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Assessment of Land Management Practices in Food Crops Production among Small Scale Farmers in Kwara State, Nigeria

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Abstract

The study carried out an assessment of agricultural land management practices in food crops production among small scale farmers in Kwara Sate, Nigeria. Specifically, the study determined the socio economic characteristics of crop farmers in Kwara State; ascertained the cropping patterns common among them; highlighted the soil conservation methods adopted by the farmers; examined the relationship between selected socio-economic characteristics of the farmers and their adoption of major agricultural land management practices; and investigated the constraints to adoption of sustainable agricultural practices among crop farmers in Kwara State, Nigeria A three stage random sampling technique was used in selecting a total of one hundred and forty four small scale food crops farmers. Descriptive statistics, binary logistic regression model and four point Likert-type scale were used to analyse the data for the study. The study revealed that food crops production in Kwara State is dominated by middle aged men who are poorly educated and have poor access to agricultural extension services. Half of the respondents (48.60%) adopted cereal-based cropping systems. 48.6% of the farmers adopted a minimum of three management practices. Crop rotation was mostly adopted by all the farmers while irrigation was the least adopted by only 29.3% of the respondents. Furthermore, the study revealed that farm size, age, education status, number of contacts with extension agents, household size and number of farm plots of the respondents were the significant factors affecting their adoption of land management practices. The study also revealed that the major constraints to the use of sustainable crop management practices among the farmers included inadequate supply of fertilizer, inadequacy of labour and credit, poor knowledge of improved agricultural practices, poor transportation, low produce prices and high cost of production. The study recommended the need for training programme on the use of appropriate sustainable practices that will take into account the cropping systems adopted by the farmers.

Keywords:
Sustainable practices, Land management, Small Scale farmers, Food crops

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INTRODUCTION

A unique characteristic of rural societies in many developing countries is the almost total dependence on agriculture for livelihood. In Nigeria for instance, rural communities are completely agrarian in nature with crop farming, fishing, or livestock keeping being the major occupation of the majority. Since almost all rural households depend directly or indirectly on agriculture, and given the large contribution of the sector to the overall economy, agriculture is a key component of growth and development (IFPRI, 2007). As a major source of income, agriculture plays a significant role in rural and economic development process (Thirtle *et al.,* 2003). As such, agricultural development is an integral part of all rural development approaches. This fact is well captured in the description of agriculture as the engine room of rural development (Ashley and Maxwell, 2001). It is therefore imperative that any attempt at rural development must focus on agriculture. It has however been observed that agriculture has changed dramatically, especially since the end of World War II. Food and fiber productivity soared due to new technologies, mechanization, increased chemical use, specialisation and government policies. Although these changes have had many positive effects and reduced many risks in farming, there have also been significant costs. Prominent among these are topsoil depletion, groundwater contamination, the decline of family farms, continued neglect of the living and working conditions for farm laborers, increasing costs of production, and the disintegration of economic and social conditions in rural communities (Agricultural Sustainability Institute, ASI, 2012).

The Nigerian agricultural sector is made up of four major sub-sectors: crop production, livestock production, forestry and fishery. According to Daramola *et al*. (2007), their contributions to the Nigerian agricultural GDP in 2007 were 85%, 19%, 4% and 1% respectively. The dominance of crop production in the agricultural sector in Nigeria therefore places it in a pivotal position in issues of sustainable agriculture in Nigeria. Food production in Nigeria, as in many developing countries is linked with small scale agriculture. The small scale farmers in this system are responsible for a large share of the total agricultural output, cultivated land and the farming population (Brown and Wolf, 2005). The importance of small scale farmers to sustainable agricultural and rural development is derived therefore from their dominance of the agricultural sector of the country.

Sustainable land management (SLM) has been defined as the adoption of appropriate land management practices that enables land users to maximize the economic and social benefits from the land while maintaining or enhancing the ecological support functions of the land resources (FAO, 2009). It is the key point for improving land resource resilience and productivity within the context of the potentially devastating effects of climate change in Sub-Saharan Africa, bridging the needs of agriculture and environment, with the twin objectives of maintaining long term productivity and ecosystem functions (land, water, biodiversity); and Increasing productivity (quality, quantity and diversity) of goods and services (including safe and healthy food). The major goal of SLM therefore is to develop economically viable agro-ecological system and to enhance the quality of the environment, so that farm lands will remain productive indefinitely. Since SLM includes the maintenance over time of soil productivity, it therefore requires the combination of soil fertility treatment such as application of mineral and organic fertilizers with soil and water conservation measures including implementation of agronomic, soil management and physical measures, such as contour ridging, terracing, tied ridges or providing ground cover through mulching, use of plants and leaving crop residues (Durno, 1992; Woodfine, 2009).

