# FACTORS INFLUENCING ADOPTION OF CLIMATE SMART AGRICULTURAL PRACTICES AMONG MAIZE FARMERS IN ONDO STATE, NIGERIA

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## ABSTRACT

The study examined the factors influencing adoption of climate smart agricultural practices among maize farmers in Ondo State, Nigeria. A Multi-stage sampling procedure was used to randomly select one hundred respondents for the study. Primary data were collected from the respondents with aid of a structured questionnaire and analysed using descriptive statistics and probit regression model. The results of this study showed that crop diversification was the most adopted climate smart agricultural practice by the respondents and adoption of Climate Smart Agricultural practices is still very low among the respondents. Result of probit regression revealed that marital status, access to extension services, farming experience, membership of farmers' association and access to credit had a positive influence on adoption of climate smart agricultural practices while age, farm size and total income had a negative influence. Based on the findings of the study, it was recommended that government should develop suitable policies that will encourage farmers especially rural farmers to adopt and utilize Climate Smart Agricultural Practices (CSAP). Equally, the study also recommended government should be geared towards supporting improved extension services, providing on-farm demonstration training, and disseminating information about climate smart agricultural practices and provide credit facilities through the Agricultural Credit Guarantee Scheme Fund and bank credit to farmers in order to enhance adoption.

**Key words:** Adoption, Agriculture, Climate smart, Farmers, Maize, Nigeria.
JEL codes: B21, O13, Q10, Q54

## 1. INTRODUCTION

Agricultural production remains the main source of income for rural communities in sub-Saharan Africa, providing employment for more than 60 percent of the population and contributing about 30 percent of the region's gross domestic product (Musa, 2021). With likely long-term changes in rainfall patterns and shifting temperature zones, climate change is expected to significantly affect agricultural production, which could be detrimental to the region's food security and economic growth. According to the Intergovernmental Panel on Climate Change (IPCC) (2007), the relationship between agriculture and climate change is a topic of increasing concern. Amid climate change projections, global agricultural production is expected to decline, posing a threat to global food security (Ogbeide-Osaretin and Olotu 2022). However, it is also important to note that agriculture accounts for a significant portion of global emissions each year, increasing as production is intensified or expanded to meet rising demand. Furthermore, it is estimated that up to 80 percent of global deforestation is attributable to agriculture (Kissinger *et al.*, 2012; Elizabeth, *et al.*, 2017).

The IPCC Fourth Assessment Report projects that climate change could reduce yields by up to 50 percent in some high-risk regions, including sub-Saharan Africa (Elizabeth, *et al.* 2017). According to this report "warming in Sub-Saharan Africa (SSA) is expected to be greater than the global average and rainfall will decline in certain areas. Also, cereal production growth for a range of crops in SSA is projected to decline by a net 3.2 percent in 2050 as a result of climate change".

Climate-Smart Agriculture (CSA) therefore represents a set of strategies that can help combat the above stated challenges of climate change by increasing resilience to weather extremes, adapting to climate change and decreasing agriculture's greenhouse gas (GHG) emissions that contribute to global warming (Steenwerth *et al.* 2014). Climate variability and extremes are a major cause of increased food insecurity, with impacts affecting all aspects of food security (FSIN, 2018; FAO, IFAD, UNICEF, WFP & WHO, 2018; Tripathi *et al*., 2016). Therefore, climate change will not only lead to lower food production and availability, but also lower food quality (Alehile *et al.*, 2022; Tripathi *et al.*, 2016). Smallholder farmers are one of the most vulnerable groups to climate change and variability. Climate change leads to wearing out of all efforts made by farmers in savings and resources accumulation. Mutabazi and others. (2015) argued that households lacking effective risk prevention are more likely to be more vulnerable to poverty and other vulnerability traps.

Food production is expected to increase by 60% to meet increased food demand, a target that cannot be achieved through normal responses to climate change (FAO, 2013). Therefore, farmers should take adaptation measures to minimize the impact of climate change. These adaptive strategies must result in increased food production without depleting natural resources. One of the most important strategies for sustainable food production is climate-friendly agriculture. It is defined as "agriculture that sustainably increases productivity and resilience (adaptation), reduces/removes greenhouse gases (mitigation), and improves national food security and achievement of development goals". (FAO, 2013). The CSA's goal is not to introduce new sustainability principles, but to integrate the details of adaptation and mitigation into sustainable agricultural policies, programs and investments (Lipper & Zilberman, 2017).

