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ASSESSMENT OF CONSTRAINTS TO AWARENESS LEVEL OF CLIMATE SMART AGRICULTURAL PRACTICES AMONG RURAL CROP FARMERS IN BENUE STATE, NIGERIA

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Abstract

This study assessed awareness level of climate smart agricultural practices among rural crop farmers in Benue State, Nigeria. All rural crop farmers in Benue State formed the population of the study, of which 219 respondents were selected as sample size using purposive and simple random sampling techniques. Primary data were used for the study, collected using a structured questionnaire. Data collected were analysed using both descriptive and inferential statistics. The findings revealed that rural crop farmers had high level of awareness of climate smart agricultural practices including, crop rotation (x=3.89), intercropping with legumes (x=3.89), irrigation (x=3.84). The results of Factor analysis on the constraints to adoption of climate-smart agricultural practices among rural crop farmers showed three distinct factors that constrained in awareness of climate-smart agricultural practices, Factor 1, which is financial/infrastructural constraints such as poor infrastructure (0.803), lack of resources (0.813), and high cost of labour (0.772). Factor 2, which is social constraints include lack of training on climate smart agricultural practices (0.854), lack of capital (0.869), lack of information (0.759), and unwillingness to change from the older practices (0.667). Factor 3 which is economic and institutional constraints include lack of understanding (0.529) and lack of national level planning (0.521). It was concluded that rural farmers in the study area were knowledgeable about climate-smart agricultural practices in Benue State It is recommended that, the Government should provide rural farmers with financial support/credit and infrastructure to enhance uniform awareness across the agricultural zones.

Keywords: Assessment, constraints, Awareness, climate smart, Agricultural Practices.

1.0 Introduction

Agriculture employs about 60–70% of Nigerians, which is the country's primary source of food and labor and is heavily reliant on climatic fluctuations (Adebayo, 2018). A significant source of income for the impoverished in rural areas, agriculture depends on food and water resources, both of which are impacted by climate change. Development and livelihood will suffer greatly if the current food and water systems are disrupted. Therefore, it is necessary to assess climate-smart agricultural practices in order to mitigate the negative effects of climate change (Adebayo, 2018).

According to the Food and Agriculture Organization (FAO) (2013), Climate Smart Agricultural Practices (CSAPs) are integrated strategies for reducing climate change, promoting other development goals, and ensuring food security. CSAPs are methods for enhancing scientific guidelines and investment environments to achieve sustainable agricultural development and guarantee food supply in the face of climate change (FAO, 2013).

Creating awareness of CSA practices and technologies to rural areas can have a substantive impact on adoption level of CSA practices (Kadzamira and Ajayi, 2019). Bringing quality benefits to more people over a wider geographical area, quickly, equitably, and lastingly through creation of awareness will inherently enhance the adoption level of CSA practices, It is important to develop insights and initiatives that will enhance effective dissemination and awareness of available CSA practices (Wekesa *et al.,* 2018).

According to Rohilla *et al.* (2018), spreading climate smart agricultural practices to the rural farmers is necessary through extension functionaries and education among the farmers. Rural farmers who are aware about climate smart agricultural practices have

more knowledge on the control and mitigation of climate change in Nigeria. Informing rural farmers on the importance of climate smart agricultural practices will improve their adoption level to mitigate the effect of climate change on agricultural production (Rohilla *et al.*, 2018). Awareness of climate smart agricultural practices such as water conservation, tillage systems, agroforestry, crop and livestock management will enhance and improve adoption level in rural areas (Olorunfemi *et al.,* 2019). According to Kadzamira (2019), rural farmers who are aware of climate smart agricultural practices have positive attitude towards it.

Climate smart agricultural practices address climate change by systematically integrating climate information into planning of sustainable agricultural systems (FAO, 2013). The major aim of this integration is to ensure sustainable livelihoods in the face of climate change. CSAP is knowledge-intensive and therefore requires awareness to enable rural farmers to make informed decisions.

