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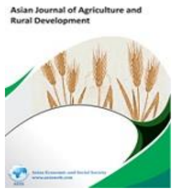

USE OF SOIL CONSERVATION PRACTICES FOR CLIMATE CHANGE ADAPTATION AMONG ARABLE CROP FARMERS IN CROSS RIVER STATE, NIGERIA

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ABSTRACT

The study examined farmers' use of soil conservation practices as strategies for climate change adaptation in Cross River State, Nigeria. A Multistage random sampling technique was used to draw 180 respondents for the study. Structured interview schedule was used to elicit data for the study while descriptive statistics was used for data analysis. Findings from the study revealed that all the respondents were aware of mulching (100%) and majority were aware of planting of cover crops (98.3%) and organic fertilizer (98.3%) among other SCP while some of the frequently utilized soil conservation practices were found to be mulching (mean – 2.95), mixed cropping (mean – 2.85), shifting cultivation (mean – 2.83), planting of cover crops (mean - 2.63) among other SCP. Population pressure on land ranked highest (mean = 2.64) as the most serious constraint to the use of soil conservation practices followed by effect of urbanization (mean = 2.53). The study concludes that arable crop farmers are aware of and are utilizing various soil conservation practices suitable to their local needs to cushion the impacts of climate change and recommends enactment of a law by governments that allows for localization of land for various purposes in order to reduce population pressure on arable land.

Contribution/ Originality

The present study investigated local farmers' adaptation measures to climate change via utilization of soil conservation practices which has shown that local farmers utilized some of these practices and have impacted greatly on their farmlands against some effects of climate change unlike most current studies that concentrated only on national and regional reviews of the subject matter without inclusion of local content which make findings inexplicit to understand.

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1. INTRODUCTION

Agricultural production and productivity is reliant on several factors such as soils and climate, genomic characteristics of crops and livestock etc. Danbaba (2007) opined that in all of these factors, climate is observed to be the utmost significant factor in crop husbandry. In the same vein, Antle, 2010 also reported that several components of agriculture and food system such as soil, water resources, crops and other components are predominantly susceptible to climate change.

According to United Nations Development Programme report (2001) the backbone of most developing economies is agriculture, with about 70 percent of the population involved in agricultural activities and residing in rural areas. In Nigeria, for example, agriculture which is largely rain fed has been and will continue to be the most important supplier of food and employment, providing employment between 65 -70 percent of its total populace. Therefore, any slight shift in climate will definitely affect agricultural productivity specifically and other economic and social activities nationwide.

Globally, the issue of climate change coupled with the continual increase in human population, showcases a remarkable food security challenge but the gigantic question is, 'how will Nigeria assist in feeding the entire population of the world projected to increase by 2050 with further 2.4 billion people? This increase in world population coupled with climate could worsen additional issues, such as depletion of water resources, erosion, and desertification, degradation of water quality and deforestation, further hampering Nigeria ability to significantly contribute to solving the world's food crises let alone its own. In addition, studies have reported that climate change is capable of increasing potential erosion rates, which can result in 10% to 20% decrease in agricultural productivity or more especially in extreme cases. Since there is a direct relationship between soil conservation techniques and sustaining and/or increasing output, studies have suggested that if the best soil conservation practices are not used, the possibility of sustaining the output levels required to feed more billions of people by 2050 the world is projected to have, is in doubt; a reason why related studies have affirmed that these sound strategies/practices will add to climate change adaptation and mitigation.

According to Eswaran *et al.* (2001) in the 20th century, land degradation was a significant world problem and has continued till date with its obvious effects on crop output, food security, quality of life and the environment. In Nigeria, Birte *et al.* (2008) documented that the total runoff-induced soil losses in the south was estimated to be 693,000 km^2 while total soil degradation in the north was estimated to be 231,000 km^2, largely through wind erosion. These facts are enough reasons why soil conservation practices ought to be taken seriously in Nigeria. These practices will not only improve the soil but to a greater extent be adopted as adaptation strategies to cushion effects of a changing climate.

