Modelling the link between soil erosion and arable crop farmers ıncome in Delta State, Nigeria

Nijerya, Delta Eyaletinde toprak erozyonu ile tarla bitkileri çiftçileri gelirleri arasındaki bağlantıyı modellemek

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ABSTRACT

The study aimed at analyzing the link between soil erosion and income of arable crop farmers in Delta State, Nigeria. A multistage sampling procedure was used. A survey of one hundred and eighty farmers was erratically chosen with a structured questionnaire. The analytical tools used were descriptive statistics and regression model. The results showed that widely held respondents were male. The educational level of respondents was low. The mean farming experience of respondents was 12 years with a mean age of 47 years. The mean family size was 6 persons with a mean farm size of 1.55ha. The most prevalent soil erosion types were gully, rill and sheet erosion. The majority of respondents reported a high level of soil erosion. The most widely used soil erosion resilience measures were mulching, planting of trees, terracing and contour and strip cropping. The major perceived effects of soil erosion were reduction of arable land, loss in productivity of cropping lands, and drop in output. The parameters that affect the income of respondents were drop in output, reduction of arable land, high input, and management, loss of productivity of cropping land, labor shifting out of agriculture and submerges of fertile arable land. The factors that influence the adoption of resilience measures were age, education, household size, farm size, income, extension visit, and farming experience. It is recommended that the Government should enact policies to discourage bush burning, deforestation, and excavation on the farming environment.

Key Words: Arable crop farmers, Adoption, Income, Resilience measures, Soil erosion

ÖZ

Bu çalışmada, Nijerya'nın Delta Eyaletindeki toprak erozyonu ile yörenin sulanabilir tarım arazilerinde faaliyet gösteren üreticilerin geliri arasındaki bağlantının incelenmesi amaçlanmıştır. Bu amaçla çok aşamalı bir örnekleme prosedürü dikkate alınmıştır. Tamamen tesadüfi 180 çiftçiyle yapılan bir anket çalışmasıyla yapılandırılan bu çalışmada kullanılan istatistiki analiz yöntemler; betimleyici istatistikler ve regresyon modelidir. Çoğunluğunun erkek deneklerden oluştuğu bu çalışmada katılımcıların eğitim düzeylerinin düşük olduğunu görmekteyiz. Katılımcıların ortalama tarım deneyimi 12 yıl olup, ortalama yaşları ise 47'dir. Ortalama aile büyüklüğünün 6 bireyden oluştuğu bu hanelerin işlediği arazi genişliği ortalama 1.55 hektardır. Araştırmanın sonuçlarına göre bölgede rastlanan en yaygın toprak erozyonu türleri yüzey, parmak (oluk) ve oyuntu (sel yarıntısı) erozyonudur. Katılımcıların çoğunluğu yüksek düzeyde toprak erozyonu bildirmiştir. En yaygın olarak kullanılan toprak erozyonu önleme yöntemleri ise, malçlama, ağaç dikme, teraslama ve kontur ve şerit usulü ekim yöntemleridir. Toprak erozyonunun algılanan başlıca etkileri, ekilebilir arazi miktarındaki azalma, ekim alanlarındaki verimlilik kayıpları ve üretim miktarındaki düşüştür. Katılımcıların gelirlerini etkileyen başlıca parametreler, üretimin ekilebilir arazilerdeki azalmadan kaynaklı olarak düşmesi, yüksek girdi ve yönetim maliyeti, ekim alanlarındaki verimlilik kaybı, tarımdan çıkarılan işgücü ve verimli sulanabilir tarım arazilerinin amaç dışı kullanımıdır. Erozyona karşı önlemlerin benimsenmesini etkileyen faktörler yaş, eğitim, hane halkı büyüklüğü, arazi genişliği, tarımsal gelir, yayım ziyareti ve çiftçilik deneyimidir. Bu çerçevede hükümetin, çalı yakılması yoluyla ormansızlaşmanın önünü keserek, tarımsal arazilerde kazıları caydırmak için politikalar çıkarması tavsiye edilir.

