

Assessment of Awareness of Climate Change Among Subsistent Farmers in Gwagwalada Area Council, Abuja

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Abstract: This study assessed awareness about climate change among subsistent farmers in Gwagwalada Area Council, Abuja. The descriptive survey design was employed. From a population of subsistent farmers across the Area Council, a sample size of 180 was selected from six communities using the simple random sampling technique. Climate Change Awareness Assessment Scale (CCAAS), a questionnaire design on a 4-point Likert scale format was used for data collection. Descriptive statistics including frequency counts, percentage, and mean (\bar{x}) were used for data analysis. Results of the study revealed that lack of awareness about climate change among subsistent farmers in Gwagwalada Area Council has impact on their adaptation mechanisms to climate change. It was recommended among others that environmental education either in formal or informal setting be employed in effective creation of awareness about climate change to subsistent farmers to boost agricultural production in Gwagwalada Area Council, Abuja.

Keywords: Agriculture, Awareness, Climate Change, Subsistent Farmer.

I. INTRODUCTION

An inevitable enterprise upon which pace of global population growth depends is agriculture. Agriculture is the art and science of cultivating the soil, growing crops and raising livestock. It includes the preparation of plant and animal products for people to use and their distribution to markets. It provides the world's food and fabrics as well as cotton, wool, and leather (National Geographic, 2021). Agriculture also has significant contributions to socio-economic growth and development of every nation of the world.

Agriculture can be classified according to degree of commercialization into two namely: commercial and subsistence. Commercial agriculture is concerned with growing of crops and the rearing of animals for raw materials, food, or export, particularly for profitable reasons. This class is practiced on a large scale as the goal of the farmer is to maximize the profit margin. Hence, it solely focuses on the production of crops and farm animals for sale, using the most advanced, efficient, and recent technologies (Miller, 2020).

On the other hand, subsistence agriculture is the form of farming in which nearly all of the crops or livestock raised are used to maintain the farmer and the farmer's family, leaving little, if any, surplus for sale or trade. Preindustrial agricultural

peoples throughout the world have traditionally practiced subsistence farming (Mbwambo, Mourice & Tarimo, 2021). Subsistence agriculture persists today on a relatively wide scale in various areas of the world, including large parts of sub-Saharan Africa. In Nigeria, majority of the rural poor depends on subsistence agriculture for survival (Adetayo & Owolade, 2012). Subsistence agriculture systems appeal to rural farmers because it allows food to be produced (with very little cost) in the rural areas, it lessens their need to find transportation to a city, and it creates opportunity to continue living in villages where housing and land are much more affordable (Ado, Leshan, Savadogo & Shah, 2018). Irrespective of type of agriculture, one of the challenges of agriculture across the world is climate change (Mbwambo, Mourice & Tarimo, 2021).

Climate change is a global environmental phenomenon due to the fact that it is one of the most significant challenges facing global society today. Long-term shifts in annual averages and seasonal patterns of precipitation, temperature, and humidity, as well as more erratic and extreme weather events leading to increased risk of floods, drought, and fire as anticipated for the future is referred to as climate change (Coumou & Rahmstorf, 2012). It refers to significant changes in global temperature, precipitation, wind patterns and other measures of climate that occur over several decades or longer.

The main causes of climate change include humanity's increased use of fossil fuels – such as coal, oil and gas to generate electricity, run cars and other forms of transport, and power manufacturing and industry, deforestation is also included because cutting down of living trees that absorb and store carbon dioxide during increasingly intensive agriculture causes the emission of heat and greenhouse gases like methane and nitrous oxide (Arbuckle, Morton & Hobbs, 2015). Agriculture is vulnerable to climate shifts and a significant source of the greenhouse gases (GHGs) that are driving those changes (Harvey, Saborio-Rodriguez, Martinez-Rodriguez, Viguera, Chain-Guadarrama, Vignola & Alpizar, 2018). Impacts of climate on agriculture include redistribution of water availability and compromised quality, increased soil erosion, and decreased crop productivity which present immediate and localized economic risks to farmers (Ado, Leshan, Savadogo & Shah, 2018).

