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The Kebbi Journal of Agriculture and Natural Sciences has the sole aim of providing an intellectual platform and ideas for scholars, by promoting interdisciplinary studies related to agriculture and natural science through publishing the latest scientific research findings that are of direct policy implications and beneficial to the research community. Consequently, the journal covers all aspects of Crop Science, Animal Science, Agricultural Economics, Agricultural Extension and Rural Development, Food Science, Fisheries and Aquaculture, Biotechnology, Soil Science and Agricultural Engineering, Forestry and Environment, Wildlife, Agricultural Education, Agro-allied Industries as well as all Natural Science researches related to Agriculture.

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ASSESSMENT OF KNOWLEDGE OF CLIMATE SMART AGRICULTURE AMONG YOUTHS IN KEBBI STATE, NIGERIA

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ABSTRACT

This study was conducted to assess the knowledge of climate-smart agriculture (CSA) among youths in Kebbi State, Nigeria. A multistage sampling procedure was utilized to select youth farmers from the population. The purposive selection of all four agricultural zones in Kebbi State was based on their level of involvement in farming activities. The Raosoft sample size calculator was employed to obtain a sample size of 342, at a 95% confidence level. Descriptive statistical techniques were used to describe and summarize the collected data. The findings revealed that the majority of respondents were male (92.1%), married (74.3%), and possessed between 6 and 10 years of farming experience. Moreover, most respondents (61.4%) did not have access to extension services, access to loans (72.8%), and had not attended any CSA training (72.8%). The major constraints to CSA knowledge among youth farmers were identified as lack of adequate extension services ($\bar{x}$ = 2.47), lack of supportive government policies ($\bar{x}$ = 2.66), while insufficient financial resources ($\bar{x}$ = 1.93) were perceived as the most significant challenge. The study concluded that the level of CSA knowledge among the respondents is low. It recommended that policymakers consider providing adequate access to extension services, financial resources, and clear government policies that support CSA training to improve their knowledge of CSA to effectively address the knowledge gaps in CSA among youths.

Keywords: Assessment, Knowledge, Climate Smart Agriculture, Constraints, Youth,

Introduction

Climate change is an increasingly pressing global challenge that poses significant threats to food security, livelihoods, and environmental sustainability. In Nigeria, the adverse effects of climate change, including erratic rainfall patterns, increased temperatures, and severe droughts, have greatly impacted agricultural productivity, particularly in regions like Kebbi State (Kebbi State Government, 2017). As a predominantly agrarian society, the economic and social fabric of Kebbi is intricately linked to agriculture, affecting not only farmers but the broader community reliant on agricultural outputs.

A key demographic in addressing the challenges posed by climate change is the youth. With over 60% of Nigeria's population under the age of 35, young people represent a vital demography capable of driving innovation and change within the agricultural sector. However, their potential is often underutilized due to a lack of knowledge and understanding of climate-smart agricultural practices (National Population Commission of Nigeria, 2006).

As a response for the need to increase food security without compromising environmental quality and in support of the Paris Agreement on climate change, Food and Agriculture Organisation (FAO) of the United Nations developed the concept of Climate Smart Agriculture (CSA) Intergovernmental Panel on Climate Change (IPCC), (2019). CSA is an approach to transform farming that aims to deliver positive outcomes on three impact pillars, namely, intensification, adaptation, and mitigation to support food security under the new realities of climate change (Lipper *et al*., 2014 and Taylor, 2018). These practices are essential for adapting to climate change and for promoting agricultural sustainability, resilience, and productivity. CSA is an approach for transforming and re-orienting agricultural production systems to sustain agricultural production under the changing climate (Food and Agriculture Organisation, 2014).

Climate Smart Agriculture encompasses strategies and technologies that increase agricultural productivity while minimising the impact on the environment. It aims to enhance resilience to climate change, reduce greenhouse gas emissions, and improve food security and livelihoods. It involves those practices that have the potential to sustainably increase productivity, strengthen the resilience of farming systems to climate change and reduce emissions of GHG from agricultural fields (De Pinto *et al*., 2020). It is not a prescription of particular agricultural technologies or practices that are collectively applicable but rather a tool to help farmers locally adjust their farming operations to sustain production under climate change (Lipper and Zilberman, 2018).