Agricultural sector is vital in eradication of extreme poverty and hunger, and supports livelihoods of close to 1.5 billion people worldwide living in rural areas. Despite its vital importance, the sector is highly sensitive and susceptible to climate change and variability, and rural farmers are disproportionately affected, as a result of poverty, high dependency on natural resources and inadequate capability to adopt climate smart agricultural practices. Climate change has been identified as one of the greatest challenges affecting rural farmers worldwide. FAO (2014) asserted that climate change is likely to cause considerable crop yield losses, thereby adversely affecting rural farmers in Nigeria. As a result, food security and income generation opportunities for the rural farmers that rely on agriculture may be in jeopardy (FAO, 2014). Given the severity of food insecurity in the world, especially in Africa, it is important that measures are

taken to minimize adverse effects of climate change on agricultural production. The recognition of this need was globally demonstrated through adoption of the Paris Agreement (United Nations Framework Convention on Climate Change (UNFCCC), 2015). The challenges of how to turn the promises of that agreement into reality necessitates the need for climate smart agricultural practices that would address the threats pose by climate change. Rural farmers frequently are not aware of the climate-smart agricultural practices that have been developed to combat and mitigate the effects of climate change. Also, they lack the knowledge necessary to access and utilize CSAPs for better agricultural activities, which has resulted in low adoption level of climate smart agricultural practices (FAO, 2020). The low adoption level maybe due to lack of proper awareness in rural areas.

Despite the potential benefits of climate smart agricultural practices, the awareness level of CSAP is still generally low, especially in rural areas. Several studies have been carried out on climate smart agricultural practices by various scholars. For instance, Anthony, Ejembi and Otene (2025) assessed the adoption level of climate smart agricultural practices. Fawole and Aderinoye-Abdulwahab (2021) assessed farmers' adoption of climate smart practices for increased productivity in Nigeria. Amin, Mubeen, Hammad and Jatoi (2015) focused on Climate Smart Agriculture for sustainable food security. From the foregoing, little or no study has been conducted on assessment of constraints of awareness level of climate smart agricultural practices among rural farmers in Benue State, Nigeria. It is against this background that this study was carried out.

2.0 Objectives of the study

The broad objective of the study was to assess awareness level of climate smart

agricultural practices among rural crop farmers in Benue State, Nigeria. The specific objectives of this study were to:

i. ascertain the level of awareness of climate smart agricultural practices among rural farmers in the three agricultural zones in the study area and
ii. identify constraints to adoption of climate smart agricultural practices among rural farmers in the study area.

Hypothesis of the study

H_{o2}: there is no significant difference among rural farmers in terms of awareness level of climate smart agricultural practices across the three agricultural zones in the study area.

3.0 Methodology

The study was conducted in Benue State, Nigeria. The State lies between longitudes 6'35' E and 8'10' E of the Greenwich Meridian and latitudes 6°30' N and 8'10' N of the equator at an elevation of 97m above sea level in Southern Guinea Savannah agroecological zone. The State has 23 Local Government Areas (LGAs), and it covers a landmass of 3,251 8 Km with an estimated population of 6,286, 170 people (NPC, 2022). It lies in the North-Central region of Nigeria and share boundaries with five other States; Nasarawa to the North, Taraba to the East, Cross-River to the South, Enugu to the South-east and Kogi to the West. The State also shares a common boundary with the Republic of Cameroon in the South-east (Benue State Agricultural and Rural Development Authority (BNARDA, 2010).

The population of the study comprised all rural crop farmers in Benue State. A sample size of 219 respondents was selected using multistage, purposive and simple random sampling techniques. In the first stage, one Local Government Area was randomly selected from each agricultural zone. These Local Government Areas were

selected after consultation with BNARDA office, and identification of Local Government Areas, where they have interventions on climate change. The second stage involved purposive selection of three rural communities from each LGA due to high number of farmers from the communities. From Vandeikya LGA , Mbagbera , Mbatyuogh and Mbakaange rural communities were selected. Yandev, Mbayion and Ipav were selected from Gboko LGA, while Igbanomnaje, Akpegede and Ugboju rural communities were selected from Otukpo LGA. The third stage of sampling involves the simple random selection of 219 farmers from the communities, corresponding to 0.5% of the sampling frame of the communities.

