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Effect of Soil Conservation Investment on Efficiency of Cassava Production in Oyo State of Nigeria

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Abstract
The study examined the effect of soil conservation investment on efficiency of cassava production in Oyo State of Nigeria. Simple random sampling technique was used to select 80 representative samples of cassava farmers from whom data for the analysis were obtained. Data analysis involved the use of descriptive statistics and multiple regression analysis. The findings of the study showed that cassava production was dominated by male farmers who were in their active farming years. The most prominent soil conservation methods practiced by cassava farmers were: bush fallowing, manuring, mulching, crop- rotation and herbicide except fertilizer that was averagely used. It was found that farm size had a negative influence on soil conservation investment while farming experience had positive influence on it.
Key words: Soil Conservation Investment, Efficiency, Cassava production, Oyo State

1.0 Introduction

Over five hundred million people live on cassava throughout the world, eating its roots or tubers due to its high energy content and its leaves that are an abundant source of protein and vitamins A and B (Tchabana, 2002, Kormawa *et al*, 2001). Cassava is an important staple food in tropical Africa and had the potential to become a cash crop in many Africa countries (Van Oirschot *et al*, 2004). Cassava is Africa's second most important food staple after maize in terms of calories consumed. In the early 1960s, Africa accounted for 42% of world cassava production. Thirty years later, in the early 1990s, Africa produced half of world cassava output, primarily because Nigeria and Ghana increase their production four fold. In the process Nigeria replaced Brazil as the world leading cassava producer (Nweke, 2004). In Nigeria, traditionally, cassava is produced on small scale family farms. As noted by Nweke (2004) the roots are processed and prepared as a subsistence crop for home consumption and for sale in village markets and transported to urban centers. In Nigeria, cassava is primarily a food crop. In the year 2000, 90% of total production in Nigeria was used as food and the balance as livestock feed (Nweke, 2004).

The presidential initiative move by the Federal Government of Nigeria in 2002 was geared towards raising the production level of cassava to 150m metric tones by the end of year 2010 and realized an income of US $5.0 billion per annum from the export of 37.6m tonnes of dry cassava products (Nigerian National Report, 2006).

The term efficiency of a firm can be defined as its ability to provide the largest possible amount of output from a given set of inputs. The modern theory of efficiency dates back to the pioneering work of Farrell (1957) who proposed that the efficiency of a firm consist of technical and allocative components and the combination of these two components provide a measure of total economic efficiency.

Soil conservation has to do with the prevention of the degradation of soil resources such that the soil can be used on a profitable basis indefinitely (Lutz *et al*, 1994). Soil conservation is in fact a comprehensive approach in soil and farm management. The practices contribute only a part of the overall target of maintaining and improving soil fertility. This extends to the improved relationship between soil, water, plant and to higher sustained yield and the most important segment of re-establishing and maintaining the ecological balance between man and nature (Aromolaran, 1996).

In spite of the overwhelming importance of soil conservation, evidence of research show that the adoption of soil conservation practices in various parts of the country is not high. For example, Agbamu (1993) in a study carried out in Lagos state showed that adoption rates for multiple cropping, minimum tillage, and zero tillage as soil conservation measures among small scale Nigerian farmers were on the average**.**

1.1 The Problem

In Nigeria, like in several other developing nations, the demand for food that is continually rising due to the geometric rise in population has resulted in the need to intensify land use and employ other scientific way of

increasing agricultural productivity. Researchers and scientists consequently embarked upon various means (traditional and scientific) aimed at achieving and generating higher yields per unit area of land. This is through intensive cultivation which includes the use of non-environmentally friendly materials and substances in order to boost agricultural productivity. However, these developed technologies aimed at increased food productivity resulted in problems of rapid soil degradation, massive soil losses, falling yield potentials, deforestation, and disruption of water resources, soil pollution and disruption of natural pasture. In this wise, Engelhard (1994) observed that the loss of biodiversity, climatic change and land degradation are closely linked, and that the immediate causes are population pressure, poverty and poor performance of extensive agriculture.

