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ROLES OF EXTENSION SERVICES IN PROMOTING CLIMATE SMART AGRICULTURE IN ONA-ARA LOCAL GOVERNMENT AREA OF OYO STATE

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ABSTRACT

This study therefore **ex**amined the role of extension agent in promoting climate smart agriculture in Ona-ara Local Government Oyo State. Specifically, the study examined the roles of extension services in promoting climate smart agriculture, various climate smart agriculture available to the respondents, factors influencing the use of climate smart agriculture and constraints faced in promoting climate smart agriculture. Multistage sampling techniques was used to select 90 respondents in the study area. Data was collected using interview schedule. Descriptive analytical tools such as frequency counts, percentage were used to analyze the data results. Majority Cover crops and intercropping was the highest available climate smart agricultural practices with a percentage of 87.8%. Extension services aid the access to financial resources was ranked first (1st) as the major role of extension service in promoting climate smart agriculture with weighted mean score (WMS) of 3.2. Infrastructural facilities such as storage and processing facilities was the highest factor influencing the use of climate smart activity with a percentage of 87.8%. Inadequate government support was ranked first as the major constraints to the use of climate smart agriculture with the weighted mean score (WMS) of 3.0. Access to infrastructural facilities such as storage and processing facilities was the highest factor influencing the use of climate smart agriculture, inadequate government support, poor extension system/service and restricted access to climate smart agricultural practices were the major constraints faced by the respondents to the use of climate smart agriculture. Socio-economic variables such as age, marital status, years spent in school and sex have decisive influence on the roles of extension services in promoting climate smart agricultural practices among farmers.

Keyword: Role, Climate smart agriculture, Extension services

INTRODUCTION

Climate change is recognized as one of the greatest threats to agricultural productivity in several regions of the world (Niang *et al*., 2014). The regions most vulnerable to climate change are the developing countries, especially the African countries, which are characterized by a high level of poverty, subsistence food production and land degradation problems (Lal *et al*. 2015). This is because their economies depend to a large extent on agriculture, and they have inadequate capital for adopting and implementing adaptation measures (Willett *et al*., 2019). Climate change is a worldwide event that poses one of the most serious risks mankind has ever faced, generating floods and droughts and hurting farmers' livelihoods by influencing ecosystems, water supplies, food security, settlements, and human health (Food and Agriculture Organization of the United Nations [FAO], 2016). Climate and agriculture are strongly interrelated universal processes and thus variations in climate influence agricultural activities. Improving the accumulations of carbon dioxide (CO2) will have a lot of prospective effects on plants and may also have a lot of indirect threats on herbivores and all other food chain members. Dangerous climate conditions such as influential rainstorms, high wind pressures, and high temperatures have much influence on agricultural activities (Amin *et al*., 2015). In response to these challenges, Climate-Smart Agricultural Practices (CSAPs) have emerged as a promising approach to enhancing agricultural resilience (Adegbeye *et al*., 2020) mitigating climate risks, and improving food security outcomes (Mach, *et al*., 2019). Climate-smart agriculture (CSA) entails an agriculture that sustainably increases productivity and resilience, reduces greenhouse gases and enhances the achievement of national food security and development goals (FAO 2016). It is not a new set of practices, but rather an integrated approach to the implementation of agricultural development programme policies (Lipper *et al*. 2014). Climate smart agriculture promotes the transformation of agriculture systems and agricultural policies, in order to increase food production, enhance food security and ensure that food is affordable, hence reducing poverty while preserving the environment and ensuring resilience to a changing climate (Mnkeni and Mutengwa 2014).

Several challenges hinder the role of extension services in fostering climate smart agriculture. These include inadequate funding, limited access to technology, poor training of extension agents, and weak farmer engagement. Additionally, many extension programs focus on traditional farming methods without integrating climate adaptation strategies, leading to slow adoption of CSA practices. This study seeks to examine the role of extension services in promoting climate smart agriculture. It will explore the barriers to adoption, assess the impact of extension programmes, and identify ways to enhance their roles in equipping farmers with sustainable, climate resilient farming techniques. Understanding these challenges is crucial for improving agricultural extension services and ensuring that farmers can effectively mitigate and adapt to climate change.

