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Effect of Market Access on the Adoption of Sustainable Soil Management Practices in Oyo State, Nigeria

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Abstract: The study examined the effect of market access on the adoption of sustainable soil management practices by farmers in the study area. Specifically, the study described the socio-economic characteristics of the farmers; identified the sustainable soil management practices adopted by the farmers; determined factors influencing the choice of sustainable soil management practices used; determined the relationship between market access and the adoption intensity of sustainable soil management practices and identified constraints faced in adopting sustainable soil management practices. Multistage sampling procedure was employed to collect data from one hundred and fifty (150) farmers. Thereafter, data collected were analyzed using descriptive statistics and multivariate probit regression. The findings revealed that the mean age of the respondents was 45 years, with a mean household size of about 6 members. Majority (69.6%) of the respondents had formal education and a mean year of experience of about 18. The study also revealed that all the respondents had access to one form of market or the other for purchase of inputs and sales of their products. In addition, the mean distance covered from farm to home was less than 5 kilometres for most of the respondents while the distance from home to major market and farm to major market was between 5 and 10 kilometres. The most popular sustainable soil management practices adopted by the farmers were the use of chemical fertilizers, crop rotation and intercropping. Furthermore, the multivariate probit regression model showed that age of the respondents, educational level, farm size, household size, farming experience, farm income, awareness of sustainable soil management practices, average distance to the input market, average distance to the output market, average price of product, average price of input for each practice, subsidies on input for each practice, significantly influenced the adoption of sustainable soil management practice by farmers. Also, it was found by the study that inadequate fund is the major constraint faced by the respondents in adopting sustainable soil management practices.

Keywords: Sustainable, Adoption, Soil, Management, Market Access, Adopters

1. Introduction

Agriculture remains preponderant among sectors in the Nigerian economy despite the strategic importance allotted to the crude oil sector. Apart from kick-starting economic growth, agriculture as a sector has the ability to reduce poverty and hunger [18]. It provides employment for a large labour force and accounts for more than one-third (34.4 percent), which was quite below the expected 50 percent contribution to the total Gross Domestic Product (GDP) in Nigeria [25, 16]. The contribution of agriculture to GDP has been on decline since early 70's, and because of overdependence on oil and other environmental and socio-economic issues, it fell from 90% in 1960 to 56% in 1969 and has been below 40% since 1986, according to empirical studies [2, 16]. Although, agricultural production in Nigeria is dominated by small scale farmers and thereby exert little influence, however, they collectively form the foundation upon which the economy rest. Small farms produce over 90 percent of Nigeria's total food production,

and employ at least 60 percent of the country's population, with farm sizes averaging less than 2 hectares [17].

Sustainable soil management approaches allow farmers to maximize yields and profitability while preserving a sustainable balance of agricultural, economic, and environmental benefits. As a result, poverty is reduced and land production is increased. Furthermore, several soil management/conservation strategies, such as conservation tillage, soil fertility improvement practices, erosion control measures, and soil conditioning practices, have proven to be sustainable among Nigerian farmers.

Market access is an example of a factor that has an impact on household assets while simultaneously providing an incentive to take action. Access to financing, knowledge, inputs, and infrastructure is determined by structures and processes, whereas trends like as prices and knowledge diffusion are determined by the vulnerability context. Poor access to markets, owing primarily to poor transportation infrastructure, is widely believed to limit agricultural productivity in developing countries' rural areas by making it more difficult to obtain productivity-enhancing inputs such as fertilizer and to obtain high prices for harvest output [23, 24]. While remoteness undoubtedly hinders market access, little study has been done to evaluate its impact, particularly in the case of soil sustainability-related input technology adoption.

Farmers are encouraged to implement sustainable soil management practices through incentives and enabling measures. Improved farmer education and technical training are among them, as are efforts for lowering input prices, passing organic farming laws that safeguards product integrity, and giving financial incentives for the adoption of sustainable techniques. Market demand for sustainable products can also be a powerful motivator. Enhancing access to such markets can provide cash for farmers, who can then invest in the long-term viability of their production systems, thereby improving food security for their communities' residents. Increased revenues aren't the only market motivation; changing the laws of the game and expanding market access are both strong motivators [7].

This study was to determine effect of market access on the adoption of sustainable soil management practices in Oyo State, Nigeria and specifically, it was to describe the socio-economic characteristics of the farmers in the study area; identify the sustainable soil management practices adopted by the farmers; determine factors influencing the choice of sustainable soil management practices used; and identify constraints faced in adopting sustainable soil management practices in the study area. The study encompassingly unites agricultural technology adoption with dominant ideas about the role of markets in facilitating and encouraging intensification in the adoption of sustainable soil management practices.