The production systems which follow a predominantly ecosystem approach offer a range of productivity, socio-economic and environmental benefits to producers and to society at large based on a sustainable basis. According to Kassam and Friedric (2011), they are based on five overall objectives: (i) simultaneous achievement of increased agricultural productivity and enhanced ecosystem services; (ii) enhanced input-use efficiency, including water, nutrients, pesticides, energy, land and labour; (iii) judicious use of external inputs derived from fossil fuels (such as mineral fertilizers and pesticides) and preference for alternatives (such as recycled organic matter, biological nitrogen fixation and integrated pest management); (iv) protection of soil, water and biodiversity

through use of 'minimum soil disturbance' and maintaining organic matter cover on the soil surface to protect the soil and enhance soil organic matter and soil biodiversity; and (v) use of managed and natural biodiversity of species to build systems' resilience to abiotic, biotic and economic stresses, with an underlying emphasis on improving soils' content of organic matter as a substrate essential for the activity of the soil biota. Furthermore, they noted that the farming practices required to implement these objectives will differ according to local conditions and needs.

Sustainable production practices involve a variety of specific and general approaches. Specific strategies must take into account topography, soil characteristics, climate, pests, local availability of inputs and the individual grower's goals. Despite the site-specific and individual nature of sustainable agriculture, several general principles can be applied to help growers select appropriate management practices: selection of species and varieties that are well suited to the site and to conditions on the farm; diversification of crops and cultural practices to enhance the biological and economic stability of the farm; management of the soil to enhance and protect soil quality; efficient and humane use of inputs; and consideration of farmers' goals and lifestyle choices (Agricultural Sustainability Institute, ASI, 2012).

A common philosophy in sustainable crop management is that a "healthy" soil is a key component of sustainability. This implies that a healthy soil will produce healthy crop plants that have optimum vigour and are less susceptible to pests. On the other hand, crop management systems that impair soil quality often result in greater inputs of water, nutrients, pesticides, and/or energy for tillage to maintain yields. In sustainable crop management systems, the soil is viewed as a fragile and living medium that must be protected and nurtured to ensure its long-term productivity and stability. Methods to protect and enhance the productivity of the soil include using cover crops, compost and/or manures, reducing tillage, avoiding traffic on wet soils, and maintaining soil cover with plants and/or mulches (Agricultural Sustainability Institute, ASI, 2012).

One of the most severe threats to the sustainability of agricultural crops production in Nigeria is declining productivity as a result of the loss of soil fertility. Soils in Nigeria suffer deficiency common to the tropical soil such as low percentage organic matter and nitrogen, shallow depth and high acidity which predispose about 63% of agricultural soils in Nigeria to low productivity (Lekwa and Whiteside 1996). The Federal Ministry of Agriculture and Rural Development (FMARD, 1987) blamed this situation on the inappropriate land and agricultural management practices in many communities across the country. Such agricultural practices have been fingered in natural vegetation transformation causing loss of soil water content, soil structure and porosity. As such, soil depletion in Nigeria can generally be attributed to the following: increase population density and pressure on agricultural lands; over grazing due to increased stocking rate; wide spread deforestation due to reduced fallow period; incompatible and unsustainable agricultural practices; and excessive use of fertilizers and other agro-chemicals (Emma-Okafor *et al.*, 2010).

In spite of the wide spread knowledge (some even indigenous) about cropping patterns such as fallowing and crop rotation known to significantly contribute to soil sustainability and other soil water and nutrient conservative measures which could help to remedy soil condition, the situation has continued to be grim. It is uncertain if farmers in Kwara State, like in many other parts of Nigeria are taking full advantage of the farming practices required for improved and sustainable agricultural production. Studies by Okoye (1998), Marshall (2004) and Rezvanfar *et al.* (2009) have shown that socio-economic characteristics including age, educational background, family size and farm size influence farmers' adoption of land management practices Therefore, the ability of crop farmers in Kwara State to adopt sustainable agricultural practices is probably affected by their socio-economic conditions. As such, this study sets to answer the following research questions:

what are the socio-economic characteristics of crop farmers in Kwara State, Nigeria?

what cropping patterns are common to them?

what soil conservation methods do they practice?

