Effects of Climate Smart Farming Practices (CSFP) on Food Security Status among Rural Farming Households in Ogun State, Nigeria

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ABSTRACT

Issues of climate change and it impact on agriculture informed the paradigm of Climate Smart Farming Practices (CSFP) and its effects on food security status among rural farming households in Ogun State, Nigeria. Primary data were used with structured questionnaire and interview through a multistage sampling procedure to select 120 household heads. Data were analyzed using frequency distribution, mean and percentages, Household Food Consumption Score (HFCS), and regression analysis. Results show that the mean age of the respondents was 41 years and about 33.3% had Tertiary Education. Most adopted Climate Smart Farming Practices adopted (29.2%) by the respondents was irrigation application in the study area. In this case, irrigation had the highest support with. Findings show that household food security status show a composite score along the borderline of diets hence, households' food consumption is at acceptable level and sufficient in the study area. Regression result show that revenue obtained from farming system is positively related with percentage contribution to the household welfare. Household participation in CSFP better predict the extent in which household is positively affected with their food security status. In conclusion, adequate food diet is needed but the extent at which CSFP adopted is low by households in the study area. It is therefore recommended that farmers should be encouraged to join one or more farmer social groups, which would expose them to agricultural innovations such as the use of CSFPs among many others.

Keywords: climate smart farming, practices, household, food security

INTRODUCTION

Food insecurity has been one of the major challenges in Nigeria in this 21st century. This situation is due to the little importance that is being attached to the nation's agricultural system in the past years because of the oil boom in Nigeria. Nigeria source their food from the importation of certain food product they need with little exportation of local product until recently where attention is being switched to encouraging in Nigeria through certain measure such as closing of boarder.

Although, no nation can produce everything its people need hence, countries engage in international trade. However, reducing importation of certain food items like rice if not total banning becomes sacrosanct (Umunna, 2023).

According to Ani and Anyika, (2021)), stated that climatic change is one of the major factor responsible for this low production which causes poverty and food insecurity among rural farming household. To solve this problem, it is necessary to train the farmers on how to adapt to this climatic change. The effect of climate may be very challenging as it has been observed by Wossen, *et al.* (2022) who stated that deprived populace in developing countries are likely to face the influence of climate change with cost on household projected that surpass billions of dollars in many nations. The effect of climate change such as desertification, landslides, droughts, and flooding will not only decrease agriculture farm products but also but also expose farmers to food insecurity. In this wise, it is necessary to devise a policy that will help farmers to be able to cope with the climatic changes to increase the farm production. To overcome the negative effect of climatic condition as identified above certain strategies have been suggested and this include community-based adaptation and awareness, training and integration of climate change adaptation as well as climate smart farming practices.

Recently, emphasis has been on Climate Smart Farming Practices **(**CSFP) as a suitable method that may meet up with subsequent daily population increase. According to Imran *et al*. (2018), CSFP that sustainably increase agricultural productivity, income, adapt and build resilience to climate change, eliminate or reduce greenhouse gas emission or adapt to changing climate, which heightens the accomplishment of national food security and developmental goals which include poverty reduction. Also, Pareek *et al.* (2020) stated that agriculture is measured to be climate smart when it achieves three key objectives which are: building resilience to climate alteration, reduction of greenhouse gas emission and sustainable increase in agricultural productivity. Sadly, the current situation revealed that Nigeria suffers from numerous environmental problems which have been directly associated with the ongoing climate change (Raimi *et al*., 2021).

The issue of climate change such as uneven rain distribution causing floods, continuous increase in temperature, severe drought etc. determines the pattern of vegetation, type and yield of crops and animals as well as the cropping season, has affected the production and thereby limit the capacity of agriculture to play its major role as supplier of food. The consequences of this climate change have been identified as a major threat to livelihood of rural household production and their well-being. Hence, the study examines CSFP and its effect on food security status among rural farming household in Ogun State.

Therefore, the specific objectives were to describe the socioeconomic characteristics of the rural farming households; identify the types of CSAP adopted by the rural farming household; determine the food security status of the rural farming household in the study area and determine the effect of CSAP on food security status of the household.

METHODOLOGY

This study was conducted in Ogun State of Nigeria. Ogun State located in the Southwest zone of Nigeria with a total land area of 16,409.26 square kilometres. It is situated between Latitude 6.2°N and 7.8°N and Longitude 3.0°E and 5.0°E. It has an estimated population of 3,486,683 people for the year 2005 (Soewu and Adekanola, 2011). The state has (20) local governments area and into four /agricultural zones which include Ikenne, Ilaro and Ijebu-Ode. The soil type is determined by the parent material and type of vegetation found in each region. Ogun state produces rice, corn (maize), cassava (manioc), yams, plantains, and bananas. Cocoa, kola nuts, rubber, palm oil and palm kernels, tobacco, fibre, and timber.