To address these shocks, policy makers and development actors have encouraged the use of agricultural conservation practices across the SSA. Examples of these efforts include soil and water conservation practices in Zambia and improved seed varieties in Nigeria (Awotide *et al*., 2016). However, adopting CA brings economic benefits to farmers by improving yields, enhancing food security and economic growth, and improving farmer welfare (Mugumaarhahama *et al*., 2021; Whitehead *et al*., 2020; Kassie, 2016). Despite its numerous benefits, however, adoption rates in SSA are often low (Gurung *et al*., 2016). Combined with the increasing global population, there is an urgent need for agriculture to adapt to ensure future food security for this growing population (Oduntan, 2022).

Climate change and variability has resulted into decline and instability in production worsening the existing food insecurity and poverty in developing countries. The effects of these climatic changes will become even more pronounced among small scale farmers, whose farming activities are weather dependent and vulnerable to climate change, and already adversely affected by environmental degradation and socio-economic risks. To ensure resilience, adoption of climate smart practices among small-scale farmers is required. It is against the above background that this research work aims to identify the climate smart practices adopted, estimate the level of adoption of climate smart agriculture, determine the factors influencing the adoption of climate smart agricultural practices and identify the reasons for non-adoption of climate smart agriculture.

## 2. LITERATURE REVIEW

### 2.1 Theoretical Literature

Adoption of climate-smart agriculture in this study builds on different perspectives and paradigms upon which many studies of adoption and adaptation are based. These include the Framework for Diffusion of Innovation (Rogers, 2013), the Adopter Perception Perspective (Reimer *et al*., 2012), and the Framework for Smallholder Adaptation (Jones *et al*., 2012). The framework assesses the dynamic processes and pathways by which individual skills determine adaptability in relation to informal and formal institutions, thereby determining the adoption of innovation (Brooks & Kelly, 2015; Dulal *et al*., 2020). The smallholder fitness framework (Jones *et al*., 2012) considers the determinants of fitness. It refers to the ability of a system to respond to, recover from, and cope with uncertainty or danger (IPCC, 2007). The framework identifies five attributes of adaptive capacity "Asset base, Institutions, Knowledge and information, Innovation, Flexible forward-looking decision making and governance" (Jones *et al*., 2012). The theory identifies information dissemination as the main determinant influencing adoption decisions, and explains how innovation is taken up in a population, characteristics that cause the innovation to spread, various mental stages that individuals undergo before they adopt an innovation and categorizes individuals depending on their attitudes towards innovation. While adopter perception perspective is based on the premise that the perception about the problem (climate change) and attributes of innovations (climate smart practices) by individuals poses significant influence to adoption of technologies (Reimer *et al*., 2012).

Adoption of climate smart practices by the small-scale farmer was positioned at the tail end of the framework and inextricably linked to all the other attributes to highlight fundamental importance of small scale farmers in guaranteeing effective and lasting adaptation. The institutions and policies consist of state, market, NGOs, farmer groups, cooperative societies, linkages-networks and partnerships and policies, regulations and practices, which influences the access and adoption of new practices through funding, supporting innovation, facilitating access to market and appropriate knowledge and information (Agrawal, 2008). Access to sufficient knowledge about climate-friendly practices and climate and weather information, as well as enabling smallholders to make important decisions about how they will change in the face of environmental change, is critical and essential for maintaining and increasing productivity (Jones *et al.*, 2012). As communities strive to adapt to climate change, the rate at which the global climate is currently changing is beyond their experience, so effectively achieving adaptive capacity requires scientific climate information is required. Even if smallholder farmers are aware of climate change issues and climate-smart practices, changing their behavior and attitudes to adopt climate-smart practices can take a long time, depending on social and economic factors. It can take a long time. Values, beliefs, views and opinions from neighbours (Pomi *et al.*, 2022). Depending on how these factors affect farmers' levels of knowledge about climate change issues and innovation practices and perceptions, they may also influence adoption of climate-friendly practices.

