Journal of Education and Practice
ISSN 2222-1735 (Paper) ISSN 2222-288X (Online)
Vol.8, No.31, 2017

Soil Conservation Techniques for Climate Change Adaptation among Abakaliki Rice Farmers in Ebonyi State, Nigeria

Egbe, Benjamin O. (Ph.D)
Agricultural Education Unit, Department of Technology and Vocational Education, Ebonyi State University Abakaliki, Nigeria.

Abstract
Rice production in Ebonyi State is greatly influenced by climate changes which need to be managed by framers for enhanced yields. The study sought to determine soil conservation measures to be used by farmers to adapt rice production to climate change in the state. Three research questions were developed to guide the study. The study was a survey design as it elicited information from 198 respondents using a questionnaire. The questionnaire was developed by the researcher on four point scales and validated by 3 experts. Date collected through the questionnaire were analysed with mean and standard deviation to answer the researcher questions. The findings reveal that rice farmers plant cover crops, apply liming materials and manures to make the soil resilient to weather changes; but do not use organic and biological agriculture to maintain soil structure. Constraints on the use of climate change adaptation measures were found as lack of knowledge, low education level; and shortage of farm inputs. It was also found that to improve upon the use of these measures, farmers need training on soil management strategies, weather changes, and soil nature. It was then recommended that government should review polices on land use, and intensify farmer education on environmental changes and their management strategies. Also, extension agents should gear their efforts towards creating awareness on soil conservation strategies and sources of credits with which to secure climate change management inputs.
Keywords: *Soil, Conservation, Techniques Rice Production and Climate Change.*

Introduction

Rice is the most important commercial crop in Ebonyi State, and the most popular cereal crop in Nigeria (Ekpe and Alimba, 2013). The authors stated further that rice farmers in Ebonyi State provide the bulk of rice that is consumed locally and beyond Nigeria, popularly called Abakaliki rice, and now "Ebonyi Rice World". That is, Ebonyi State produces almost 50% of the total Nigeria output of rice.

Rice farmers in Ebonyi state experience climate changes through late arrival of rains, and drying up of streams and the small Ebonyi River, which affect rice production in most communities of the state. Another major problem is that the poorly planned urban and quarry industry rub farmers off valuable land and labour. Also, top fertile rice soils are constantly being eroded due to continuous cropping system and other poor farming practices. These factors according to Ayoade (2005) have detrimental effects on soil, and rice yield. He added that one major way of addressing these problems is by adapting agriculture to climate changes through soil conservation techniques.

In their words, Fapojuwo, Olawoye and Fabuson (2013) soil conservation technique is the utilization of various processes to solve soil management problems. It is the protection of all surface deposits through the use of mulching; cover cropping, manuring and biological agricultures. In this study, soil conservation techniques involve the use of different strategies to improve environmental quality so as to enhance rice production. Thus, Akpata, Samuel and Adeola (2009) said that the purpose of conserving soil is to reduce drastic changes in the soil temperature, air, and moisture. Some measures can be used to adapt agriculture to climate changes.

Climate changes according to Segerson and Dixon (1998) are the variability or fluctuations in the climate conditions of a place. To adapt to these changes, means having the ability to adjust to the variability in the farming environment and then cope with their consequences. Adaptation is explained in the context of this research as the ability of farmers in rice production system to manage environmental changes, cope with the disturbances resulting from such changes and organize themselves for better rice production under varying climate changes. It is the reaction to or anticipated environmental changes (Yohe, 2002). He added that for farmers to positively react to changes in the environment, they need to build climate change resilience and adaptive measures. To assist them do this, it is necessary to examine what the small scale farmers use to restore soil properties for rice production.

Rice production in Ebonyi State is predominately dominated by small holders under rain fed condition. Farm size cultivated by a household is generally small, ranging from less than one hectare to a few hectares. Human labour is greatly utilized for work. These variables have significant impact on rice yield. Farmers need to be strengthened to cope in a way that will be beneficial to them. It is against this background that this research is designed to equip farmers with the techniques of coping with climate disturbances.

Objectives

The study was designed to determine the use of soil conservation techniques as climate change adaptation strategies among Abakaliki rice farmers in Ebonyi State, Nigeria. Specifically the study sought to:

1. Identify the type of climate change adaptation strategies utilized by rice farmers.
2. Ascertain the constraints on the use of climate adaptation strategies
3. Determine ways of improving farmers' competencies towards the use of adaptation strategies.