Specifically, this research work described the socioeconomic characteristics of the respondents, identified the climate smart agricultural practices used by the arable crop farmers. identified the roles of extension services in promoting climate smart agriculture among the respondents, identified the various climate smart agricultural practices available to the respondents, identified the factors influencing the use of climate smart agriculture among the respondents and investigated the constraints faced in promoting climate smart agriculture among respondents in the study area.

The hypothesis for the study is stated as follows: There is no significant relationship between the selected socio-economic characteristics of the respondents and roles of extension services in promoting climate smart agriculture

RESEARCH METHODOLOGY

This study was caried out in Ona-ara Local Government Area (LGA) of Oyo State, which was created in 1989 with the administrative headquarters located in Akanran. It shares boundaries with Egbeda Local Government to the North, Oluyole to the West, Osun State to the East and Ogun State to the South. The Local Government Area covers a total land area of 425,544 square kilometers with a population density of 707 persons per square kilometer. Using a growth rate of 3.2% from 2006 population census, the 2010 estimated population figure for the (LGA) was projected to be 300,659 (NPC, 2006). There are 11 wards in the (LGA) and resident of the (LGA) are Yoruba and other tribes from various part of the country. The people are of Christianity, Islam and traditional religion background and are predominately farmers and traders. Farming population is scattered all over the various communities of Badeku, Jago, Ojoku, Ajia, Foworogun e.t.c The main products from their farming activities are Yam, Cassava, Cashew, maize, kolanut, groundnut. (Eniola *et al*., 2020). The target population of the study included both male and female arable crop farmers in Ona-Ara Local Government Area of Oyo state. Multi-stage sampling technique was used in selecting the respondents for this study. The first stage involved the random selection of 30% of the total number of wards, which amounted to the selection of four wards out of the eleven wards in the LGA. The second stage involved the random selection of two villages in each of the selected wards making a total of 8 villages. The third stage involved the selection of 12 farming households which were randomly selected from the selected villages to make a total of 90 respondents which was used for the study. Descriptive Stastitical Tools such as frequency counts, percentage and mean, were used to describe the socioeconomical characteristics of the respondents. As well as other objectives of the research work. With the use of STATA, ordered probit regression was used to test the stated hypothesis for the study.

RESULTS AND DISCUSSIONS

Socioeconomics characteristics of the respondents

Age

Table 1 reveals that 64.4% of the respondents were between the age of 31-50 years while 15.8% and 14.4% indicated they were above 50 years of age and not more than 30 years of age respectively. The mean age of the respondents was revealed to be 43.2 years, an indication that farmers in the study area are still young, energetic, and still in the productive years. Their economically active status due to their age is expected to influence their usage of climate smart agriculture due to the inquisitiveness of the youth and their zeal to make optimum profit from agricultural venture. The result is in line with the findings of Akintonde *et al.,* (2023) who revealed that the mean age of the arable farmers that utilize climate change adaptation strategies is not more than 50 years of age, which reveal their economic prowess and zeal to succeed against the negative effect of climate change.

Years spent in school
Almost half (48.9%) of the respondents indicated they spent between 7-12 years in school; 21.1% indicated they spent not more than 6 years while 18.9% and 11.1% indicated they do not have formal education and spent above 12 years in school respectively. The mean years spent in school by the respondents is revealed to be 8.7 years. This result implies that majority of the respondents are literate though with low educational background. The exposure of the respondents to education is expected to aid the roles of the extension agents to promoting climate smart agriculture in the study area, as they are likely to have the requisite knowledge to demand for clarification about the use of climate smart agriculture from the extension agent or agencies.

Sex
Majority (77.8%) of the respondents are male while 22.2% were female. This result is an indication that male dominates agricultural production though female are also major stakeholders in agriculture though with limited roles which might be as a result of their access to agricultural inputs. Males are more involve in arable farming than their female counterpart (Akintonde *et al.,* 2023)

Marital status
Majority (71.1%) of the respondents are married while 15.6% and 13.3% are widow and single respectively. The result implies that agricultural production is a profitable venture that can be practiced irrespective of the marital status of individuals. Majority being married is expected to contribute to the usage of climate smart agriculture, hence they might influence the rate at which extension agents contribute to promotion of climate smart agriculture in the study area. Married individuals are more concerned with seeking information on climate change and fending for food than singles or divorced individuals who may tend to consider their personal wellbeing alone (Yohanna, 2007).