What relationship exist between selected socio-economic characteristics of crop farmers

in the State and their adoption of sustainable agricultural practices?

what militates against successful adoption of sustainable agricultural practices among farmers in Kwara State?

Objectives

The main objective of the study was to assess sustainable agricultural practices in food crop production among small scale farmers in Kwara state, Nigeria. The specific objectives of the study were to:

1- Determine the socio economic characteristics of crop farmers in Kwara State;

2- Ascertain the cropping patterns common among them;

3- Highlight the soil conservation methods adopted by the farmers;

4- Examine the relationship between selected socio-economic characteristics of the farmers and their adoption of major agricultural land management practices; and

5- Investigate the constraints to adoption of sustainable agricultural practices among crop farmers in Kwara State, Nigeria.

Literature review

The adoption of land management practices is multidimensional with numerous factors affecting the willingness of farmers to use various conservation practices (Rezvanfar *et al*., 2009). The effects of most socio-economic variables on the adoption of land management practices have not been conclusive and have been noted to vary with location given the divergent reports available from existing literature.

Higher educational attainment is characteristically linked with increased awareness and hence better adoption. It has been reported that educational attainment has a positive and significant relationship with the adoption of sustainable land management practices among farmers (Okoye, 1998; Deininger *et al*., 2003 and Pender *et al.,* 2003). While Clay *et al*. (1998) reported educational attainment to be insignificant to the adoption of land management practices, Warriner and Moul (1992) presented education as having a negative relationship with adoption. According to Okoye (1998), age is positively correlated with the adoption of sustainable land management practices; however, Abd-Ella *et al*. (1981) reported a negative relationship between the two. Pender and Gebremadhin (2004) concluded that male headed households were more likely to use contour plowing and manure on a regular basis, Mulat *et al*. (1997) held a contrary opinion from a study carried out in the Ethiopian highlands in which male –headed households were found to most likely use less soil management practices. A high household size could be expected to imply more labour to carry out land management practices, however, Shiferaw and Holden (1998) confirmed a negative correlation between family size and land conservation practices. Holden and Yohannes (2002) however found no relationship between family size and land management practices.

Farm size has been positively linked to the adoption of land management practices (Cramb, 1999; Hagos, 2003; Demeke, 2003 and Teklewold, 2004). Deininger *et al*. (2003) reported a negative relationship between farm size and some land management practices such as tree planting. Land tenure affects adoption of land management practices primarily by influencing transferability of property rights thereby affecting the reversibility of land investments and ability to use land as collateral. Ayalew *et al*. (2005) opined that where land tenure is insecure, chances of sustainable land management practices are slim. Deininger *et al.* (2003) observed that access to agricultural extension services has a positive relationship with the adoption of land management practices. This view was also held by Marshall (2004) and Okunade (2006).

MATERIALS AND METHODS

The study area is Kwara State, Nigeria. With a total of sixteen Local Government Areas, the state has a land area of about 36,825 km^2 (Federal Office of Statistics, 1999) and a population of 2,371,089 (Kwara State Planning Commission, 2007) Major tribes in the State are Yoruba, Nupe, Fulani and Baruba. The state is located between latitudes 7^{0}45'N and 9^{0}30'N and longitude 2^{0}30'E & 6^{0}25'E. The topography is mainly plain to slightly gentle rolling lands. The mean annual rainfall ranges between 1000mm and 1500mm. Average temperature ranges between 30^{0}C and 35^{0}C. The rainy season in the state falls between March and October with a short break in August. The dry season is between November and February. The climatic

condition favors the cultivation of arable crops including millet, cassava, yam, cowpea, maize, and rice. As obtainable in other States of Nigeria, Agricultural extension service delivery has been largely public and administered by the Agricultural Development Projects (ADPs) under the supervision of the State Ministries of Agriculture. A number of special agricultural development schemes/projects embarked upon by the Government and some non-governmental organizations (NGOs) over time have also addressed agricultural extension in the State.