2. Methodology

2.1. Study Area

The study was carried out in Oyo State which is located between Longitudes 8°00'N 4°00'E and Latitude 8.000°N 4.000°E with an approximately 28,454 square kilometers area of land [9]. The population of the state was 5,580,894 according to 2006 census [14]. Oyo is an inland State in western Nigeria bordered on the north by Kwara State, on the east by Osun State and on the west by Ogun State and Republic of Benin [22].

The climate in Oyo State is tropical, with dry and wet seasons and high humidity. The dry season runs from November to March, and the wet season is from April to October. Almost all of the year, the average daily temperature is between 25°C (77°F) and 35°C (95°F). Oyo State has a rain forest in the south and a guinea savannah in the north, Towards the south, dense woodland gives way to grassland with trees interspersed in the north [22].

Maize, yam, cassava, millet, rice, plantain, cocoa tree, palm tree, and cashew are among the crops that thrive in the state's environment. Ipapo, Ilora, Sepeteri, Eruwa, Ogbomoso, Iresaadu, Ijaiye, Akufo, and Lalupon all have Government Farm Settlements [22].

2.2. Data Source and Data Collection

Primary data used for this study were collected through the administration of a well-structured questionnaire which included both close and open ended questions as well as personal interview with the respondents in the study area.

2.3. Sampling Procedure and Sampling Size

A multi-stage sampling procedure was used for this study. The first stage involved a random selection of three Local Government Areas (LGA) namely: Lagelu, Ibarapa East and Ona-ara. At the second stage, five (5) farming communities were selected using snowball sampling from each of the Local Government. Ten (10) respondents were randomly selected from each of the communities, which accentuate the selection of fifty (50) respondents from each LGA and cumulate One hundred and fifty (150) respondents selected for the study. Invariably, One hundred and forty-eight (148) questionnaires were recovered and used for the study.

2.4. Data Analysis

The following statistical tools were employed in this study:

i. Descriptive Statistics;
ii. Multivariate Probit Regression.

2.4.1. Descriptive Statistics

The descriptive statistics such as mean, percentages and frequency distribution were used to achieve the specific objectives of describing the socio-economic characteristics of the farmers in the study area; identifying the sustainable soil management practices adopted by the farmers; and identifying constraints faced in adopting sustainable soil management practices in the study area.

2.4.2. Multivariate Probit Regression

This was used to achieve objective of determining the factors influencing the adoption of sustainable soil management practices used.

$$Y_i = \Phi(\beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + \beta_{11}X_{11} + \beta_{12}X_{12} + \beta_{13}X_{13} + \beta_{14}X_{14} + \beta_{15}X_{15} + \varepsilon_i,) \quad (1)$$

Where;
Y_1 = Use of fertilizer;
Y_2 = Use of improved seed;
Y_3 = Leaving crop residual in the field and Mulching/Cover cropping;
Y_4 = No-tillage;
Y_5 = Crop rotation/Intercropping.

Table 1. *Description and Measurement of Explanatory Variables used for Multivariate Probit Regression Model.*

Code	Explanatory variable	Measurement
X_1	Age	In years
X_2	Education Level	Years spent in school
X_3	Farm size	In acre
X_4	Household size	Number of family members
X_5	Farming Experience	In years
X_6	Farm income	Amount in Naira
X_7	Awareness of Sustainable soil management Practices	1 – Aware; 0 – Otherwise
X_8	Land Tenure	1 if the farmer owns the plot; 0 otherwise
X_9	Average distance to the output market	Kilometre travelled to nearest output market
X_{10}	Average distance to the input market	Kilometre travelled to nearest Input market
X_{11}	Credit/Loan Access	1 if Yes; 0 otherwise
X_{12}	Access to extension service	Number of time Extension agent visit the farm in a year
X_{13}	Average price of product	Price of product in Naira
X_{14}	Average price of the input for each practice	Price of input in Naira
X_{15}	Subsidies on input for each practice	1 if Yes; 0 otherwise

Source: Author, 2019
Note: Adoptions of chemical and organic fertilizers were merged as Y_1 and Adoption of leaving crop residual in the field, mulching/cover cropping were merged as Y_3. This is done based on sustainable soil management practice classification according to Jairo Castano et al (2005) [10] where chemical and organic fertilizers were classified as fertilization practices and leaving crop residual in the field, mulching/cover cropping as run-off control as well as crop rotation/intercropping being classified as conditioning practices.

