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Shifting Cultivation, Bush Fallow Influence on Environmental Sustainability of Obudu And Obanliku Local Government Areas of Cross River State, Nigeria

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Abstract

This study investigated the extent to which shifting cultivation and bush fallow influence environmental sustainability of Obudu and Obanliku Local Government Areas of Cross River State. Two null hypotheses were formulated to guide the study. Literature was reviewed based on the variables of the study. The survey research design was adopted for the study. The population of the study comprised 780 farmers from the study area: A sample 507 was drawn for the study using stratified and simple random sampling techniques. A four – point modified Likert-Scale instrument entitled Shifting Cultivation and Bush Fallow Practices and Environmental Sustainability Questionnaire (SCBFPESQ) was developed to elicit responses from the respondents. The instrument consisted of 30 items. Five items in the instrument measured one sub-variable. The instrument was validated by two experts in the Test and Measurement department of the University of Calabar. Test re-test reliability estimate using Pearson Moment Correlation Statistical tool was carried out to find the internal consistency of the instrument. Data was collected by the researcher with the help of two trained research assistants. All the hypotheses were analysed at 0.05 level of significance using one-way analysis of variance (ANOVA). The result of the analysis revealed that; shifting cultivation and bush fallow significantly influence environmental sustainability. Based on the finding of the study, five significantly influence recommendations were made among which was include; that Ministries of Environment and that of Agriculture should organise regular public awareness/enlightenment campaigns to sensitize farmers on the consequences of

	unsustainable farming practice and improving methods of crop, cultivation. Based on the findings of the research, it was concluded that shifting cultivation and bush fallow farming practices exert tremendous influence on environmental sustainability.

Introduction

Environmental sustainability is a means of using resources and human activity so that the society, its members and its resources, are able to meet their needs and express their greatest potential in the present, while preserving biodiversity and natural ecosystems, planning and acting to maintain these ideal resource for future use. It is a state in which the demands placed on the environmental resources by the farmers can be met without reducing its capacity to allow all people to live well now and in the future. Anthony (2002) maintained that environmental sustainability arose out of the realization that man's exploitation of nature continues to have unintended but damaging impact on the environment. This is based on the conviction that the future needs have to be met. It is a development that meets the need of the people at present without compromising the ability of the future generation to meet their needs.

According to Uche, Olele and Nwabueze (2013) environmental sustainability is the systematic approach of making sure that man's interaction with the natural resources within the environment are pursued with the idea of keeping the environment clean based on idea-seeking behaviour. Iwena (2007) states that environmental sustainability refers to the goals and practices, method and techniques which provide growth, but do not deplete the environment in the long term. Environmental sustainability has become a prominent global issue with many groups working to develop plans about the use and preservation of natural resources. These groups include non-governmental organisations (NGOs), agricultural extension workers, the government and other volunteer organisations. They, acting independently and in cooperation, help in creating awareness by organising seminars, group discussions, lectures etc to ensure that farmers are involved in farming practices that sustain the environment and develop plans that will not only preserve natural resources and maintain soil fertility but will also improve crop yield.

Traditional farming practice is the type of farming in which the farmer uses simple farm tools and techniques in clearing a farm land, engaging in superficial tillage of land and planting with subsequent harvesting of the farm produce for livelihood. Farmers in Northern part of Cross River especially in Obudu and Obanliku employ farming practices which deplete the natural resources which before now enhanced adequate production of farm produce. The centre for integrated Agricultural System (2014) state that farmers engage in different primitive farming practices which do not enhance sustainable usage of the environment. These practices involved gathering nuts, grains fruits, leaves, cutting of trees and hunting of animals for livelihood. The

emphasis is more on resource utilization rather and resource management strategy to achieve environmental sustainability.

Hodo (2001) maintain that shifting cultivation and bush fallowing are the most widespread farming practices and they are often labelled as the most land-use problems in the world. He also added that shifting cultivation or bush fallow is associated with bush burning and green clearing and these are conditions that limit crop yields due to soil fertility increase weeds or pest out breaks, though they are over come during the fallow time after a certain number of years but lack environmental sustainability.