Methodology

The area of study is Ebonyi State, which is one of the 36 States of Nigeria. Ebonyi was chosen as the study area because of the high interest of farmers in rice production which is greatly influenced by climate changes. Multistage random sampling method was used to select an extension block in each of the three agricultural zones of the state: Abakaliki, Afikpo, and Onueke.

Thereafter, three communities were randomly selected from each block; and from each community, 17 rice farmers and 5 extension agents were picked for the study. This gave 198 respondents, made up of 153 farmers and 45 extension officers.

Questionnaire was developed by the researchers on four point scales and validated by 3 experts. The mean cut off point of 2.50 was estimated from the four scale values. The instrument was used for eliciting information from the respondents. Data were analysed using mean and standard deviation, to answer the research questions.

Results and Discussion

Table 1: Mean Ratings on Types of Climate Adaptation strategies adopted by Rice Farmers.

S/N	Soil conservation techniques	$\bar{X}$	SD	Remarks
1	Planting of vegetative covers to conserve moisture	2.97	0.73	Adopted
2	Use of liming materials like ashes	2.73	0.79	Adopted
3	Addition of manure to rice farm land	3.10	0.61	Adopted
4	Use of minimum or zero tillage to conserve soil properties and prevent loss	2.51	0.81	Adopted
5	Mulching to prevent high temperature and water loss	2.42	0.85	Not Adopted
6	Use of terracing and contouring to prevent loss of water through erosion	2.56	0.84	Adopted
7	Use of organic and biological agriculture to maintain soil structure and secure aeration	2.44	0.88	Not Adopted
8	Use of natural sequencing farming to restore water cycles	2.48	0.87	Not Adopted
9	Application of molasses and humus to make soil resilient to weather changes	2.59	0.80	Adopted

Source: field survey, 2014.

Data presented in table 1 reveal that six out of nine items had their mean above 2.50 which is the cut-off point. This implies that the six items on planting of cover crops after harvesting of rice, liming of rice field, application of manure to rice farm, minimum tillage, terracing and contouring, and the application of humus and molasses are used by the farmers in study area to adapt the soil to climate changes.

Application of manures enjoyed highest mean while minimum or zero tillage had the least mean. The other three items on mulching, use of organic and biological agriculture and the use of natural sequencing farming are not effectively adopted as climate change adaption techniques, as the mean of each item is below 2.50, (cut off point). These findings agree with common observations that rice farmers only mulch their nursery sites, no sequencing farming; rather rice is grown on continuous basis in the same land year in and year out. Again, the farming system adopted does not enhance biological activities in the soil which will build and maintain soil structure to secure aeration.

Table 2 Mean Ratings on Constraints to the use of Climate Change Adaptation Strategies.

S/N	Constraints on Adapting to Climate Change	$\bar{X}$	SD	Remarks
1	Socio-economic status of farmers limits their use of soil management techniques to adapt rice farming to varying climate changes.	2.67	0.79	Constraint
2	Lack of knowledge on soil conservation techniques is a limiting factor on climate adaptation	2.89	0.76	Constraint
3	Population pressure on land affects adapting to climate changes.	2.74	0.74	Constraint
4	Effects of urbanization reduce farmers' efforts towards climate change adaption	2.49	0.92	Not Constraint
5	Shortage of farm inputs limits adapting rice production to climate changes.	2.78	0.75	Constraint
6	Inadequate information and education reduce the use of soil conservation techniques to adapt rice production to climate changes	2.88	0.79	Constraint
7	Unfavourable land tenure system limits use of soil management strategies towards adapting to climate changes.	2.54	0.93	Constraint
8	Shortage of farm labour affects adaptation to climate changes using soil conservation techniques	2.45	0.97	Not Constraint
9	Continuous cropping reduces chances of farmers to adapt to climate change using soil management techniques	2.66	0.79	Constraint

Source: field survey, 2014.

Data presented in table 2, show the major constraints affecting the use of climate change adaptation strategies as lack of knowledge on soil conservation ($\bar{X}$ = 2.89), inadequate information and education ($\bar{X}$ = 2.88), and shortage of farm inputs ($\bar{X}$ = 2.78). These results explain the importance of education and extension service in providing information to farmers on various techniques. In keeping with these results, Ajayi and Solomon, (2010) reported that adequate information and follow up are necessary for farmers adoption and use of innovations and techniques. Again, pressure from population enjoyed high mean (2.74) signifying that it leads to land management problems. This result is in consonance with the popular opinion that human activities cause land degradation through loss of soil fertility which adversely affects food security. However, urbanization and shortage of labour had means of 2.49 and 2.45 respectively, implying that they are not major problems of farmers' adapting rice farming to climate change. The standard deviations had close range of 0.74 to 0.97, indicating close opinions of the respondents which also are not far from the mean.