Subsistent farmers are highly vulnerable to climate change because most of them depend on rain-fed agriculture, cultivation of marginal areas, and there is also lack of access to technical or financial support that could help them invest in more climate-resilient agriculture. It brings about substantial welfare losses especially for subsistent farmers whose main source of livelihood derives from agriculture (Ricart, Olcina & Rico, 2018).

To reduce the undesirable effects of climate change, farmers are to adapt to the situation. Adaptation to climate change impacts can be considered from three different perspectives - risk awareness, risk perception and capacity to mitigate negative impacts on the production system (Juana, Kahaka & Okurut, 2013). However, adaption depends on perception and awareness. How farmers perceive the impacts strongly affects how they deal with climate-induced risks and opportunities, and the precise nature of their behavioral responses to this perception will shape adaptation options, the process involved and adaptation outcomes (Mandleni & Anim, 2011). Therefore, knowing the level of farmers' perception and awareness of climate change is very important for understanding the local exposure to climate risks and the farmers' adaptive mechanism to cope with climate change impacts.

Objectives of the Study

This study assessed awareness of climate change among subsistent farmers in Gwagwalada Area Council, Abuja. Specifically, the study:

- i. Assessed the level of awareness about climate change among subsistent farmers in Gwagwalada Area Council, Abuja.
- ii. Assessed subsistent farmers' levels of perception about climate change in Gwagwalada Area Council, Abuja.
- iii. Examined some mechanisms for adaptation to climate change among subsistent farmers in Gwagwalada Area Council, Abuja.

Research Questions

Based on the objectives of the study, the following research questions were raised:

- i. What is the level of awareness about climate change among subsistent farmers in Gwagwalada Area Council, Abuja?
- ii. What is the level of perception among subsistent farmers about climate change in Gwagwalada Area Council, Abuja?
- iii. What are some adaptation mechanisms to climate change practiced by subsistent farmers in Gwagwalada Area Council, Abuja?

Conceptual Framework

Conceptual framework is a logical mean used in research study to make conceptual distinctions and organize ideas. It

enables the researcher to find links between the existing literature and his/her own research goals. The conceptual framework for this study is diagrammatically presented thus:

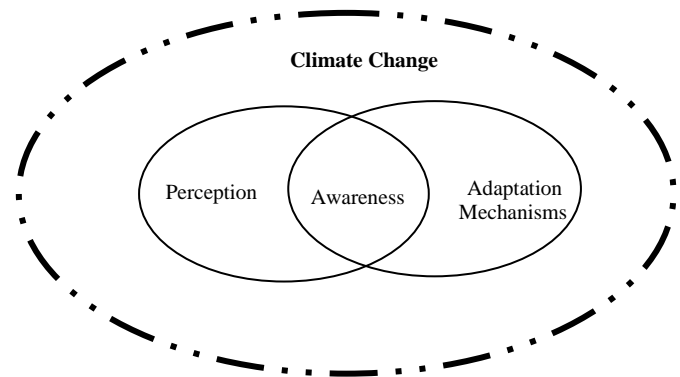


Figure 1: Conceptual Framework

Source: Researchers (2022)

This study recognized awareness of climate change as central variable. Other variables include perception, and adaptation mechanisms to the main variable. Awareness is a factor which determines perceptions. Coordination of awareness about climate change with perception about it paves way for means of adaptation to climate change. With this assumption, impacts of climate change among subsistent farmers can be easily assessed and mitigated.

II. EMPIRICAL REVIEW

The main concern of this section is review of empirical studies that are related to the present study. The reviewed studies are chronologically presented as follows: Mandleni and Anim (2011) investigated the extent of awareness of climate change by livestock farmers in the Eastern Cape Province of South Africa. The results indicated that marital status, level of education, formal extension, temperatures and the way in which land was acquired, significantly affected awareness of climate change. Variables that significantly affected adaptation selections were gender, formal extension, information received about climate change, temperatures and the way in which land was acquired.

Idrisa, Ogunbameru, Ibrahim and Bawa (2013) examined the awareness and adaptation to climate change among farmers in the Sahel Savannah agro-ecological zone of Borno State, Nigeria. The descriptive survey design was adopted. Findings of the study revealed that majority of the respondents were small-scale farm holders; majority of the respondents was aware of the phenomenon of climate change and; analysis of adaptation practices used by the respondents showed that planting ahead of rains and planting of cover crops were used most. Also, it was discovered that educational qualification and the number of extension contacts were the most important factors influencing the use of adaptation measures among the respondents; the main constraints on climate change adaptation measures by farmers in the study area were poor financial resources and unavailability of weather information.