However, despite benefits of CSA, the youth in Kebbi State face significant barriers to its adoption. There is a notable gap in awareness and understanding of climate-smart practices among young farmers in Kebbi State. Many youths are either unaware of CSA principles or lack the necessary skills to implement them effectively. This lack of knowledge, socio-cultural attitudes towards agriculture, often leads to a reluctance to engage in farm activities and a preference for non-agricultural employment opportunities.

Furthermore, the involvement of youths in agricultural activities remains limited. The prevailing negative perception of agriculture, coupled with inadequate access to resources, training, and supportive policies, exacerbates the situation and limits the potential contributions of youths to climate-smart practices.

The overarching problem, therefore, lies in understanding the current levels of knowledge related to CSA among the youths in Kebbi State. Without a comprehensive assessment of this factor, it is challenging to design targeted interventions and educational programmes that can effectively promote the adoption of CSA principles.

A lot of research has been conducted in the area of CSA, for instance Mansur *et al.* (2024), Mbanasor *et al*. (2024), Umesh *et al.* (2023), Hebsale *et al.* (2023), Hassan *et al.* (2023), Aturihaihi *et al.* (2022), Mendoza *et al*. (2020), Nyasimi *et al.* (2017), and Teerdoo *et al.* (2014). Most of these studies gave much emphasis on general farming population without looking at young farming population who are believed to be the backbone of agriculture. Also, the above studies used smaller sample size and most of these studies were conducted outside Nigeria with the exception of a few. Therefore, there is a need to conduct another study that will assess knowledge of CSA among youths in Kebbi State, Nigeria. Hence, this paper aims to describe the sociodemographic characteristics of respondents and assess their knowledge of climate-smart agriculture in the study area.

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Methodology

Description of the Study Area

Kebbi State was created in 1991 out of former Sokoto State, Nigeria. The State is made up of 21 local government Areas (LGAs) and falls between latitude $12^0$46N and 12^0.27N and longitude $4^0$19E and $4^0$11E. Agriculture is the main occupation of the people of the State especially in rural areas. The State has a mean temperature of 23^{o}C and a maximum temperature of about 40^o C. This climate peculiarity supports the production of a wide range of arable crops, roots and tubers, agroforestry, fisheries and livestock. The total cultivable land in the State consists of 320,000 hectares (ha) upland and 170,000 ha of Fadama land, with high potential of surface water and extractable shallow aquifer to support medium and small-scale irrigation activities (Kebbi State Government, 2017).