Anahtar Kelimeler: Ekilebilir tarım çiftçileri, Adaptasyon, Gelir, Dayanıklılık ölçüleri, Toprak erozyonu

Introduction

Soil erosion is common in all areas of the world, but developing countries suffer more because of the inability of their farming populations to replace lost soils and nutrients (Ajayi and Banmeke, 2009;Mohamed, 2015). Phatak et al., (2002) and Humberto and Lal, (2008) opined that globally it has been estimated that about 1.1 billion hectares of land are affected by soil erosion, with annual global loss of agricultural land due to erosion estimated at 3 million hectares (Woreka, 2004 as cited by Igwe et al., 2017). Behera and Panda (2009) stated that it is impossible to achieve food security without overcoming the problem of nutrient depletion. Francis (2012) asserted that soil erosion results in infertility and lead to desertification and devastating flooding. Soil erosion impacts negatively on crop productivity and environmental quality and depresses the socio-economic status of lithosphere; it is therefore a threat to the landowners' livelihoods as well as the overall health of an ecosystem (Egbai et al., 2012).

Soil erosion posed a serious threat to natural resources and the environment according to (Rahman et al., 2009; Ume et al., 2014). Soil erosion diminishes the productivity of agricultural and forest ecosystem (Pimentel, 2006). Similarly, Quinton (2014) opined that soil erosion is a universally momentous environmental procedure which vitiates the soil we depend on for food, fuel, clean water, carbon storage and substrates for infrastructural development.

Globally, about 80% of the contemporary degradation of agricultural land is triggered by soil erosion (Angima, Scott, O'neil, Ong and Weesies, 2003). All forms of modern day development efforts caused environmental degradation in addition to traditional practices. According to (Fakoya, 2011; Egede 2013) man's activities such human factors include overgrazing, excessive farm activities, tillage, clearing of bushes, extractive industries, road construction, bush burning, over-population, lumbering,

residential buildings, development of urban centers, industrialization, fumigation with pesticides, mining (open cast and soil excavation) etc. have caused soil erosion in many parts of the world and Nigeria in particular. Man, through his economic and social activities, has changed the nature of the environment consciously and unconsciously and each of these activities has one effect or the other on agricultural systems. Soil erosion is a severe ecological, pecuniary and societal challenge which not only originate stark land degradation and soil productivity loss but likewise threatens the constancy and health of the social order in general and sustainable development of rural area in particular (Zheng et al., 2004). Eze and Osahon (2016) identified mixed cropping, strip cropping and tie ridging as the most used soil erosion controlled techniques in Southeast, Nigeria. The findings of Tesfaye and Kasahun (2015) in Oromia, Ethiopia recognized crop rotation, compost, animal manure and intercropping as soil erosion control methods. Dimelu, Ogbonna and Enwelu (2013) studied the soil erosion conservation practices in Enugu, and the results showed that the soil conservation techniques used as adaptive measures were crop rotation, mulching, liming, contour bonds and terracing. They noted that the farmers that practiced crop rotation and mulching had a significant increase in their crop yield and this conservation practice was encouraged for increased production, income for farmers and enhanced food security for the nation. In a study conducted in Kogi by Onu and Mohamed (2014) on soil erosion prevention and control, it was revealed that mulching, cover cropping, strip cropping and contour bonding were the local controls for soil erosion. In a study by Eze and Mbah (2013) on constraints to soil erosion control methods in Anambra State Nigeria, it was revealed that the main adaptive control measures by the farmers were strip cropping and making ridges across the slope. None of these studies was conducted in Delta State.

No soil erosion effect on income of arable crop farmers related study has been conducted in this

area before now. Lack of up-to-date data restrict the application of some empirical and process-based models. Another drawback is that most soil erosion research do not take into consideration the socioeconomic factors of soil erosion menace.

In this regard, the coping strategies used by farmers to survive the consequence of soil erosion to generate income need to be known in order to help them develop better strategies to strengthen the use of the ones already in use.

The loss of arable land, destruction of crops and siltation of soil, thus reducing soil fertility will definitely lead to poor harvest which will affect the income of arable crop farmers. Therefore, this study find out the effect of soil erosion on the income of arable crop farmers. This research answers the following questions;

i. What are the socioeconomic characteristics of the respondents?

ii. What are the types of soil erosion experienced?

iii. What is the level of seriousness of the soil erosion?

iv. What is the degree of soil erosion menace parameters on the income of arable crop farmers?

v. What are the resilience measures adopted by the farmers?

vi. Is there any relationship between resilience measures adopted by the farmers and socioeconomic characteristics?

