EFFECTS OF INVOLVEMENT IN SUSTAINABLE AGRONOMIC PRACTICES ON FOOD SECURITY OF RURAL HOUSEHOLDS IN OBAFEMI-OWODE LOCAL GOVERNMENT AREA, OGUN STATE, NIGERIA

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ABSTRACT
The subsistence nature of farming among rural households is likely to put them at risk of losing access to food during the lean season, however, sustainable agronomic practices (SAPs) is expected to guarantee adequate supply of food all year round. This study assessed the effect of involvement in SAPs on food security of rural households in Obafemi Owode Local Government Area, Ogun State, Nigeria. The study used multistage sampling procedure to collect data on socioeconomic characteristics, awareness on SAPs, involvement in SAPs, and food security status from 117 household heads. Data were analysed using frequency, percentage, mean, multiple regression, Chi-square, and PPMC. Results revealed mean age of 46±7.5 years, majority (76.1%) of the households were male headed; majority (92.3%) had formal education and the average household size was 5.0 persons. Overall awareness level on SAPs was low (56.4%), crop rotation with mean value of 0.62 was the most practiced SAPs, however, the overall involvement of respondents in SAPs was low (57.3%), and about half (50.4%) of the respondents were food insecure in the study area. Practice of mulching and composting (β = -0.22), and erosion control by terrace (β = -0.18) could have effects on household food insecurity. There was significant relationship between level of education and occurrence of household food insecurity (x^2 = 9.487). Therefore, level of education, improved practice of mulching, composting, and erosion control by terrace would enhance household food security. Hence, it is recommended that more awareness and training be facilitated on mulching, composting and erosion control by terrace to increase farmers' involvement and guarantee food security.

Keywords: Food insecurity, Involvement in sustainable agronomic practices, effects, rural household**.**

INTRODUCTION

Food security is a situation that exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet the dietary needs and food preferences for an active and healthy life (Food and Agriculture Organisation (FAO), 2001). Danladi and Ojo (2018) reported that the concept of household food security is multidimensional. It integrates food stability, access, and availability of nutritionally adequate food for utilisation.

Most of the world food insecure countries are in Africa and many of these countries face severe poverty and hunger. Even in the continent, sub-Saharan African countries had highest prevalence in hunger, malnutrition and famine due to subsistence nature of agriculture, economic and political instability, and high population growth rate among others (Babatunde *et al*., 2007).

Much of the food in Asia and Africa is produced by smallholder farmers (FAO, 2014). However, smallholder farmers are the most affected by food insecurity (Barrett, 2010; World Bank, 2007). As reported by Amaza (2018), the most vulnerable group in Nigeria are the rural smallholder farmers, especially women and children in the marginal areas who do not have access to adequate quality of food they want.

In Nigeria, more than 65 per cent of the Nigerian population is said to be food insecure (Osagie, 2013). This assertion is in line with the report of FAO (2016), which posited that approximately 70% of the Nigerian population lives below poverty line, with resultant effect on food access.

Rural farmers' involvement in sustainable agronomic practices (SAPs) and diversifying agricultural production should expectedly guarantee adequate supply of nutritious food for a year round. Sibhatu and Qaim (2017) posited that it is well known that smallholder households typically consume a sizeable part of what they produce at home. However, increasing production diversity on smallholder farms through introduction of additional crop and livestock species can improve smallholder diets and nutrition through the subsistence pathway. The promotion and adoption of sustainable farm practices and improved agricultural technologies therefore offers an opportunity to increase production and income substantially, thereby reduce food insecurity (Nata *et al.,* 2014).

The subsistence nature of farming among rural households tend to make them unable to generate sufficient income and also put them at risk of losing access to food during the lean or off season. There exists a generally held notion that rural households have both physical and economic access to adequate food during the farming season. However, how much access they have to adequate food during lean or off season is not yet established.

Owing to depletion of household and market food stocks, increase in prices of staple

during lean or off season, the need to harp on potentials of SAPs in relation to rural household food access becomes imperative.

Specifically, the objectives are to:

1. determine rural households level of awareness about sustainable agronomic practices;
2. evaluate rural households level of involvement in sustainable agronomic practices;
3. assess the occurrence of household food insecurity; and
4. determine the effect of involvement in sustainable agronomic practices on food insecurity.

The hypothesis of the study is: There is no significant relationship between personal characteristics of respondents and food security status.

