



PERCEPTIONS OF CLIMATE CHANGE EFFECT ON COCOA FARMERS IN ZONE III OF AGRICULTURAL DEVELOPMENT PROGRAMME TARABA STATE, NIGERIA

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ABSTRACT

This study examined the socio-economic factors and perceptions of climate change among cocoa farmers in Taraba State, Nigeria. Climate change threatens cocoa yields, quality, and farm sustainability. Purposive, simple and stratified sampling technique was used in selecting 248 farmers for the study. Data were collected using structured questionnaires. The results showed that 93% of farmers were male, with an average age of 44.73 years, and 74.6% had at least secondary education, averaging 11.61 years of formal schooling. Farmers reported several climate change impacts, including increased costs of fungicides and pesticides ($\bar{x} = 3.23$), higher disease incidence such as black pod ($\bar{x} = 3.18$), pest attacks like capsids ($\bar{x} = 3.22$), and cocoa pod and flower abortion ($\bar{x} = 4.67$). They demonstrated a moderate awareness of climate change effects, particularly pest outbreaks, yield decline, and crop failure. Most information about climate change was obtained through interactions with fellow farmers. Based on these findings, it is recommended that extension services be tailored to farmers' literacy levels and incorporate training on climate-smart practices, innovative resilience strategies, and modern technologies. Additionally, diversifying credit sources beyond informal lenders could improve farmers' financial independence and adaptive capacity. Implementing these measures would enhance farmers' resilience to climate impacts and boost cocoa productivity in the region.

Keywords: Cocoa, Farmers, Climate-change, Perception, Socioeconomic, Information.

INTRODUCTION

Climate change has emerged as one of the most urgent global issues of the 21st century, profoundly impacting agricultural output and rural communities worldwide. Characterised by long-term shifts in temperature, rainfall patterns, solar radiation, and humidity, climate change is a major concern that affects ecosystems, human health, and food security (Food and Agriculture Organization [FAO], 2024). These climatic shifts result in unpredictable weather, disrupting traditional farming schedules and decreasing agricultural productivity (Isa, 2023). Cocoa, a crucial crop for many West African nations, is particularly vulnerable to climatic variations due to its tropical origins and specific environmental needs. Over 70% of global cocoa production comes from West Africa, with Nigeria being a key producer (International Cocoa Organization [ICCO], 2024). However, climate change threatens cocoa cultivation through reduced yields, quality deterioration, and potential farm abandonment (Isa, 2023). The effects of climate change include rising temperatures, irregular rainfall, droughts, and floods all of which have both direct and indirect consequences for cocoa farming. Cocoa plants are highly sensitive to climatic shifts; even slight variations in temperature and rainfall can lead to lower yields, increased pest and disease problems, and financial losses for farmers. Despite these vulnerabilities, farmers' perceptions and their ability to adapt differ widely, largely influenced by socioeconomic factors.

Understanding these socioeconomic factors that shape farmers' perceptions of climate change is essential for creating effective adaptation strategies. Variables such as income, education, access to information and resources, land ownership, and credit availability significantly influence how farmers perceive climate risks and their willingness to adopt mitigation measures. For instance, farmers with higher education levels and better resource access tend to recognize climate change signs earlier and are more proactive in implementing adaptation strategies. Conversely, those with limited resources often have reduced awareness and are more vulnerable. In Taraba State, there is limited research on how socioeconomic variables affect farmers' perceptions and responses to climate change. Most existing studies emphasize physical environmental impacts without adequately addressing the social



and economic dimensions that influence adaptive behaviour. This gap hinders the development of targeted policies and interventions tailored to the needs and capacities of local farmers.

The findings of this study aim to enhance understanding of Perceptions of Climate Change vulnerability among cocoa farmers in Taraba State. This knowledge is vital for designing sustainable, context-specific interventions that improve farmers' resilience while supporting the continued productivity of cocoa farming in the region. As climate change poses increasing threats to agriculture globally, localized research like this is crucial for informing policy and strengthening community-level adaptive capacities.