Small scale crop farmers in the study area constituted the population for this study. A three stage random sampling technique was used to select the sample for the study. The first stage involved the random selection of four (4) Local Government Areas: Edu, Asa, Kaiama, and Ifelodun out of the sixteen Local Government Areas in the State. The second stage involved the random selection of three (3) villages from each of the selected Local Government Areas using the Kwara State Agricultural Development Programme (KWADP) village listing. The third stage was the random selection of twelve (12) small scale farmers from each of the villages selected. Information on the number of the total farmers in each village was obtained from the village council. This was used in preparing the list of the farmers that form the sampling frame from which the random selection of the farmers was carried out. Every other farmer was thereafter randomly selected from the list. A total of one hundred and forty four (144) respondents were surveyed but responses from only one hundred and thirty five (135) farmers were found to be useful for the study.

Data for the study were obtained by the administration of a structured questionnaire by well trained enumerators. Descriptive statistical tools employed to analyze data collected were frequency, percentages and means. A four point Likert-type scale was employed to investigate constraints to the adoption of sustainable agricultural practices. The scale was graded as follows: Not severe = 1, Less severe = 2, Severe = 3 and Very severe = 4. Respondents rated various possible constraints based on their perception of the severity of the constraints to them. To examine the causal relationship between the use of soil management practices and some selected socio-economic variables, binary logistic regression model was adopted. The regression model in its linear form is presented as follows:

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, u)$

Where Y_i = use of i^{th} soil management practice (used =1, 0 otherwise)

X_1 = Total farm size (ha)
X_2 = Age of farmer (years)
X_3 = Education level
X_4 = Number of visits by extension agents in the year.
X_5 = Number of farm plots
X_6 = Household size
X_7 = Error term

RESULTS AND DISCUSSION

Socio-economic characteristics of the respondents

The socio-economic characteristics of the respondents including age, household size, sex, marital and educational status are as presented in table 1.

Table 1 shows that with a mean age of 50.72 years and close to 60% of the respondent being 50 years and above, the youth who are known to possess the physical strength required for crop farming are largely not as involved in agriculture as expected. This is particularly significant giving the fact that youths have been reported to constitute about 60% of the population of the Nigeria (Vision 2010 Report, 2005) and that they account for 70% of the State population (Akinyemi, 2011). This may not be unconnected with the fact that agriculture is increasingly being rejected among the youths particularly because of preference for white collar jobs. The Majority of the respondents have household sizes of between 5 and 10. This is of particular importance because of the implication of household size on the availability of farm labour. The dominance of male in crop farming in the study area is expressed in the fact that 92.6% of the respondents were male. Only 28.9% of the farmers had a minimum of primary school education. Education has been known to influence adoption positively. However, the farmers are poorly educated on the average and this may affect their level of adoption of sustainable agricultural practices.

Occupational characteristics

In view of their importance on the use of sustainable crop and soil management practices,

Table 1: Socio-Economic characteristics of the respondents.

Characteristics	Frequency	Percentage
Age of Respondents		
>40	12	8.9
40-49	44	32.6
50-59	69	51.1
60 and above	10	7.4
Total	135	100
Household Size		
<5	4	3
5-10	125	92.6
>10	6	4.4
Total	135	100
Sex of the Respondents		
Female	10	7.4
Male	125	92.6
Total	135	100
Marital Status		
Married	127	94.1
Divorced	2	1.5
Widower	6	4.4
Single	0	0
Total	135	100
Educational Status		
No formal education	51	37.8
Adult education (out of school)	10	7.4
Quranic education	35	25.9
Primary education	24	17.8
Secondary education	4	3
Tertiary education	11	8.1
Total	135	100

Source: Field survey, 2012

this section is based on the discussion of the occupational characteristics of the farmers. Details of such characteristics including the place of farming as a source of income, mode of land acquisition, source of capital for farming, farm size, number of farm plots and contact with extension agents are presented in table 2.

About two thirds of the respondents have farming as their primary occupation. Only 35% of the farmers have full ownership titles by having purchased their farmland. The ownership structure is important as farmers may not be willing to expend effort towards conservation practices on land temporarily held by them. The fact that 83% of the respondents rely on their meager personal savings may have implications for the adoption of agricultural practices that are financially demanding. Mean size of farmland under cultivation was 2 ha. Some agricultural practices such as fallowing are known to require more land area. Inadequate land area may therefore pose a problem in the adoption of such practices. An abysmally poor level of extension contact was recorded among the respondents with only 6.7% of them having extension contact. Thus the use of the sustainable practices might have been affected negatively due to low level of enlightenment on the need for farmers to adopt them by the extension agents.