Adetayo and Owolade (2012) examined the level of climate change awareness among the poor-resource farmers in Oyo state. The descriptive survey design was employed in the study. Findings indicated that the level of climate change awareness was generally low among the resource poor farmers. Likewise, Adebayo, Onu, Adebayo and Anyanwu (2012) assessed the awareness, vulnerability and adaptation of farmers to climate change in Adamawa state. Findings of the study disclosed that majority of the farmers in the state are aware of climate change and submitted that climate change has affected their farming activities in recent years. The effects identified included reduced crop yield, shortage of water and biomass for animals due to low rainfall and frequent dry spells. Similarly, farmers are making efforts to adapt to climate change in various ways such as planting tolerant crop varieties, altering planting schedules, planting early maturing varieties and crop diversification.

Falaki, Akangbe and Ayinde (2013) examined farmers' perception of climate change in North Central zone of Nigeria. Results of the study showed an increasing trend in temperature and rainfall amount, rainfall unpredictability, corroborated by majority of the farmers' perception. Bush burning, tree cutting and sinful behaviour were ranked as leading causes of climate change. Sex was significantly related to climate change perception and adaptation. Age, sex education and household size had significant impacts on the farmers' perception of climate change effect on social, biological and eco-system functions.

Arbuckle, Morton and Hobbs (2015) examined farmers' perspectives on climate change adaptation and mitigation in Iowa, USA. Results indicate that beliefs varied with trust, and beliefs in turn had a significant direct effect on perceived risks from climate change. Support for adaptation varied with perceived risks, while attitudes toward greenhouse gases (GHG) reduction (mitigation) were associated predominantly with variation in beliefs. Most farmers were supportive of adaptation responses, but few endorsed GHG reduction, suggesting that outreach should focus on interventions that have adaptive and mitigative properties (reduced tillage, improved fertilizer management).

Nkwusi, Adeaga, Ayejuyo & Annuk (2015) examined farmers' awareness and perception about climate change and how it affects their agricultural activities. Results of the study showed that the level of awareness of changing climate in Lagos has increased, but a large number of farmers still lack good understanding of the concept of climate change. Also, the findings showed that younger farmers with higher education background understood what climate change is all about while older farmers do not really understand but have been able to develop some adaptation measures based on experience.

Harvey, Saborio-Rodriguez, Martinez-Rodriguez, Viguera, Chain-Guadarrama, Vignola and Alpizar (2018) surveyed 860 smallholder coffee and basic grain (maize/bean) farmers

across six Central American landscapes ((Turrialba and Los Santos in Costa Rica, Choluteca and Yoro in Honduras, and Chiquimula and Acatenango in Guatemala) to understand farmer perceptions of climate change and the impacts they are experiencing, how they are changing their agricultural systems in response to climate change, and their adaptation needs. Findings of the study revealed that majority of the farmers have observed climate change, and most are already experiencing impacts of rising temperatures, unpredictable rainfall and extreme weather events on crop yields, pest and disease incidence, income generation and, in some cases, food security; and there was significant heterogeneity among farmers in the severity of climate change impacts, their responses to these impacts, and their adaptation needs.

Mustafa, AbdLatif, Bashir, Shamsudin, and Daud (2018) investigated the determinants of farmers' awareness of climate change. The results showed that farmers were aware of prevailing temperature and rainfall patterns, but there is still a considerable potential for public perception to be shaped by relevant stakeholders. Further, it was found that farmers' level of awareness is determined by the environmental communication network, such as socioeconomic, institutional, and geographic factors. Intensification of climate change awareness was recommended.

Asrat and Simane (2018) analyzed farmers' perception and adaptation to climate change in the Dabus watershed, North-West Ethiopia. Based on the model result educational attainment, the age of the head of the household, the number of crop failures in the past, changes in temperature and precipitation significantly influenced farmers' perception of climate change. Farmers' adaptation decision in both the wet and dry lowland conditions is influenced by household size, the gender of household head, cultivated land size, education, farm experience, non-farm income, income from livestock, climate information, extension advice, farm-home distance and number of parcels.