Years of experience in farming
Table 1 further revealed that 45.6% of the respondents have accumulated between 11-20 years of experience in farming while 27.8% and 26.7% indicated they have garnered experience of not more than 10 years and above 20 years of experience in farming. The mean years of experience garnered by respondents is revealed to be 17 years, an indication that respondents in the study area have vast experience in farming, hence they are expected to be equip with climate smart agriculture and this experience is expected to influence the roles played by extension agents in promoting climate smart agriculture. Variation in years of farming experience may be due to age differences and years they venture into arable crop production (Akintonde *et al.,*2023).

Household size
Above half (51.1%) of the respondents indicated they have not more than 5 members in their household while 48.9% indicated they have above 5 members in their household. The mean household size in the study area is revealed to be 6 members. This result is an indication that respondents in the study area have a fair large household size. This is expected to influence their knowledge about climate smart agriculture as their respective household have access to various sources of information due to their large size, hence the extension agents are faced with numerous questions and enquiry from the farmers about climate smart agriculture, hence it aids the roles played by the extension agents/ agency.

Primary occupation
Above half (53.3%) of the respondents indicated farming as their primary occupation; 25.6% indicated civil service while 12.2% and 8.9% indicated they artisan and traders respectively. This result implies that respondents in the study area are engaged in various economic activities and this is expected to influence the rate at which they relate with extension agents which is expected to influence the roles played by extension agents to promote climate smart agriculture in the study area.

Secondary occupation
Majority (76.7%) of the respondents have farming as their secondary occupation while 23.3% indicated trading as their secondary occupation. This result is an indication that farming is a dominant profession in the study area, hence the need for extension agents to optimally play their role in promoting smart agriculture in the study area.

Contact with extension agents
Majority (86.7%) of the respondents indicated they have contact with extension agents while only 13.3% indicated they do not have contact with extension agents. This is an evidence that extension agents and services exist and function in the study area, hence this is expected to influence the role extension agents play in promoting climate smart agriculture in the study area.

Farm size

Almost 70.0% of the respondents indicated they cultivates between 11-20 hectares of land while 20.0% and 11.1% indicated they cultivates not more than 10 hectares and above 20 hectares of land respectively. The mean hectares of land cultivated by the respondents is revealed to be 15.1 hectares of land. This result implies that farmers in the study area are into commercial farming though not on a very large scale. Roles played by extension agents on the promotion of climate smart agriculture is expected to influence the size of farmland cultivated by farmers in the study area.

Climate smart agricultural practices available in the study area

Table 2 shows the distribution of the respondents by climate smart agricultural practices available in the study area. The results showed that majority (87.8%) of the respondents indicated planting of cover crops and intercropping as available climate smart agricultural practices while 86.7% of the respondents indicated mulching and crop rotation respectively. Furthermore, 77.8%, 68.9% and 67.8% indicated weather forecasting services, planting drought resistant crop varieties and planting early maturing crop varieties as climate smart agricultural services available to farmers in the study area respectively. This result is an indication that crop farmers in the study area are aware and make use of genetically modified seedlings for their production, an indication of their relationship with research institute which might be as a factor of their relationship with extension agents/ agencies. In addition, 47.8% and 45.6% indicated use of integrated pest management practices and contour farming respectively while 42.2% indicated rainwater harvesting as climate smart agricultural practices available to farmers in the study area. Lastly, 23.3% and 22.2% indicated agroforestry and conservation agriculture as climate smart agriculture available in the study area. The limited number of respondents that indicated the availability might be due to low access to input needed to utilize the climate smart agricultural practices.