According to Anthony (2012), food production is on the increase, declining soil fertility especially in the absence of the knowledge for environmental conservation, can impose tremendous pressure on the environmental conservation, can impose tremendous pressure on the environment. In the same vein Anijah-Obi (2001) observed that heavy reliance on indigenous knowledge is a key element of unsustainable traditional agricultural practices, which is often resulting in the loss of plant species and biodiversity, thus calling for the urgent need to salvage them.

Similarly, these primitive agricultural practices which CAIS (2014) describes as unsustainable, causes drought, flooding, erosion, loss of soil fertility and also primitive farming practices such as constant clearing and burning, slash and superficial tillage by hand, planting, tillage on mounds or ridges, unscientific compositing, clean weeding of grass as practiced in Northern Cross River State threaten the ecosystem. These have resulted in erosion, flooding and exposure of the land to harsh climatic conditions. These primitive practices endanger the existing environmental resources.

In the past shifting cultivation and bush fallow was used predominantly with the aid of primitive tools. This farming practice was based on the restorative properties of vegetation and woody species involving partial clearing of the forest or bush fallow, followed by slash burning of the vegetation for seed-bed preparation and partial release of nutrients and short term intercropping.

The most common system of agricultural used in Nigeria traditional villages is the shifting cultivation and bush fallowing. Under this system the farmer clears a piece of land of its natural vegetation and plants his crop. After one to three successive planting seasons he leaves this piece of land and clears another, to allow the first piece of land to regain its fertility (Agricinfor, 2015). The farmers may come back to the first piece of land after many years. During this period, this first piece of land grows back into bush and the land regains its richness through the dead leaves that fall and decay on the soil. Kustermann, Christian and Hulsberge (2010) commented that when the farmers observe that the soil has lost much of its fertility, the farmer moves over to another plot of land leaving the former plot to re-grow into a bush. They also

added that the farmer uses this type of traditional farming practice because he is conscious of the environmental issues.

According to Buddemer (2020) when a plot of land is under bush fallow, there is hardly any addition of nutrient of the soil (aquifer). If, however, the fallow period extends to five or more years, the roots of the plants in the soil will grow deeper into the subsoil. There they will recapture the nutrient lost from the top soil through leaching and return them to the topsoil through dead decay materials like leaves and other debris. Soldat (2009) accounts that it will give way for soil rejuvenation therefore making shifting cultivation an environmental friendly practice.

According to Bisong (2004), it is the practice that involve minimum tillage practice to conserve soil organic matter and biotic life. This also encourages the conversion of all available biomass on the farm into compost rather than burning. The review of millennium development goals, according to the International Federation of Organic Agriculture Movement (IFOAM) (2002) support this view that biotic integrity, such as changes in community composition, tree species and diversity arises from the friendly practice. Omoogun (2004) also noted that to ensure healthy production, we must maintain a healthy environment and minimize those activities that destroy the vegetation or ecosystem.

However, shifting cultivation has its advantages, since extensive areas of land are being cleared for agriculture purposes. Due to the excessive cultivation of large expanses of land, more forests or vegetation are cleared yearly so that enough land can be used for agricultural purpose. Paul (2011) therefore noted that along with logging, shifting cultivation practice has been repeatedly criticised as a major cause of loss of tropical forests in the tropical environment. According to Ukanga (2016) shifting cultivation account, for about 50 to 75% of the 17million hectares of forest currently destroyed every year. This leads to greater poverty and drainage to natural resources in the environment, because the soil does not meet the required need of the people in the environment. He also pointed out that to compensate for loss of fertility and lower yield, larger areas of land may be cultivated.

The different sources of pressure on the land resources due to lack of shifting cultivation due to overpopulation has result in using irrigation farming and when farmers engage on this type of farming it reduces soil fertility agricultural production some farmers over-irrigate the farm lands, because of there are unpleasant results, for example under irrigation or over irrigation, which lead to water stress in plants with consequent low yield (Agricinfor, 2015). According to Food and Agriculture Organisation (2010) over-irrigation due to the absence of shifting cultivation, usually results in waste of energy, reduction in soil quality leading to loss of essential plant nutrients and general drainage problems in the environment.