Ricart, Olcina and Rico (2018) evaluated public attitudes and farmers' beliefs towards climate change adaptation. The study focused on awareness, perception, and populism in European countries. The results proved how public experience of climate change is interdependent with the belief that climate change is happening. What is also notable is that the greater the years of farmers' farming experiences, the greater the percentage rate of their climate change awareness. Differences among farmers and public perceptions were also noted. Uncertainty, coupled with skepticism, the media, and political will, are common findings when asking to farmers and the public for the main weaknesses in adaptation to climate change.

Ado, Leshan, Savadogo and Shah (2018) assessed farmers' awareness and perceptions of climate change impacts in Aguié Department, Niger Republic. The results from a descriptive analysis show that the majority of respondents were aware of climate risks, but had differing perceptions of

climate change impacts on production and annual revenue. A regression test revealed that climate-related information is highly significant in determining farmers' awareness of climate change impacts. Most of the respondents reported negative impacts from climate change, and the majority, therefore, adjusted their farming system, albeit at different levels. A probit analysis shows that awareness, perception, education, crop production, soil fertility and annual revenue are highly influential on farmers' climate change impacts adaptation. It was concluded that farmers' awareness and perceptions are key factors in the climate change impacts adaptation debate.

Fahad, Inayat, Wang, Dong, Hub and Khan (2020) investigated farmers' awareness level and their perceptions of climate change in Khyber Pakhtunkhwa province, Pakistan. Results of the study exposed that majority of the farm households were aware of climate change. Socio-economics and demographic variables such as age of farm households, education level, farming experience, land ownership status, extension and information sources access were pointedly related to farm households' awareness of climate change. In addition, it was disclosed that the evaluation of farm households' adaptation behavior suggests that farm households are active in using several adaptation strategies such as crop diversification and use of irrigation etc.

Mbwambo, Mourice and Tarimo (2021) examined smallholder farmers' perceptions of climate change in Tanzania. It was discovered that farmers' perceptions were consistent with meteorological data both pointing to significant decline in rainfall and increase in temperature. Also, factors such as level of education, farming experience, and access to climate information influenced farmers' perception on climate change aspects.

The above studies are related to the present study holistically, however, the studies are different from the present study regarding scope and location.

III. METHODOLOGY

The descriptive survey design was employed for this study. Population of the study comprised of subsistent farmers in Gwagwalada Area Council. These mainly reside in rural villages across the Area Council, although some also reside within the urban areas. The researchers adopted the simple random sampling technique to select 180 farmers within the area council.

Data of the study were collected using a questionnaire entitled "Climate Change Awareness Assessment Scale (CCAAS)". CCAAS was constructed in a modified 4-point Likert scale format with the following scales Very High Extent (VHE), High Extent (HE), Low Extent (LE), and Very Low Extent (VLE) with rating points of 4, 3, 2, and 1 respectively. Also, Strongly Agree (SA) – 4 points, Agree (A) – 3 points, Disagree (D) – 2 points, and Strongly Disagree (SD) – 1 point format was used. The instrument has two sections A and B.

While Section A contained demographic information of the respondents, Section B contained 30 questionnaire items raised based on research questions of the study.

The researchers carried out distribution of copies of the questionnaire to the respondents in their respective villages and wards. The contents of the instrument were read to the respondents in most cases due to the level of their education. Where necessary, it was translated to the respondents in their vernacular languages to enhance comprehension of the contents of the instrument for better supply of information. The distribution exercise was done within six weeks. Out of 180 copies of instrument distributed, 176 were completely filled and returned. The study enjoyed 97.7% return rate.

Descriptive statistics of frequency counts, mean (\bar{x}), and simple percentage were used for analysis of the data collected. Since the scale in the questionnaire was a 4-point Likert scale, a mean score cut-off point of 2.50 and above for any item (statement) was regarded as agreed; while a mean score cut-off point that was below 2.50 was regarded as disagreed.