Soil conservation is a set of management strategies for the prevention of soil being eroded from the earth's surface or becoming chemically altered by over use, Salinization, acidification, or other chemical soil contaminations (Ezeaku, 2012). It comprises the combination of all methods of management and land use to guard against soil depletion or deterioration by natural or man-induced factors such as planting of cover crops, bush fallowing, conservation tillage, organic fertilizer, agro-forestry, mulching, alley farming etc. (Dimelu *et al.*, 2012). Highlighting on the importance of soil conservation practices, Dumaski *et al.* (2006) opine that soil conservation efforts of farmers promote minimum disturbance of the soil by tillage, balance application of chemical inputs which are only required for improved soil quality for healthy crop and animal production with careful management. Accordingly, effective soil conservation practices reduce land and water pollution; reduce long-term dependency on external inputs which often times led to increased cost of production, enhance environmental management, improved water quality and water use efficiency, reduced emission of greenhouse gases through lessened use of fossil fuel and finally improved agricultural productivity with minimum cost (Smith and Smithers, 2006). Thus, the common objective of soil conservation is the improvement of crop production and environmental protection (Pla, 2014). According to Abdul-hanan *et al.* (2014), at the onset of climate change, the adoption of soil and water conservation techniques in Sub Saharan Africa has become even more crucial.

Empirical studies on the use of soil and water conservation abound in Africa and other parts of the world. Currently, Mekuriaw and Hurni (2017) finding in a related study revealed that a large percentage (87%) of farmers in Ethopian high-potential areas used physical soil and water conservation measures to keep the soil on their cultivated land and to improve yields while in low-potential areas, nearly all farmlands in the sample that required physical soil and water structures were terraced and thus able to minimize the rate of soil erosion and improved ecosystem services. In a similar study undertaken by Ashoori *et al.* (2016) in paddy fields of Guilan Province, Iran; finding from study revealed that a good percentage of farmers implemented agronomic soil and water conservation measures such as ratoon cropping, crop rotation, use of compost or manure and conservation tillage while a considerably lower percentage of farmers implemented physical soil and water conservation measures such as bunds and terracing etc. in the study area.

From the foregoing, it is important to identify the various soil conservation practices that are utilized by arable crop farmers in Cross River State to cushion the menace of soil erosion and land degradation as a result of the impact of climate change in order to create resistance in climate change and adaptation practices into contemporary procedures. In so doing, crop farmers will be encouraged to adopt sustainable soil management practices which are effective in assisting them to adapt to a changing climate. . It is expected that if farmers adopt these adaptation strategies viz-a-viz soil conservation practices, on-farm vulnerabilities will be considerably reduced resulting in increase in yields of farmers and income which will in turn improve their living standard.

Although, in Nigeria few studies on soil conservation practices used as soil conservation practices have been documented (Mishra and Rais, 2013; Fapojuwo *et al.*, 2012; Dimelu *et al.*, 2012; Jorge *et al.*, 2012; Birte *et al.*, 2008), it appears there is little or no research undertaken on soil conservation practices used as climate change adaptation strategies in Cross River State. However, this study will attempt to fill the gap identified for a sound policy formulation on climate change adaptation strategies suited to their local needs through soil conservation practices.

2. OBJECTIVES OF THE STUDY

The main objective of this study is to ascertain the use of soil conservation practices as strategies for climate change adaptation among arable crop farmers in Cross River State. The specific objectives are to;

1. Describe the socio-economic characteristics of the farmers in the study area.
2. Ascertain respondents' awareness of soil conservation practices as climate change adaptation strategies.
3. Determine respondents' use of soil conservation practices as strategies for climate change adaptation in the study area.
4. Identify the constraints to the use of soil conservation practices as strategies for climate change adaptation in the study area.

3. MATERIALS AND METHODS

The study was conducted in Cross River State, Nigeria. The state lies within longitude 4^0 50' and 9^0 28' East of the Greenwich Meridian and latitude 5^0 23' and 4^0 27' North of the equator (Ofem *et al.*, 2013). The state has a landmass of 22,342.176 square kilometres (Adinya, 2009) with a total population estimate of 3,862 634 people (National Population Census, 2006). Cross River State is located within the tropical rainforest belt. It records heavy rainfall during the wet season, usually from April to October and severe sunshine during the dry season, usually from November to March.