Descriptive and inferential statistics were used to analyse data for this study.

4.0 Results and Discussion

4.1 Awareness

Table 1 shows that crop rotation had a mean value of (x= 3.89), intercropping with legumes had mean value of (x=3.89) and irrigation with a mean value of (x= 3.84). The findings indicated that most of the respondents were highly aware of crop rotation (x= 3.89) as a climate-smart agricultural practice in the study area. This may be due to the fact that crop rotation has been a traditional practice passed down through generations. Also, the climate and weather patterns including flooding and drought make crop rotation essential for adapting to changing conditions, leading to its awareness level. This findings agrees with Opeyemi *et al*. (2021), who identified crop rotation as a climate-smart agricultural practice farmers are aware of in Delta State.

The result revealed that intercropping with legumes as a climate-smart agricultural practice had a mean value of (x =3.89). This indicates that the rural farmers in the study area have high level of awareness on intercropping with legumes as a climate-smart

agricultural practice. This may be due to the fact that farmers in the study area have likely been exposed to various agricultural practices, including intercropping, through farmers sharing experiences and knowledge with each other, extension services, and local organizations and community groups promoting agricultural practices. Also, the presence of research institutions and Universities conducting agricultural research and outreach to rural farmers. Access to agricultural information through media outlet like radio, Tv and print media may also lead to high adoption level of intercropping as a climate smart agricultural practice in Benue State. This is similar to the findings of (Onoja *et al*., 2019) who reported that farmers in East and West Africa have high level of awareness on intercropping with legumes.

Also, the level of awareness of climate-smart agricultural practices revealed that irrigation had a mean value of (x= 3.84). This is an indication that rural farmers in the study area have high level of awareness of irrigation as a climate-smart agricultural practice. The high level of awareness on irrigation farming in the study area maybe due to effective extension services by government agencies, NGOs, and research institutions. Formal education and training programs in agriculture and related fields and awareness campaigns carried out by Lower Benue River Basin Development Authority. Also, awareness programs carried out by Fadama I and National Fadama Development Project II created awareness on the development of small-scale irrigation practices in the Benue State. As a result farmers in Benue state have become highly aware of the importance of irrigation in sustaining their agricultural livelihoods. This implies that, rural farmers who are aware of irrigation use it during dry season and times of drought to supply water to crops for enhanced production. This is similar to the findings of Adebisi-Adelani and Oyesola (2014) who reported a high level of awareness of irrigation by citrus farmers in

Benue State. Also in agreement with the findings of Rohilla *et al*. (2018) who reported that farmers had a high level of awareness on irrigation as a climate smart agricultural practice.

Table 1: Level of Awareness of Climate Smart Agricultural Practice (n=219)

Climate smart agricultural practices	Level of Awareness			Mean	Std. dev.
	High	Moderate	Low		
Conservation agriculture	104 (47.49)	81 (36.99)	34 (15.53)	3.32	0.728
Agroforestry	98 (44.75)	72 (32.88)	49 (22.37)	3.22	0.789
Water harvesting and efficient use	120 (54.79)	63 (28.77)	36 (16.44)	3.38	0.753
Use of safety nets	113 (51.60)	90 (41.10)	16 (7.31)	3.44	0.628
Crop rotation	196 (89.50)	22 (10.05)	1 (0.46)	3.89	0.327
Intercropping with legumes	197 (89.95)	19 (8.68)	3 (1.37)	3.89	0.359
Irrigation	186 (84.93)	30 (13.70)	3 (1.37)	3.84	0.406
Minimum tillage	156 (71.23)	38 (17.35)	25 (11.42)	3.71	0.442
Contour farming	128 (58.45)	40 (18.26)	51 (23.29)	3.35	0.834
Terracing	117 (53.42)	39 (17.81)	63 (28.77)	3.25	0.874
Integrated nutrient management	118 (53.88)	27 (12.33)	74 (33.79)	3.20	0.916