The result of the study will be a useful guide in the development and policy making with regards to sustainable soil conservation strategies for realization of sufficient income. It will be useful for other part of the country that are highly vulnerable to soil erosion. It will be useful for policy makers in design and implementation of policies issues on welfare of the arable crop farmers.

Objective of the study

The main objective of the study was to determine the effect of soil erosion on arable crop farmers' income in Delta State, Nigeria. The specific objectives were to:

i. describes the socio-economic characteristics of the farmers.

ii. identify types of soil erosion experienced

iii. identify level of seriousness of soil erosion

iv. assess the degree of soil erosion menace parameters on the income of arable crop farmers

v. ascertains the level of perceived effect of soil erosion among the farmers.

vi. identify resilience measures adopted by the farmers

vii. examine the relationship between resilience measures adopted by the farmers and socioeconomic characteristics

Hypotheses

The following hypotheses were tested.

Ho1: There is no significant relationship between soil erosion menace parameters and income of arable crop farmers

Ho2: There is no significant relationship of the influence of socioeconomic attributes of farmers on adoption of soil erosion resilience measures

Materials and Methods

The study was investigated in Delta State The state sandwiched between longitude 5°00 and 6° 45E and latitude 5° 00N and 6° 30°N. Delta State is shared into (3) three Agricultural zones namely Delta North, Delta South, and Delta Central Agricultural zone.

It is circumscribed in the North by Edo State, in the East by Anambra State, in the South-East by Bayelsa State and on the Southern flank is the Bight of Benin. The state has land mass of 18,050km2 with a total population of about 4,098,391 people (National Population Commission, 2006). The vegetation of the state varies from one ecological zone to the other. It is mangrove swamp along the coast in the Southern part of the state to ever green forest in the central parts and Savannah in some part of the Northern ecological zones. Delta State has a tropical climate marked by two distinctive seasons. The dry season occurs between December and April. The rainy season happens

between May to November with a short-lived dry period in August, "known as August break". The average rainfall is about 266.5cm in the coasted areas and 190.5cm in the Northern part with the heaviest rainfall in the month of July. The daily temperature ranges from 20°C to 34°C with an average of about 30°C. The major crops grown include tree crops such as rubber, oil palm, tuber crops such as cassava, yam, melon, groundnut, plantain, cocoyam, pepper, pineapple, oranges and maize.

Sampling procedure and sample size

The sampling procedure for the study involved both purposive and random sampling. Firstly, two local government areas were carefully chosen from each agricultural zone. This gave a total of six LGAs. The LGAs were Ika South, Oshimili south, Ughelli north, Udu, Isoko north and Bomadi. Secondly, two communities each were randomly picked from the LGAs totally 12 communities. The list of all arable crop farmers was compiled for each of the handpicked communities to form the sample frame. Thirdly, 15 respondents were randomly selected totally 180 farmers. Primary data were collected using structured questionnaires.

Method of data analysis

Descriptive and inferential statistics were used for the data analysis. Objective (i), (ii) and (vi) was realized with descriptive statistics. Objective (iii) was achieved with 3-point Likert scale (highly severe =3, severe=2 and not severe=1).

The level of adoption of soil erosion resilience measures by the farmers was measured using Likert's scale. The hypothesis 2 was analyzed with the use of multiple regression. Objective (v) was achieved with 4-point Likert's scale calibrated as follows: very high (VH) = 4; high (H) = 3; fairly high (FA) = 2; and not high (NH) = 1 to ascertain the level of perceived effect of soil erosion among the farmers. Objective (iv) assess the degree of soil erosion menace parameters on the income of arable crop farmers was achieved with multiple

regression analysis. The model is implicitly specified as follows:

$Y = f (X_1, X_2, X_3, X_4, X_n + e)$

where:

Y = Income of respondent (₦)

X_1 = Drop in output

X_2 = Reduction of arable land

X_3 = Require high input and management

X_4 = Loss in productivity of cropping land

X_5 = Reduction in fallow period

X_6 = Labor shifting out of agriculture

X_7 = Submerges of fertile arable lands

Objective (vii) examine the relationship between resilience measures adopted by the farmers and socioeconomic characteristics was achieved with regression model.