Cropping patterns among respondents

Certain management practices are dependent on the type of cropping systems adopted by the farmers. This is based on the diversity of cropping potentials in the country at large and the study area in particular. Table 3 therefore presents the distribution of the respondents according to their cropping systems.

The most common cropping pattern among the respondents is the maize/cassava mixture. Table 3 reveals that 19.1% of the respondents followed maize/ cassava intercropping on

Table 2: Distribution of respondents according to occupational characteristics.

Characteristics	Frequency	Percentage
Farming as primary occupation		
Yes	89	65.9
No	46	34.1
Total	135	100
Mode of land Acquisition		
Borrowed	7	5.2
Inherited	63	46.7
Communal	17	12.6
Purchased	48	35.6
Total	135	100
Sources of capital		
Credit	11	8.1
Internal source (friends & family)	12	8.9
Personal saving	112	83
Total	135	100
Farm size (Ha.)		
<2	76	56.3
2-2.99	19	14.1
3-3.99	20	14.8
>3.99	20	14.8
Total	135	100
Contact with Extension Agent		
Yes	9	6.7
No	126	93.3
Total	135	100
vi. No of Farm Plots		
1	47	34.8
>1	88	65.2
Total	135	100

Source: Field survey, 2012

21.87% of the entire farm land. Further analyses revealed that half of the respondents (48.60%) adopted cereal-based cropping systems comprising maize/cassava and maize/melon intercropping as well as maize and, sorghum mono-cropping which cover about half of the entire farm land (51.48%). Furthermore, heavy nutrient drawers such as cereals (maize, sorghum) and tubers (cassava and yam) planted either individually or in various combinations were planted on 58% of the entire farm land by about 3/5 of the farmers (59%). This is in sharp contrast with the cultivation of legumes with only 27.7% of the respondents growing leguminous soil conservation crops (soya beans and melon) on about 24% of the total land area. While the food needs of the farmers is very important in dictating the cropping system adopted, it is also possible that the farmers were not properly informed about the importance of legumes in nutrients fixation as well as their cover cropping characteristics which are beneficial in soil conservation.

Agricultural land management practices adopted by respondents

Various agricultural practices adopted by the farmers which have effects on agricultural sustainability including mulching, use of cover crops, crop rotation with or without legumes, irrigation, composting, use of organic manure, and fertilizer application are presented in table 4.

As shown in table 4, about half of the respondents (48.6%) engaged a minimum of three management practices. Crop rotation was the major single crop management practice adopted by all (100%) of the farmers. On the other hand, irrigation was the least adopted agricultural practice with only 29.3% of the respondents involved in it. This may be connected to the high cost of irrigation. As a sole management practice, crop rotation alone was adopted by 22.2%

Table 3: Cropping patterns among respondents.

Cropping System	Frequency	Percent	Farm Size (ha)	% Farm Size
Maize/ Cassava	53	19.1	67.2	21.87
Maize/ Melon	32	11.5	37	12.04
Cassava	39	14	39	12.69
Maize	34	12.2	36.5	11.88
Soya Beans	31	11.2	26	8.46
Yam	22	7.9	18	5.86
Sorghum	16	5.8	17.5	5.69
Cassava/ Soya beans	14	5	10.5	3.42
Others	37	13.3	55.6	18.09
Total	278	100	307.3	100

R^2=0/82 D.W=2.02

of the farmers. Further analysis however revealed that only 31.20% of the respondents practice crop rotation with legumes. This implies that the majority of the respondents wrongly applies crop rotation with non leguminous plants. The majority of the respondents (52.40%) apply inorganic fertilizer in production while only 16.80% use organic manure and/or composting. Further analysis of the data revealed that only 5.40% (1.6+1.9+1.9) of the respondents apply both inorganic fertilizer and compost or organic manure(The implication is that while it is desirable to apply various management practices, about 94.60% of the respondents who did not include both inorganic and organic fertilizers in their management practices can be said not to apply sustainable land management practices in production. This is because use of both inorganic and organic manure constitute what is generally termed integrated land management system.

Effects of selected socio-economic factors on usage of soil management practices among respondents

This section presents the effect of selected socio-economic characteristics on soil manage-

Table 4: Distribution of respondents according to agricultural land practices adopted.