The soils of the state are ultisols and alfisols but predominantly ultisols (FAO/UNESCO, 1974). The major occupation of the people is farming. The population for the study constituted of all arable crop farmers in the state. Data for the study was collected with the use of structured interview schedule. Multistage random selection technique was used in the selection of respondents for the study. In stage one, a simple random technique was used to select one block per agricultural zone out of the three zones in the state. This gives a total of three blocks. These selected blocks include, Biase, Ikom, and Ogoja each in Calabar, Ikom and Ogoja agricultural zone respectively. This was done in order to have a representative sample from each zone since each zone differs ecologically. The second stage was the selection of three cells from each block using simple random selection techniques, giving a total of 9 cells for the study.These selected cells include Ishibori, Ekajuk and Mbube in Ogoja block, Akparabong, Okuni and Nde in Ikom block and Adim, Akpet and Ehom in Biase block each representing Ogoja, Ikom and Calabar agricultural zones respectively. Lastly, twenty arable crop farmers were selected from a list of arable crop farmers provided by field extension agents using simple random selection technique. Therefore, total sample size of 180 respondents was used for the study. Seventeen soil conservation practices disseminated across the three zones in the state were all selected for the survey. They include,application of mulches, planting of cover crops, conservation tillage, liming, terracing, contouring, organic and inorganic fertilizers, crop rotation, shifting cultivation, ridging, land rotation, bush fallowing, liming, alley farming, agroforestry and planting of windbreak.

To obtain a quantitative measure for respondents awareness of soil conservation practices, for each item, a dummy (aware = 1 for satisfactory awareness of each item and not aware = 0) were assigned to the variables. A three point grading scale with response categories of always use (AU) = 3, rarely use (RU) = 2 and never use (NU) = 1 was used on seventeen items (soil conservation practices) and was used to measure the extent of use of soil Conservation practices as climate change adaptation strategies. A mean score of 2 was then obtained. Items with mean score above or equal 2 were considered used by the respondents while items with mean scores less than 2 were considered not used by the respondents. Finally, A three point grading scale with response categories of very serious (VS) = 3, serious (S) = 2 and not serious (NS) = 1 was used on eleven items (constraints to the use of soil conservation practices) to measure objective 5. A mean score of 2 was then obtained. Items with mean value or score above or equal to 2 were considered as serious constraints faced by arable crop farmers to the use of soil conservation practices and vice versa. The mean for each item was obtained and ranked accordingly. Generally, descriptive statistics was used to analyze the objectives with the help of SPSS edition 20.

4. RESULTS AND DISCUSSION

4.1. Socio-economic characteristics of the respondents

Based on the result of the analysis under socio-economic profiling of the respondents as presented in Table, the reveals that majority (52.8%) of the respondents were males while 47.2% were females. Although, the result reveals that the percentage of males that are into arable crop production is higher than that of the females but the percentage difference is quite low indicating that both males and females are involved in arable crop production. However, according to Fapojuwo *et al*. (2012) access and control of resources and land tenure system tend to favour the men, thus warranting their greater involvement in arable crop production.

Most (41.1%) of the respondents were between 30 – 39 years, only 1.7% were aged below 30 years. This result reveals that majority of the respondents were in their active and prime years thus supporting the findings of Sabo (2006) that middle aged farmers were necessary since farming demands much energy. According to Surry (1997), individual's efficiency tend to be high and activities are approached with seriousness when one is young and agile.

Most (32.8%) of the respondents had Secondary School Certificate and First School Leaving Certificate (32.8) as the highest educational qualification attained respectively while only 22.2% had no formal education. This result reveals that majority of the respondents were predominantly literate. This high literacy level among farmers usually speeds up communication and information flow and the transfer of new innovations or technologies like soil conservation practices. This finding agrees with Angba and Ogar (2012) study where only 2.5% and 22.9% respondents had tertiary and no formal education respectively. Aboh (2010) reported a high correlation between education and cassava farmers' productivity in rural communities of Akwa Ibom State.

However, 78.3% of the respondents were married and are still living with their spouses while only 1.7% were single. This finding implies that majority of the respondents were married with families to fend for. The high proportion of married respondents according to Elemi (2014) could be related to socio cultural factor where land is only handed over to individuals who are married.

A greater percentage (63.9%) of the respondents had between 5 – 10 household sizes while only 0.6% had above 15 household sizes. This large number of household size is in line with Effiong (2005), who posited that a relatively large household size enhances the availability of family labour which reduces constraints on labour cost in agricultural production. World Bank (1999) also reported that the proportion of rural poor household increases as the size of family becomes larger.