- i. describe socioeconomic characteristics of the respondents,
- ii. examine the perception of respondents on effects of climate change on cocoa production
- iii. examined the respondents information sources and awareness about climate change,

METHODOLOGY

The study area is TADP Zone III Taraba State, Nigeria. It is situated between latitudes 6°30' and 8°30' north of the Equator, and longitudes 9°00' and 12°00' east of the Greenwich Meridian (Ezra *et al.*, 2023). The state has an estimated land area of approximately 54,428 square kilometres. It is bounded to the west by Nasarawa and Benue States; to the northwest by Plateau State; to the north by Bauchi and Gombe States; and to the northeast by Adamawa State. Additionally, Taraba State shares an international border with the Republic of Cameroon to the southeast and south.

Geographically, Taraba State largely lies within the tropical zone, characterized by Guinea Savannah vegetation. The southern parts of the state are predominantly covered with forests and tall grasses, while the northern regions are marked by short grasses interspersed with short trees (Isa, 2023). According to the 2006 National population Commission (NPC, 2006), the population of Taraba State was approximately 2,294,800. Based on a projected annual growth rate of 3.2%, the population is estimated to reach around 3,552,344 by 2025 (NPC in Danladi *et al.*, 2025). The major occupation of the population is agriculture which includes livestock rearing and crop production by cultivating tree crops (perennials crops) such as cocoa, coffee, tea, pear, plantain, shear nuts and citrus, as well as intercropping with arable crops such as groundnut, maize, rice and soybeans.

The dry and rainy seasons common to the tropical regions are also the dominant climatic features found in the State. The rainy season start by early April and last till October while the dry season starts by November and ends in March. The average rainfall in the state is about 1,350 mm in the southern part. This reduces gradually to about 750 mm in the northern parts of the state. The mean minimum daily temperature is 14.8⁰c and the mean maximum temperature is 34.4⁰C (Jauro *et al* 2021). Taraba State has been delineated by Taraba Agricultural Development Programme into four agricultural zones namely Zone I (Zing zone), Zone II (Wukari zone), Zone III (Takum zone), and Zone IV (Gembu zone). The cocoa zone within the state is Zone III (Takum zone) that comprises of the following Local Governments areas; Gashaka, Kurmi, Ussa Donga Takum and part of Bali (TADP in Oruonye *et al.* 2016)

Sampling Technique and Sample Size

The population of this study comprises of all cocoa farmers in TADP Zone III. The number of registered cocoa farmers across the Zone III was 1,043 farmers. A purposive, simple random sampling and stratified random sampling procedure was used to select respondents for this study. The first stage was purposive selection of two blocks out of the eleven blocks in Zone III due to the large number of cocoa farmers in the blocks; these were Abong and Serti blocks. The second stage was random selection of 3 cells from each of the two blocks earlier drawn to give a total of 6 cells. Based on the sample frame of 722 Krejcie and Morgan table 1970 recommended a sample size of 248. Finally, the third stage was a proportionate allocation across board to 248 sample size.

Data Collection and Analysis

Questionnaires were used to elicit information from the respondents. The collected data were analysed using descriptive statistics (such as frequency, means, standard deviation and percentage) were used to achieve the objectives.



RESULTS AND DISCUSSION

Socio-economic Characteristics of the Respondents

The results presented in Table 1 indicate that the most (93%) of respondents were male. This dominance of male farmers largely stems from traditional roles where men serve as family heads responsible for providing for their households. Such a pattern is reflective of broader trends across many African farm communities, where men typically have greater access to land, capital, and resources necessary for cocoa cultivation. The predominance of males may also be attributed to the labour-intensive nature of cocoa farming, which often requires substantial physical effort that women might find challenging to undertake effectively. However, women were frequently engaged primarily in post-harvest activities such as processing rather than in direct cultivation. These trends align with the findings of Famakinwa *et al.* (2023), reported that about 88% of cocoa farmers in Osun State, Nigeria, and were male. The labour demands and time-intensive processes involved in cocoa farming tend to discourage female participation, especially considering cultural and societal norms that often restrict women's access to land and farming opportunities. Moreover, many women serve as heads of households but lack the necessary land rights or resources to participate fully in cocoa cultivation. Consequently, promoting gender inclusivity is not only essential for empowering women but also for broadening the base of farmers capable of adopting climate change adaptation strategies, which ultimately benefits the cocoa industry.