Akinbile and Adekunle (1999) too observed that the survival of man depends on the diversity of the ecosystem as the evidence of accelerating depletion of natural resources. Hence, to meet the challenges posed by rising population and demand for food, this study was therefore designed to provide answers to the following research questions:

(i) What are the socio-economic characteristics of the respondents in the study area?
(ii) What are the methods of soil conservation practiced in the study area?
(iii) What are the effects of soil conservation investment on efficiency of small scale cassava production?

An important motivating factor for this study is the fact that there is paucity of studies on soil conservation investment and efficiency of cassava production in Oyo State.

1.2 Objectives of the Study

The main objective of this study was to examine the effect of soil conservation investment on efficiency of small scale cassava production. The specific objectives of the study were to:

(i) Describe the socio-economic characteristics of the respondents in the study area.
(ii) Describe the types of soil conservation methods practiced in the study area.
(iii) Determine the effect of soil conservation investment on efficiency of cassava production in the study area.

2.0 Methodology

2.1 The Study Area

The study was carried out in Ido Local Government Area (LGA) formerly known as Akinyele West LGA, with its headquarters at Ido town. It is located between Longitude 2^0 30 and 55^0 15E and latitude 6045N and 9041. The LGA has a population of about 55,893 and it occupied a land mass of 865.49 km^2 with about 57 percent of the total land used for agricultural purposes (NPC, 2006). It is bounded along the sides by Akinyele, Oluyole, Ibarapa LGAs of Oyo State and Odeda LGA of Ogun state. The inhabitants are predominantly farmers and farming accounts for 63% of total economic status in the Local Government Area. The agricultural land supports the growth of arable and cash crops such as cassava, yam, maize, kolanut, cocoa, oil palm. Animal husbandry is also extensively practiced. The LGA consists of about 78 settlements distributed into 10 wards.

2.2 Sampling Procedure and Sample Size

The population of this study constitutes the farmers that were engaged in small scale cassava production in Ido Local Government. Multistage sampling technique was employed in sample selection. First, eight villages in Ido LGA were simple randomly chosen. The villages chosen were Eleshine, Oloje, Odebode, Akufo, Onikede, Araromi, Aderoju and Agoro for the study. Second, 10 farmers were selected by simple random technique from each of the villages, giving a total sample size of 80 respondents.

2.3 Measurement of Variable

The dependent variable of the study was the farmers' expenditure on soil conservation while the independent variables were the farmers' socio-economics characteristics such as age, education, farming experience, gender, farm size *et cetera*.

2.4 Method of Data Collection and Analysis of Data

Data were collected from respondents by the use of a well-structured questionnaire. Data analysis involved the use of the following analytical tools:

1. Descriptive statistics which involved the use of frequencies and percentage distribution was used to achieve the first and second objectives.
2. Multiple regression analysis which was used to analyze the effect of soil conservation investment on efficiency of cassava production.

The implicit form of the regression model is specified as follows:

ESC= f (FRMZ, LBR, CASKG, HHZ, AGE, EXPER, EDYR, EVST, DSTC, CRDT, TOTR)

Where,

Y= ESC= Expenditure on soil conservation (Naira per hectare of cropped land)

FRMZ = Farm size (ha)

LBR = Hired and family labour (Man-days)
CASKG = Cassava per kg.
HHZ = Household size
AGE = Age of farm (year)
EXPER = Farming experience (year)
EDYR = Education (year)
EVAST= Extension visitation
DSTC= Distance (km)
CRDT= Credit
TOTR= Total revenue.

3.0 Results and Discussion

3.1 Socio-economic Characteristics of the Farmers.

3.1.1 Age of the Respondents.

The distribution of respondents by age is shown in table 1. It is observed from the table that the highest percentage (67.5%) of respondents were between the ages of 41-60 years while the lowest percentage (12.5%) of respondents were between the ages of 61-80 years. It was further revealed that 20% of respondents between the ages of 21-40 years. By implication, the active age groups of the farmers were between 41-50 years in the study area. Age of respondents have direct influence on the production in the sense that it determines an individual capacity in most farming operations. Age also has influence on the degree of technologies adoption.