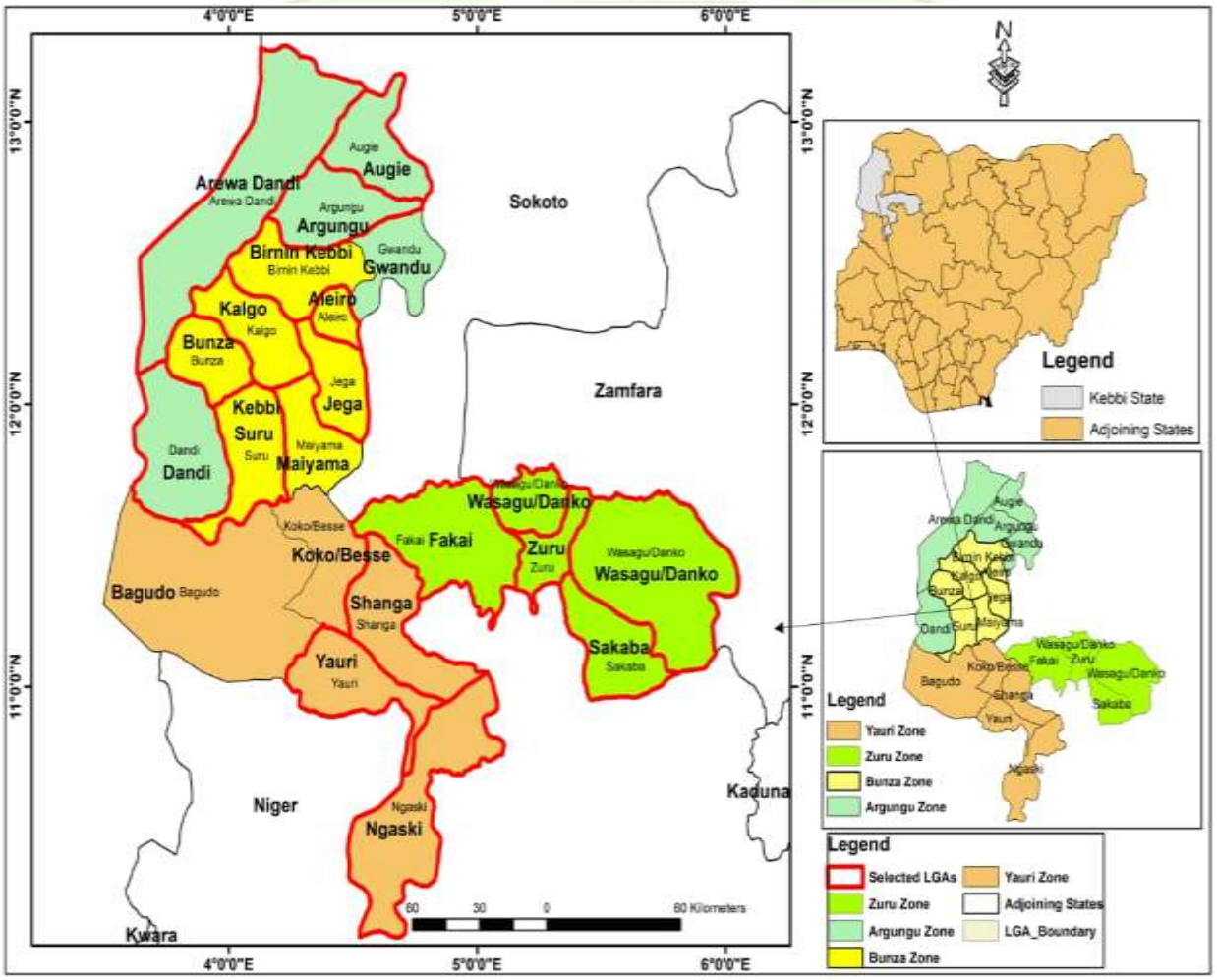

Figure 1: Map of Kebbi State Showing the Study Area

Sampling Procedure and Sample Size

The sampling frame of the study comprises of 3065 registered young farmers across the four (4) agricultural zones in Kebbi State, namely Argungu Zone, Bunza Zone, Yauri Zone and Zuru Zone. A multi stage sampling technique was used to select respondents for the study. Firstly, purposive selection of all the four agricultural zones in Kebbi State. This is because they are the state's sole agricultural zones and that more agricultural activities occur there than anywhere else. Secondly, in each of the agricultural zones, two Local Government Areas were randomly selected to obtain a total of eight (8) LGAs. Thirdly, three (3) villages were selected randomly from each of the eight (8) LGAs early selected from the four (4) agricultural zones, thus giving a total of twenty-four (24) villages. Finally, a Raosoft sample size calculator was used to obtained the sample size at 95% confidence level. This was calculated to be 342.

Raosoft: sample size *n* and margin of error *E* are given by

$X = Z(^{C}/100)^2 \, r \, (100-r)$

$N = {}^{NX}/((N-1) \, E^2 + X)$

$E = Sqrt[{}^{(N-n) \, X}/n(N-1)]$

Where: N is the population size, r is the fraction of responses that you are interested in, and Z(c/100) is the critical value for the confidence level c.

Methods of Data Collection

Primary data for the study was gathered through the use of a structured questionnaire designed in line with the objective of the study. Secondary data were sourced from the literatures. The questionnaire for the study was used to collect information on the level of knowledge about CSA among youths in the study area.

Methods of Data Analysis

Data collected was inputted using SPSS 20 software and were analysed using descriptive statistics such as mean, standard deviation and percentages. The results were presented through descriptive statistical method.