Furthermore, the findings revealed that the average age of farmers were approximately 44 years. Most farmers fall within the age bracket of 31-40 year, indicating a relatively young farming population engaged in cocoa production. This age group is particularly significant because it coincides with the most productive years of farmers' lives, when they possess both the physical capacity and the potential for innovation necessary for adopting effective climate adaptation strategies. The prevalence of young and middle-aged farmers suggests that they are well-positioned to respond effectively to climate-related challenges and to implement sustainable farming practices. This finding is consistent with Adejuwon *et al.* (2023) that reported over 42% of cocoa farmers in Nigeria's humid zones are between 31 and 45 years old. These studies reinforce the idea that the active farming population within this age group holds considerable potential for climate change adaptation and resilience building in cocoa production.

In addition, findings in Table 1 showed that 40.7% of the respondents attained secondary education, while 33.9% completed tertiary education. Additionally, 17.3% had primary education, and 8.1% had no formal education. This distribution indicates that most farmers possess a reasonable level of literacy, which is crucial for understanding information related to climate change and for adopting innovative adaptation measures. These observations align with the findings of Arimi *et al.* (2025), reported that a substantial proportion (83%) of cocoa farmers in Oyo State, Nigeria, had formal education. Their study underscores the importance of education in strengthening farmers' capacity to adapt to climate variability. Conversely, farmers with no formal education tend to be less receptive to technologically advanced adaptation measures, often favouring simpler, traditional strategies due to limited understanding of complex technologies and the uncertainties associated with innovative interventions.

Additionally, the findings on farming experience, as shown in Table, indicated that 55.6% of farmers had an average of 23.84 years of agricultural practice. This substantial level of experience reflects a high degree of expertise, which is crucial in understanding and responding to the effects of climate change on cocoa production. This result aligns with the findings of Idris *et al.* (2024), who noted that farmers with more years of experience tend to develop improved management strategies, interpret weather signals more effectively, and adopt resilient agricultural practices. Farmers with extensive experience are more probably with local weather patterns and climatic cues, enabling them to perceive climate variability more accurately and develop appropriate adaptation strategies. For instance, seasoned farmers may have observed long-term climate shifts and are thus more likely to diversify cropping systems, adopt climate-smart practices, or adjust their farming schedules accordingly.

Moreover, the results revealed that most (94.6%) of the respondents cultivate cocoa on small size farms, with an average farm size of approximately 4.77 hectares. This indicates that most cocoa farmers in Zone III, Taraba State, operate on relatively small plots, predominantly below five hectares.



This small-scale farming aligns with findings by Kolapo *et al.* (2025), who observed that about 11% of cocoa farmers manage less than two hectares, while 68% cultivate between 2.1 and 4 hectares. These patterns are consistent with regional trends across Nigeria, where subsistence and small-scale farming dominate. The limited farm sizes suggest that farmers are mainly engaged in resource-constrained, small-scale cultivation. This resource limitation influences their perceptions of climate change impacts and constrains their capacity to implement extensive adaptation strategies.

The study's findings also indicated that a significant majority (79%) of respondents reported limited or no access to extension support. This suggests that many farmers receive inadequate guidance and information regarding climate change adaptation. Consequently, the dissemination of vital information on climate resilience strategies remains insufficient, which hampers farmers' awareness and capacity to adopt effective measures. These findings are consistent with previous studies; for example, Kolapo *et al.* (2025) reported that 78.33% of farmers in Southwest Nigeria had never been visited by extension agents. Similarly, Arimi *et al.* (2025) observed that 41% of cocoa farmers in Oyo State experienced irregular extension visits. Access to extension services is critical for equipping farmers with the necessary knowledge and practical skills to adapt to climate variability. Therefore, the low frequency of extension support significantly hampers farmers' ability to implement appropriate adaptation strategies, which could otherwise improve cocoa yield and quality while safeguarding income levels. This situation highlights an ineffective extension system where most farmers are either rarely supported or not supported at all.