Data Collection and Sampling Procedure

Primary data were collected through the administration of well-structured questionnaire and interview schedule on the selected respondents. A multistage sampling procedure was employed in selecting the respondents. The first stage involved purposive selection of two local governments out of the four OGADEP zones due. The second stage involved random selection of 3 villages each from each of the local government areas. The third stage involved the selection of 20 rural farming household at random from each village, thus having 120 respondents.

Analytical Technique

Descriptive statistics such as frequency distribution, mean and the percentage were used to describe the socioeconomic characteristics of the rural household and identify the types of Climate Smart Farming Practices adopted by rural household while the Household Food Consumption Score (HFCS) was used to determine the food security status of selected farming household. Lastly, regression analysis was used to determine the effect of Climate Smart Agriculture Practices on food security status of the households.

Household Food Consumption Score

To measure food security status of the farm households, Household Food Consumption Score (HFCS) was used as proxies for food security of farmers. This tool is developed by World Food Programme(WFP) and is commonly used as proxies for access to food. HFCS is a weighted score based on dietary diversity, food frequency and the nutritional importance of food groups consumed.

The HFCS of a household is calculated by multiplying the frequency of foods consumed within 7 days with the weighting of each food group. The weighting of food groups was determined by WFP according to the nutrition density of the food group.

Regression Model

Ordinal least square regression estimate was used to determine the effect of CSFPs on food security status of the household. The ordinal least square estimate is thus expressed as;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + d_1 + d_2 + U$$

Therefore, the regression analysis is as follows;

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, D_1, D_2 \ldots\ldots\ldots\ldots\ldots\ldots U)$

Y=food security status (household food consumption score)

X_1 = Age of the household head (years), X_2 = Household size (number), X_3 = Income of household head (naira), X_4 = Labour cost (naira), X_5 = Farm size (hectares), X_6=CSFPs adopted (adoption indicators), D_1 = Marital status (dummy variable, 1= single, 2 = married), D_2 = access to credit (dummy variable, yes = 1, otherwise = 0), U = error term.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Respondents

The distribution of respondents according to socioeconomic characteristics is presented in Table 1. The mean age of the respondents was 41 years with a standard deviation of 10.959. This implies that majority of the respondents were between the middle age category 40-60 which formed the active years of the respondents and therefore, they are strong enough to engage in agricultural practices (Ojoko et al., 2016). About 33.3% had tertiary education. There is likelihood that respondents with considerable level of education can easily adopt CSAP as they can easily access information (Jalagat, 2019). Farmers with large farm sizes tend to have better access to agricultural credits as land could acts as loan collateral which in turn could influence access to new and improved technologies.

Climate Smart Farming Practices

Table 2 shows the types of Climate Smart Farming Practices adopted by the respondents in the study area. In this case, irrigation had the highest support with 29.2% of the total. Conservation Agriculture with 12.5%, Agro-Forestry with 4.2%, Planting Cover Crops with 5%, Uses of Organic Manure with 15.8%, Crop Rotation with 1.7%, Crop diversification, intercropping with 4.2%, Uses of Wetland (Fadama) with 17.5%, Mulching with 3.3%, Planting Drought and Heat Tolerant Crops with 1.7%, and Soil Conservation Techniques with 1.7%.

Table 1: Socioeconomic characteristics of the respondents

Characteristics	Frequency	Percentage (%)
Age (yrs.)		
20-29	21	17.5
30-39	27	22.5
40-60	68	56.7
>60	4	3.3
Sex		
Male	75	62.5
Female	45	37.5
Total	120	100
Marital Status		
Single	31	25.8
Married	89	74.2
Farm size (hct)		
0 -1	103	85.8
2- 4	17	14.2
Education		
No formal	10	8.3
Primary	24	20
Secondary	46	38.4
Tertiary	40	33.3
Household size		
0-4	37	30.8
5-9	76	63.3
>10	7	5.8
Other sources of income		
Yes	17	14.2
No	103	85.8
Revenue (₦)		
51,001 - 80,000	49	24.2
81,001- 100,000	21	17.6
100,001- 500,000	35	29.4
>500,000	15	11.7

Source: Field Survey, 2021

Table 2: Climate Smart Farming Practices (CSFP) adopted by the Respondents

Climate Smart farming Practices	Frequency	Percentages
Agro-Forestry	5	4.2
Planting Cover Crops	6	5.0
Uses of Organic Manure	19	15.8
Crop Rotation	2	1.7
Crop diversification	5	4.2
Intercropping	4	3.3
Uses of Wetland (Fadama)	21	17.5
Mulching	4	3.3
Planting Drought and Heat Tolerant Crops	2	1.7
Soil Conservation Techniques	2	1.7
Irrigation	35	29.2
Total	**120**	**100**