Again, the following variables were removed from the model due to multi - collinearity and figure omission:

X_8 = Land tenure, X_{11} =Credit/loan access, X_{12} = Access to extension

3. Results and Discussion

3.1. Socio-economic Characteristics of Respondents

Table 2. *Socio-economic Characteristics of Respondents.*

Characteristics	Frequency	Percentage
Age		
≤ 30	17	11.5
31 – 40	40	27.0
41 – 50	47	31.8
51 – 60	36	24.3
>60	8	5.4
Household Size		
1 – 5	75	50.7
6 – 10	58	39.2
11 – 15	15	10.1
Educational Status		
No Formal Education	45	30.4
Primary Education	31	20.9
Secondary Education	42	28.4
NCE/OND	13	8.8
HND	9	6.1
First Degree	7	4.7
M.Sc Degree	1	0.7
Years of Experience		
1 – 10	49	33.1
11 – 20	49	33.1
21 – 30	36	24.3
31 – 40	12	8.1
> 40	2	1.4
Farm Size (Ha)		
0.01 – 1.00	52	35.1
1.01 – 2.00	35	23.7
2.01 – 3.00	16	10.8
3.01 – 4.00	15	10.1
4.01 – 5.00	14	9.5
> 5.00	16	10.8
Distance from Farm to Home (Km)		
≤ 5	81	54.7
5.01–10	50	33.8
10.01–15	7	4.7
15.01 – 20	7	4.7
>20	3	2.1
Distance from Home to Major Market (Km)		
≤ 5	29	19.6
5.01 – 10	68	45.9
10.01 – 15	38	25.7
15.01 – 20	10	6.8
>20	3	2.0
Distance of Farm to Major Market (Km)		
≤ 5	13	8.8
5.01 – 10	75	50.7
10.01 – 15	36	24.3
15.01 – 20	13	8.8

Characteristics	Frequency	Percentage
>20	11	7.4
Access to Information		
Yes	136	91.9
No	12	8.1
Sources of the Information		
Family and Friends	27	19.9
Extension Agents	43	31.6
Other Farmers	36	26.5
Radio	10	7.4
Television	1	0.7
Association	19	13.9
Members of Cooperative Society		
Members	79	53.4
Non-Members	69	46.6
Access to Credit		
Have access	63	42.6
Do not have access	85	57.4

Source: Computed from field survey, 2019.

Table 2 showed that the majority of the respondents (31.8 percent) were between the ages of 41 and 50, with an average mean age of around 45 years. This is in line with the findings of Ogunleye et al., (2015) [15], who found that the typical farmer in Oyo State was relatively young; and according to Adeola and Adetunbi (2015) [1], who also noticed that age has a positive link with the adoption of innovations, accentuate that the respondents were still in their productive age, which is likely to make them more responsive to the adoption of innovations.

According to the respondents' household sizes, the majority (50.7 percent) of respondents had households with one to five persons, and the mean household size of the respondents in the study area is six as Ashagidigbi et al (2011) [3] discovered. They have a somewhat big family size and this is particularly important because household size has an impact on the availability of farm labor in the research area.

Some (30.4 percent) of the respondents do not have any formal education, while 69.6 percent had their education from primary to tertiary level. The implication of this is that adoption of sustainable soil management practices may likely be increased because variation in formal education positively influenced adoption of sustainable soil management practices, as some of the practices are knowledge intensive [21], which requires being able to 'decode' and 'analyze' information [4] to efficiently integrate such practices into their farming systems.

The average farming experience of the respondents was about 18 years, indicating that farming is not unusual among the respondents in the study area, and the fact that the maximum years of experience was 53 years implied that there are farmers in the area who have spent most of their lives in the farming business. This is in line with Kshirsagar et al., (2002) [12], who claim that having more farming experience gives you more confidence in using sustainable soil management approaches, which may be the case with the farmers in the research area.

Larger percentage (35.1%) of the respondents in the study area has their farm size between 0.01 and 1.0 hectare. The mean farm size of the respondents was 2.56 hectare which indicated that the study area is dominated by small scale farmers. This finding followed the assertion of Edeoghon *et al.,* (2008)[6] that Nigerian agricultural sector is dominated by small scale farmers whose farms vary between 0.10 and 5.00 hectares in size.

The majority of respondents (54.7%) traveled between 1 and 5 kilometers from their homes to their farms, while 33.8 percent traveled between 5.01 and 10 kilometers. The average distance between the respondents' farms and their homes is 6.40 kilometers, indicating that they do not live close to their farms.

Also, distribution of respondents by distance from home to major market revealed that most (45.9%) of the respondents covered the distance between 5.01 – 10 km from their respective homes to the major markets in the study area. The mean distance of home to major market of the respondents is about 10km.

Moreover, the distance traveled by the majority (50.7 percent) of respondents from their farms to major markets is between 5.01 and 10 km. Farmers have to travel a great distance to transport their products to the nearest major market in the study area, as seen by the average distance of 11.74 kilometers between farm and main market.