3.1.2 Gender of the Respondents

Table 2 shows the distribution of the respondents by gender. Most of the farmers (76.25%) were males while 23.75% of the farmers were females. These results which show that male farmers dominated cassava production in the study area might be connected with the fact that cassava farming might be tedious for female farmers who preferred vegetable production to cassava production.

3.1.3 Farming Experience of the Respondents.

Table 3 shows that majority of the respondents (about 66%) have been in cassava production between 11 and 20 years. The results shown in table 3 imply that farmers in the study area were well experienced in cassava production which may therefore improve on their efficiency of cassava production.

3.1.4 Educational Level

Table 4 shows that 27.5% of the cassava farmers had no formal education, 52.5% attained primary education, 17.5% attained Senior Secondary School (SSCE), while 2.5% attained National Diploma (ND). The implication of the findings is that majority of the farmers are literate and this is likely to make them respond to the new innovations.

3.1.5: Household Size of Farmers

Table 5 shows that 95.0% of the farmers had household size ranging between 1-10 people and 3.75% had between 11 and 20 people. The result is an indication that cassava farmers in the study area had large household size which is a characteristic of a developing country. However, the result also implies availability of abundant family labour to be used in cassava production.

3.1.6: Farm Size

Table 6 shows that 96.25% of the farmers had farm size ranging from 1-5 hectares of land for cultivation while 3.75% of the farmers had their farm size ranging from 6-10 hectares of land for cultivation of cassava.

3.1.7: Soil Conservation Practiced in the Study Area.

A total of 6 soil conservation methods practiced by cassava farmers were identified in the study area as indicated in table 7. These include fertilizer, mulching, herbicide, manuring, bush fallowing and crop rotation.

A total of 78 respondents representing 97.5% practiced bush fallowing. This shows that bush fallowing was the most common soil conservation practiced in the area. This probably might not be unconnected with the fact that bush fallowing helps the soil to regain its fertility over time. It also supports the findings that there is abundant farm land available to cassava farmers as shown in table 6.

Manuring is the next to bush fallowing with about 96% of farmers practicing it. The least practiced soil conservation method was the use of inorganic fertilizer with 50% of the farmers practicing it. This might probably be as a result of expensive nature of organic fertilizer in the study area.

3.2 Regression Result

In fitting the functional forms, the ordinary least squares estimator was employed and the estimated results are shown in table 8. The resulting explicit equations are considered with respect to their explanatory powers, the adjusted R^2 values as well as significant levels of coefficient. The magnitude and signs of the coefficients of the

explanatory variables are also important. The double–log model was consequently adopted for the study because it had relatively strongest explanatory powers than the other models.

Table 8 shows that farm size had a negative coefficient which was statistically significant at 5% level of significance. This shows that there was negative relationship between farm size and soil conservation investment against a priori expectations (Ogbonna *et al*, 2007). According to Nwaru and Ironall (2005), the poor financial position of farmers compels them to produce on a very small scale and so earn relatively small income. With respect to soil conservation investment practices, small scale farmers are likely to show two types of responses. They are likely to be reluctant to take risk associated with soil conservation investment practices than larger farmers. Again, their weak financial positions might pose severe limitations even if the readiness to invest on these improved soil conservation investment practices is available.

Farming experience had a positive coefficient that was significant at 1% level of significance. This implies that the more the experience of the farmers, the more the adoption of soil conservation investment practices. Nwaru and Ironall (2005) opined that experience is the knowledge and skill gained by contact with facts and events. The results show that the more the experience of cassava farmers the more the amount spent on conservation practices.

4.0 Conclusion

The study examined the effect of soil conservation investment on efficiency of cassava production in Oyo State of Nigeria. Simple random sampling technique was used to select 80 representative samples of cassava farmers from whom data for the analysis were obtained. Data analysis involved the use of descriptive statistics and multiple regression analysis. The findings of the study showed that cassava production was dominated by male farmers who were in their active farming years. The most prominent soil conservation methods practiced by the cassava farmers were: bush fallowing, manuring, mulching, crop- rotation and herbicide except fertilizer that was averagely used. It was found that farm size had a negative influence on soil conservation investment while farming experience had positive influence on it. Hence, cassava farmers, while expanding their farm size should be assisted by policy makers through the provision credit facilities which will assist them in adopting modern but costly soil conservation technologies which will consequently boost cassava production in the country. All other things being equal, this might lead to the meeting of increasing food requirements by the increasing populace.