## 2.2 Empirical Literature

Oyawole *et al.*, (2020) examined women empowerment and adoption of climate-smart agricultural practices in Nigeria. Using the empowerment score and women empowerment gap for each household which were derived from the Abbreviated Women's Empowerment in Agriculture Index, a multivariate probit model which controlled for the influence of gender and women empowerment on climate-smart agricultural practices' adoption was estimated. The study made use of data from the ECOWAS-RAAF-PASANAO survey conducted in Nigeria in 2017. The results show that men are significantly more empowered than women in four out of the five domains of empowerment and are more likely to adopt crop rotation. However, female plot managers have a higher likelihood of adopting green manure and agroforestry, while no significant gender differences in the adoption of organic manure and zero/minimum tillage were found.

Nugun *et al.*, (2021) determined the impacts and barriers to adoption of climate-smart agriculture (CSA) practices in North-Western Nigerian drylands. Mixed methods design was employed with thirty smallholders per community selected from a baseline study of 220 smallholders from the two study communities. Smallholders were engaged in a farmer participatory learning and action (PLA) on CSA adoption for resilience. Impacts of PLA were evaluated six months post-implementation and barriers for adoption explored. Pre- and post-PLA training indicated a change in confidence to adopt some CSA practices. Both communities showed greater confidence ($p < .05$) related to solving climate-related problems and the use of fertiliser. Communities differed in relation to other factors: Kofa exhibited improved confidence (71.4%) in solving water challenges while Zango showed greater confidence (76%) in relation to solving environmental problems. They found gender-responsive CSA promote women participation in farming.

Wamalwa (2017) discussed the adoption of climate smart agricultural practices among small scale farmers of kitutu and nyaribari chache in kisii county, Kenya. The study therefore examined factors influencing adoption of climate smart practices among farmers of Kitutu and Nyaribari Chache in Kisii County, evaluated their existing knowledge, attitude and practice of these practices, assessed their perception of climate change, examined the extent of climate information dissemination, and the resultant impact on uptake of these practices. The research adopted a survey research design, where both quantitative and qualitative research strategies were used. The study revealed that there was an emerging appreciation of climate change problem and need for adoption of climate smart practices, their adoption was mainly constrained by weak legal and policy framework, financial setbacks, limited climate information and knowledge of climate smart practices.

Abegunde (2020) examined the determinants of the adoption of climate-smart agricultural practices by small-scale farming households in king cetshwayo district municipality, SouthAfrica. With the aid of a close-ended questionnaire, structured interviews were conducted and formed the basis on which data were generated from 327 small-scale farmers selected through random sampling. Descriptive statistics, Composite Score Index and a Generalized Ordered Logit Regression (gologit) model were employed for the analysis. The study revealed that the use of organic manure, crop rotation and crop diversification were the most popular CSA practices among the sampled farmers. Educational status, farm income, farming experience, size of farmland, contact with agricultural extension, exposure to media, agricultural production activity, membership of an agricultural association or group and the perception of the impact of climate change were found to be statistically significant and positively correlated with the level of CSA adoption.

Muntaka *et al*., (2020) examined Application of Fractional Regression in Modeling Maize Farmers' Adoption of Climate Smart Agricultural Practices in Katsina State, Nigeria. Primary data were used to elicit information from maize farmers through pre-tested structured questionnaires. Fractional Regression Models was used to model the adoption frequency of the climate Smart agricultural practices. The findings from this study show that majority of the respondents have adopted the use of organic manure, crop rotation, mixed cropping, use of cover cropping, minimum tillage and use of drought and heat tolerant crop varieties. Inferential statistics affirmed that membership of cooperative and marital status was factors that are statistically significant thus influencing the rate of adoption of CSAPs in the study area.

Oyewole *et al*., (2022) examined Adoption and Utilization of Climate Smart Agricultural Practices by Cassava Farming Households in Ido Local Government Area, Oyo State, Nigeria. A two-stage sampling procedure was used to purposively select one hundred and twenty (120) registered farmers engaged in cassava crop production for questionnaire administration. Data obtained were analysed using descriptive and inferential statistics. The study revealed that cassava farming activities in the study area is at a small scale level owing to the size of farmland cultivated by majority (70.0%) of the respondents'. It was also observed that majority (76.7%) of the respondents' in the study area generally have adequate knowledge of climate smart agricultural practices though their mean adoption score (4.38) is critically low. This may be linked to the respondents' low level of literacy and the barriers affecting the adoption and utilization of climate agricultural practices.