It was also observed that 91.9 percent of the respondents in the study area have access to information on sustainable soil management practices through the different sources while (8.1%) have no access to information. Out of the respondents that have access to information, it was further revealed that larger percentage of them (31.6%) got their information from extension agents while the least (0.7%) of them got information from television in the study area. The result agrees with the finding of Adeola and Adetunbi, (2015) [1] that extension agency was the common source of information on sustainable agricultural practices. The implication of this is that adoption of sustainable soil management practices may be influenced positively among the respondents because informational factors relate to knowledge acquisition [5].

The results of the respondents' membership in cooperative societies showed that 53.4 percent were members and 46.6 percent were non-members, moreover, farmer's involvement in membership of associations has a vital role in influencing their behaviour toward adoption of new technology. The involvement of more than the average of respondents may favorably affect their adoption of sustainable soil management practices [11].

In terms of access to credit, the majority of respondents in the study area (57.4%) do not have access to credit. The findings are consistent with the report of Sulaiman, et al., (2011) [20], who found that the majority of farmers in the study area lack access to finance. Access to credit do facilitates the purchase of inputs such as improved seed varieties, chemical fertilizers, and organic fertilizers [8], moreover, it has implications for the adoption of sustainable soil management practices because enough funds may not be available for the respondents to acquire the input needed for sustainable soil management practices.

Table 3. *Distribution of the Respondents by Awareness and Adoption of Sustainable Soil Management Practices.*

Characteristics	Distribution of the Respondents by Awareness		Distribution of the Respondents by Adoption	
	Frequency	Percentage	Frequency	Percentage
Use of Chemical Fertilizers				
Yes	145	98.0	89	60.1
No	3	2.0	59	39.9
Use of Organic Fertilizers				
Yes	133	89.9	43	29.1
No	15	10.1	105	70.9
Use of Improved Seed				
Yes	144	97.3	84	56.8
No	4	2.7	64	43.2
Leaving Crop Residues in the Field				
Yes	127	85.8	59	39.9
No	21	14.2	89	60.1
No-tillage				
Yes	64	43.2	17	11.5
No	84	56.8	131	88.5
Crop Rotation				
Yes	142	95.9	126	85.1
No	6	4.1	22	14.9
Inter-cropping				
Yes	134	90.5	132	89.2
No	14	9.5	16	10.8
Mulching				
Yes	117	79.1	77	52.0
No	31	20.9	71	48.0
Cover Cropping				
Yes	126	85.1	32	21.6
No	22	14.9	116	78.4

Source: Computed from field survey, 2019.

3.2. Distribution of Respondents by Awareness and Adoption of Sustainable Soil Management Practices

Table 3 showed the distribution of the respondents based on their awareness and adoption of sustainable soil management practices. It further revealed that majority (98%, 89.9%, 97.3%, 85.8%, 95.9%, 90.5%, 79.1% and 85.1%) of the respondents were aware of the use of Chemical fertilizers, Organic fertilizers, Improved seed, Leaving crop residual in the field, Crop rotation, Inter-cropping, Mulching and Cover cropping respectively while few of them (43.2%) were aware of No –tillage practice in the study area. These results are in agreement with the findings of Edeoghon *et al.,* (2008) [6] who reported that farmers in Edo State are aware of these sustainable agricultural practices and that the higher the respondents' awareness the higher the likelihood of the respondents' adoption of sustainable soil management practices.

Moreover, the distribution of the respondents based on the type of sustainable soil management practices adopted revealed that majority (60%, 85.1% and 89.2%) of the respondents adopted the use of Chemical fertilizers, Crop rotation and Intercropping, respectively. More than average (56.8% and 52%) of the respondents also adopted improved seed and mulching respectively, while few (29.1%, 39.9%, 11.5% and 21.6%) of them despite their high level of awareness of some of these practices, adopted the use of Organic fertilizers, Leaving crop residues on the field, No –tillage and Cover cropping respectively in the study area.

3.3. Factors Influencing the Choice of Sustainable Soil Management Practices Adopted by Respondents

Tables 4 and 5 respectively present the results of the Multivariate Probit Regression and the marginal effect showing the socio economic and market access variables that influenced the choice of various sustainable soil management practices adopted in the study area. The results were presented in the following order; use of fertilizer, use of improved seed, leaving crop residues in the field, No-tillage, crop rotation/intercropping.

3.3.1. Use of Fertilizers

The findings revealed that farmers' 'use of fertilizers' was positively influenced by their age, educational level, farming experience, farm income, awareness of the practice, and the availability of fertilizer subsidies. Thus, the older the farmers are; and the more the years they spent in school as well as on the farm; and the higher their farm income; and the greater the fertilizer subsidies; the more likely they will use chemical or organic fertilizers. The marginal effect indicated that as the aforementioned variables increases, the likelihood of adopting the practice increased by 0.01 percent, 8.41 percent, 0.53 percent, and 5.23 percent, respectively.