It was also found out that 72.2% of the respondents had between 10 – 20 years of farming experience while only 0.6% had between 31 – 40 years' experience in farming. This finding shows that majority of the farmers have over 10 years of farming experience. Farming experience plays a very important role in agribusiness or farm enterprise. Fapojuwo (2012) noted that with long years of farming experience these soil conservation techniques also double up as climate change adaptation strategies used by arable crop farmers in order to still keep them in the farming business.

Near half (48.9%) of the respondents had farm sizes between 1-3 hectares. This implies that majority of the respondents are small scale arable crop farmers, which is typical of most farmers in Nigeria in particular and Africa at large. This result agrees with the view of Eric (1996), cited in Ajayi and Solomon (2010) that small farming holdings constitute more than 70.0% of all farming activities in Nigeria.

Majority (39.4%) of the respondents had the highest monthly income of N21, 000.00 – N30, 000.00 while only 3.3% had monthly income of N10, 000.00 and below. Economic factor that determine farm practices in the opinion of Onasanya (2007) also include farmers' income access to soil enhancing input, educational level, farm size or number of farm plots etc. Majority (47.2%) of the respondents had no contact at all with extension agents while 34.4% had contact with extension agents monthly. According to FAO (2005), frequency of farmers contact with extension will increase in direct relationship to the ease of access by farmers in a social context.

Table 1: Frequency distribution of the socioeconomic characteristics of respondents

Description of variables	Frequency	Percentage
i. Gender		
Male	95	52.8
Female	85	47.2
Total	180	100
ii. Age		

Below 30	3	1.7
30 – 39	74	41.1
40 -49	66	36.7
50 & Above	37	20.6
Total	180	100
iii. Educational Level		
No Formal Education	40	22.2
FSLC	59	32.8
SSCE	59	32.8
OND/NCE	16	8.9
B.Sc./HND	6	3.3
Total	180	100
iv Marital Status		
Single	3	1.7
Married	141	78.3
Divorced	9	5.0
Widowed	15	8.3
Separated	12	6.7
Total	180	100
v. Household Size		
Less Than 5	54	30.0
5 – 10	115	63.9
11 – 15	10	5.6
Above 15	1	0.6
Total	180	100
vi. Farm Size		
Less Than 1	27	15.0
1 -3	88	48.9
4 -6	63	35.0
Above 6	2	1.1
Total	180	100
vii. Years of Farming Experience		
Less Than 10	22	12.2
10 – 20	130	72.2
21 – 30	26	14.4
31 – 40	1	0.6
Above 40	1	0.6
Total	180	100
viii. Income		
N10,000 & Below	6	3.3
N11,000 – N20,000	65	36.1
N21,000 – N30,000	71	39.4
N31,000 & Above	38	21.1
Total	180	100
ix. Contact With Extension Agent		
Not at All	85	47.2
Weekly	10	5.6
Monthly	62	34.4
Quarterly	23	12.8
Total	60	100

Field Survey, 2014

4.2. Awareness of soil conservation practices

Based on the result of the analysis of respondents' awareness of soil conservation practices as climate change adaptation strategies as displayed in Table 2, the result shows that, all the respondents (100%) were aware of mulching and 98.9% were aware of inorganic fertilizer, shifting cultivation, bush fallowing and mixed cropping respectively among others as climate change adaptation strategies. However, only terracing, contouring, liming and alley farming that the respondents were not aware of.

This finding implies that arable crop farmers were quite aware of different climate change adaptation strategies that can enhance their yield and productivity. The findings are in conformity with Fapojuwo *et al*. (2012); Akinbile and Odebode (2007) and Iheke and Onyenorah (2010) studies where majority of the respondents were aware of mulching, organic fertilizer, multiple or mixed cropping, crop rotation etc. to conserve the soil. Araya and Adjaye (2001) and Anim (1999) reported that farmers awareness and perceptions of soil erosion problem as a result of changes in climate, positively and significantly affected their decisions to adopt soil conservation measures. In the same vein, Hassan and Nhemachena (2008) noted that awareness of climate problems and the potential benefits of taking action are important determinants of adoption of agricultural technologies while Yohe and Tol (2002) added that these adaptive capacity/strategies vary significantly from system to system, sector to sector and region to region due to range of available technological options for adaptation, availability of resources and their distribution across the population and stock of human capital with respect to education and security among others. This non- awareness of terracing and contouring according to Fapojuwo *et al*. (2012) might be due to their complexities and newness to farmers and could not be adopted because of inadequate knowledge and are only applicable in hilly areas.