In addition, the findings revealed that approximately 69% of farmers had access to some form of credit. Among these, a significant proportion (62.5%) primarily obtain trade credit from cocoa buyers, while 6.5% rely on informal sources such as family and friends and the remaining 31% access alternative credit channels. Notably, reliance on Licensed Cocoa Buying Companies (LBCs) for credit suggests that these companies often extend credit as part of their strategy to secure farmers' sales post-harvest. This dependence on a limited range of credit sources highlights resource constraints and may restrict farmers' ability to invest in improved farming techniques or respond effectively to climate-induced shocks. Supporting this, Kolapo *et al.* (2025) found that over 79% of farmers lack access to credit, mainly due to the absence of collateral and limited financial information. As a result, many cocoa farmers are unable to purchase essential inputs such as pesticides, fertilizers, or new equipment, which are vital for resilient farming practices. Furthermore, the limited credit options restrict farmers' capacity to expand their farms, invest in land improvements, or cover costs related to planting and harvesting all of which are crucial for climate adaptation. This over-reliance on a narrow range of credit sources may also lead to power imbalances, reducing farmers' bargaining power during price negotiations and limiting their financial autonomy. Consequently, such constraints can hinder their ability to adapt to or recover from the adverse effects of climate change.

Lastly, the findings indicated that inheritance is the most prevalent method of land acquisition, constituting 74.6% of land holdings. This reflects the deep-rooted traditional and kinship-based land tenure systems within the community. Purchase is the second most common method, accounting for 21.4%, with other less frequent methods including gifts (5.6%), leasehold arrangements (0.4%), traditional land-sharing practices such as wushira (1.6%), and rental agreements (1.2%). The reliance on inheritance underscores the importance of familial ties and customary land rights in the study area. While inheritance provides stability and continuity in land use, it can also pose challenges related to land scarcity, intergenerational conflicts, and limited access for new farmers. These land acquisition patterns are consistent with the findings of Famakinwa *et al.* (2023), who reported that 59% of respondents inherited land from family members, while about 34% acquired land through leasehold or rental arrangements.



Table 1: Socio-economic Characteristics of the Respondents (n = 248)

Variables	Frequency	Percentage %	Mean	Std. Deviation
Sex				
Male	230	93		
Female	18	7		
Age of the Respondents			44.73	12.52604
18-30	35	14.1		
31-40	88	35.5		
41-50	47	19.0		
51 and Above	78	31.5		
Level of Education			11.61	4.51004
No Formal Education	20	8.1		
Primary Education	43	17.3		
Secondary Education	101	40.7		
Tertiary Education	84	33.9		
Farming Experience			23.84	11.35173
<10	10	4.0		
11-20	100	40.3		
>21	138	55.6		
Farm Size/Ha			4.77	6.41037
1-10	235	94.8		
11-20	10	4.0		
21 and Above	3	1.2		
Extension Visit			0.40	0.85717
Never	196	79		
Once	17	7.7		
Twice	17	7.7		
Trice and Above	14	5.6		
Sources of Credit				
Family/Friends	16	6.5		
Cocoa Buyers	155	62.5		
Others	77	31.0		
Land Acquisition				
Purchase	53	21.4	0.2137	0.41075
Rent	3	1.2	0.0121	10954
Leasehold	1	0.4	0.0040	0.6350
Gift	14	5.6	0.0565	0.23126
Inheritance	185	74.6	0.7460	0.43620
Wushira (a traditional land-sharing practice)	4	1.6	0.0161	12623

Source: Field Survey 2025

Respondents' Perception on Climate Change

The respondents' perceptions regarding the effect of climate change were presented in Table 2. It shows the physical manifestation of climate change on cocoa production. Which indicates that climate change have led to increased costs of fungicides and pesticides $\bar{x} = 4.8347$. This implies that perception underscores the tangible economic challenges faced by respondents, including increased expenditures on chemical controls due to heightened pest and disease pressures driven by climate variability. This suggests alterations in the development of pests and diseases affecting cocoa and changes in the crop's resistance to such threats. This conformed to Famakinwa *et al.* (2023) that observed cocoa farmers have been forced to develop adaptive strategies to mitigate these effects; some of these strategies adopted were use of pesticide and herbicide among others. Similarly, Akinfiresoye *et al.* (2022) reported that 36 % of the farmers used more than three types of fungicides, while 22 % used two types and only 14 % used one type of fungicides. Majority of these famers used more than two fungicides.