Generally, this result implies that arable crop farmers in the study area are familiar with climate smart agriculture and this is expected to influence their use of it. The result conforms with the findings of Ayanwuyi (2013) who reported that conservation agriculture, planting of cover crops and planting of drought resistance crops as adaptation strategies available to farmers. The result also conforms with the findings of Otitoju and Enete (2014) who reported that planting of cover crops as part of adaptation strategies used by arable crop farmers.

Roles of extension services in promoting climate smart agriculture

Table 3 shows the distribution of the respondents according to the roles of extension services in promoting climate smart agriculture. Using the Weighted Mean Score (WMS), extension services aid the access to financial resources was ranked first (1st) with weighted mean score (WMS) of 3.2 while extension services aids the access to improved seeds and extension service aid the access to improved technologies were both ranked 2nd with each having a WMS of 3.1 based on the roles extension services plays in promoting climate smart agriculture to farmers in the study area. This result is an indication that extension service/agents in the study area are well and adequately informed about innovation in agriculture to curb the effect of climate change through the promotion of climate smart agriculture. Furthermore, training on the use of available climate smart agriculture was ranked 4th, an indication that extension service train farmers on the expertise use of available climate smart agriculture to achieve optimum benefit to be derived from the usage. Also, provision of demonstration farm to aid the usage of climate smart agriculture and development of policy to aid availability and accessibility of climate smart agriculture were both ranked 5th with weighted mean score of 2.7 based on the rate at which extension agents contribute to the promotion of climate smart agriculture in the study area. Lastly, dissemination of improved technologies on climate smart agriculture was ranked 7th with weighted mean score of 2.4. This result implies that extension services aid the diffusion of climate smart agriculture among the farmers in the study area. Generally, this result implies that extension services contribute their role to the promotion of climate smart agriculture among the farmers by guiding the farmers on the appropriate usage of the climate smart agriculture, provide pathways to ease accessibility and enhance their knowledge about the expertise use of the available climate smart agriculture in the study area, hence extension services plays a major role in the promotion of climate smart agriculture in the study area.

Factors influencing the use of climate smart agriculture

Table 4 shows the distribution of the respondents by factors influencing the use of climate smart agriculture. The result showed that majority (87.8%) of the respondents indicated access to infrastructural facilities such as storage and processing facilities; 75.6% indicated high awareness about climate smart agriculture and conditions of the soil; 74.4% indicated peers influence while 67.8% and 65.6% indicated access to extension services and strong attachment to traditional farming respectively as factors influencing the use of climate smart agriculture for agricultural cultivation in the study area. Also, 63.3%, 61.1% and 60.0% indicated lack of market access to climate smart products (organic products), access to weather forecasting services/information and high cost of implementation respectively as factors that influence the use of climate smart agriculture. This result is an indication that financial buoyancy, timely information and link to agricultural inputs are factors that have huge implication on the use of climate smart agriculture by farmers in the study area.

Furthermore, above half (55.6%) of the respondents indicated farm size and availability of climate smart technologies while 53.3% indicated land tenure and ownership status of land as factors influencing the use of climate smart agriculture. Lastly, 44.4% indicated inadequate access to credit source and funding as factor that influence the use of climate smart agriculture in the study area.

Generally, this result implies that farmers in the study area are well aware of climate smart agriculture and are ready to use it, though their usage is based on several factors that will bring about ease of use. This result is in line with the study of Kal and Mbanasor (2023) who reported that education, access to credit and farm size were significant factors that influence the use of climate smart agriculture by arable crop farmers.

Constraints faced in promoting climate smart agriculture

Table 5 shows the distribution of the respondents by their constraints faced in promoting climate smart agriculture. Using the generated Weighted Mean Score (WMS) for the ranking of the constraints it was revealed that inadequate government support, poor extension system/service and restricted access to climate smart agriculture inputs were ranked 1st , 2nd and 3rd with each having a weighted mean score (WMS) of 3.0, 2.5 and 2.4 respectively. Also, poor access to climate information was ranked 4th with WMS of 2.1 while insufficient training for extension agents on climate smart agriculture practices and insufficient funding for extension programme were both ranked 5th with each having a WMS of 2.0 respectively. Lastly, poor access to credit facilities and inadequate availability of climate smart agricultural inputs were ranked 7th and 8th with weighted mean score of 1.8 and 1.5 respectively.