The regression model was implicitly specified as follows:

$Y = f(X_1, X_2, X_3, X_4, X_n + e)$

where:

Y = adoption level of soil erosion resilience measures

X_1 = formal education (years)

X_2 = age of respondent (years)

X_3 = extension visits (number of times by extension agents in a year)

X_4 = household size (number of persons)

X_5 =cropping pattern (mixed cropping=1, otherwise=0)

X_6 = farming experience (years)

X_7 = gender (male=1, female=0)

X_8 =income per annual (₦)

X_9 =labor cost (₦)

X_{10} =farm size (ha)

Four functional forms of the model namely linear, semi log, exponential and double log were fitted to determine the function with the best fit and the linear model proved to be the best fit.

Results and Discussion

Socioeconomic characteristics of respondents

Gender

The result of gender in Table 1 revealed that 119 of the respondents were males while 61 were

females which account for about 66.1% and 33.9% respectively. This shows that arable crop production is mostly male dominated. The reason is that arable crop production requires energy and physical strength for soil erosion management.

Educational level

The result showed the level of education of the respondents in the study area. About 38.3% of the respondents had no formal education. This was closely followed by 28.9% of the respondents that attended primary school. Those who had only secondary and tertiary education were 18.9% and 13.9% respectively. This indicated that 67.2% of the respondents were illiterate. The level of educational attainment remains paramount in enhancing farmer's understanding of soil erosion and the adoption of soil erosion resilience measures. Thus, literate farmers tend to have a better understanding of the risks associated with soil erosion and tend to spend more time and money on soil resilience measures than the illiterates farmers. It can be deduced that this scenario will continue to affect appropriate use of adaptation measures.

Farming experience

The result shows that 22.3% of the respondents had between 1-5 years of experience in arable crop production and total of 33.3% had between 6-10 years. About 31.3% of them had farming experience of above 15 years. The least years of farming experience was 11-15 years which account for 13.3%. The mean years of farming experience was 12 years. The study suggests that majority of the farmers had a long period of farming experiences. A condition that suggests, farmers in the study area would have a better understanding of soil erosion and conversant with constraints and needs to increase safeguarding measures.

Age of respondents

The result presented indicates that most (45.6%) of the respondents were between 48-57

years. Those aged 38-47years reached 34.4%, while those aged 28-37 years reached 13.3% of the respondents. The mean age of respondents was 47 years. The implication is that respondents are still very strong and matured and this can prompt them to utilize resilience measures effectively.

Table 1: Socioeconomic Characteristics of Respondents (N= 180)

Variable	Frequency	Percentage
Gender		
Male	119	66.1
Female	61	33.9
Educational level		
No Formal Education	69	38.3
Primary Education	52	28.9
Secondary Education	34	18.9
Tertiary Education	25	13.9
Farming experience(years)		
1-5 years	40	22.3
6-10 years	60	33.3
11-15 years	24	13.3
>15 years	56	31.3
Mean	12 years	
Age of respondents(years)		
28-37	24	13.3
38-47	62	34.4
48-57	82	45.6
58-67	10	5.6
>67	2	1.1
Mean	47 years	
Household size (number)		
1-4	50	27.8
5-8	121	67.2
9-12	5	2.8
>12	4	2.2
Mean	6 persons	
Farm size(ha)		
<1ha	20	11.1
1-2ha	139	77.3
2.1-3ha	15	8.3
3.1-4ha	6	3.3
Mean	1.55ha	

Household size

Most (67.2%) had household size of 5-8 persons. This was followed by those (27.8%) who had household size of 1-4 persons. The mean household size was 6 persons. This implies that large family size exist in the study area. This could

positively influence the soil erosion control practices when majority of the household members are in the agricultural productive class. This is because effective soil erosion resilience measures are optimistically ties to the high labor force in the households. The relatively large household size suggest that the farmers might use family labor, to reduce labor cost required in soil erosion control practices.

Farm size

Most (77.3%) of the respondents had farm size of 1-2 ha. This was followed by those (11.1%) who had farm size of less than 1ha and those (8.3%) who had farm size of 2.1ha-3ha. The mean farm size was 1.55ha. This implies that most of the

farmers were smallholder farmers. Farmers with larger holdings are more likely to practice measures for soil erosion control than those with smaller holdings because adoption costs relative to farm size are lower.