METHODOLOGY

This study was carried out in Obafemi Owode local government area, Ogun state with Owode town as its headquarters. The local government covers an area of 1,410 Km^2 with an estimated population of 228,851 people as at the 2006 census. The local government is administratively divided into twelve wards. The local government is located in Ogun Central Senatorial District, which borders Odeda local government and Oyo state to the North, Sagamu and Ikenne local government to the East, Ifo local government and Lagos state to the South (Thomas and Fadipe, 2018).

Multistage sampling procedure was used in selecting respondents. The first stage involved random selection of four wards from the twelve wards in the study area. Second stage involved the use of snowball sampling technique to identify two hundred and sixty household heads involved in farming. Finally, 45% of the identified household heads was randomly selected to give a sample size of 117 respondents. Questionnaire was used to elicit information from the farming households for the purpose of this study.

The degree of occurrence of household food insecurity was measured using Household Food Insecurity Access Scale (HFIAS) score. HFIAS score is a continuous measure of the degree of food insecurity in the household in the past four weeks (30 days). Nine frequency of occurrence questions were presented to the respondents. For these questions, no occurrence was assigned 0, rarely was assigned 1, sometimes was assigned 2, and often was assigned score of 3. The maximum score for a household was 27, while the minimum score was 0. Consequently, the average score (8.33) was used to categorize respondents into food secure and food insecure. Above the average score indicates food insecure household.

Descriptive statistics was used to analyse and present the variables in form of frequency, percentage, mean and standard deviation, while inferential statistics was used to test the hypotheses of this study. Multiple regression was used to analyse the effect of each of the sustainable agronomic practices on food security status. The regression model is stated below as:

$Y= a + b_1X_1 + b_2X_2 + ,\ldots,+ b_nX_n + e$

Where:

Y = the dependent variable (Household food security)

a = the coefficient of the constant term

B = (Beta coefficient) the coefficient of the independent variables

e = error term

X = the independent variables

X_1 = Crop rotation (Involved = 1, Not involved = 0)

X_2 = Mulching and composting (Involved = 1, Not involved = 0)

X_3 = Cover cropping (Involved = 1, Not involved = 0)

X_4 = Manure management (Involved = 1, Not involved = 0)

X_5 = Efficient use of fertiliser (Involved = 1, Not involved = 0)

X_6 = Agroforestry (Involved = 1, Not involved = 0)

X_7 = Integrated pest management (Involved = 1, Not involved = 0)

X_8 = Improved livestock management (Involved = 1, Not involved = 0)

X_9 = Diversion ditches and drainage channels (Involved = 1, Not involved = 0)

X_{10} = Irrigation (Involved = 1, Not involved = 0)

X_{11} = Water storage in the soil to increase soil moisture (Involved = 1, Not involved = 0)

X_{12} = Erosion control by terrace (Involved = 1, Not involved = 0)

RESULTS AND DISCUSSION

Personal characteristics of respondents

Result on Table 1 shows that, the mean age of respondents was 46.1 years, with more than half (53.0%) being between age 41-49 years. This suggests that household heads in the study area are adults in their active age, full of energy and with potentials that could be put to use in agriculture which is crucial in ensuring food security.

Similarly, Table 1 reveals that majority (76.1%) of the household heads in the study area were male. The result further shows that majority (86.3%) of the respondents were married. This suggests that household heads in the study area are likely to face expenditure burden on food items which may affect household food security as a

result of having additional member to feed and it further suggests marital equilibrium in the study area.

Result in Table 1 further shows that respondents' household size range between 2 to 9 household members, with average household size of 5 persons, while majority (75.2%) had 2-5 household members. This implies availability of farm labour and in contrast, large household size could lead to increase in household food consumption and consequently affect family expenditure. In a similar vein, the result shows that majority (92.3%) had formal education. This indicates a relatively high literacy level which could make the respondents receptive and comprehend improved agricultural practices and in turn translate to household food security.

Result on Table 1 reveals that most (76.9%) of the respondents engaged in agriculture as primary occupation. This implies that respondents rely on agriculture as an important economic activity in the study area. In addition, majority (76.1%) of the respondents belong to one or more agricultural associations. This suggests that information on improved agricultural practices to enhance food availability and access can be easily diffused in the study area.

The result on Table 1 further shows average farm size of 3.7acres, with majority (76.9%) cultivating between 1-4 acres, while others cultivated more than 4 acres of farm land. This suggests predominant practice of subsistence farming in the study area.