Table 2: Distribution of arable farmers' by awareness of soil conservation Practice (n = 180)

Soil conservation practices	Aware (%)	Not aware (%)
Mulching	180(100)	-
Planting cover crops	177(98.3)	3(1.7)
Terracing	44(24.4)	136(75.6)
Contouring	96(53.3)	84(46.7)
Organic fertilizer	179(99.4)	1(0.6)
Inorganic fertilizer	178(98.9)	2(1.1)
Crop rotation	163(90.6)	17(9.4)
Shifting cultivation	178(98.9)	2(1.1)
Ridging	129(71.7)	51(28.3)
Land rotation	103(57.2)	77(42.8)
Bush fallowing	178(98.9)	2(1.1)
Conservation tillage	174(96.7)	6(3.3)
Liming	68(37.8)	112(62.2)
Mixed cropping	178(98.9)	2(1.1)
Alley farming	81(45.0)	99(55.0)
Agroforestry	166(92.2)	14(7.8)
Planting windbreak	171(95.0)	9(5.0)

Field Survey, 2014: Multiple responses

4.3. Farmers' Use of soil conservation practices

Based on the result of the analysis on the use of soil conservation practices by arable crop farmers as depicted in table 3, the result shows that respondents' use of soil conservation practices ranked highest for use of mulching with a mean value of 2.95. This is followed by mixed cropping (2.84), shifting cultivation (2.83), bush fallowing (2.79), planting of cover crops (2.63), organic fertilizer and inorganic fertilizer (2.56), conservation tillage and planting windbreaks (2.41) respectively.

This finding is in conformity with Akinbile and Odebode (2007) where respondents used cover cropping, multiple cropping, fallow system, organic manure etc. to conserve the soil and also agrees with Dimelu *et al.* (2012) finding which revealed that farmers commonly used both agronomic, soil management and mechanical strategies of soil conservation as strategies for climate change adaptation and further explained that either practices is important because they affect chemical, physical and biological properties of the soil. For instance, Olaitan and Omamia (2006) opined that agronomic soil conservation practices (cover crops, mulching, fallowing and others) are used to provide surface covers to reduce erosion by water and wind in order to conserve the soil, protect the soil from direct sun rays and enrich the soil by the decay of their fallen leaves while some reduces the risk of serious pest and disease outbreaks. Also emphasizing on its importance, Agele *et al.* (2000) pointed out that the crop residues released reduce the soil temperature by some degree in the upper centimetres of the top soil and offer better moisture conservation by decreasing the intensity of radiation, wind velocity and evaporation and concluded that, it is these elements that enhanced its prospects for climate change adaptation and mitigation. However, the finding also revealed that terracing, contouring, ridging crop rotation, land rotation etc. were not used by arable farmers in the study area. Birte *et al*. (2008) noted that although, farmers were not generally aware of and unable to use mechanical soil conservation practices such as terraces and contours, the practices are effective soil conservation technologies as they reduce soil loss, but because the installation and maintenance is typically labour intensive, they are not commonly adopted by farmers even though they are both adaptive and mitigation measures to climate variability and when used, excessive soil and wind erosion, loss of degraded lands, and silting up of the field are reduced. The mitigation potentials are also achieved through carbon sequestration (absorption of carbon from the atmosphere) by tree planting or vegetative barrier.

Table 3: Mean distribution of arable farmers' use of soil conservation practices as climate change adaptation strategies (n =180)