Types of soil erosion

The result reveals that the majority of the farmers 50.6% indicated gully erosion occurrence. About 35% and 14.4% reported sheet erosion and rill erosion respectively. This means that gully erosion is more rampant followed by sheet erosion. Suggesting soil erosion may not be effectively stopped. If drastic action is not taken farmers productivity and income can be affected.
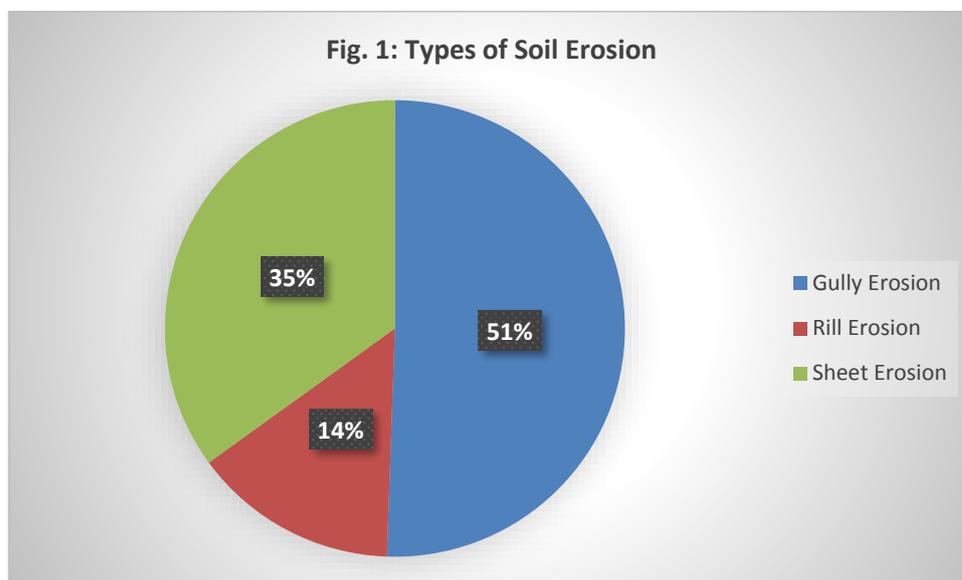
Figure 1. Types of Soil Erosion
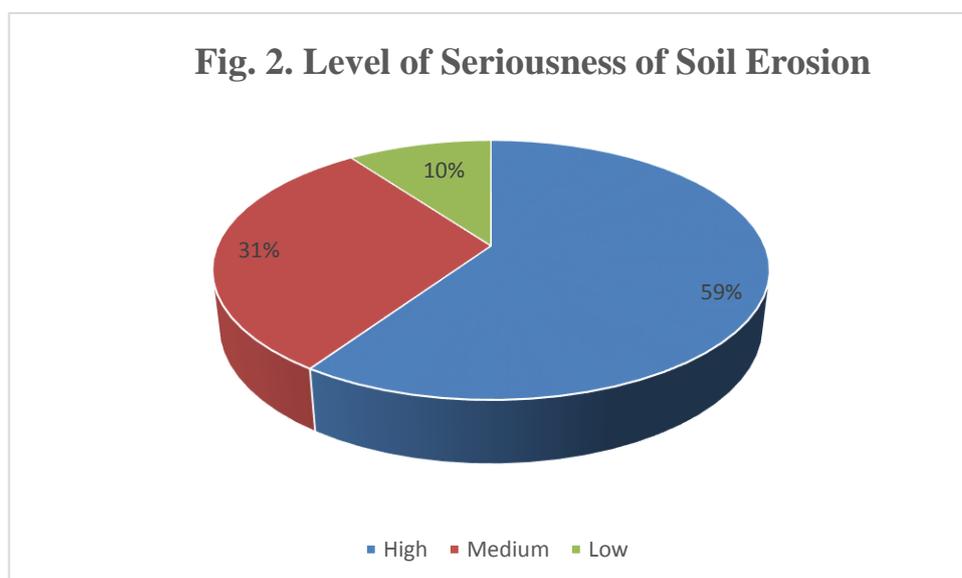
Figure 2. Level of Seriousness of Soil Erosion

Level of seriousness of soil erosion

The level of seriousness of soil erosion has remains the single most important soil degradation problem constraining farmers from achieving and acceptable level of food production. The result reveals that the majority of the farmers 59.4% indicated that the level of seriousness of soil erosion was high. This was followed by 30.6% of respondents' responses that the level of soil erosion was medium. Only a small percentage of the respondents measuring 10% reported low level. This means that the level of seriousness soil erosion is high in the study area.

