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CLIMATE CHANGE VARIATION AND FARMER'S VIEWPOINT ON AGRICULTURE IN SEMI-ARID REGION

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Abstract

It is anticipated that the variation in change within climate brought on by an increase in greenhouse gases would lead to greater temperatures as well as changing patterns of rain and snow, both of which will have a momentous impact on the lives of people. This research was conducted with the objectives of determining how residents of northern Nigeria's farming communities felt about the change within climate variation affects, how they reacted to those changes, and what impact those changes had on agricultural output in the region. For the purpose of the study, one hundred residents of Kaduna were selected at random for taking part. In order to learn how the unpredictability of change within climate and the strategies of adaptation impact agricultural production, a descriptive poll was conducted. The findings indicate that greater majority of individuals are aware of the gravity of change within climate and the fact that the majority of the impacts of change within climate on agricultural and livestock output are negative. The majority of individuals believe that the many strategies that have been developed to counter the undesirable effects of change within climate on agricultural output and livestock production are effective, as the findings of the survey demonstrated.

Keywords: Adaptation strategies, Agricultural production, Climate change, farmers, livelihood, precipitation

1. Introduction

Background

Over the past few decades, agriculture has faced a serious challenge from climate change. Some African and Asian nations, who primarily rely on agriculture, are concerned about it.(Alcayaga et al., 2022; Kemausuor et al., 2011; Ojo & Baiyegunhi, 2021).

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Higher temperatures and shifting rainfall patterns are projected as a consequence of increasing change within climate variation caused by rising greenhouse gas emissions, both of which will have a detrimental impact on human lives. In its Human Development Report for 2007–2008, the United Nations Development Programme (UNDP) highlights the critical links between poverty and change within climate and the consequences for livelihoods. Influence within the change in climate are global, affecting every country. Sub-Saharan Africa (SSA) is expected to be the area most harmed by climate change, but contributing the least to global warming, according to the Intergovernmental Panel on change within climate(IPCC). Despite experiencing the fastest rate of temperature

increase of any place on Earth, it is also the poorest. Up to 40% of the population lives in dry and semi-arid areas, while 25% of the population lives in coastal regions, making the continent very sensitive to climate change. Both agriculture and change within climate are global phenomena that interact with one another.(Kemausuor et al., 2011; Parry et al., 2007). The primary industry for the production of food worldwide is agriculture.(Pathak, 2023).

Although the relationship between and influence of change within climate variation on severe events is yet very unclear, (O'Brien et al., 2008) suggest that deeper understanding is required to support actions that reduce susceptibility. The negative impacts of rising temperatures on yields are likely to be offset by change within climate caused by a rise in atmospheric carbon dioxide concentration.(Pathak, 2023; Zinyengere et al., 2013). Recent decades have seen a momentous increase in the frequency, severity, and impact of disasters, which disproportionately afflict the least fortunate in least developed nations. (Jantarasami et al., 2010). These catastrophes happen because of shocks or pressures that weaker individuals, groups, and ecosystems are unable to counter or recover from without the assistance of outside parties. (Ireland, 2010). The consequences of change within climate are now a major element in determining development, and how communities and households react to these changes will determine their potential for future growth.

Previous studies have shown that while the average annual rainfall in northern Nigeria will remain steady, the inter-annual variation will increase. Extreme droughts are also anticipated to increase in frequency (Morton, 2007). change within climatevariation is a fact that is currently having a negative impact on rural life in West Africa as well as many other regions of the African continent and globally, and it is becoming an increasingly difficult problem in the area Adambounou et al. (2019) and Rahman (2008; Adambounou et al. Future Predictions Affected by change within climate(Google Scholar, n.d.). Most of the impoverished and marginalized population depend on agriculture for their survival and has little capability to adjust to the effects of climate change.

The very variable character of climate conditions and the challenges faced by most of Sub-Saharan African farmers in coping with large weather events were made clear by climate extremes between 1972 and 1984. (Moser & Ekstrom, 2010).With climate projections indicating that the continent will become drier(Cooper et al., 2008; Kemausuor et al., 2011) and extremes will become more common (Pachauri et al., n.d.), It is obvious that impoverished countries would suffer more from change within climate because their populations depend more heavily on the natural resources that are at risk from the floods and droughts brought on by climate change. This, in turn, is likely to have a detrimental impact on the poor's livelihoods and perpetuate poverty.(Kusakari et al., 2014).