Most studies tend to focus on the adoption of climate smart agricultural practices (Oyewole *et al*., 2022; Muntaka *et al*., 2020; Abegunde *et al*., 2020; Wamalwa *et al*., 2017) but not in the study area. This study contributes to literature by providing recent information on the determinants of adoption of climate smart agricultural practices in the study area and in addition to previous studies which were carried out in different locations, this research work determined the level of adoption and reasons for non-adoption in the study area. Periods covered by previous researches in this area may not be applicable to current period as Nigeria is currently faced with various economic challenges raging from floods, revenue falls due global oil price, global health issues caused by viruses to insecurity threatening the lives of farmers. This study therefore expand its scope to a more recent period of 2021.

## 3. METHODOLOGY

### 3.1 Analytical Framework

In this study, a farmer is considered to be an adopter of a CSA practice if he/she has used the practice at least one planting season before the interview and was still utilizing such practice as at the time of interview (Afolami *et al.*, 2015). It is assumed that each plot manager (i.e. household head) compares the CSA practices with the traditional technology and adopts it if he/she perceives that the expected utility from adoption exceeds the utility of the traditional technology (Awotide *et al.*, 2016). Thus, this study utilized the probit model, as it models the influence of the set of explanatory variables on the level of adoption of the different CSA practices. The observable binary (1, 0) for whether respondent is an adopter or otherwise is assumed in the usual probit model. 1 if had 50% and above adoption of Climate Smart Agricultural Practices (high adopters); 0 if had below 50% adoption of Climate Smart Agricultural Practices (low adopters). This was expressed as, $q_{it} = bx_{it} + e_{it}$ as explained in equation 2.

### 3.2 The Study Area

The study was carried out in Ondo State. Ondo State is located in South west Nigeria. The State is made up of 18 Local Government Areas, and is bounded in the North by Ekiti and Kogi States, in the East by Edo State, in the West by Osun and Ogun States and in the South by the Atlantic Ocean. Ondo State is located entirely within the tropics. It is located between latitudes 5.50 and 6.30$^{o}$N and longitudes 4.30 and 5.5$^{o}$E. The tropical climate of the State is broadly of two seasons: rainy season (April – October) and dry season (November – March). The annual rainfall varies from 2,000 mm in the southern areas to 1,150mm in the northern areas. It has an area of 762km$^2$ and population of 3,441,024 at the 2006 census.

### 3.3 Source of Data

Primary data were used for this study. The data were collected through the use of a structured questionnaire.

### 3.4 Sampling Technique and Sample Size

Multi-stage sampling procedure was used in the selection of respondents in the study area. The first stage involved a random selection of two Local Government Areas (LGAs) in Ondo State. The second stage involved a random selection of five (5) communities from each of the selected LGAs where maize farmers are dominant, while the third stage involved random selection of ten (10) farmers from each of the selected communities. This gave a total of hundred (100) respondents that were sampled for the study.

### 3.5 Analytical Techniques

Descriptive statistics such as frequency distribution and percentages were used to identify the climate smart agricultural practices adopted by farmers, determine level of adoption of climate smart agricultural practices and identify the reasons for non-adoption of climate smart agricultural practices. Descriptive statistics therefore allow us to present the data in a more meaningful way which allows simpler interpretation of the data. Probit regression model was used to examine the factors influencing adoption of climate smart agricultural practices.

#### 3.5.1 Probit Regression Model

Probit model was used to examine the factors influencing the adoption of climate smart agricultural practices by maize farmers in the study area.