Types of soil erosion resilience measures

Table 2 shows the percentage of farmers who practiced different types of soil erosion resilience measures in the study area. From Table 2, the results indicates that mulching 38.9%, planting of trees 13.9%, terracing 7.8% and contour and strip cropping 10% were the most widely used soil erosion resilience measures by the farmer in the study area. A few percentage of farmers used crop rotation 6.7%, and discourages bush burning 5.6%, prevent further development of rills and gullies near their farm boundaries. This means that farmers in the study area have no good knowledge and did not effectively practiced the different forms of soil erosion resilience measures to maintain infiltration and safe-disposal of run-off on their farms

Table 2: Resilience measures of soil erosion

Types of Measures	Frequency	Percentage
Mulching	70	38.9
Discouraging bush burning and others	10	5.6
Use of crop rotation	12	6.7
Use of sentilization campaigns	8	4.4
Manuring and use of organic fertilizers	7	3.9
Use of terraces	14	7.8
Creation of proper drainage channels	5	2.8
Contour and strip cropping techniques	18	10
Government assistance	5	2.8
Planting of trees	25	13.9
Intercropping with legumes	6	3.3
Total	180	100.0

Perceived effects of soil erosion

The result in Table 3 revealed that reduction in arable lands had a mean score of 2.97. The respondents admitted that loss in productivity of cropping lands had made them handicap to enjoy the dividend of arable crop production with a mean score of 2.95. The respondents affirmed that soil erosion had led to drop in output with a mean sore of 2.91. The respondents also agreed that reduction in fallow period had hindered them in judicious use of their farm land with a mean score of 2.82. The farmers' response indicated that soil erosion had led to labor shift out of agriculture with a mean score of 2.82. The respondents reported that soil erosion required high input and management with a mean score of 2.61. The result further showed that soil erosion leads to submerges of fertile arable lands with a mean score of 2.44. This implies that soil erosion has negative effect on arable crop farmers.

Table 3: Perceived effect of soil erosion

Effects of soil erosion parameters	Mean	Std. Deviation	Remark
Drop in output	2.91	0.29	Severe
Submerges of fertile arable lands	2.44	0.67	Severe
Reduction of arable lands	2.97	0.18	Severe
Reduction in fallow period	2.82	0.49	Severe
Require high input and management	2.61	0.59	Severe
Loss in productivity of cropping lands	2.95	0.26	Severe
Labor shifting out of agriculture	2.82	0.40	Severe

Effect of soil erosion on the income of arable crop farmers

Table 4 showed a regression result of the relationship between soil erosion menace parameters and income of arable crop farmers. The coefficient of determination (R^2) was 0.584, indicating that about 58.4% of the variations was accounted for the explanatory variables included in the model. The result also shows that the F-ratio (33.463***) was significant at 1% level which shows a high goodness of fit of the model used. The coefficient of drop in output was statistically significant at 1% level and negatively

related to income. This implies that a unit increase in drop of output will decrease their income. Reduction of arable land had an inverse relationship with income (-0.334). It implies that the higher the unavailability of land for planting the lower the income. This is attributable to the fact that in the presence of soil erosion, farmers were deprived parts of their farmlands.

Require high input and management was significant and bore negative sign. This means that a unit increase will lead to a unit decrease in income (-0.271). Soil erosion, which forms serious challenge negatively affects the income of the farmers when they are not adequately and efficiently managed.

Loss in productivity of cropping land is also found to have an inverse relationship with income

(-4.47E-005). As the productivity reduced, farm incomes also reduced as a result of the fact that the land area that accommodated crops had been depleted.

The inverse relationship between soil erosion and labor shifting out of agriculture (0.230) is indicative of the fact that the arable crop farmers were no longer self-employed which might have led to lower income accruing to them after losing their farmland to soil erosion.