Practices	Always use	Rarely use	Never use	Mean	SD
Mulching	171(95.0)	9(5.0)	-	2.95	0.219
Planting cover crops	116(64.4)	62(34.4)	2(1.1)	2.63	0.506
Terracing	--	3(1.7)	177(96.3)	1.02	0.128
Contouring	4(2.2)	23(12.8)	153(85.0)	1.17	0.434
Organic fertilizer	103(57.2)	74(41.1)	3(1.7)	2.56	0.531
Inorganic fertilizer	105(58.3)	68(37.8)	7(3.9)	2.56	0.581
Crop rotation	15(8.3)	68(37.8)	97(53.9)	1.54	0.655
Shifting cultivation	152(84.4)	22(12.2)	5(2.8)	2.83	0.456
Ridging	15(8.3)	114(7.8)	151(83.9)	1.24	0.594
Land rotation	16(8.9)	47(26.1)	117(65.0)	1.44	0.653
Bush fallowing	147(81.7)	28(15.6)	5(2.8)	2.79	0.473
Conservation tillage	87(48.3)	80(44.4)	13(7.2)	2.41	0.623
Liming	4(2.2)	9(5.0)	167(92.8)	1.09	0.362
Mixed cropping	161(89.4)	9(5.0)	10(5.6)	2.84	0.498
Alley farming	19(10.6)	30(16.7)	131(72.8)	1.38	0.670
Agroforestry	30(16.7)	96(953.3)	54(30.0)	1.87	0.672
Windbreaks	90(70.0)	71(39.4)	19(10.6)	2.41	0.675

Source: field survey2014

4.4. Constraints to the use of soil conservation practices

Table 5 shows the distribution of respondents based on the constraints encountered in the use of soil conservation practices as climate change adaptation strategies. Based on the result of the analysis, population pressure on land ranked first (2.64) followed by effect of urbanization (2.53) among others. However, inadequate labour (mean =1.82) ranked least. This implies that the most serious constraints encountered by the respondents in the study area were population pressure on land followed by effect of urbanization. The finding is in line with Fapojuwo *et al.* (2012) result where major constraints affecting the use of soil conservation practices were population pressure on the land/effect of urbanization, lack of knowledge on soil conservation techniques and inadequate information and education. The result supports the importance of training and extension service in providing information to farmers on different techniques/strategies. Thus, Ajayi and Oloruntoba (2004) in Ajayi and Solomon (2010) reported that adequate information and follow up were useful in the adoption and continuous used of improved technologies and techniques like soil conservation by farmers.

Table 4: Respondents' constraints to the use of soil conservation practices as climate change adaptation strategies (n =180)

Constraints	VS	S	NT	Mean	SD	Rank
Population pressure on land	120(66.7)	56(31.1)	4(2.2)	2.64	0.525	1
Effect of urbanization	98(54.4)	79(43.9)	3(1.7)	2.53	0.533	2
Lack of knowledge on SCP	106(58.9)	61(33.9)	13(7.2)	2.52	0.630	3
Inadequate information / education	99(55.0)	71(39.4)	10(5.6)	2.49	0.603	4
Inadequate supply of organic matter	33(18.3)	92(51.1)	55(30.6)	1.88	0.690	8
Inadequate farmland	80(44.4)	74(41.1)	26(14.4)	2.30	0.708	5
Unfavorable land tenure system	46(25.5)	91(50.6)	43(23.9)	2.02	0.705	6
Inadequate capital	44(24.4)	58(32.2)	78(43.3)	1.81	0.804	10
Inadequate labor	23(12.8)	98(54.4)	59(32.8)	1.80	0.646	11
Inadequate availability of SC materials	28(15.6)	91(50.6)	61(33.9)	1.82	0.681	9
Others	52(28.9)	80(44.4)	48(26.7)	2.02	0.747	6

Source: field survey, 2014. Key: VS = very serious, S = serious, NT = not serious and figures in parenthesis = percentages

5. SUMMARY AND CONCLUSION

From the result of the survey, males are relatively predominant in arable crop farming in the study area. There is a strong marital knot as divorced rate was low. Respondents contact with extension agents was very low while years of farming experience was quite long. Educational level was quite low which obviously affected some adoption of technologies in the study area. Some of the major soil conservation practices respondents had awareness of and used as climate change adaptation strategies were mulching, planting cover crops and mixed cropping, organic fertilizer etc. This suggests that farmers only used technologies they were aware of. Population pressure on land ranked first among other constraints encountered among arable crop farmers in the use of soil conservation practices. This suggests that a major constraint encountered in the use of soil conservation practices was population pressure on land.

5.1. Recommendations

Based on the findings of the study of the study, the following recommendations are made.

Trainings should be organized by both public and private agricultural extension agents for farmers to educate and inform them about environmentally friendly soil conservation practices that will help them adapt to a changing climate, thereby increasing their yields hence improving their income.

The three tiers of government should enact laws that will allow for the localization of land for various purposes in order to reduce population pressure on arable land since population pressure on land was the most serious constraint faced by arable crops farmers in the use of soil conservation in the study area.

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