An upsurge in seasonal and interannual variation, an increase in the frequency and intensity of extreme events associated to both delayed and rapid onset hazards, and a general trend toward higher average temperatures and precipitation are the most prominent effects of change within climatevariation. These risks, including rising temperatures and flooding, put local populations at greater risk, having serious effects on their quality of life, primarily by placing more demands on already-strained social institutions, increasing environmental threats, and reducing chances for employment. (Mahdi, n.d.; Onyekuru & Marchant, 2014). Not only is change within climate inevitable, but adaptation is necessary to lessen its consequences because, as stated by the (Pachauri et al., n.d.) Furthermore, it safeguards against the potential for higher future adaptation costs,

particularly for poor populations.

IPCC defines adaptation as "measures taken by natural and human systems to reduce vulnerability to the adverse effects of change within climate or to take advantage of opportunities to counteract those effects. "Similar findings have been published in recent years (Change, 2014; Saddique et al., 2022).

However, weather variations and the ensuing decrease in crop output have a considerable impact on crop cultivation in underdeveloped countries.(Apata T.G.* (PhD), 2009; Modi et al., 2021). Change within climate momentously affects rural livelihoods, especially in poorer countries, making the farming community even more susceptible.(Abid et al., 2019; Saddique et al., 2022). The goals of the research were to investigate how farmers in northern Nigeria see change within climatevariation, how they've adapted to this variation, and what effect it's had on their harvests.

2. METHODOLOGY

Study Area

The Kaduna LGA in Kaduna State was the target of this investigation. More over half a million people call the state home, and the study area is located there at longitude 10o19'59.99" N and latitude 7o45'0.00" E. This is according to the National Population Commission. Agriculture is a primary economic activity within area. Farmers in this area were specifically targeted because they are more vulnerable to the negative effects of change within climate due to the region's weather, economy, and way of life.(Ojiako et al., no date). In addition, the area was used as a model for the Adaptation Project's focus on livelihood diversity in 2011. There is a lengthy dry season from November to April or May since the area is in the Tropical Continental Zone of Nigeria, followed by a short rainy season from September to October.

Regular annual temperature in the study area was 21.3 degrees Celsius (Ojiako et al., n.d.), with the highest temperatures occurring shortly before the start of the rains, when they reached roughly 40.0 degrees Celsius. The grassy Guinea Savannah biome is where you'll find Kaduna, and it's also got some trees and shrubs.

Figure 1:MNCH2 Kaduna State (Adambounou, 2019, pp.104-117)

Data and Method

The researchers utilized surveys and focus group discussions as means to gather information. They collected data from 100 valid responses for further analysis. The survey and interviews were conducted among individuals who fell under different categories, including the impoverished, local government officials, and various stakeholders involved in agriculture, change within climate knowledge, and adaptation.

To ensure an appropriate sample size, the researchers employed both simple random and purposive sampling techniques. Purposeful sampling was used to select farmers that are present locally and official from the Kaduna state local government area, while simple random sampling was employed for the general population.

Upon collection, the researchers performed several tasks, such as editing, categorizing, organizing, classifying, and compiling the collected data within charts and tables for further interpretation.

Additionally, a multivariate regression model was employed to analyse the data and predict changes within dependent variable due to alterations within independent variable. Factor analysis conducted to condense the primary variables into a concise set of essential elements, enabling a comprehensive analysis and reliable results.

The items were rated as follows:

3 – Very relevant 2 – Quite relevant 1 – Slightly relevant

Subsequently, the items were divided into two groups, with category 1 items in one group and categories 2 and 3 in the other. The Content Validity Index (CVI) was then calculated using the following formula:

$$CVI = \frac{\text{Item rated as very relevant and relevant (2 and 3)}}{\text{Total number of items}}$$

For the instrument to be considered valid, the CVI needed to fall within the statistically acceptable range of 0.7 to 1.

Cronbach's Alpha Coefficient formula is used. This coefficient demonstrates the reliability of the instruments, with values falling within the accepted statistical range of 0.7 to 1.

3. RESULTS AND DISCUSSION

Farmers viewpoint on change within climatevariation

There is adequate information concerning change in the climate by farmers in the study area, many of the respondent agreed on fact that farmers have understanding concerning reality, severity, and consequence of change in climate. Few numbers of the respondent disagree on the assertion of irregularity within the rainfall is the manifestation of change within climate within the region.