Management Practices	Frequency	Percentage
Mulching, fertilizer, cover crops, crop rotation	6	1.9
Mulching, cover crops, crop rotation	5	1.6
Mulching, cover crops, crop rotation with legumes	1	0.3
Mulching, crop rotation	13	4.1
Mulching, crop rotation with legumes	3	0.9
Cover crops, crop rotation, crop rotation with legumes	12	3.8
Cover crops, crop rotation, irrigation	2	0.6
Crop rotation	70	22.2
Cover crops, crop rotation, composting	1	0.3
crop rotation, crop rotation with legumes, organic manure	15	4.7
crop rotation, organic manure	5	1.6
crop rotation, organic manure, irrigation	10	3.2
crop rotation, composting, irrigation	5	1.6
crop rotation, irrigation	14	4.4
Fertilizer, cover crops, crop rotation	14	4.4
Fertilizer, crop rotation	57	18
Fertilizer, crop rotation, crop rotation with legumes, composting	5	1.6
Fertilizer, crop rotation, crop rotation with legumes, irrigation	42	13.3
Fertilizer, crop rotation, composting, irrigation	6	1.9
Fertilizer, crop rotation, irrigation	15	4.7
Fertilizer, crop rotation with legumes, composting, irrigation	6	1.9
Fertilizer, crop rotation with legumes, irrigation	9	2.8
Total	316	100

Source: Field survey, 2012

Table 6: Distribution of respondents according to constraints faced in the adoption of sustainable agricultural practices.

Constraints to Use of Sustainable Practices	Frequency of Respondents Based on Perception					Likert Mean Score	Rank
	Very Severe	Severe	Less Severe	Not Severe	Total		
Inadequate Supply of Fertilizer	96	24	9	5	134	3.57	1
Non-availability of Labour	62	63	9	0	134	3.4	2
Non-availability of Credit	57	70	9	0	134	3.4	2
Inadequate Knowledge of Modern Technique	70	45	19	0	134	3.38	3
High Labour Cost	54	73	4	3	134	3.32	4
Transportation Problems	29	76	24	5	134	2.96	5
High Cost of Irrigation Water	28	79	19	8	134	2.95	6
Low Produce Price	40	44	50	0	134	2.93	7
High Cost of Soil Management	17	67	49	1	134	2.75	8
Inadequate Improved Variety of Seed/Planting Material	20	53	52	9	134	2.63	9
Insufficient Land Availability	20	12	47	55	134	1.98	10
Insufficient Extension Services	18	14	22	80	134	1.78	11

Source: Field survey, 2012

ment practices among the respondents. Table 5 shows the result of the binary logistic regression to determine the socio-economic factors that affects the adoption of soil management practices among the respondents.

The results presented in table 5 show that 51.2%, 32.70%, 15.60%, 55.40% and 39.8% of variation in the use of crop rotation, cover cropping, bush fallow, mulching and use of fertilizer respectively were explained by the independent variables as implied by their pseudo R-square (R^2) values. The variables that had significant effects on usage of the soil management practices are farm size, age, education, number of contacts with extension agents, number of farm plots, and household size of respondents.

Farm size positively influenced the use of mulching at 1% level of significance implying that respondents with large farm size had higher probability of making use of mulching. While farm size negatively influenced the use of crop rotation at 10% level of significance which implies that as farm size decreases the farmers may likely increase the use of crop rotation.

The age of the household head was positive and significant at 10% probability level for the use of crop rotation, while the situation was different for the use of mulching which was negatively influenced by age of the household head at 5% probability level. This implies that an increase in the age of the household head will likely increase the use of crop rotation. Hence while the older

Table 5: Effects of socioeconomic factors on adoption of soil management practices.

Variables	Soil Management Practices				
	Crop rotation	Cover Cropping	Bush Fallow	Mulching	Use of Fertilizer
Farm size (X_1)	-0.398***	0.251	-0.012	0.727*	0.069
Age (X_2)	0.05***	-0.024	-0.001	0.20**	-0.0065
Education (X_3)	0.103	0.034	0.001	0.089	0.150**
Contacts with Extension Agents (X_4)	-0.649*	-0.288*	-0.33*	0.569*	0.321**
Number of Farm Plots (X_5)	-1.675*	-1.358**	-0.567	2.612*	-0.58
Household size (X_6)	-0.219***	-0.078	-0.021	0.134***	0.086
Constant	4.569	2.787	-0.356	-4.869	-1.546
R^2	0.512	0.327	0.156	0.554	0.398

Source: Data Analysis, 2012.