Measurement of Variables

Knowledge of CSA was evaluated using a 5-point Likert-type scale that ranges from "not knowledgeable" to "very knowledgeable" (5). A mean score of 3.0 was obtained. Thus, (1 + 2 + 3 + 4 + 5 = 15 / 5 = 3.0). Therefore, a score of 3.0 was used to categorise respondents' knowledge of CSA into low knowledge, moderate knowledge, and high knowledge. Knowledge of CSA was, however, assessed based on four dimensions, namely: knowledge of CSA objectives, knowledge of specific CSA practices, knowledge of the benefits of CSA, and knowledge of CSA adoption strategies. All respondents scored below the mean of 3.0

Results and Discussion

This section presents the results of data analysis and discusses the implications with respect to the specific objectives of the study.

Socio-Demographic Characteristics of Respondents

Table 1 revealed that a majority of the respondents were male (92.1%), married (74.3%), and that 46.5% had between 6 and 10 years of farming experience. This conforms to the findings of Adisa *et al*. (2019), and Ahmed and Adisa (2020), who reported that farming in the North Central region is dominated by males and that the majority of the respondents are married, suggesting a need to take on obligations and find ways to provide food and income for their dependents to avoid food insecurity and poverty.

Table 1: Socio-Demographic Characteristics of Respondents

Variable	Frequency	Percent
Sex		
Male	315	92.1
Female	27	7.9
Marital Status		
Married	254	74.3
Single	75	21.9
Divorced	13	3.8
Widow	0	0.0
Separated	0	0.0
Farming experience (Years)		
1-5	92	26.9
6-10	159	46.5
11-15	38	11.1
16-20	41	12.0
≥20	12	3.5
Access to Extension Services		
No	210	61.4
Yes	132	38.6
Access to Loan		
No	249	72.8
Yes	93	27.2
Attended CSA Training		
No	266	77.8
Yes	76	22.2

Source: Field survey, 2025

However, the relatively smaller proportion of farmers with over 20 years of experience may suggest challenges related to the aging of farmers or limited knowledge transfer to younger generations. This assertion is supported by Sania *et al*. (2017), who stated that years of experience have a reduction effect on the inefficiency of crop production. Similarly, a majority of the respondents (61.4%) do not have access to extension services, 72.8% did not have access to loans, and 56.1% have never attended any CSA training. Extension services are crucial for disseminating knowledge on new farming practices, including CSA techniques, and for providing farmers with the necessary support to adopt these practices. This is consistent with the work of Alene *et al*. (2023), who argued that access to extension services is critical for improving agricultural productivity. A study by Abaje (2020), indicated that lack of access to credits significantly hampers agricultural productivity among farmers. He found that 70% of farmers in rural Nigeria reported insufficient access to financial services, which parallels the 72.8% finding of the study. The relatively low percentage of farmers who have received CSA training suggests a need to expand training programs. Training is essential for farmers to understand the principles and practices of CSA and how to implement them effectively. A study by Verchot (2017), highlights that farmers who have participated in CSA training demonstrate a higher level of CSA knowledge and a greater likelihood of

adopting climate-smart practices compared to those who have not received training.

Respondents Knowledge of CSA objectives

Table 2 presents the results of respondents' levels of knowledge of CSA objectives. Increasing agricultural productivity has a mean of 2.74 and a standard deviation of 1.49, suggesting low awareness with notable variability. Similarly, enhancing resilience to climate change reflects slightly lower awareness ($\bar{x}$ = 2.30), while reducing greenhouse gas emissions scores closer to the first objective ($\bar{x}$ = 2.64). This is in line with the findings of Ochieng *et al*. (2021), who found that farmers had varying levels of knowledge regarding the main objectives of CSA, which included increasing agricultural productivity, enhancing resilience to climate change, and reducing greenhouse gas emissions. The authors reported mean knowledge scores that indicated a low understanding of these objectives, akin to the findings of this study.