Uche, Olele and Nwabueze (2013) in a study carried out on the Contributions of Higher Educational Institutions towards Sustainable Environmental Development in South-South noted that 13% of vegetation is utilized by agriculture, they also estimated that seventy percent (70%) of rain forest resources are destroyed yearly due to agricultural logging or practiced timber exploitation, demand for fuel wood and bush burning because of shifting cultivation practice. Uche et al (2013) also reported that the disappearance of original forest or vegetation is due to the unsustainable farming practices resulting in a vast spectacular expansion of all dead trees which are relics of the original tropical moist forests.

The ecological approach to forest management places due emphases on the dynamics of the forest function and their resilience and response to changes. It stresses the importance of adopting policies which allow practice of traditional farming system to adopt to changing conditions with minimum adverse input. This approach, according to Dorah, Kirschenmann and Magdoff (2007), is the allocation and management of vegetation soil resources on the basis of an understanding of the functional components of the physical and biological environment, and the relationship among the components. Bisong (2004), places emphasis on the practices which guarantee the ability of ecosystems to maintain a relatively constant condition in its species composition, biomass and productivity around an equilibrium point.

On the contrary Powell and William (2003) believe in the concept of internal and external disturbances and the expectation of the environment to return to its steady condition fairly quickly. This knowledge is therefore employed to safeguard the human perceived health of the soil environment as observed by Ogomombi and Oladokun (2003) on the farming that would result in soil loss not greater than the production of new soil. They also agree; that when the shifting cultivation period is not long enough, the soil quickly loses its fertility and becomes less suitable for further crop production, waste of farmers' energy resources in frequent slashing of agricultural yields, that clearing and burning of bushes in shifting cultivation affects organic matter in the soil and the soil physical conditions and finally that, uncontrolled bush fires can destroy forest resources and game reserves. Shifting cultivation is often associated with forest clearing, leading to a decline of forest area or desertification. Negative consequences of deforestation are widely known. Deforestation gives birth to land degradation, loss of biological species and endangered species, thereby contributing to global warming and unsustainable environment.

Ulayi &Edinyang (2019) carried out a research on traditional practice and promotion of environmental conservation. To assess traditional practices and the promotion of environmental conservation in Abak Local Government Area of Akwa Ibom State. The study tool entitled traditional conservation practices questionnaire (TCPQ) was used for data collection, 200 respondents of Abak Local Government Area. Both males and females were sampled for the study using simple random sampling. The data was analysed using Pearson Product Moment Correlation Coefficient and independent t-test to test the five hypotheses formulated for the study. Findings of this study showed that there is a significant relationship

between traditional conservation practices and modern environmental strategies in the promotion of environmental conservation of Abak Government Area, while traditional land use practices and gender have no significant influence in conservation of the environment in Abak Local Government Area. Based on the findings recommendations were given, among others that men and women should continue to participate in the traditional conservation practices that is carried out in the locally.

Another research work conducted by Jassam (2014), to examine the effect of bush clearing on the environment is apt for this study. The study "The impact of Local Farmers harvesting techniques on environmental management in Cross River Central Senatorial District of Cross River State applied a descriptive research method. The sample of 100 respondents were administered with questionnaires for data collection and 845 finding showed that there is a significant positive impact of local farmers harvesting techniques and environmental management. It also showed the impact of harvesting techniques on the environmental management generally on environmental sustainability. Therefore, the researcher intends to find out the extent to which shifting cultivation and bush fallow influence environmental sustainability in Obudu and Obanliku Local Government Area of Cross River State, Nigeria.

Statement of the problem

The global environmental issues as well as environmental problems in the study area are manifold due to the activities of man and the types of farming practices of the people. Farming practices like shifting cultivation, bush fallow have led to deforestation, erosion, flooding, biodiversity depletion, global warming and exposed the soil to harsh climatic conditions and loss of soil fertility. Inadequate food production may be attributed to the type of farming practice of the people. The socio-economic and environmental degradation of the environment in the study area is quite disturbing. Apart from the acute shortage of fuel-wood, decrease of crops yield, we have shortage of domestic fuel wood and industrial timber, loss of biodiversity and genetic resources, destruction of wildlife habitats, decline of watershed function, uncontrolled flood and desert encroachment, and an increasing number of people in the local communities who rely on soil resources for their livelihood has contributed to global warming and green house effects due to farming practices in the area.