The model is given as:

$$\mathrm{P}\left(\mathrm{Y}_t = \frac{1}{x_i}\right) = \frac{\exp(x_i\beta)}{1+\exp(x_i\beta)} \qquad (1)$$

This was expressed as,

$$q_{it} = bx_{it} + e_{it} \qquad (2)$$

Where $q_{it}$ = an unobservable latent variable for adopters

$x_{it}$ = vector of explanatory variables

b = vector of parameter to be estimated

$e_{it}$ = error term

The observable binary (1, 0) for whether respondent is an adopter or otherwise is assumed in the usual probit model. The level of adoption of climate smart agriculture such that; 1 if had 50% and above adoption of Climate Smart Agricultural Practices (high adopters); 0 if had below 50% adoption of Climate Smart Agricultural Practices (low adopters).

The probability that the binary assumes the value 1 implies,

$$prob.(q_{it} = 1) = \frac{e^{x_{it}} + \beta^{x_{it}}}{1+e^{x_{it}} + \beta^{x_{it}}} \qquad (3)$$

Thus, in this study, the explanatory variables (Xs) that were included in the model are:

$X_1$ = Age (in years), $X_2$ = Marital status (married =1, 0 = others), $X_3$= Sex (male =1, female = 0), $X_4$ = Household Size (in numbers), $X_5$ = Education Level (years of formal education), $X_6$ = Farm

Size (in hectares), $X_7$ = Exposure to extension agent (Yes =1, No = 0), $X_8$ = Years of experience (in years), $X_9$ = Membership of co-operative societies (Yes =1, No = 0), $X_{10}$ = Access to Credit or Loans (Yes =1, No = 0), $X_{11}$ = total income (in naira), $\beta$ = Vector of parameters, $\varepsilon$ = error term.

## 4. RESULTS AND DISCUSSION OF FINDINGS

### 4.1 Climate Smart Agricultural Practices Adopted by Farmers

Table 1 shows the climate smart practices adopted by farmers. Among the ten practices, only crop diversification recorded an adoption percentage of about 21%, which happens to be most adopted climate smart practice in the study area. Specifically, Planting of drought and heat tolerant crops, and conservation agriculture were the second and third most adopted climate smart agricultural practices by 14% and 11% of the respondents respectively. This shows that there is an acceptable level of diversity in the adaptation practices among the farmers in the study area. The implication of this is that some of the farmers can select from a range of adaptation practices without being affected by factors such as income, age, technical know-how etc.

**Table1: Distribution According to the Adoption of Climate Smart Agricultural Practices**

| Climate Smart Practices | Frequency | Percentage | Ranking |
|---|---|---|---|
| Integrated pest management | 9 | 9.00 | 5$^{th}$ |
| Conservation agriculture | 11 | 11.00 | 3$^{rd}$ |
| Agro-forestry | 9 | 9.00 | 5$^{th}$ |
| Mulching | 10 | 10.00 | 4$^{th}$ |
| Crop rotation | 5 | 5.00 | 10$^{th}$ |
| Crop diversification | 21 | 21.00 | 1$^{st}$ |
| Planting of cover crops | 8 | 8.00 | 7$^{th}$ |
| Irrigation | 7 | 7.00 | 8$^{th}$ |

| | | | |
|---|---|---|---|
| Use of organic manure | 6 | 6.00 | 9th |
| Planting of drought and heat tolerant crops | 14 | 14.00 | 2nd |
| **Total** | **100** | **100** | |

**Source: Computed from Field Survey, 2021**

**Multiple response exist**

## 4.2 Level of Adoption of Climate Smart Agricultural Practices

Table 2 also shows the level of adoption of climate smart agricultural practices by the farmers. About 28% of respondents had 50% and above adoption of the Climate Smart Agricultural Practices while about 72% of respondents had below 50% adoption of Climate Smart Agricultural Practices. It can be deduced from this result that the adoption of Climate Smart Agricultural practices is still low among the household heads despite policymakers and scientist advocacy for more adoption of climate smart agricultural practices to mitigate the effects of climate change on agricultural productivity and improved farmers' livelihoods. Considering the changing climatic conditions and the need for climate adaptation to ensure sustainable food production, the result of this study is rather revealing, therefore, the need for policy makers to redirect their efforts in promoting these technologies among maize farming households in the study area.