The findings in Table 2 presented an average score on perception that climate change is a significant threat to cocoa production $\bar{x} = 4.81$, indicating a strong consensus among respondents that climate change poses a significant threat to agriculture, particularly in cocoa-producing regions. This widespread awareness underscores the recognition among farmers of climate change as a critical challenge affecting food security, livelihoods, and the broader economic stability of rural communities. These findings are consistent with recent studies; for example, Adejuwon *et al.* (2023) reported that 43% of farmers experienced crop damage attributable to climate-related factors, while 40% reported post-harvest losses linked to changing climatic conditions. Similarly, Suh and Molua (2022) highlighted that climate variability adversely affects agricultural productivity and the resilience of rural livelihoods. Many farmers observed noticeable impacts on productivity, especially changes in rainfall patterns over time, which directly influence cocoa cultivation. Such perceptions reflect an understanding of the tangible effects of climate variability on agricultural outcomes.

Furthermore, results in Table 2 revealed that changing climatic conditions contributed to a higher incidence of diseases, particularly black pod disease $\bar{x} = 4.7944$. The high mean scores indicated agreement among respondents, suggests that changing climatic conditions have a significant impact on the increased incidence of diseases, especially black pod disease. This indicates that variations in climate factors such as temperature, humidity, and rainfall contribute to creating a favourable environment for disease development and spread. Kongor *et al.* (2024) noted that excessive rainfall and high humidity promote the establishment and reproduction of fungi responsible for cocoa black pod disease. Similarly, Attiogbe *et al.* (2024) argued that increased relative humidity from climate change can intensify black pod incidence, a major cocoa disease. Adejuwon *et al.* (2023) also observed that high rainfall adversely affects metabolic processes vital for pod development, and elevated humidity levels increase the occurrence of black pod disease. These findings align with previous research by Kosoe and Ahmed (2022), who reported that climate change accelerates the spread of black pod disease by weakening the crop's resistance to pests and diseases.

The finding in Table 2 showed agreement that climate change significantly elevates pest attacks, such as capsid outbreaks $\bar{x} = 4.7460$. The high mean scores reflect a consensus among respondents that climate change poses a significant threat to agricultural food production. Rising temperatures create favourable conditions for pests such as capsids, which weaken the crop's resistance to pests and diseases (Adejuwon *et al.*, 2023). This aligns with the broader recognition of climate change's impact on agricultural health, as pest outbreaks have reinforced farmers' perceptions of climate change as a serious threat to food security (Balasha *et al.*, 2023). Additionally, pests and diseases frequently target various parts of the cocoa plant, leading to considerable economic losses (Darmawan & Abdul-Mutalib, 2024).

Similarly, findings in Table 2 indicated that heat waves are linked to cocoa pod and flower abortion $\bar{x} = 4.6694$, as indicated majority of respondents agreed that additional water stress on crops, reduced pollen viability, embryo abortion, and ultimately reduced seed yield due to climate change. Therefore, excessive heat can significantly hinder photosynthesis and increase water stress within cacao plants, resulting in shrivelled flowers and smaller, rotted pods (Ridwan Akeem 2025). This is in line with Shrestha *et al.* (2022) who observed Farmers perceived a change in the number of hot days where 75% perceived increase. Likewise, Kongor *et al.* (2024) reported that changes in temperature and rainfall patterns are linked to poor reproductive development in cocoa trees, aligning with farmers' perceptions of declining flowering and fruiting.



Table 2: Farmers Perception of Climate Change

Variables	Mean	Std. Deviation	Remark
Increase the cost of fungicide/pesticides	4.83	.486	Agreed
Significant threat to cocoa production in my area	4.81	.393	Agreed
Increases disease incidence like black pod	4.79	.405	Agreed
Increase pest attacks (e.g., capsids)	4.75	.436	Agreed
Heat waves cause cocoa pods and flower abortion	4.67	.471	Agreed
Weather patterns are becoming unpredictable	4.65	.478	Agreed
Reduce my cocoa yield	4.65	.527	Agreed
Rainfall now starts later than before (onset)	4.59	.509	Agreed
Heavy rainfall damage cocoa pods	4.51	.667	Agreed
Prolonged dry spells reduce soil moisture for cocoa	4.40	.621	Agreed
Dry spells during the rainy season are more frequent	4.37	.752	Agreed
Causes death of young cocoa trees	4.33	.566	Agreed
Temperatures are generally hotter now than before	4.33	.781	Agreed
Rainfall now end earlier than before	4.31	.894	Agreed
Cocoa beans size and quality have reduced due to climate change	4.20	.789	Agreed
Rainfall duration has decreased	4.20	1.013	Agreed