Generally, this result is an indication that the availability of climate smart agricultural practices in the study area is met with problems which have hindered the usage of climate smart agriculture. The result conforms with the findings of Orifah *et al.,* (2021) who reported that inadequate information on weather,inadequate access to improved technology were major constraints to the utilization of adaptation strategies.

Relationship between selected socioeconomic characteristics of the respondents and roles of extension services in promoting climate smart agriculture (CSA)

Ordered probit and marginal effect regression estimate regression from the fitted model (which follows a standard normal distribution) in which the response variable is the roles of extension services in promoting climate smart agricultural practices among farmers, while the explanatory variables are the selected socioeconomics characteristics of farmers. Ordered probit regression was used to determine specific role of each independent variable in explaining the variance among the farmers. The roles of extension services in promoting climate smart agricultural practices among farmers represents the dependent variable while the independent variables regressed include age, sex, marital status, years spent in school, household size, years of farming experience, primary occupation, contact with extension agent and farm size. The coefficients of the variables are very important in discussing the results of the analyzed data. These coefficients represent the variation in the percentage change in the dependent variable (roles of extension services in promoting climate smart agricultural practices among farmers) that occurred as a result of change in independent variables in the ordered probit regression model. The estimate revealed from the pooled result in table 4.7; an LR $chi^2(9)$ of 19.62, prob> chi^2 of 0.0204 and pseudo R^2 of 0.1112.

The coefficient of age is negative and statistically significant at 5%, which suggests that the involvement of each age category in the roles of extension services in promoting climate smart agricultural practices among farmers would have a likelihood to influence roles of extension services in promoting climate smart agricultural practices among farmers by 4.0%. This result implies that irrespective of the age status of the respondents, age influenced the roles played by extension services in roles of extension services in promoting climate smart agricultural practices among farmers. Also the coefficient of marital status is negatively and statistically significant at 5%, which suggests that roles of extension services in promoting climate smart agricultural practices among farmers would have a likelihood to influence the promotion of climate smart agricultural practices by 4.1% while the coefficient of years spent in school is negatively and statistically significant at 10% which implies that the level of literacy have significant influence on the roles of extension services in promoting climate smart agricultural practices among farmers by 8.7% while the coefficient of sex is positively and statistically significant at 5% which suggests that involvement of either sex in the roles of extension services in promoting climate smart agricultural practices among farmers would have a likelihood to influence their promotion of climate smart agricultural practices by 5%.

Generally, these results implies that all the aforementioned selected socio-economic variables (age, marital status, years spent in school, sex) have decisive influence on the roles of extension services in promoting climate smart agricultural practices among farmers. Therefore, the null hypothesis stated is rejected; hence alternative hypothesis is accepted in like manner.

CONCLUSION AND RECOMMENDATION

Based on the major findings of the study, extension services aids the access to financial resources, improved technologies and improved seeds were ranked as the major roles of extension services to promoting climate smart technologies in the study area, inadequate government support, poor extension system/service and restricted access to climate smart agricultural practices were one of the most significant constraints hindering the use of climate smart agriculture. Therefore stakeholders such as government, non-governmental organization, and individuals involved in agriculture should make policies that will enhance adequate support to promote, access, and afford inputs needed for the promoting climate smart agriculture practices among farmers in the study area. Extension departments should be given priority by all stakeholders involved in agriculture, as this will aid the growth of extension services in the execution of their activities.