Table 2: Respondents' Knowledge of CSA Objectives

Variable	N	Mean	Std. Deviation
Increasing agricultural productivity	342	2.74	1.490
Enhancing resilience to climate change	342	2.30	1.519
Reducing greenhouse gas emissions	342	2.64	1.445

Source: Field survey, 2025

Respondents' Knowledge of Specific CSA Practices

Table 3 indicates that efficient water management shows moderate knowledge ($\bar{x}$ = 2.51), while Conservation tillage techniques scores lower at 2.18, indicating limited understanding. In contrast, Use of organic fertilisers records the highest mean which is moderate ($\bar{x}$ = 3.58), showing this practice is widely recognised. Intercropping and crop diversification and Integrated pest management both show low knowledge with means of 2.80 and 2.73, respectively. A similar observation was made by Basiru *et al*. (2024). However, the findings show that application of organic and inorganic fertilisers is the most common and widely adopted practice for coping with the effects of climate change and that among farmers and that conservation tillage is the least adopted in the study area.

Table 3: Respondents' Knowledge of Specific CSA Practices

Variable	N	Mean	Std. Deviation
Efficient water management (e.g., drip irrigation)	342	2.51	1.490
Conservation tillage techniques	342	2.18	1.420
Use of organic fertilisers (e.g., composting)	342	3.58	1.546
Intercropping and crop diversification	342	2.80	1.438
Integrated pest management methods	342	2.73	1.439

Source: Field survey, 2025

Respondents' Knowledge of the Benefits of CSA

Table 4 shows that climate resilience in farming is rated low ($\bar{x}$ = 2.04), whereas increased crop productivity ($\bar{x}$ = 2.70) and Farmers' income ($\bar{x}$ = 2.80) are also low acknowledged. Other benefits like reducing environmental degradation ($\bar{x}$ = 2.52), reducing food insecurity ($\bar{x}$ = 2.88), and reduced rural-urban migration ($\bar{x}$ = 2.59) show low levels of recognition. This agrees with the finding of Msweli *et al*. (2022), who stated that youth farmers generally have low level of knowledge of benefits of CSA which include food security, increasing farmers income and increasing crop productivity in Mzinti, Nkomazi Local Municipality South Africa.

Table 5: Respondents' Knowledge of Benefits of CSA

Variable	N	Mean	Std. Deviation
Climate resilience in farming	342	2.04	1.395
Increased crop productivity	342	2.70	1.276
Increased farmers income	342	2.80	1.350
Reduced environmental degradation	342	2.52	1.558
Reduced food insecurity	342	2.88	1.376
Reduced rural-urban migration	342	2.59	1.643

Source: Field survey, 2025

Respondents' Knowledge of CSA Adoption Strategies

Table 5 revealed that the relatively low mean score for the adoption of drought-resistant crops ($\bar{x}$ = 2.22) suggests that respondents do not prioritise this strategy highly. The mean score ($\bar{x}$ = 2.58) for improved water storage and irrigation indicates a higher importance placed on this strategy compared to drought-resistant crops, though it still reflects a low level of adoption. Although the mean score ($\bar{x}$ = 2.47) for diversification of crop types and varieties is better than that for drought-resistant crops, it still indicates only low adoption. This corroborates the findings of Oduntan *et al*. (2022), who found that crop diversification was the most adopted climate smart agricultural practice by the respondents.

Table 5: Respondents' Knowledge of CSA Adoption Strategies

Variable	N	Mean	Std. Deviation
Adoption of drought-resistant crops	342	2.22	1.534
Improved water storage and irrigation	342	2.47	1.314
Diversification of crop types and varieties	342	2.58	1.388

Source: Field survey, 2025

Conclusion

The study on the basis of major findings concluded that: In general, youths demonstrated a low level of knowledge of CSA. Specifically, their knowledge was low in objectives of CSA, specific CSA practices, low in crop diversification, low in water conservation, low in planting drought-resistant crops, low in integrated pest management and agroforestry, low in solar-powered irrigation, but moderate only in use of organic fertilisers. The youths had a low level of knowledge in crop diversification, so they have areas where they need to improve.

Lack of adequate extension services, lack of access to credits, and lack of access to CSA training were the most significant constraints that limited youths' knowledge of CSA. Therefore, this study highlights the need to enhance respondents' access to extension services, financial resources, and government policies that support CSA training to improve their knowledge of CSA.

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