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Table 1: Distribution of the Respondents by Age.

Age (Years)	Frequency	Percentage
21-40	16	20.0
41-60	54	67.5
61-80	10	12.5
Total	80	100.0

Source: Field survey Data, 2010.

Table 2: Distribution of the Respondent by Gender.

Gender	Frequency	Percentage
Male	61	76.25
Female	19	23.75
Total	80	100.0

Source: Field survey Data, 2010.

Table 3: Distribution of the Respondents by Farming Experience**.**

Experience (years)	Frequency	Percentage
1-10	53	66.25
11-20	24	30
21-30	2	2.5
>30	1	1.25
Total	80	100.0

Source: Field survey Data, 2010.

Table 4: Distribution of Respondents by Education Level

Level of education	Frequency	Percentage
No formal education	22	27.5
Primary	42	52.5
SSCE	14	17.5
ND	2	2.5
Total	80	100.0

Source: Field survey Data, 2010.

Table 5: Distribution of Respondents Household Size.

Household size	Frequency	Percentage
1-10	76	96.25
11-20	4	3.75
Total	80	100.0

Source: Field survey Data, 2010.

Table 6: Distribution of Respondents by Farm Size.

Farm size (Ha)	Frequency	Percentage
1-5	77	96.25
6-10	3	3.75
Total	80	100.0

Source: Field survey Data, 2010.

Table 7: Distribution of Respondents According to Soil Conservation Practiced

Soil conservation practiced	Frequency*	Percentage*
Fertilizer	40	50.0
Mulching	75	93.75
Herbicide	59	73.75
Manuring	77	96.25
Bush fallowing	78	97.5
Crop rotation	75	93.75

*Multiple responses
Source: Field survey Data, 2010.

Table 8: Regression Results on Effect of Soil Conservation Investment on Efficiency of Cassava Production.

Variable	Cobb-Douglas	Exponential	Semi-log	Linear
Constant	1.608	7.963	10858.926	7062.147
	(0.344)	(13.601)	(0.737)	(2.778) **
Farm size	-1.045	-0.229	-2531.523	-1008.471
	(-4.728) **	(-5.294) **	(-3.630) **	(-4.113) **
Labour	-0.154	-1.311E-05	-1307.799	-5.446E-02
	(-0.610)	(-1.225)	(-1.647)	(-1.172)
Cassava per kg	-0.135	6.249E-05	-1297.558	-7.946E-02
	(-0.549)	(0.287)	(-1.671)	(-0.084)
Household size	-5.709E-02	5.388E-02	-470.330	363.434
	(-0.211)	(1.283)	(-0.551)	(1.993)
Age	0.620	3.860E-04	1635.045	-33.518
	(1.139)	(0.035)	(0.951)	(-0.709)
Experience	0.535	5.313E-02	1606.720	158.283
	(2.894**	(2.781) **	(2.758) **	(1.908)
Education (year)	1.974E-02	-2.137E-02	-648.090	-176.117
	(0.056)	(-0.978)	(-0.583)	(-1.856)
Extension	9.404E-03	-2.964E-02	-503.817	-241.438
visitation	(0.045)	(-0.402)	(-0.771)	(-0.755)
Distance	-0.158	-1.364E-02	-338.451	-40.092
	(-0.938)	(-0.902)	(-0.638)	(-0.610)
Credit	0.343	8.751E-06	833.215	3.103E-02
	(1.721)	(2.032) **	(1.324)	(1.659)
Total revenue	0.238	1.676E-06	13.721	-1.207E-04
	(1.453)	(1.245)	(0.027)	(-0.021)
Adjusted R^2	0.424	0.388	0.372	0.304
R^2	0.535	0.474	0.493	0.401
F –ratio	4.809*	5.560*	4.066*	4.130*

Y = ESC. (Expenditure on soil conservation)
Note: Values in parentheses represent t- values.
** Means significant at the 5% level.
* Means significant at the 1% level
Source: Computer Analysis of the Field Survey Data, 2010