Submerges of fertile arable land is also found to have an inverse relationship with soil erosion (-0.187) as the rate of submerging of fertile land is increased, farm incomes also reduced as a result of the fact that area that accommodated crops has been reduced.

Table 4: Effect of soil erosion on the income of arable crop farmers

Variables	Coeff.	Std. Error	T	Sig.
Constant	-.581	.366	-1.589	.114
Drop in output	-.678	.107	6.339***	.000
Reduction of arable land	-.334	.062	5.361***	.000
Require high input and management	-.271	.061	-4.444***	.000
Loss in productivity of cropping land	-4.476E-005	.000	-3.436**	.001
Reduction in fallow period	-.052	.062	-.840	.402
Labor shifting out of agriculture	-.230	.062	3.717***	.000
Submerges of fertile arable lands	-.187	.090	-2.085**	.039
R-square	0.584			
F-ratio	34.463			

Influence of socioeconomic characteristics of farmers on adoption of soil erosion resilience measures

The coefficient of determination (R^2) was 0.539, indicating that about 53.9% of the variations was accounted for the explanatory variable included in the model. The result also shows that the F-ratio (19.721***) was significant at 1% level which shows a high goodness of fit of the model used. The coefficient of age of respondents was positively related to adoption of soil erosion resilience measures and statistically significant at 1% level. The implication of this is that age does contribute to adoption. This finding is in agreement with Umoh (2006) in his study of urban farming. The coefficient of level of education is positively related to adoption of

resilience measures and significant at 5% level of significance. The implication of this is that adoption of soil erosion resilience measures increases with the level of education. The likely implication of this is that the more educated the farmers are the more attention they pay to effective management of their farms.

Household size is also found to have positive relationship with adoption of soil erosion resilience measures. As the household sizes increases, farm incomes also reduced as a result of the fact that the land area that accommodated crops had been reduced. Farm size had positive relationship with adoption of soil erosion resilience measures. It implies that one unit increase in adoption of soil erosion resilience measures incident would lead to one unit

increase in farm size. This is attributable to the fact that in the presence of adaptation measures, farmers' farmlands will be safe for expansion. The coefficient of income was positive and significant at 1% level. This implies that a unit increase in income will increase their adoption of soil erosion resilience measures. The coefficient obtained for extension visit was found positive and this was significant at 5% level of probability. This implies that increase in extension visit will increase their adoption level of soil erosion resilience measures. The coefficient of farming experience is positive and significant at 5% level of significance. This implies that 1% increase in farming experience will lead to a unit increase in the adoption of soil erosion resilience measures.

Table 5: Influence of socioeconomic characteristics of farmers on adoption of soil erosion resilience measures

Variables	Coefficients	Std. Error	t	Sig.
Constant	-11.191	3.931	-2.847	.005
Age	.393	.053	7.446***	.000
Education	1.313	.558	2.352**	.020
Household size	.738	.215	3.433***	.001
Gender	.845	1.187	.712	.477
Farm size	.788	.256	3.083**	.002
Labor cost	-2.350E-005	.000	-.584	.560
Cropping pattern	-1.304	1.595	-.818	.415
Income	.578	.166	3.477***	.000
Extension visit	.869	.351	2.476**	.007
Farming experience	3.217	1.409	2.283**	.024
R-square	0.539			
F-ratio	19.721			

Conclusion

The study established that soil erosion is a serious issue in the study area. Understanding the soil erosion parameters on farmers' income and their resilience measures adopted are vital for policy formulation. The study found out that only few of the measures were adopted. The study was able to identify the perceived effects of soil erosion. The study showed that there is significant relationship between effects of soil erosions on income of farmers. Similarly socioeconomic factors influence adoption of resilience measures under study. Based on the findings, the following recommendations are made:

i. Government should enact policies to discourage bush burning, deforestation and excavation on farming environment

ii. Creation of proper drainage channels

iii. Government should assist the farmers financially to encourage adoption of resilience measures

iv. Planting of trees should be encouraged by farmers

v. Government should help the farmers on land reclamation

vi. Extension visits should be encouraged for more enlightenment of arable farmers

Conflict of Interest: The authors declare that have no conflict of interest.

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