Over the years' frantic efforts have been made by the government, agricultural extension workers and environmental agencies to sustain the environment in Obudu and Obanliku Local Government Areas of Cross River State. These attempts have not yielded minimum or no positive impact because of the type of farming practices employed by the farmers in the study area.

Non-Governmental Organisations (NGOs), agricultural extension workers, the Government and other volunteer organisations have made a significant effort in creating of awareness, organising seminars, group discussion, lectures etc, for farmers who are engaged in excessive

logging of wood, setting fire on farm land, and farming practice that are not sustainable, to ensure this menace is stopped but to no avail.

However, these efforts must be intensified. It is on this basis that this study intends to find out whether these farming practices such as shifting cultivation and bush fallow have influence on environmental sustainability in the study area.

Purpose of the Study

The study is aimed at investigating the extent to which traditional farming practices influence environmental sustainability in Obudu and Obanliku Local Government Areas of Cross River State. The study specifically sought to:

1. Determine the extent to which shifting cultivation influence environmental sustainability.
2. Find out the extent to which bush fallow influences environmental sustainability.

Research Questions

The following research questions were posed to guide the study.

1. To what extent does shifting cultivation influence environmental sustainability?
2. To what extent does bush fallow influence environmental sustainability?

Statement of hypotheses

The following null hypotheses were postulated to guide the study:

1. Shifting cultivation does not significantly influence environmental sustainability.
2. There is no significant influence of bush fallow on environmental sustainability.

Methodology

The researcher adopted the survey design. Survey is an extensive cross sectional approach, where a number of cases are considered at a particular time and the data is gathered to study the opinions, behaviour, attitudes, habits, desires, values and beliefs etc. (the characteristics of certain population are studied). Osuala (2013), asserts that the survey research design is the systematic way of measuring variables by asking people question and then examine relationship among the variables. The design was considered appropriate because, it enables the researcher to obtain information by gathering data from a particular sample of a given population, through personal or impersonal means, to study its characteristics.

The population of the study consists of 780 Obudu and Obanliku Local Government Area of Cross River State. The population each of which practice shifting cultivation and bush fallow system.

The sampling technique adopted for this study was the simple random sampling technique. The aim was to give every member of the population, equal and independent opportunity of being selected. The main purpose of using simple random sampling technique was to compose a sample that will yield research data that can be generalized to large population.

The technique employed by the researcher is the hat and draw (balloting) method. Here, the researcher wrote the names of all the farmers on pieces of papers, rolled each slip into a paper ball, mixed those paper balls well in a container (hat) and blindly drew the required number of farmers that practice shifting cultivation and bush fallows. In the same manner, the required sample was randomly drawn for the study.

The sample of the study comprised 200 farmers in Obudu and Obanliku of Local Government Area Cross River State.

The major instrument used for this study was the questionnaire. The questionnaire had two sections. Section "A" was used to seek information in respect of the subject demographic or personal data such as sex, age, educational qualification etc. while, section "B" composed of questionnaire items designed to evaluate the study.

There were four items on a four point modified Likert scale to measure each of the sub independent variables and six items to measure the dependent variable of the study.

Validity of an instrument is the extent to which a particular instrument measured what it purports to measure or whether it actually tested the desired variables.

The researcher administered copies of the questionnaire directly to the respondents with the help of the trained research assistants. The questionnaire was distributed by the researcher and two research assistants who explained the purpose of the study to all farmers who practice shifting cultivation and bush fallow. The farmers were asked to give their candid response to each of the items. A total of 200 copies of the questionnaire were administered and retrieved from the respondents.

After collecting copies of the questionnaire, codes and scores were assigned to each item. For ease of preparation, a coding schedule was prepared by developing a key for each of the constructs of the instrument.