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Table 1 Distribution of respondents according to socioeconomic characteristics

n=90

Socioeconomic characteristics	Frequency	Percentage	Mean
Age			
(years) ≤	13	14.4	43.2
30	58	64.4	
31-50	19	21.1	
Years spent in school			
No formal education	1 7	18.9	8.7
≤ 6	1 9	21.1	
7-12	4 4	48.9	
Above 12	1 0	11.1	
Sex			
Male	70	77.8	
Female	20	22.2	
Marital status			
Single	12	13.3	
Widow	14	15.6	
Married	64	71.1	
Years of experience in			
farming ≤ 10	25	27.8	17
11-20	41	45.6	
Above 20	24	26.7	
Household size			
≤ 5	46	51.1	6
Above 5	44	48.9	
Primary occupation			
Farming	48	53.3	
Trading	8	8.9	
Artisan	11	12.2	
Civil service	23	25.6	
Secondary occupation			
Farming	69	76.7	
Trading	21	23.3	
Contact with extension			
agents Yes	78	86.7	
No	12	13.3	
Farm size (acres)			
≤ 10	18	20.0	
11-20	62	68.9	

Source: Field Survey, 2025

Table 2: Distribution of respondents according to various climate smart agriculture in the study area

*Climate smart agricultural practices	Frequency	Percentage
Mulching	78	86.7
Planting of cover crops	7 9	97.8
Rainwater harvesting	3 8	42.2
Contour farming	4 1	45.6
Planting drought-resistant crop varieties	6 2	68.9
Planting early maturing crop varieties	6 1	67.8
Agroforestry	2 1	23.2
Crop rotation	7 8	86.7
Intercropping	7 9	87.8
Use of integrated pest management practices	4 3	47.8
Conservation agriculture	2 0	22.2

Source: Field Survey, 2025 ***:** Multiple responses

Table 3: Distribution of respondents according to roles of extension services in promoting climate smart agriculture

Roles of extension services in promoting climate smart agriculture (CSA)	WMS	Rank
Training on the use of available CSA	3.0	4th
Provision of demonstration farm to aid the usage of CSA	2.7	5th
Dissemination of improved technologies on CSA	2.4	7th
Development of policy to aid availability and accessibility of CSA	2.7	5th
Extension service aid the access to improved seeds	3.1	2nd
Extension service aid the access financial resources	3.2	1st
Extension service aid the access to improved technologies	3.1	2nd

Source: Field Survey, 2025
WMS: Weighted Mean Score

Table 4: Distribution of respondents according to factors influencing the use of climate smart agriculture

Factors Influencing the use of climate smart agriculture	Frequency	Percentage
High cost of implementation	54	60.0
Inadequate access to credit source and funding	40	44.4
Lack of market access to climate-smart products (organic products)	57	63.3
Farm size	50	55.6
High awareness and education about climate smart agriculture	68	75.6

Strong attachment to traditional farming	59	65.6
Peers influence	6 7	74.4
Conditions of the soil	6 8	75.6
Availability of climate smart technologies	5 0	55.6
Access to infrastructural facilities such as storage and processing facilities	79	87.8
Access to extension services	61	67.8
Land tenure and ownership status of land	48	53.3
Access to weather forecasting services/information	55	61.1

Source: Field Survey, 2025 ***:** Multiple responses

Table 5: Distribution of respondents according to severity of constraints faced in promoting climate smart agriculture

Constraints faced in promoting climate smart agriculture	WMS	Rank
Inadequate government support	3.0	1st
Poor extension system/service	2.5	2nd
Insufficient funding for extension programme	2.0	5th
Inadequate training for extension agents on climate smart agriculture practices	2.0	5th
Poor access to climate information	2.1	4th
Inadequate availability of CSA inputs	1.5	8th
Restricted access to smart	2.4	3rd
Poor access to credit facilities	1.8	7th

Source: Field Survey, 2025
WMS: Weighted Mean Score

Table 6 Ordered probit regression showing significant relationship between the selected socio-economics characteristics of the respondents and roles of extension services in promoting climate smart agricultural practices among farmers in the study area.

Socio-economics characteristics	dy/dx	Standard error	Z-Value
Farm size	-0.487324	0.5699	-0.86
Age	-0.040811	0.0229	1.78**
Household Size	0.019722	0.0645	0.31
Marital status	-0.844355	0.413	-2.04*

Years spent in school	-0.087475	0.0483	-1.81**
Sex	0.795774	0.4559	1.75**
Years of experience in farming	0.001794	0.00052	0.34

Source: Computed Data, 2025

Significant level *Significant at the 0.05 level

**Significant at the 0.1 level

***Significant at the 0.01 level

Pseudo R of o.1112