**Table 2: Distribution of Respondents According to the Level of Adoption of CSA**

| **Adoption Level** | **Frequency** | **Percentage (%)** |
|---|---|---|
| High Adopters (50% & Above Adoption of Climate Smart Agricultural Practices) | 28 | 28 |
| Low Adopters (<50% Adoption of Climate Smart Agricultural Practices) | 72 | 72 |
| Total | 100 | 100 |

**Source: Computed from Field Survey, 2021**

## 4.3 Factors Influencing the Adoption of Climate Smart Agricultural Practices

The results of the probit regression model revealed that age, marital status, farm size, access to extension agents, farming experience, membership to cooperative society, access to credit and the farmer's total income significantly affected the adoption of climate smart agricultural practices by medium and low adopters in the study area.

The coefficient of age was significant at 1% level of probability ($p<0.01$) and negatively related to adoption of climate smart agriculture by the farmers in the study area. This implies that older farmers are less likely to adopt climate smart agriculture. It has been noted that the older one becomes more risk averse. This might also be due to the fact that farmers tend to be more conservative as they age and had a negative or reserved attitude towards the adoption of innovations and technologies that may improve their productivity. Policy intervention should focus on the young farmers to encourage them to adopt and educate the old ones on the need to adopt climate smart agricultural practices.

The coefficient of marital status was significant at 5% ($p<0.05$) level and positively related to adoption of climate smart agriculture by farmers in the study area. This implies that adoption of climate smart agricultural practices was higher for farmers who are married and are more likely to adopt. Steenwerth *et al.* (2014) opined that the higher rate of adoption by married couples has a bearing on the lopsidedness of extension services, the major means of innovation diffusion.

The coefficients of farm size and access to extension agents were significant at 1% ($p<0.01$) and 5% ($p<0.01$) level of probability respectively. The negative coefficient of farm size shows that smallholder farmers are more likely to adopt climate smart technology. Moreover, access to extension services had a positive coefficient which implies that farmers who have access to extension services are more likely to adopt climate smart technologies. According to Ohen 2013, smaller farm size increases the ability of the farmers to adopt agricultural innovation and extension services provide informal training that helps to unlock the natural talents and inherent enterprising qualities of the farmer, enhancing his ability to understand and evaluate and adopt new production techniques leading to increased farm productivity.

The coefficient of farming experience and membership of farmers' association was positively significant at 1% level ($p<0.01$). This implies that farmers with more experience and are members of farmer's association are more likely to adopt climate smart technologies in the study area. This finding is consistent with previous research that farming experience was an essential indicator for the adoption of agricultural technologies to enhance productivity among farmers (Grazhdani 2013).

The coefficients of income and access to credit are significant at 10% ($p<0.10$) probability level. The respondent's access to credit is positively related to adoption of climate smart agricultural practices. This means that respondents who have access to credit are more likely to adopt climate-smart agricultural practices. On the other hand, the coefficient of income carries a negative sign. This is in contrast with (Dance & Sarpong, 2011; Adger *et al.*, 2007), lack of fund and access to credit prohibits smallholder farmers from assuming risks of financial leverage associated with the adoption of new technology in their farms. Lower incomes farmers can barely afford the proposed adaptation practices.

**Table 3: Factors influencing the Adoption of Climate Smart Agricultural Practices**

Parameter Estimates

| Variables | Co-efficient | Std. Error | T-Stat | P-Value |
|---|---|---|---|---|
| Constant | -59.320 | 78964.002 | 3.86 | .217 |
| Age | -1.005 | 548.781 | 4.77 | .002*** |
| Marital Status | 19.596 | 35266.538 | 2.45 | .018** |
| Gender | -19.897 | 14087.816 | 1.16 | .612 |
| Household Size | -2.130 | 5470.978 | 3.89 | .124 |
| Educational Status | .820 | 839.422 | 3.28 | .341 |

| | | | | |
|---|---|---|---|---|
| Farm size | -3.152 | 2275.575 | 2.41 | .004*** |
| Access to Extension Service | 15.525 | 13810.658 | 3.67 | .043** |
| Farming Experience | 1.265 | 961.143 | 1.86 | .000*** |
| Membership of Cooperative Society | .179 | 7881.697 | 2.62 | .000*** |
| Access to Credit | .748 | 35643.283 | 1.42 | .102* |
| Total Income | -5.413E-7 | .013 | 2.16 | .065* |
| $R^2$ (Pseudo) | 0.8958 | | | |
| Likelihood Ratio | 57.17 | | | |