Presentation and Analysis of Data

Table 1: Demographic Data of the Respondents

Variable	Classification	Frequency Count	Percentage
Gender	Male	108	61.36
	Female	68	38.64
	Total	176	100
Academic Qualification	FSLC	22	12.50
	SSCE	34	19.32
	NCE/OND	46	26.14
	HND/First Degree	63	35.80
	Master Degree	11	6.25
	Total	176	100
Age (year)	20 – 30	51	28.98
	31 – 40	63	35.80
	41 – 50	46	26.14
	Above 50	16	9.09
	Total	176	100
Farming Experiences (year)	1 – 5	7	3.98
	6 – 10	16	9.09
	11 – 15	67	38.07
	Above 15	86	48.86
	Total	176	100

Table 1 is concerned with demographic information of the respondents. Table 1 showed that the respondents of the study comprised of 108 males and 68 females. In terms of the academic qualification of the respondents, 22 were first school leaving certificate holders, 34 had SSCE certificate, 46 were OND/NCE holders, while 63 and 11 respondents had first degree/HND, and postgraduate certificates respectively.

Regarding the ages of the respondents 51 of them were between the ages of 20 and 30, 63 had ages between 31 and 40, while 46 respondents were aged between 41 and 50, and 16 of them were more than 50 years. Likewise, for experiences of the respondents in farming, majority of the respondents, 86, had more than 15 years farming experience, while only 7 respondents had farming experience between 1 and 5 years. 16 and 67 of the respondents had experiences ranging from 6 to 10, and 11 to 15 years respectively. This

means that the respondents are mature, educated, and experienced. Therefore, information obtained from them could be reliable.

IV. ANALYSIS OF RESEARCH QUESTIONS

Research Question One:

What is the level of awareness about climate change among subsistent farmers in Gwagwalada Area Council, Abuja?

Table 2: Awareness about climate change among subsistent farmers

S/N	Questionnaire Item	VHE	HE	LE	VLE	Mean	Result
1	There is access to timely and accurate weather information	21	23	59	73	1.95	Disagreed
2	Climate change information campaigns by governments and environmental groups are frequently carried out	19	20	61	76	1.90	Disagreed
3	Radio and television are providing regular information about climate change	26	29	66	55	2.15	Disagreed
4	There is education and extension services providing essential information regarding climate change	21	24	68	63	2.02	Disagreed
5	There is media outreach in local languages regarding effects of climate change	23	21	65	67	2.00	Disagreed
6	Farmers are being educated about climate change, mitigation and adaptation measures by Government Agricultural Agents	22	24	60	70	1.99	Disagreed
7	Management practices relevant to adaptation to climatic conditions are regularly broadcast through radio and television	23	24	63	66	2.02	Disagreed
General Mean						2.00	Disagreed

Table 2 captured data relating to the research question one which is concerned with level of awareness about climate change among subsistent farmers in Gwagwalada Area Council, Abuja. The questionnaire items on the table received rating means that are less than 2.50. The general rating mean

for the items was 2.00. This implies that level of awareness among subsistent farmers in the Area Council is low.

Research Question Two:

What is the level of perception of subsistent farmers about climate change in Gwagwalada Area Council, Abuja?

Table 3: Perception of subsistent farmers about climate change

S/N	Questionnaire Item	VHE	HE	LE	VLE	Mean	Result
1	The temperature has increased over the years	61	68	29	18	2.98	Agree
2	Cool and warm seasons are sometimes on the extreme	64	61	26	25	2.93	Agree
3	When the rains will begin is unknown	67	67	21	21	3.02	Agree
4	Rainfall occurs in much shorter periods	67	62	19	28	2.95	Agree
5	Rainy season begins later than usual	71	60	18	27	2.99	Agree
6	Climate change has negatively impacted crop production	67	59	22	28	2.94	Agree
7	There is increase in pest and disease outbreaks due to climate change	63	63	26	24	2.94	Agree
8	Change in climate has led to food shortages	65	65	25	21	2.99	Agree
9	Climate change has multiple factors associated with it such as drought and the volume of rain fall and how fast the rains evaporate	66	58	27	25	2.94	Agree
10	Climate change increases the chance of outbreak of wildfires	71	49	29	27	2.93	Agree
11	Climate change aggravates erosion, decline in organic matter, and salinization	61	58	30	27	2.87	Agree
12	Climate change increases the rate of biodiversity loss, landslides, desertification and flooding	65	62	24	25	2.95	Agree
13	Crop failure and other adverse conditions are caused by climate change	58	63	30	25	2.88	Agree
14	Climate change is caused by natural phenomena and especially by human activities	61	60	27	28	2.88	Agree
15	Adaptation measures is a mechanism to fight climate change	61	64	23	28	2.90	Agree
General Mean						2.94	Agreed