On the other hand, average distance to the input market, average distance to the output market, and average price of fertilizers had a negative impact on use of fertilizers. This

means that farmers who are close to the input and output markets are more likely to use fertilizers. Furthermore, the lower the price of fertilizers, the more likely the practice will be adopted.

In terms of marginal effects, increasing the average distance to the input market, the average distance to the output market and the average price of fertilizers may reduce the probability of using fertilizers by 1.67 percent, 3.55 percent, and 0.02 percent, respectively.

3.3.2. Use of Improved Seed

The farmer's decision of choice to use improved seed was significant and positively influenced by farm income, awareness of the sustainable soil management practice, average price of product and subsidies. In other words, the more the farm income; the higher the awareness of the practice; the higher the price of the farmer's products in the market; and the more the subsidies they get on the input (improved seed), the more likely farmers will choose to adopt the use of improved seed. It was further revealed that farm size and average price of the input were negatively related to the use of improved seed, implying that smaller farm size cum low price of the improved seed tend farmers to adopt the use of improved seed. The marginal effect as presented in Table 5 showed that the probability of adoption of this practice may increase by an increase in farm income, awareness of the sustainable soil management practice, average price of product and subsidies on the input by 3.32e-5%, 30%, 5.21e-4% and 0.5% respectively, and may decrease by 1.12% and 0.06% with an increase in farm size and average price of the input respectively.

3.3.3. Leaving Crop Residues in the Field

The respondents' age, level of education, farm income, and awareness of the practice had significant and positive influence on their decision to leave crop residue in the field. This indicated that the older the farmers; the more years they had spent gaining knowledge; the higher their farm income; and the greater their awareness of the practice, the more likely the respondents were to adopt the practice. However, household size, average distance to output market, and input subsidies for each practice all have a negative impact on the decision to use the practice of leaving crop residues in the field. Thereby, farmers with smaller household sizes, shorter distances to the output market, and lower input subsidies for each practice may be more likely to adopt the 'leaving crop residual in the field' practice. The marginal effect indicated that leaving crop residue in the field may increase by 0.06 percent, 0.73 percent, 7.93e-06, and 7.95 percent with an increase in respondents' age, educational level, farm income, and awareness of the sustainable soil management practice, respectively, and it may decrease by 0.86 percent, 0.33 percent, and 1.94 percent with an increase in household size, average distance to the output market, and subsidies, respectively.

3.3.4. No-tillage

Table 4 also revealed that adoption of 'No-tillage' practice was positively influenced by educational level, farm income, awareness of the sustainable soil management practice, average product price and subsidies on the practice's input. This meant that a positive change in the aforementioned variables would increase the likelihood of farmers opting for no-tillage practices. However, farm size, average distance to the input market, average distance to the output market, and average price of the input negatively influenced the use of the practice depicting that as the variables increase, the likelihood of adopting no-tillage practices decreases.

Table 5 further explained that adoption of 'No-tillage' practice could rise by 1.77 percent, 1.72e-05 percent, 10.40 percent, 2.99e-04 percent, and 1.14 percent, respectively, as education, farm income, awareness of sustainable soil management practices, average product price, and subsidies on the practice's inputs rise. And with an increase in farm size, average distance to the input market, average distance to the output market, and average price of the input; adopting 'No-tillage' practice may reduce by 0.64 percent, 0.01 percent, 0.78 percent, and 0.04 percent, respectively.

3.3.5. Crop Rotation/Intercropping

As shown in Table 5, the adoption of crop rotation/intercropping was significantly influenced by the respondent's age, education level, farming experience, farm income, awareness of the practice, average product price, and subsidies on input of practices, all of which were positively related to crop rotation/intercropping. This indicated that the older the farmer; the more the knowledge acquisition; the more years of experience; the increase in farm income; the increase in awareness of the practice; the higher the product price and the more subsidies on sustainable soil management practices input; the more likely the farmers will adopt crop rotation/intercropping. With an upward movement of age of respondent, education level, farming experience, farm income, awareness of the practice, average price of product, and subsidies on input of practices, the adoption of crop rotation/intercropping as a practice may possibly increase by 0.02 percent, 1.24 percent, 0.05 percent, 7.75e-06 percent, 18.13 percent, 2.09e-04 percent, and 0.66 percent, respectively.