Source: Field Survey, 2021

Food Security Status of Rural Farming Households

Result in Table 3 (check appendix) present the food security status of rural farming household in Ogun State. Findings show that the diet consumed by the households has acceptable household food consumption. However, the composite score obtains from this analysis indicated in the borderline diet. For this reason, the thresholds can be raised from 21 and 35 to 28 and 42. The above table shows that consumption of oil and sugar for the overall population is higher, which serves as the FCS thresholds as follows:

Table 4: Household food consumption score

Food consumption Index	Decision
Poor Food consumption: 0-28	-
Borderline Food consumption: 28 – 42	-
Acceptable Food consumption: >42 and Above	83>42 *** Accepted.

Source: Computed from Field Survey Data, 2021

The results in table 4 show that that the farming households' food consumption is at acceptable level and sufficient in the study area.

Effect of Climate Smart Farming Practices (CSFP) on Food Security Status

Table 5 showed the model's R squared and adjusted R square as 78% and 76% respectively. This implies that the independent variables explained the model. Five out of eight variables are significant. These are household size, income of household, farm size, CSFPs adopted and access to credit, in which all had a significant and showed positive relationship with overall food security status among the households (Table 3). This indicate that the relative risk ratio for a one-unit increase in any of these variables will lead to an increment in the output of overall percentage contribution of CSFPs to determine the evidence for appropriate prediction of the effect of CSFPs on food security status of rural household in the area of study. Furthermore, for proper prediction of the model presented here in, it could be observed that the regression model indicate that a unit increase in the household size of household head is associated with a 6.56 significant increase in the relative log odds of the fitness of the effect of CSFPs on food security status, for there will be limit on the expenses incurred for labour that would assist during the farming practices.

Table 5: effect of Climate Smart Farming Practices on food security status respondents

	B Coefficients	**Std. Error**	**t- Sig.**
(Constant)	96.730023	6.93700	0.335
Age of the farmers (years)	-2.5042011	0.53910	-0.125
Household size (number)	6.560023	2.23622	0.036**
Household Income (Naira)	16.36204	3.86003	0.032**
Labour Cost (naira)	1.032097	1.25511	0.128
Farm size (hectares)	9.517430	0.42936	0.017**
CSAPs adopted	5.0420945	2.65732	0.008**
Marital Status	0.13622	0.00672	0.152
Access to Credit	9.652100	2.56300	0.034**

Source: Computed from Field Survey Data, 2021. ****Significant at 5% (0.05) = 1.42; Prob>F= 0.009; R. Square= 0.7618; Adjusted R Square = 0.7603; Root MSE = 13.103**

Table 5 also shows that a naira increase in household income is associated with 16.63 significant increase in the relative log odds of their participation of CSFPs which will in-turn boost the socio-economic status of the household and there will be a viable significant effect on the overall food surplus that will be available in the household. More so, as revealed in the above table three (3) that income obtained from farming system is positively related with percentage contribution of income from farming system. This implies that the relative risk ratio for a one-unit increase in the variable of income from household farm business enterprise production, there is an output increment to determine the evidence to better predict the household participation in CSFP to boost up their overall food security status. More so, farm size (9.517) is high and positively related with overall percentage of farmer's household, thereby has significant impact on their food security status. The finding implies that the household food security could be determined by the adoption of CSFP in the study area. This could be associated to the fact that a larger area of farm size provides a greater opportunity for surplus production, and it is important to know that size of land is very essential because transaction costs are largely fixed costs that can be read across more output on large farms (Wudil, et al., 2023).

Additionally, other variable such as CSFPs adopted by the household revealed that with a unit increase by 5.042 and Access to credit with a unit rise by 9.65; all indicated that the output increment of each variable determines the evidence to better predict the extent in which household is effected by their participation in CSFP which automatically have positive implication on the food security status of their households. In this light, the unstandardized coefficient of B value indicated that the fitness of the effect of CSFP showed significant effect on household food security in Ogun State.

CONCLUSION AND RECOMMENDATION

The study concluded that adequate food security is needed in the area of study hence, the degree of CSFP is less adopted by the rural farming household in the study area. It is therefore recommended that farmers should be encouraged to join one or more farmer social groups, which would expose them to agricultural innovations such as the use of CSFPs among many others. Extension agents be motivated to educate and enlighten farmers on the benefits of CSFPs in agricultural production having favorable government policies that eradicate constraints militating against the usage of CSFPs in the study area such as unstable market prices, pest and disease, high cost of usage, insufficient land, inadequate farm input, insufficient information and most importantly lack of storage and processing facilities.

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