Table 3 captured data relating to the research question two which is concerned with perception of subsistent farmers regarding climate change in Gwagwalada Area Council, Abuja. The questionnaire items on the table received rating means that are greater than 2.50. The general rating mean for the items was 2.94. This implies that in spite of low level of awareness among subsistent farmers about climate change in

the Area Council, they perceived a high level of factors leading to climate change conditions.

Research Question Three:

What are some adaptation mechanisms to climate change practiced by subsistent farmers in Gwagwalada Area Council, Abuja?

Table 4: Some Adaptation mechanisms to climate change practiced by subsistent farmers

S/N	Questionnaire Item	SA	A	D	SD	Mean	Result
1	Dry season farming through irrigation is practiced in response to climate change	41	41	46	48	2.43	Disagreed
2	Agroforestry and restoration activities are common among farmers	28	39	54	55	2.23	Disagreed
3	Adoption of agro-ecological practices including the use of mechanization, and the use of new crop varieties are common among subsistent farmers	28	32	56	60	2.16	Disagreed
4	Use of pesticides, herbicides, and fungicides is generally practiced	47	48	41	40	2.58	Agreed
5	Soil and water conservation practices is prevalent	45	47	41	43	2.53	Agreed
6	Application of manure, and irrigation are practiced	43	45	46	42	2.51	Agreed
7	Indigenous technologies are being promoted for adaptation by farmers	45	43	46	42	2.52	Agreed
8	Use of drought-resistant crops is a good adaptation mechanism	36	41	51	48	2.37	Disagreed
General Mean						2.41	Disagreed

Table 4 captured data relating to research question three which is concerned with some adaptation mechanisms to climate change practiced by subsistent farmers in Gwagwalada Area Council, Abuja. Half of the questionnaire items on the table received rating means greater than 2.50, while the remaining half received ratings that are less than 2.50. The general rating mean for the items was 2.41. This implies that adaptation mechanism to climate change among subsistent farmers in the Area Council is not very satisfactory.

V. DISCUSSION OF FINDINGS

Based on the outcome from the analyses of data presented on tables 1 to 4, the findings of this study are discussed as follows:

Awareness is an essential component of mitigating the effect of climate change, as submitted by scholars in the literature reviewed. Unfortunately the level of awareness of climate change among subsistent farmers in Gwagwalada Area Council of Abuja is very low. The study disclosed that there is no access to timely and accurate weather information by subsistent farmers, government is not proactive in the dissemination of information regarding climate change, radio and television stations in the Area Council are more concerned about commercial programmes whereas programmes related to information about climate change are seldom featured. Also, agricultural extension services to subsistent farmers in this regards are poor, and the farmers are seldom informed of adaptation mechanisms relevant to climatic change.

The finding on low level of awareness is consistent with the findings of Mandleni and Anim (2011) who disclosed low level of awareness on climate change among livestock farmers in the Eastern Cape Province of South Africa. Also, Adetayo and Owolade (2012) disclosed low level of climate change awareness among the poor-resource farmers in Oyo State, Nigeria.

However, this finding is inconsistent with the finding of Idrisa, Ogunbameru, Ibrahim and Bawa (2013) who disclosed high level of awareness of climate change among farmers in the Sahel Savannah agro-ecological zone of Borno State, Nigeria. Likewise, Adebayo, Onu, Adebayo and Anyanwu (2012) disclosed high level of awareness of farmers to climate change in Adamawa State. In the same vein, Nkwusi, Adeaga, Ayejuyo & Annuk (2015) disclosed increase in farmers' awareness about climate change in Lagos State, Nigeria. Equally, Mustafa, AbdLatif, Bashir, Shamsudin, and Daud (2018) disclosed farmers' awareness about climate change in Pakistan to be moderate.

The high level of awareness reported by these researchers must have been due to timely sensitization of farmers by the government and other relevant authorities on issues related to climate change.