* P ≤ 0.01; ** P ≤ 0.05; *** P ≤ 0.1

Note: Logistic regression could not be computed for irrigation, composting and organic manure because there were very few respondents who adopted them in the syudy and were therefore eliminated in the regression.

and more experienced farmers will likely adopt crop rotation, the younger farmers will likely prefer to use mulching. This may be as a result of the fact that younger farmers are more innovative and better adopters than older farmers. Besides, preference for such practice may be due to the fact that it will reduce drudgery associated with highly labour intensive practices.

The educational level of the farmers also positively influenced the use of fertilizer by the farmers. This was found to be significant at 5% level of significance. The more educated the farmers are, the higher their likelihood for the use fertilizer.

While the coefficient of number of contacts with extension agents was negative for crop rotation, cover cropping and bush fallow, it was positive for mulching and the use of fertilizer. This implies that the use of Mulching practice and use of fertilizer will likely increase as the number of contacts with extension agents increases. On the other hand, as the farmers contact with extension workers reduce the farmers' probability of using crop rotation, cover cropping, bush fallow will likely increase. This implies that the farmers will likely rely more on their indigenuos knowledge and practices with reduced level of extension contact.

The number of farm plots cultivated positively influenced the use of mulching. As such, farmers will likely use more of mulching as their farm plots increase in number. This may be due to increased labour requirements in higher number of farm plots which the farmers may not be able to afford. Crop rotation and cover cropping practices were however negatively influenced by the number of farm plots. This indicates that the use of crop rotation and cover cropping is likely to reduce with increase in number of farm plots. Similar findings have been reported by (Aromolaran, 1998).

Constraints faced by farmers in the adoption of sustainable agricultural practices

Farmers are often faced with various challenges in the use of sustainable practices in crop production. An assessment of the constraints faced by the farmers is presented in table 6.

Inadequate supply of fertilizer, with a mean score of 3.57 was reported as the most severe constraint. 89.5% of the respondents identified with this constraint. This often results in low level of application due to inadequate access to fertilizer among the farmers. Other problems considered to be severe are inadequacy of credit and labour (both with mean scores of 3.4); inadequate knowledge of improved methods and high cost of labour were also rated high with average scores of 3.38 and 3.32 respectively. The inadequate knowledge of improved methods may be a result of the poor level of extension contact as earlirer reported. Other constraints included cost of transportation, high cost of adoption, low produce price and poor transportation. Poor transportation may be fingered in a number of other constraints particularly those involving high costs. The low produce price reported may make it difficult for the farmers to afford the various costs associated with sustainable agricultural practices. Contrary to expectation, the least severe problem reported by the respondents was insufficient extension service. Even though, the negative impact of inadequate extension contact is already implied in inadequate knowledge of improved method of land management, response by the farmers may suggest the fact that farmers have not had the opportunity to appreciate the need for extension service in improved and sustainable agricultural production.

CONCLUSION AND RECOMMENDATIONS

The study assessed sustainable agricultural practices in food crop production among small scale farmers in Kwara State, Nigeria. Findings from the study revealed that while farmers engaged in a number of sustainable agricultural practices, the majority who constitute about 95% of the farmers do not apply sustainable practices in food crops production (see above). In order to improve on this situation, this study makes the following recommendations based on its findings:

1- There is the need for better information on the need for complementary use of organic manure and inorganic fertilizer in food crop production among farmers in Kwara State, Nigeria;

2- Increased extension contact is of paramount importance for small scale crop farmers with specific emphasis on sustainable agricultural practices. This may call for a stakeholder conference, including farmers, on the appropriate land management practices that would suit their cropping systems. Besides, there may be the need for regular joint traiing programmes for the farmers on relevant agricultural land management practices;

3- Farmers should make concerted efforts to avail themselves of training opportunities on appropriate use of farm input especially farm land for optimum production that would take account of costs of adoption of the various land management practices adopted by the farmers. Such training programmes should be used as a springboard for updating the knowledge of the of young farmers on appropriate land management practices for their cropping systems;

4- Agriculture should be accorded more priority in youth empowerment scheme of the Kwara State government. This is with a view to encouraging the youth to taking better interest in agricultural food crops production using sustainable practices; and

5- Land fragmentation which often results from high number of farm plots operated by the farmers should be curtailed. This therefore calls for consolidation of land holdings among the farmers which may be achieved through rejuvenation of farmers' cooperatives and other farmers' associations.

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