However, farm size, household size, and distance to the output market were all significant but had a negative impact on crop rotation/intercropping adoption, implying that increasing these variables reduces the likelihood of the practice being adopted and vice versa. Thereby, adoption of this practice may decrease by 0.60%, 1.34% and 0.49% with a rise in farm size, household size and distance to the output market respectively. These results are in agreement with the findings of Naboth, (2015) [13] that variables such as education level, farm size, farm income, awareness of sustainable soil management practices and distance to input-produce markets significantly influences the adoption of sustainable soil management practices in Uganda.

Table 4. *Multivariate Probit Regression Result Showing Factors Influencing Choice of Sustainable Soil Management Practices Adopted by Respondents.*

Variables	Use of fertilizer	Use of improved seed	Leaving crop residues in the field	No-Tillage	Crop rotation/intercropping
Age	Base Outcome	0.1018 (0.900)	0.1530** (0.047)	0.1718 (0.836)	0.0243*(0.051)
Education Level	Base Outcome	0.2664 (0.639)	0.3476*** (0.000)	0.6674** (0.046)	0.7348**0.019)
Farm size	Base Outcome	-0.2728*** (0.002)	-1.5476 (0.771)	-0.3224*** (0.000)	-0.4412***(0.001)
Household size	Base Outcome	0.3212 (0.346)	-0.6104* (0.072)	0.5652 (0.104)	-0.7374**(0.030)
Farming Experience	Base Outcome	-0.2750 (0.724)	-0.2926 (0.704)	-0.7169 (0.380)	-0.1950** (0.021)
Farm income	Base Outcome	-6.79e-06*** (0.003)	-5.67e-06*** (0.002)	-5.06e-06** (0.016)	-2.78e-06* (0.053)
Awareness of Sustainable Soil Management Practices	Base Outcome	4.9245* (0.056)	5.4868** (0.034)	5.0303* (0.055)	5.1097** (0.048)
Average distance to the input market	Base Outcome	-0.9329 (0.296)	0.2270** (0.023)	0.4665 (0.581)	0.0048 (0.954)
Average price of product	Base Outcome	0.1140*** (0.000)	0.0007 (0.466)	0.0001*** (0.000)	0.0120** (0.025)
Average price of the input for each practice	Base Outcome	2.1640* (0.084)	0.0013 (0.109)	0.0258*** (0.000)	0.0089 (0.258)
Subsidies on input for each practice	Base Outcome	0.3341** (0.043)	0.3294** (0.047)	0.3094* (0.061)	-1.6852** (0.039)
Average distance to the output market	Base Outcome	-1.6852 (0.200)	-1.9877*** (0.000)	-0.5326* (0.059)	-2.6223* (0.051)
Constant	Base Outcome	-9.2832 (0.281)	-10.3806 (0.223)	-10.6699 (0.218)	-14.4405 (0.092)
Log likelihood	-117.96365	-117.02157	-117.00037	-117.00031	-117.00031

Notes: *, ** *and* *** indicate that coefficient is significant at 1%, 5% and 10% significant level respectively while the value in parenthesis indicate P-value.
Source: Computed from field survey, 2019.

Table 5. *Marginal Effect of Multivariate Probit Regression Result Showing Factors Influencing Choice of Sustainable Soil Management Practices Adopted by Respondents.*

Variables	Use of fertilizer	Use of improved seed	Leaving crop residues in the field	No-Tillage	Crop rotation/intercropping
Age	0.0001** (0.041)	0.0004 (0.936)	0.0006*** (0.007)	0.0001 (0.971)	0.0002** (0.041)
Education Level	0.0841*** (0.000)	0.0244 (0.483)	0.0073*** (0.000)	0.0177** (0.024)	0.0124** (0.022)
Farm size	-0.0436 (0.605)	-0.0112*** (0.000)	-0.0025 (0.767)	-0.0064*** (0.000)	-0.0060*** (0.000)
Household size	-0.0900 (0.139)	-0.0293 (0.206)	-0.0086** (0.040)	-0.0205 (0.111)	-0.0134*** (0.000)
Farming Experience	0.0053* (0.098)	0.0019 (0.667)	0.0005 (0.661)	0.0012 (0.616)	0.0005*** (0.010)
Farm income	7.57e-07** (0.036)	3.32e-07** (0.031)	7.93e-08*** (0.000)	1.72e-07*** (0.001)	7.75e-08** (0.032)
Awareness of Sustainable soil management Practices	0.8069** (0.043)	0.3022* (0.051)	0.0795*** (0.003)	0.1040* (0.051)	0.1813*** (0.008)
Average distance to the input market	-0.0167* (0.093)	-0.0017 (0.713)	-0.0001 (0.270)	-0.0001* (0.096)	-0.0001 (0.964)
Average distance to the output market	-0.0355* (0.083)	-0.0119 (0.224)	-0.0033*** (0.000)	-0.0078** (0.039)	-0.0049* (0.074)
Average price of product	0.0000 (0.364)	5.21e-06*** (0.000)	1.30e-06 (0.485)	2.99e-06*** (0.000)	2.09e-06** (0.028)
Average price of the input for each practice	-0.0002* (0.071)	-0.0006** (0.048)	-0.0000 (0.350)	-0.0004*** (0.000)	-0.0000 (0.237)
Subsidies on input for each practice	0.0523** (0.049)	0.0050*** (0.010)	-0.0194* (0.096)	0.0114*** (0.000)	0.0066*** (0.000)
Constant		-9.2832 (0.281)	-10.3806 (0.223)	-10.6699 (0.218)	-14.4405 (0.092)
Log likelihood	-117.96365	-117.02157	-117.00037	-117.00031	-117.00031
Wald chi2 (48)	63.71				
Prob> chi2	0.0640				