Table 1: Distribution of respondents by personal characteristics (N= 117)

Variables		Frequency	Percentage	Mean	SD
Age	≤40	26	22.2	46.1	7.5
	41-49	62	53.0		
	50-58	23	19.7		
	≥59	6	5.1		
Sex	Male	89	76.1		
	Female	28	23.9		
Marital status	Single	3	2.6		
	Married	101	86.3		
	Divorced	8	6.8		
	Widowed	5	4.3		
Household size	2-5	88	75.2	4.6	1.3
	6-9	29	24.8		
Level of education	No formal education	9	7.7		
	Primary education	35	29.9		
	Secondary education	57	48.7		
	Tertiary education	16	13.7		
Primary occupation	Farming	90	76.9		
	Trading	11	9.4		
	Civil servant	5	4.3		
	Artisan	11	9.4		
Secondary occupation	Not applicable	54	46.2		
	Farming	20	17.1		
	Trading	31	26.5		
	Artisan	12	10.3		
Years of farming experience	5-14	59	50.4	15	6.9
	15-24	57	4.2		
	≥25	11	9.4		
Estimated monthly income (₦)	< 50000	42	35.9	56965.8	19047.1
	50000 -100000	74	63.2		
	>100000	1	0.9		
Member of association	Yes	89	76.1		
	No	28	23.9		
Farm size (Acres)	1-4	90	76.9	3.7	1.2
	>4	27	23.1		

SD: Standard Deviation
Source, Field survey (2018)

Awareness of respondents on sustainable agronomic practices

From Table 2, the mean score shows that respondents were more aware of irrigation (0.98), followed by crop rotation (0.74); as well as diversion ditches and drainage channels (0.68). This shows that respondents have information that would enhance their skills in soil and water management and subsequently lower water demand. This agrees with Singh and Grover (2013), who posited that in sustaining agriculture to enhance provision of food, it is the responsibility of extension agents to disseminate best practices and innovation.

Table 2: Distribution of respondents based on awareness of sustainable agronomic practices (N= 117)

Sustainable agricultural practices	Mean	Rank
Crop rotation	0.74	2nd
Mulching and composting	0.41	7th
Cover cropping	0.39	8th
Manure management	0.48	5th
Efficient use of fertiliser	0.48	5th
Agroforestry	0.57	4th
Integrated pest management	0.35	11th
Improved livestock management	0.37	10th
Diversion ditches and drainage channels	0.68	3rd
Irrigation	0.98	1st
Storing water in reservoir to allow it sink into the soil and increase soil moisture	0.30	12th
Erosion control by terrace	0.38	9th

*Multiple responses
Source: Field survey, 2018

Respondents' involvement in sustainable agronomic practices

Using the mean score to rank the order which respondents were involved in SAPs, Table 3 shows that crop rotation was practiced more (0.62), followed by practice of diversion ditches and drainage channels (0.41) than other sustainable agronomic practices.

Overall, Table 4 reveals that more than half (57.3%) of the respondents reported low level of involvement in SAPs in the study area. This implies that the low level of involvement in SAPs was due to inadequate information and knowledge of sustainable agricultural initiatives. This is in agreement with Okoba and De Graff (2005) who posited that farmers' lack of knowledge of soil management is one of the reasons for the low practice of SAPs.

Table3: Distribution of respondents based on involvement in sustainable agronomic practices (N= 117)

Sustainable agricultural practices	Mean	Rank
Crop rotation	0.62	1st
Mulching and composting	0.39	3rd
Cover cropping	0.28	11th
Manure management	0.29	10th
Efficient use of fertiliser	0.39	3rd
Agroforestry	0.33	7th
Integrated pest management	0.37	6th
Improved livestock management	0.39	3rd
Diversion ditches and drainage channels	0.41	2nd
Irrigation	0.30	9th
Storing water in reservoir to allow it sink into the soil and increase soil moisture	0.34	8th
Erosion control by terrace	0.16	12th

Source: Field survey, 2018

Table 4: Categorization of respondents' level of involvement in sustainable agronomic practices (N= 117)

Level of involvement	Frequency	Percentage
Low level (below mean)	67	57.3
High level (mean and above)	50	42.7

Source: Field survey, 2018mean = 4.29

Occurrence of household food insecurity

Considering occurrence of food insecurity in the study area, the mean score was used to show the degree of occurrence. Table 5 reveals that respondents had worry that their household members would not have enough food to eat, and household member(s) had to eat smaller meal than they felt needed (1.39), followed by household members not able to eat the kind of food preferred due to lack of resources (1.06).

Consequently, Table 6 shows that slightly more than half (50.4%) of the households were food insecure. Thus, it can be inferred that although the gap between food secure and insecure households is close, there is occurrence of food insecurity in the study area. This suggests that if adequate information on sustainable agricultural practices is disseminated, and more farming households are involved in the practice of sustainable agriculture, occurrence of food insecurity may reduce. This corroborates Nata *et al.* (2014) who posited that promotion and adoption of sustainable farm practices offers an opportunity to improve productivity and income substantially, and reduce food insecurity.