Source: Field survey 2025

Farmers Information Sources and Awareness in Relation to Climate Change

Table 3 presents results of farmers' sources and awareness about climate change. The findings indicate a striking level of awareness with climate change among the respondents, with a substantial 97% acknowledging its existence. This widespread awareness suggests that climate change has become deeply ingrained in public understanding, partly due to the shared knowledge and experiences of farmers in predicting local climate conditions. This is consistent with the idea that more experienced farmers possess a deeper understanding of weather patterns and their impact on agricultural practices, which is further reinforced by media coverage, educational initiatives, and global discussions on sustainability." (Balasha, *et al.*, 2023). However, while awareness appears to be nearly universal, it is essential to differentiate between mere recognition and comprehensive understanding. Existing literature indicates that 96% of the farmers were aware of the effect of climate change on cocoa production (Okeniyi, *et al.*, 2021).

The findings in Table 3 on level of awareness of respondents regarding increased pest and disease outbreaks $\bar{x} = 4.6694$, indicate moderate level of awareness on the perceived effects of climate change by respondents regarding the consequences of climate change, it corroborate to Balasha, *et al.* (2023) reported that about 92% of male farmers worried about the appearance of new pests such as millipedes and fall armyworms that caused significant crop losses.

More so, the findings in Table 3 demonstrate a moderate level of awareness of respondents about the decline in yield $\bar{x} = 4.5968$ the impact of climate change on cocoa production, the factors that might influence the yield includes the type of soil, soil fertility, insect and pest attack, and agronomy practices (choice of cultivars, planting density, and pesticides and herbicides). However, some of these factors were directly or indirectly affected by climate. Among the climate variables, Kosoe and Ahmed (2022), opined that rainfall has the greatest impact on cocoa yield. It was observed that some crop yields are lower in recent years compared to the past 30 years (Nyang'au, *et al.*, 2021).

The study illustrates respondents' awareness of crop failure as a consequence of climate change $\bar{x} = 4.5605$. This mean score indicates a moderate level of awareness among the respondents suggests that negative yield period was characterized by cocoa yield failure when rainfall and humidity were less than the threshold values while temperature and sunshine seems to be at extreme level that climate change can lead to crop failure (Adejuwon *et al.*, 2023). Likewise, Okeniyi *et al* (2021) reported that



crop failure, 16.7% believed as a result of increased in pest and disease outbreak while 23% said it causes by high heat waves.

This study showed decrease in rainfall on cocoa production, $\bar{x} = 4.1290$ indicated moderate level of awareness by the respondents. This elevated mean suggests that the majority of respondents were aware of climate change through productivity factors such as rainfall and how it changed over time (Idris, *et al.*, 2024). This align with previous study by Bobadoye, *et al.* (2020) in Ibadan Nigeria, reported that 54% of the agroforestry farmers perceived decreasing rainfall duration. Pest and disease proliferation decreased cocoa yields, crop failure and decrease in rainfall as a critical factor affecting cocoa production. Similarly, Okeniyi *et al* (2021) reported that 23% believed high heat waves was caused as a result of climate change.

Farmers' Sources of Climate Change Information from the Sampled Area

The findings in Table 3 showed that respondents sourced climate change information through interactions with fellow farmers with a mean score of $\bar{x} = 3.4677$. This implied that majority of the respondents learn faster from fellow farmers as it relates to agricultural operations. It suggests how broad the social network influence climate change awareness. Which concurred with recent literature of Osuji *et al.* (2025) reported that 99.6% of cocoa farmers received climate information from Farmer-to-farmer extension services. Likewise, Balasha, *et al* (2023) reported that 61% of the male farmers referred to fellow farmers as the main source of knowledge about climate change.