Notes: *, ** and *** indicate that coefficient is significant at 1%, 5% and 10% significant level respectively while the value in parenthesis indicate P-value.
Source: Computed from field survey, 2019.

3.4. Constraints Faced in Adopting Sustainable Soil Management Practices

The result on Table 6 showed the distribution of the respondents by the constraints faced in adopting sustainable soil management practices. The adoption by farmers of sustainable soil management practices depends on its benefits, but also on the following external constraints identified by the respondents as: high cost of inputs, inadequate fund, far distance from input market, inadequate labour, no incentives from government, and scarcity of input that may impede their adoption in the study area. This agrees with the findings of Sivan van L. and Wageningen U. R., (2015) [19] that lack of money and labour, no understanding of the technology, scarcity and high cost of inputs as well as far distance from the sources of inputs are the constraints faced by farmers in adopting Integrated Soil Fertility Management practices. From the constraints, inadequate fund was found to be the major constraint faced in adopting sustainable soil management practices among the respondents.

Table 6. *Distribution of Respondents by Constraints Faced in Adopting Sustainable Soil Management Practices.*

Constraints	Frequency	Percentage	Rank
Inadequate fund	99	66.9	1
Inadequate labour	70	47.3	2
Scarcity of input	30	20.3	3
High cost of inputs	17	11.5	4
No incentives from government	17	11.5	4
Far distance from input market	13	8.8	6

Source: Computed from field survey, 2019.

4. Conclusion

The study revealed that market access variables such as awareness of sustainable soil management practices, average distance to the input market, average distance to the output market, average price of product, average price of input for each practice, subsidies on input for each practice and good road infrastructure can motivate farmers to adopt sustainable soil management practices, other factors kept constant. As a result, in order for soil to be used sustainably in the study area, both local and central governments must work together to develop and improve market and transportation facilities near the farmers. Controlling the cost of sustainable soil management inputs is also important.

5. Recommendation

According to the findings of this study, recommendations were made on the note that extension services should be reinforced by the government and NGOs adequately through provision of necessary facilities and ensure easy delivery of service to farmers in order to make sustainable soil management practices popular among the farmers in the study area and that the Federal Government should put price regulation policy in place to help farmers sell their output at profitable price to increase their farm income which will further motivate them to invest in sustainable soil management practices.

Furthermore, the State Government should put in place good road infrastructure to reduce the number of hours spent on the road in purchasing input and selling farm output, thereby encouraging farmers to adopt sustainable soil management practices. Farmers should also form cooperative societies in order to access credit from financial institutions, non-governmental organizations, and governmental bodies such as the Bank of Agriculture, the Central Bank of Nigeria, and the Federal Ministry of Agriculture and Rural Development in order to adopt sustainable soil management practices.

References

[1] Adeola, R. G. and Adetunbi, S. I. (2015) Farmers' Perception of Sustainable Agriculture in South-Western Nigeria: Implications for Rural Economy, *International Journal of Applied Agricultural and Apicultural Research.* IJAAAR 11 (1&2): 86-92, 2015.

[2] Amujoyegbe, B. J. and Elemo, K. A. (2012), Decline in Crop Productivity in Nigeria: A review of possible strategies, increase and sustained production. *Journal of Agriculture and Biological Sciences* 3 (1): 250-256.

[3] Ashagidigbi W. M., Falusi, A. O. and Awopeju, S. O. (2011): The Effects of Rural Infrastructure Development on Crop Farmer's Productivity in Osun State. World Rural Observations 2011]. ISSN: 1944-6543.

[4] Bryan, S. (2014). Institutional deficiencies and adoption of farm innovations: Implications and options for agricultural research centers: International Potato Center.

[5] D'Emden, F. H., Llewellyn, R. S. and Burton, M. P. (2006). Adoption of conservation tillage in Australian cropping regions: an application of duration analysis. Technology Forecast Society Change, 73, 630–647.