Table 3 Mean Ratings on Ways of Improving Farmers Competencies Towards the use of Climate Adaptation Strategies.

S/N	Competencies	$\bar{X}$	SD	Remarks
1	Equipping farmers with technical knowledge of soil conservation is required towards climate adaptation	2.68	0.79	Required
2	Training farmers on prevailing weather changes of an area is vital in soil management	2.77	0.71	Required
3	Providing farmers with information on sources of credits is useful towards climate adaptation	2.79	0.70	Required
4	Extension education on the type and nature of rice land/soil is vital ingredient towards climate adaptation	2.81	0.60	Required
5	Enhancing farmers' ability to engage in biological agriculture is necessary for climate change adaptation	2.80	0.63	Required
6	Changing farmers' attitudes in favour of soil management techniques will improve their use of climate change adaption strategies	2.82	0.61	Required
7	Enhancing farmers' socio-economic background will improve use of climate change adaptation strategies	2.76	0.72	Required
8	Equipping farmers with skills for keeping records of environmental changes is a necessary tool for solving climate change problem.	2.57	89	Required

Source: Field survey, 2014

Table 3 reveals competencies required by rice farmers to improve the use of soil conservation techniques for climate change adaptation. The results show that all the items had their mean ratings above 2.50 (cut off point), signifying that each was required. These findings are in keeping with the reports of Ajayi and

Oloruntoba (2002) that, farmers need skills, knowledge and good attitudes to accept and adopt major Agricultural technologies. The result also agreed with the report of Akinble (2003) that, the more literate farmers are, the more they comprehend and use farm technologies.

The standard deviations ranged from 0.60 to 0.89 in the eight competencies, showing that, the opinions of the respondents are close to each other and not far from the mean.

Conclusion and Recommendation

Results of this study show that farmers use some of the soil conservation techniques in improving the nutrients in their rice farm lands and increasing yield. Also the study identified the major constraints that could affect the use of these soil; conservation techniques like lack of knowledge, low education and shortage of farm inputs. This study revealed further that farmers require competency training on various farm activities.

The study therefore made the following recommendations

1. Government should review policies on land use or land tenure system to expand farm land holdings of small scale farmers to increase food productions.
2. Training should be organized by extension agents for farmers to educate them on environmental changes and techniques of managing these changes
3. Agricultural extension agents should improve their efforts in creating awareness on soil conservation techniques required by small scale farmers for greater rice production; and sources of credits with which to secure soil management farm inputs.

References

Ajayi, M.T and Oloruntoba, A. (2004): Farmers' Adoption and Perception of Major Agricultural Technologies. Journal of Scientific and Industrial Studies 2 (1): 14-18.

Ajayi, M.T and Solomon O. (2010) Influence of Extension Contact and Farmers' Socio-economic Characteristics on adoption of oil palm Technology in Aniocha North Local Government Area, Delta State. Nigeria Journal of Agricultural Science and Technology (JAGST) 12(2), 35-46.

Akinbile, L.A (2003): Farmers' Perception of Effectiveness of Fisheries Extension Services in Nigeria. Journal of Extension Systems, 19(1), 32-44.

Ayoade, J.O. (2005) Introduction to Agro-Climatology. 2nd Edition, University Press, Ibadan, Nigeria.

Ekpe, I & Alimba, J.O (2013), Economics of rice Production in Ebonyi State, South East Nigeria. International Journal of Food, Agriculture and Veterinary Science. 3(2), 77-81.

Fapojuwo, O.E, Olawoye, J.E, & Fabusoro, E. (2013). Soil conservation Strategies for Climate Change Adaptation among Arable Crop Farmers in South West Nigeria. Journal of Extension Systems 18(2) 94-103.

Segerson, K & Dixon, B. (1998) Climate Change and Agriculture: The Role of Farmer Adaptation Cambridge University Press, Cambridge.

Yohe, G. (2002) Indicators for Social and Economic Coping Capacity – Moving Toward a Working Definition of Adaptive Capacity. Global Environmental Change 12. 25-40.