The following procedure was adopted for the analysis of research data on a hypothesis by hypothesis basis. All the hypotheses were tested on .05 level of significance using one way analysis of variance (ANOVA)

Ho:1
There is no significant influence of shifting cultivation on environmental sustainability.
The independent variable is this hypothesis is shifting cultivation (Low, Moderate and high); while the dependent variable is environmental sustainability. To test this hypothesis, environmental sustainability from shifting cultivation; low, moderate and high were compared

using One-Way Analysis of Variance (ANOVA). The result of the analysis is presented in Table 1.

The result on Table 1 revealed that the calculated F-value of 58.985 was higher than the critical F-value of 3.00 at .05 level of signifance, with 2 and 485 degrees of freedom. With this result, the null hypothesis was rejected. This result therefore implied that, shifting cultivation significantly influences environmental sustainability.

Since shifting cultivation have significant influence on environmental sustainability, a post hoc analysis was employed using Fishers' Least Significant Difference (LSD) multiple comparison analysis. The result of the analysis is presented in Table.

The result of the analysis in Table showed that respondents whose shifting cultivation is low are significantly different in their environmental sustainability from those whose shifting cultivation is either moderate or high. Also, respondents whose shifting cultivation is moderate are significantly different from those who are high in environmental sustainability.

Table 1
One-way analysis of variance (ANOVA) of the influence of shifting cultivation on environmental sustainability. (=488)

Shifting cultivation	N	X	SD		
Low - 1	159	19.40	.49		
Moderate – 2	266	18.17	1.68		
High – 3	63	19.51	.50		
Total	488	18.74	1.43		
Source of variance	SS	Df	Ms	F-ratio	P-level
Between groups	194.760	2	97.380	58.985*	.000
Within groups	800.707	485	1.651		
Total	995.467	487			

*Significant at .05 level, critical F-3.00, df=2,485.

Table 2
Fishers' Least Significant Differences (LSD) multiple comparison analysis of the influence of shifting cultivation on environmental sustainability LSD

(i) Shifting cultivation	(j) Shifting cultivation	Mean Difference (I-J)	Std. Error	P-level.
1.00	2.00	1.23710(*)	.12880	.000
	3.00	-.10542	.19128	.582
2.00	1.00	-123710(*)	.12880	.000
	3.00	-1.34252(*)	.18003	.000
3.00	1.00	.10542	.19128	.582
	2.00	1.34252(*)	.18003	.000

*The mean difference is significant at the .05 level.

Ho2
Bush fallow has no significant influence on environmental sustainability
The independent variable in this hypothesis is bush fallow (Low, moderate and high); while the dependent variable is environmental sustainability. To test this hypothesis, environmental sustainability from low, moderate and high bush fallow were compared using One-Way Analysis of Variance (ANOVA). The result of the analysis is presented in table 3.

The result on table 3 revealed that the calculated F-value of 800.719 is higher than the critical F-value of 3.00 at .05 level of significance with 2 and 485 degree of freedom. With this result the null hypothesis was rejected. This result therefore implied that, bush fallow significantly influenced environmental sustainability. Since bush fallow has a significant influence on environmental sustainability, a post hoc analysis was employed using Fishers' Least Significant Difference (LSD) multiple comparison analysis. The result of the analysis is presented in Table 3.

The result of the analysis in Table 4 showed that respondents whose bush fallow is low are significantly different in their environmental sustainability from those whose bush fallow is either moderate or high. Also respondents whose bush fallow is moderate are significantly different from those who are high in environmental sustainability.

Table 3
One-way analysis of variance (ANOVA) of the influence of bush fallow on environmental sustainability (N=488)

Shifting cultivation	N	X	SD		
Low - 1	63	15.49	.50		
Moderate – 2	267	19.24	.69		
High – 3	158	19.20	.75		
Total	488	18.74	1.43		
Source of variance	SS	Df	Ms	F-ratio	P-level
Between groups	764.067	2	382.034	800.719*	.000
Within groups	321.400	485	.477		
Total	995.467	487			

*Significant at .05 level, critical F-3.00, df=2,485.

Table 4
Fishers' Least Significant Difference (LSD) multiple comparison analysis of the influence of bush fallow on environmental sustainability LSD

(i) Shifting cultivation	(j) Shifting cultivation	Mean Difference (I-J)	Std. Error	P-level.
1.00	2.00	-3.7489(*)	.09675	.000
	3.00	-3.71047(*)	.10292	.000
2.00	1.00	3.74389(*)	.09675	.000
	3.00	.03342	.06933	.630
3.00	1.00	3.71047(*)	.10292	.000
	2.00	-.03342	.06933	.630

* The mean difference is significant at the .05 level.