[6] Edeoghon, C. O., Ajayi, M. T. and Ugboya, T. O., (2008). Awareness and Use of Sustainable Agricultural Practices by Arable Farmers in Ikpoba-Okha Local Government Area of Edo State. *Journal of Sustainable Development in Agriculture and Environment.* 3 (2). 55-63.

[7] FAO, (2016). Innovative Markets for Sustainable Agriculture: Exploring How Innovations in Market Institutions Encourage Sustainable Agriculture in Developing Countries, by A. Loconto, A. S. Poisot and P. Santacoloma. Rome.

[8] Geta, E., Bogale, A., Kassa, B., and Elias, E. (2013). Determinants of Farmers' Decision on SoilFertility Management Options for Maize Production in Southern Ethiopia. *American Journal of Experimental Agriculture, 3* (1), 226-239.

[9] Hogan, C. M., (2009). Painted Hunting Dog: LayconPictus, GlobalTwitcher.com, ed. N. Stromberg Archived, 2010, Wayback Machine.

[10] Jairo Castano, Matthew Meulenberg and Aad van Tilburg (2005). The impact of marketing systems on soil sustainability of agriculture in developing countries: a method and an application. *American Journal of Agricultural Economics* 33 (2005) 51–66.

[11] Kassie, M., H. Teklewold, M. Jaleta, P. Marenya, and O. Erenstein. (2015). Understanding the Adoption of A Portfolio of Sustainable Intensification Practices in Eastern and Southern Africa. *Land Use Policy* 42: 400-411.

[12] Kshirsagar, K., Pandey, S. and Bellon, M., (2002). Farmer Perceptions, Varietal Characteristics and Technology Adoption: A Rainfed Rice Village in Orissa. Economic and Political Weekly. 37. 1239-1246. 10.2307/4411927.

[13] Naboth, B. (2015), "Farmers' Knowledge, Perceptions, and Socioeconomic Factors Influencing Decision Making For Integrated Soil Fertility Management Practices in Masaka and Rakai Districts, Central Uganda". Graduate Theses and Dissertations. 15231. https://lib.dr.iastate.edu/etd/15231

[14] National Population Commission, (2006) Census. Federal Republic of Nigeria, December, 2006.

[15] Ogunleye, A. A., Oluwafemi, Zacchaeus O., Arowolo, K. O. and Odegbile, O. S. (2015) Analysis of Socio Economic Factors Affecting Farmers Participation in Cooperative Societies in Surulere Local Government Area of Oyo State. *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS) ISSN: 2319-2372. Volume 8, Issue 5 Ver. I (May. 2015*), PP 40-44 www.iosrjournals.org DOI: 10.9790/2380-08514044.

[16] Olajide, O. T., Akinlabi, B. H., and Tijani, A. A. (2012). Agriculture Resource and Economic Growth in Nigeria. *European Scientific Journal* October edition Vol. 8, No 22. ISSN: 1857 – 7881 (Print) e-ISSN 1857 – 7431. https://eujournal.org/index.php/esj/article/view/422/570

[17] Oluwatayo, I. B., Sekunmade, A. B., and Adesoji, S. A. (2008) Resource Use Effciency of Maize Farmers in Rural Nigeria: Evidence from Ekiti State. *World Journal of Agricultural Sciences* 4 (1): 91-99. IDOSI Publications.

[18] Onyenweaku, C. E., Nwachukwu, I. N., Opara, T. C., (2010), Productivity Growth in Food Crop Production in Imo State Nigeria. *African Crop Science Journal*, 18 (3): 89-95.

[19] Sivan V. L. and Wageningen U. R., (2015): Market Access and the Adoption of Integrated Soil Fertility Management in Mbeya Region, Tanzania. International Development Studies Development Economics Group, Tanzania.

[20] Sulaiman, Yusuf A., Odutuyo, Omobolaji E. and Ashagidigbi, Waheed M. Agricultural Intensification and Poverty in Oyo State. *World Rural Observations* 2011; 3 (4): 98-106. ISSN: 1944-6543.

[21] Teklewold, H., M. Kassie, and B. Shiferaw.(2013). Adoption of Multiple Sustainable Agricultural Practices in Rural Ethiopia. *Journal of Agricultural Economics* 64 (3): 597-623.

[22] Wikipedia Online Encyclopedia, (2019), https://en.m.wikipedia.org/wiki/Oyo_State

[23] World Bank (2017). Enabling the Business of Agriculture 2017." Washington, DC: World Bank. doi: 10.1596/978-1-4648-1021-3.

[24] World Bank, (2008). World Development Report 2008: Agriculture for Development."Washington, DC: World Bank.

[25] World Bank, (2005), World Bank development report, Washington, D. C. 102-109.