Perception about climate change among subsistent farmers is the focus of research question two in this study. Outcome of the analyses of data collected in this regard showed that the farmers are perceiving numerous indicators of climate change. These include increase in temperature, short period of rainfall, drought, among others. Aftermaths of climate change such as erosion, decline in organic matter and salinization in the soil,

biodiversity loss, landslides, desertification, as well as crop failure are being perceived. Therefore, perceptions of subsistent farmers on climate change in Gwagwalada Area Council, Abuja are variously observed and widely perceived.

This finding agrees with the findings of Idrisa, Ogunbameru, Ibrahim and Bawa (2013) who revealed that climate change is recognized by farmers in the Sahel Savannah agro-ecological zone of Borno State, Nigeria. Also, Falaki, Akangbe and Ayinde (2013) disclosed that farmers perceived and realized very vividly the effects of climate change in North Central zone of Nigeria. Likewise, Arbuckle, Morton and Hobbs (2015) revealed that farmers' perspectives on climate change adaptation and mitigation is obvious in Iowa, USA. Moreover, Nkwusi, Adeaga, Ayejuyo and Annuk (2015) revealed increase in perception about climate change among farmers in Lagos State. Furthermore, Mustafa, AbdLatif, Bashir, Shamsudin, and Daud (2018) disclosed farmers' perception of climate change in Pakistan. In addition, Asrat and Simane (2018) revealed increase in farmers' perception to climate change in the Dabus watershed, North-West Ethiopia to be satisfactory. However, Ado, Leshan, Savadogo and Shah (2018) disclosed some differences in farmers' perceptions to climate change impacts in Aguié in Niger Republic. Additionally, Mbwambo, Mourice and Tarimo (2021) disclosed that smallholder farmers are conversant with measures advocated for adaption to climate change conditions in Tanzania.

Regarding some adaption mechanisms to climate change perceived by subsistent farmers in Gwagwalada Area Council, Abuja, this study revealed a general unsatisfactory adaptation mechanisms. Perhaps, this cannot be isolated from poor awareness level on issues related to climate change among the farmers. Although some of the recommended adaptation mechanisms are being practiced, but the magnitude of the practices is insufficient.

This finding supports the findings of Idrisa, Ogunbameru, Ibrahim and Bawa (2013) who disclosed lapses in adaptation to climate change among farmers in the Sahel Savannah agro-ecological zone of Borno State, Nigeria due majorly to financial factor. More so, Adebayo, Onu, Adebayo and Anyanwu (2012) revealed unresponsive adaptation mechanisms of farmers to climate change in Adamawa State, Nigeria due to government's nonchalant attitude on matters of climate change.

However, the marginal mechanisms perceived by subsistent farmers in the Area Council is a move in the right direction and it supports the findings of Asrat and Simane (2018) who disclosed factors such as experience and education of farmers' as influencing their adaptation to climate change in the Dabus watershed, North-West Ethiopia. Equally, Ricart, Olcina and Rico (2018) corroborated the level of farmers' experience with awareness to impact positively on their knowledge and adaptation measures towards climate change. These factors should be adopted and adapted as mechanisms for boosting

agricultural production among subsistent farmers in Gwagwalada Area Council, Abuja.

VI. CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study, the following conclusions were reached: Awareness about climate change is essential to fight its impact on agricultural production. Unfortunately, subsistent farmers in Gwagwalada Area Council, Abuja are not sufficiently conscious of climate change and its effects. Lack of awareness about climate change among subsistent farmers influenced their perceptions about climate change and its effects on their agricultural practices. Poor perception hindered adaption mechanisms of subsistent farmers towards combating the effects of climate change on agricultural activities. In line with these conclusions, the study made the following recommendations:

- i. Environmental education either in formal or informal settings should be employed in effective creation of awareness about climate change to subsistent farmers to boost agricultural production in Gwagwalada Area Council, Abuja.
- ii. Gwagwalada Area Council administration should be proactive in taking advantage of subsistent farmers' high level of perception of factors responsible to climate change to sensitize them more on effective adaption mechanisms.
- iii. Gwagwalada Area Council Administration should provide equipment, irrigation facilities, improved varieties and pest resistant seedlings, crops and livestock as well as organic farming approaches and avail the farmers with the services of extension workers to guide them on issues and problems associated with climate change.

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