Discussion of findings

This section is concerned with the discussion of findings that emerged from the results of the analysis. The discussion is presented in accordance with the variables of the study. The result of the first hypothesis of the study indicated that, the calculated F-value of 108.122 was higher than the critical F-value of 3.00 at .05 level of significance, with 2 and 485 degree of freedom. With this result the null hypothesis was rejected. This result therefore implied that, shifting cultivation significantly influenced environmental sustainability. This implies that respondents whose shifting cultivation is low are significantly different in their environmental sustainability from whose shifting cultivation is either moderate or high. Also respondents whose shifting cultivation is moderate are significantly different from those who are high in their environmental sustainability. The finding is in line with the view of Agricinfor (2015) who opined that the most common system of agriculture used in Nigeria traditional villages is the shifting cultivation. Under this study the farmer clears a piece of land of its natural vegetation and plants his crop. After one to three successive planting seasons he leaves this piece of land and clears another, to allow the first piece of land to regain its fertility. The farmer may come

back to the first piece of land after many years. During this period, this first piece of land grows into bushes and the land regains its richness through the dead leaves that fall and decay on the soil. Kustermann, Christian and Hulsberge (2010) also commended that when the farmers observe that the soil has lost much of its fertility, the farmer moves over to another plot of land leaving the former plot to re-grow into a bush. They also added that the farmers uses this type of traditional farming practice because he is conscious of the environment issues. Buddemeier (2020) also noted that when a plot is under bush fallow, there is hardly any addition of nutrient of the soil (aquifer). If however, the fallow period extend to five years, the roots of the plants in the soil will grow deeper into the subsoil. There they will recapture the nutrient lost from the top soil through leaching and return them to the topsoil through dead decay materials like falling lead debris.

Omoogun (2004) also noted that to ensure healthy production we must maintain a healthy environment and minimize those activities that destroy the vegetation or ecosystem. Massive area of land are being cleared for agriculture purposes, due to excessive cultivation of larger expanse of land, more forest or vegetation are cleared yearly so that enough land can be use for agricultural purpose. Paul (2011) also noted that along with logging, shifting cultivation practice has being repeatedly criticised as a major course of loss of tropical forest in the tropical environment.

Agricinfor (2015) also explained that because of the different sources of pressure on the land resources due to lack of shifting cultivation, irrigation agriculture where farmers engage in irrigation to apply water, has emerged, though some farmers over irrigate the farm land, due to improper irrigation scheduling. This leads to negative consequences, for example under irrigation or itemed irrigation, which leads to water stress in plant with consequent low yield. According to Food and Agricultural Organisation (2010) also noted that over irrigation because of absence of shifting cultivation usually results in waste of energy, reduction in soil quality leaching of essential plant nutrients and generally creates drainage problems in the environment.

Uche, Olele and Nwabueze (2020 also estimated that seventy percent (70%) of rain forest resources are destroyed yearly due to agricultural logging or practices timber exploitation, demand for fuel wood and bush burning because of shifting cultivation practice. Uche et al (2013) also reported that disappearance of original forest or vegetation is due to the unsustainable farming practices left with a vast spectacular expansion of fall dead trees which are relics of the original tropical moist forests.

The ecological approach to forest management places due emphases on the dynamic of the forest function; their resilience and response to changes, it stresses the importance of adopting policies which allow practice of traditional farming system to adopt to changing conditions with minimum adverse input. Is the allocation and management of vegetation soil resources on

the basis of an understanding of the functional components of the physical and biological environment and the relationship among the components. The ability of ecosystem maintains a relatively constant condition in its species composition, biomass and productivity around an equilibrium point.