( ) percentages

4.2 Constraints to Adoption of Climate Smart Agricultural Practices among Rural Farmers

Factor analysis, using the principal factor model with iteration and Varimax rotation was used to determine the constraints to adoption of climate smart agricultural practices among rural farmers presented in Table 2. The loading under each factor represents a correlation of the identified constraint factor. Kaiser´s criterion using factor loading above 0.5 was adopted in naming and interpreting the factor and constraint variables. The factor analysis results reveal three distinct factors that contribute to

constraints in agricultural production.

Factor 1 (Financial/infrastructural), variables that had significant influence on the awareness and adoption level of Climate Smart Agricultural Practices were poor infrastructure (0.803), lack of resources (0.813), and high cost of labor (0.722). It could be that farmers in Benue State face significant challenges stemming from inadequate physical and financial resources, including poor road networks, insufficient funding, and high labor costs, which can hinder the adoption of Climate Smart Agricultural Practices. The finding is similar to that of Akudugo (2012) who reported lack of capital as a factor affecting adoption of improved technologies.

The results further revealed that factor 2 (Social factors), lack of training on CSAP (0.854), lack of capital (0.869), lack of information (0.759), and lack of technical expertise (0.774). It could be that farmers and agricultural practitioners experience limitations in knowledge, skills, and access to financial resources needed to adopt Climate Smart Agricultural Practices. This suggest that lack of training opportunities, capital, and technical expertise may inhibit their ability to improve farming techniques, access markets, and enhance adoption of Climate Smart Agricultural Practices. The study agrees with the findings of Adebiye and Okunlola (2013) who reported that, availability of information determine adoption of innovations and thus climate smart agricultural practices.

Factor 3, (Economic and institutional factors), variables that significantly affected the awareness and adoption level of climate smart agricultural practices in the study area were lack of understanding (0.529), unwillingness to change from older practices (0.667), lack of national-level planning (0.566), and limited access to extension services (0.512). This suggests that rural farmers face challenges related to

Economic and institutional factors, including resistance to change, inadequate policy support, and limited access to extension services and agricultural information. These constraints may reflect broader systemic issues within the agricultural sector, such as weak policy implementation, insufficient government support, and ineffective extension systems. This is in line with the findings of Rohilla *et al.* (2018) who showed that, economic and institutional factors constrain the adoption of new technology.

Table 2: Factor analysis of constraints to adoption of climate smart agricultural practices among rural farmers

S/N	**Variables**	**Factor 1**	**Factor 2**	**Factor**
i.	Lack of training on CSAP	0.394	**0.854**	0.062
ii.	Lack of capital	0.351	**0.869**	0.125
iii.	Lack of information	0.337	**0.759**	0.351
vi.	Lack of understanding	0.358	0.623	**0.529**
v.	Unwillingness to change from the older practices	0.329	**0.667**	0.343
vi.	Poor infrastructure	**0.803**	0.416	0.144
vii.	Lack of resources	**0.813**	0.440	0.105
viii.	High cost of labour	**0.772**	0.330	0.303
ix.	Lack of technical expertise	**0.774**	0.388	0.277
x.	Lack of national level planning	**0.566**	0.277	**0.521**
xi.	Lack of land ownership	0.247	0.189	0.332
xii.	Limited access to extension services	**0.512**	0.294	0.468

Factor 1: Financial/infrastructural constraints

Factor 2: Social constraints

Factor 3: Economic/ institutional constraints

Rotation Method: Varimax with Kaiser Normalization

5.0 Conclusion and Recommendations

5.1 Conclusion

Based on the findings of this research, it was concluded that rural farmers are knowledgeable about climate smart agricultural practices and there is a significant difference in the level of awareness of climate smart agricultural practices across the three agro-ecological zones in Benue State.

5.2 Recommendations

It is recommended that the Government should provide rural farmers with financial support/credit and infrastructure to enhance uniform awareness across the agricultural zones.

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