Table 5: Distribution of respondents' degree of occurrence of household food insecurity access (N=117)

Food insecurity access statements	No occurrence	Rarely	Sometimes	Often	Mean	Rank
Anxiety and uncertainty about the household food supply						
In the past four weeks, did you worry that your household would not have enough food?	34.2	11.1	35.9	18.8	1.39	1st
Insufficient Quality (includes variety and preferences of the type of food)						
In the past four weeks, were you or any household member not able to eat the kinds of foods you preferred because of a lack of resources?	41.0	14.5	41.9	2.6	1.06	3rd
In the past four weeks, did you or any household member have to eat a limited variety of foods due to a lack of resources?	48.7	11.1	35.9	4.3	0.96	6th
In the past four weeks, did you or any household member have to eat some foods that you really did not want to eat because of a lack of resources to obtain other types of food?	44.4	17.1	30.8	7.7	1.02	5th
Insufficient food intake and its physical consequence						
In the past four weeks, did you or any household member have to eat a smaller meal than you felt you needed because there was not enough food?	39.3	10.3	23.1	27.4	1.39	1st
In the past four weeks, did you or any other household member have to eat fewer meals in a day because there was not enough food?	47.	14.5	24.8	12.8	1.03	4th
In the past four weeks, was there ever no food to eat of any kind in your household because of lack of resources to get food?	74.4	19.7	5.1	0.9	0.32	8th
In the past four weeks, did you or any household member go to sleep at night hungry because there was not enough food?	44.4	27.4	23.9	4.3	0.88	7th
In the past four weeks, did you or any household member go a whole day and night without eating anything because there was not enough food?	82.1	9.4	6.0	2.6	0.29	9th

Source: Field survey, 2018

Table 6: Categorization of respondents' household food security status (N= 117)

Food security status	Frequency	Percentage
Food secure(below mean)	58	49.6
Food insecure(above mean)	59	50.4

Mean = 8.33

Source: Field survey, 2018

Effects of sustainable agronomic practices on respondents' food security status

Table 7 shows that practice of mulching, and erosion control by terrace could enhance household food security at ($p \leq 0.05$ and $p < 0.10$) respectively. These accounted for 46% variation in food security in the study area. The negative value of mulching (β = -0.22), and erosion control by terrace (β = -0.18) respectively suggests that the less the practice of these sustainable agronomic practices, the more the household food insecurity. This is in agreement with Olarinre*et al.* (2019) who posited that the more farmers engaged in sustainable agricultural practices, the less food insecure they become.

Table 7: Regression analysis of effect of sustainable agronomic practices on household food insecurity

Variables	Beta	T	Sig (p)
Crop rotation	-0.106	-1.144	0.255
Mulching and composting	-0.223	-2.319	0.022**
Cover cropping	-0.077	-0.841	0.402
Manure management	-0.025	-0.251	0.802
Efficient use of fertiliser	-0.138	-1.442	0.152
Agroforestry	-0.057	-0.593	0.555
Integrated pest management	0.069	0.674	0.502
Improved livestock management	0.144	1.501	0.136
Diversion ditches and drainage channels	0.059	0.585	0.560
Irrigation	0.094	0.969	0.335
Storing water in reservoir to allow it sink into the soil and increase soil moisture	-0.153	-1.591	0.115
Erosion control by terrace	-0.181	-1.914	0.058*

**Significant at ≤ 0.05 level, *Significant at < 0.10 level. R^2 = 0.144Adjusted R = 0.046

Relationship between personal characteristics and household food security

The result on Table 8 shows significant relationship between respondents' level of education and household food security (x^2 = 9.487). This implies that education could make farmers receptive to agricultural initiatives which in turn improve productivity if practiced and enhance household food security.

Table 8: Chi-square analysis between selected personal characteristics and food security

Variable	N	χ^2-value	df	p-value
Sex	117	0.146	1	0.703
Marital status	117	2.214	3	0.503
Level of education	117	9.487	3	0.023**

**Significant at p<0.05

CONCLUSION AND RECOMMENDATIONS

The study concluded that the rural households had low awareness of sustainable agricultural practices. There was also low involvement in sustainable agricultural practices. However, the practices of mulching and erosion control could enhance household food security. The study thus, recommend that more awareness on sustainable agriculture should be created, this could increase the practice of sustainable farming in the rural areas and consequently improve household food availability, access and utilisation. In addition, awareness and training should be facilitated on mulching, composting and erosion control by terrace to enhance food security in the study area.

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