Bush fallow and environmental sustainability

The result of the second hypothesis indicated that, the calculated F-value of 645.39 was higher than the critical F-value of 3.00 at .05 level of significance, with 2 and 485 degree of freedom. With this result the null hypothesis was rejected. This result therefore implied that, bush fallow significantly influenced environmental sustainability. This signified that respondents whose bush fallow is low are significantly different in their environmental sustainability from those whose bush fallow is either moderate or high. Also respondents whose bush fallow is moderate are significantly different from those who are high in environmental sustainability. The finding of this study agrees with that of Martins and Reminlekum (2015) who observed that with this method the farmer can operate throughout the year and he can operate economically. The farmer can feed his animals like Cattle, pigs, chickens, with his farming products, especially at times when such crop are attracting low price in the market. They also added that the need to have a source of manure in order to maintain an effective rotation made traditional farmers to combine crop production with animals and so started the bush fallow. Kustenmann et al (2010) also opined that this system has another advantage of the farm yard manures being used to enrich the soil and also the use of farm by product like straws, groundnut, hauling cowpea tops as livestock feed. In some community the animals do not only supply manure but also serve as a means of transportation and provide labour for ploughing.

Centre for integrated Agriculture system (2014) also acknowledged that farms with both livestock's and crops can gather fertility through growing nitrogen-fixing forage grasses such as white clover or alfalfa and grows crops or cereals whereas fertility is established. Mader and Paul (2002) report that Biological research into soil and soil organisms has proven beneficial to farming. Varieties of bacteria and fungi breakdown chemicals plast matter and animal waste into productive soil nutrients. In turn, they produce benefit of healthier yields and more productive soil for the future crops are environment.

FAO (2010) also affirmed that bush fallow as a traditional farming practices maintain soil fertility by recycling soil nutrients and allowing the introduction and use of rotation between various crops and forage legumes and trees or for land to remain fallow and grasses and shrubs to become re-established. Kathleen and Robert (2003) also noted that this maintain soil biodiversity, minimize soil loss, help to cover water and provide suitable habitat. For birds this is a form of environmental sustainability. Helga, Julia and Robert (2013) also observed that bush fallow system make the best use of crop resides. When they are not used as feeds, stalks may be incorporated direct into the soil, where for some time, they act as a nutrient trap, exacerbating deficiencies. FAO (2014) also added that bush fallow is a lower risk strategy than monoculture, especially when climate pests and disease and market prices are unfavourable

for one crop or type of livestock. However, even when the attention of the farmer is divided, he still achieves high productivity and reduced environmental issues like erosion. International Federation of Organic Movement (IFOAM) (2002) also said that farming in a piece of land and allow fallow for some year before farming again and mixing is exchanging resources between different farms and its enable recycling of resources generated in such a farm land. This can be used to resolve waste disposal problems where by crop farmers use dung from animal farms for fertilizer.

This practice involves multiple cropping and keeping different types of animals together. For example grain-legume association can provide grain with nitrogen. With plant inter-cropping farmers can make the most of the space available to them by selecting plants and cropping formations that maximize the advantage of light, moisture and soil nutrients. For example the mixed animal system include chicken, fish production where chicken dung serves as fish fodder, or swamp rice/fish production where fish drops are used for rice for manure or fish may help reduce populations of existing and emerging disease vectors such as mosquitoes.

Conclusion

Sequel to the results and findings of the study the following conclusions were reached. Shifting cultivation significantly influenced environmental sustainability; Bush fallow significantly influenced environmental sustainability.

Recommendations

On the basis of the findings of this study, the following recommendations were made;

1. The Ministry of Agriculture in collaboration with that of environment, should organise regular public awareness/enlightenment campaigns to sensitize farmers on the consequences of unsustainable practices and improved methods of crop production.
2. Government should encourage agro-forestry and forestation initiatives by providing micro-finance/subsidies and tree-crop seedlings for intending farmers.
3. Legal framework should be put in place to regulate unsustainable exploitation of natural resources and the degradation of the environment.
4. Adult educators should be encouraged to expose rural farmers to learning experiences which will make them understand the influence of various farming practices and environmental sustainability.
5. Environmental/Agricultural Extension workers should be trained and re-trained on their roles as agents of environmental conservation and sustainability.
6. Manpower/skill development should be adopted by government as a means of encouraging economic survival and to reduce over-dependence on conservation of forest resources.

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