The results also revealed that respondents received information on climate change through radio broadcasts $\bar{x} = 2.3508$. This indicated that majority of respondents rarely get information from radio broadcast. This suggests radio services were less effective may be due to less listenership because of inadequate interest and focus in broadcasting to local farmers in local languages and may be less intervention in dissemination of agricultural programs and modern farming activities through radio. The findings contradict some of these studies Isa (2023) conducted studies in Southern Taraba state Nigeria, reported that (42%) of the respondents source information on climate change through radio and Extension agents that has to do with the fact that international radio and state radio stations have scored high in acceptability and popularity because of their special interest and focus in broadcasting to local farmers in local languages. Likewise, Yakubu, *et al.* (2024) reported that majority, 97% of the farmers had radio as their source of climate change awareness therefore, the mass media especially radio and televisions were the major avenues through which farmers sourced information on climate change. The prominence of radio as one of the fastest, simplest, most powerful, and in most cases the only effective way of communicating with the majority of people living in the rural areas. Show the importance of utilizing mass communication tools in agricultural extension programs to effectively reach and educate cocoa farmers in the rural areas.

The findings in Table 3 also showed that respondents sources information on climate change information through community meetings with a mean score of $\bar{x} = 1.8629$, indicating that respondents predominantly reported receiving little to no information about climate change from community meetings. The mean score suggests that respondents are positioned between "never received" and "rarely received" climate change information, reflecting a low level of engagement or dissemination of climate-related issues within the community forums. This inadequate information dissemination could hinder community adaptation efforts, reduce awareness of climate risks, and limit community participation in mitigation strategies. This finding agreed with recent study by Yona, *et al.* (2025) reported that only (25%) source climate change information from community meetings. This show the importance of community-based communication platforms in influencing farmers' knowledge and practices related to cocoa farming.

In addition, the finding in Table 3 showed that respondents sources information on climate change through Non-governmental organizations with a mean score of $\bar{x} = 1.8105$. The relatively low mean suggests that NGOs were generally perceived as not very active or involved frequently in the area or issue being measured, which could imply limited outreach, influence, or participation. This aligns with existing research, which emphasizes the significance of disseminating climate change information through extension agents enhanced more chances of adapting to climate change but it can be less



effective because of less intervention of government or non-governmental agricultural extension workers in farming activities (Bosekeng, *et al.*, 2020).

Table 3: Farmers Information Sources and Awareness about Climate Change

Variables	Frequency	Percentage	Mean	Std. Deviation
A. Farmers Awareness about Climate Change				
Have you ever heard of climate change	241	97		
Increase in pest and disease outbreak			4.67	.771
Decline in yield			4.61	.853
Crop failure			4.56	.866
Decrease in rainfall			4.13	.794
High heat waves			4.11	.874
Increases in temperature			4.04	.752
Increased in drought experience			3.93	.879
B. Sources of climate change information				
Fellow farmers			3.47	.899
Radio			2.35	1.167
Community Meeting			1.86	1.115
NGOs			1.81	.877
Social Media(What Sapp, Facebook)			1.66	1.041
Television			1.37	.926
Extension Agent			1.34	.824
Research Institute (Extension outreach)			1.10	.399
Mobile phone (SMS)			1.00	.000

Source: Field survey, 2025

CONCLUSION AND RECOMMENDATIONS

The findings underscore that cocoa farmers in Taraba State possess a substantial understanding of climate change and its detrimental effects on cocoa cultivation. Their perceptions are shaped by tangible experiences, including shifts in weather patterns, increased pest and disease prevalence, and reduced productivity. While their level of awareness is moderate, it is complemented by active engagement in adaptation efforts, largely driven by their educational background and resourcefulness. The study recommended that:

1. It is recommended that extension officers and community development agencies develop agricultural programs that are practical and suited to farmers' literacy levels, considering most farmers are literate in the study area, to improve knowledge dissemination. Additionally, encouraging the formation of farmer groups can enhance access to resources, information, and mutual support, which can boost farmers' productivity and resilience.
2. Policymakers and agricultural development agencies must prioritize investment in climate-smart solutions, including drought-tolerant crop varieties and soil preservation methods, making sure these innovations are affordable and easily accessible to farmers.
3. Improve communication strategies by employing various platforms like radio programs, community organizations, and extension services to effectively spread climate resilience information. It is important to designate specific persons or groups responsible for overseeing and coordinating these communication efforts to ensure consistent and effective outreach.
4. Encourage the adoption of sustainable resource management techniques like mulching and water harvesting, and create a system to track their effectiveness for continuous adjustment. Designate responsible individuals or groups to ensure consistent application and on-going enhancement of these methods.



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