their environment and personal health.

Recommendation

In the light of the importance of implementing the EAE programmes discussed above to urgently reorientate the crop farmers in Akwa Ibom State (and others like them elsewhere) towards adoption of sustainable farming/practices, the researchers recommend that existing departments of Adult and Non-Formal Education with EAE programmes in Nigerian Universities (such as those at the Universities of Port Harcourt and Calabar) should be commissioned by government to collaborate with other Nigerian institutions concerned with crop research, to develop and provide the requisite EAE programmes. This should be done with financial and moral support from the various agencies superintending over the university departments and the collaborating institutions, including State and Federal Ministries of Education and Agriculture.

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