**Source: Computed from Field Survey (2021)**

***** = significant at 1%, ** = significant at 5% and * = significant at 10%**

### 4.4 Reasons for Non-Adoption of Climate Smart Agriculture by the Respondents

Table 4 shows the reasons for non-adoption of climate smart agriculture by maize farmers in the study area. Many reasons were cited by respondents for not taking up the practices which ranges from lack of finance (22%), low level of income (15%), lack of labour (6%), high cost of agrochemicals (10%), lack of extension agent (17%), inadequate credit facilities (8%), unavailability of improved varieties which are drought and heat tolerant (14%), and lastly inadequate access to farm machineries (8%). Lack of finance may be connected with poor background of most respondents, also the problem of credit facilities and loans was expected because it was noticed that majority of the farmers depended solely on their personal savings to finance their maize production venture. High cost of agrochemical hindered the farmers from buying farm chemicals thereby leading to reduction in crop yield. Lacks of extension agents also affect the farmers because it was noticed that most of the farmers did not get adequate information from the extension agents on new technologies. This clearly affirmed lack of knowledge and assets as the main causes that had hindered farmers from adopting climate smart agricultural practices. This was supported by Abdulahhi *et al*., (2021) who argued that in spite of the benefits associated with adoption of climate smart practices, barriers such as lack of finance, lack of technical knowledge and possible short-term yields reductions, lack of risk management options (insurance), and lack of access to information regarding new technologies can make farmers reluctant to adopt them.

**Table 4: Distribution of Respondents by Reasons for Non-Adoption of CSAP**

| Constraints | Frequency | Percentage | Rank |
|---|---|---|---|
| Poor extension contact. | 17 | 17.00 | 2nd |
| Lack of finance. | 22 | 22.00 | 1st |
| High cost of agro-chemicals | 10 | 10.00 | 5th |
| Inadequate access to farm machineries and other farm inputs. | 8 | 8.00 | 6th |
| Unavailability of improved varieties which are drought and heat tolerant | 14 | 14.00 | 4th |
| Lack of labour | 8 | 8.00 | 8th |
| Inadequate credit facilities | 10 | 10.00 | 7th |
| Low level of income | 11 | 11.00 | 3rd |
| **Total** | **100** | **100.00** | |

**Source: Computed from Field Survey, 2021**

## 5. CONCLUSION AND POLICY RECOMMENDATIONS

This article examined the factors influencing adoption of climate smart agricultural practices among maize farmers in Ondo State, Nigeria. The study revealed that the most adopted climate smart agricultural practices in the study area was crop diversification. Adoption of climate smart agricultural practices is still very low among the respondents despite policymakers and scientist advocacy for more adoption of climate smart agricultural practices to mitigate the effects of climate change on agricultural productivity and improved farmers' livelihoods. Also, maize farmers' adoption level of climate smart agricultural practices is positively influenced by marital status, access to extension services, farming experience, membership of farmers' association and access to credit. However, age, farm size and total income negatively influenced farmers' adoption level of climate smart agricultural practices. Many reasons were cited by respondents for not taking up the climate smart practices which ranges from lack of finance, poor extension contact, high cost of agrochemicals, inadequate credit facilities, inadequate access to farm machineries, lack of labour and unavailability of improved varieties which are drought and heat tolerant. Based on the findings of the study, the following were recommended that:

1. Government should develop suitable policies that will encourage and educate farmers especially the old and risk averse rural farmers to adopt and utilize Climate Smart Agricultural Practices (CSAPs).
2. Government should provide and support on-farm demonstration training and dissemination of information about climate smart agricultural practices to the farmers by the extension agents to enable farmers who are not willing to adopt CSAPs see the need to adopt.
3. There is should be provision of credit facilities through the Agricultural Credit Guarantee Scheme Fund and bank credit to farmers by government in order to enhance adoption.
4. The extension agents should target farmers with larger area of land to adopt the use of climate-smart agricultural practices This would be an encouragement for those with smaller farm size to adopt CSAPs.

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