The results of the survey on farmers' viewpoints of change within climate variation are shown in the graph below. 72 % of respondents agreed that farmers in the research area have a broad understanding of climate change, while 12 % were neutral and 16 % disagreed. This demonstrates that rural communities in Kaduna state are well aware of the issue of climate change. Furthermore, 81 % of respondents agreed, 7% were neutral, and 12% disagreed that farmers recognise the truth and severity of change within climate in the region. 74% of respondents agreed, 15% were neutral, and 11% disagreed that influence within the change in climate are felt by all members of the region's farming communities. In addition, 68 % agreed, 16 % were neutral, and 16 % disputed that rainfall irregularities are a reflection concerning the change in climate within region. In addition, 82 % of respondents agreed, 9% were neutral, and 9% disagreed that local farmers are experiencing prolonged droughts because of

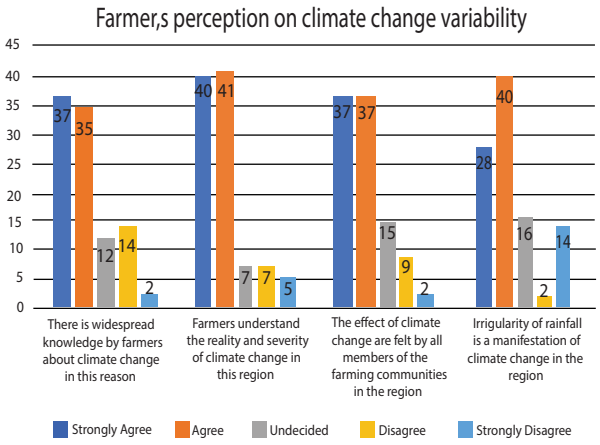

Figure 2: Farmer's perception on climate change variability (Borges, 2020)

climate change.

Moreover, when asked if there is a pattern to the bad agricultural harvests as a result of climate change, 74 % agreed, 14 % were neutral, and 12 % disagreed. In response to the allegation that water scarcities are increasing in the region as the climatic change occur, 73 % agreed, 16 % were neutral, and 11 % disagreed. 77 % respondents were agreed, 4 % were neutral, and 19 % disagreed that farmers understood change within climate is an enduring and lasting challenge that they must adapt to. Because of the viewpoint that change within climate is an enduring and lasting concern that must be addressed, this meant that there is extensive awareness change within climatevariation issues and necessity for

adaptation strategies.

Adaptation approaches adopted by local farmers for coping change within climate impact

The findings reveal that local farmers in Kaduna State have implemented various adaptation strategies in agricultural production to eliminate the effects of climate change. These strategies include the introduction of local irrigation techniques to assist farmers in coping with water scarcity, the adoption of crop rotation as a mechanism to enhance soil fertility, and the utilization of local fertilizers in gardens to counteract soil nutrient depletion. Furthermore, farmers have chosen to cultivate drought-resistant crop varieties to ensure higher yields even under adverse climatic conditions.

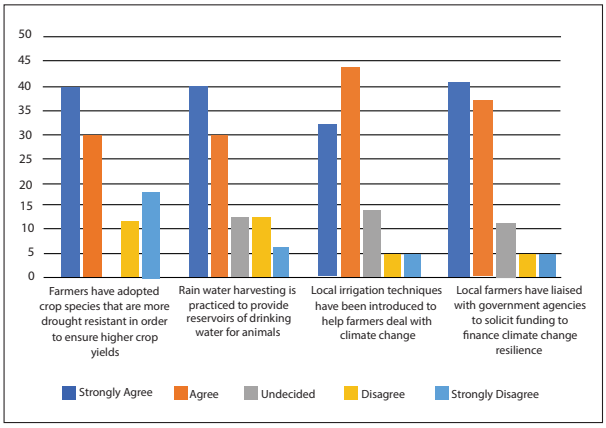

Figure 3:Farmer's perception on climate change variability (Borges, 2020)

In addition, farmers have increased their use of pesticides, practiced rainwater harvesting to save water resources for animal consumption during dry seasons, and implemented feed conservation practices using dry grass. Moreover, farmers have embraced tree planting as a means for mitigating the further impacts of change within climate on the environment.

These findings align with the IPCC (Intergovernmental Panel on Climate Change) report of 2007, which emphasizes importance of adaptation in addressing change within climate effects. The report highlights that adaptation is not only inevitable but also crucial in understanding the potential future costs of adaptation, particularly for vulnerable populations. Additionally, it emphasizes the significance of adaptation in minimizing unintended negative social, economic, and ecological consequences.

The study indicates that a momentous proportion of farmers recognize the necessity of adapting to change within climate rather than fighting it. Furthermore, farmers have adopted communal knowledge-sharing and teamwork to develop effective survival strategies. This collaborative approach among farmers demonstrates their understanding of the collective effort required to address change within climate challenges.

Farmers in Kaduna State have also undertaken initiatives to combat climate change. They have taken measures to halt deforestation, bush burning, and charcoal burning, indicating their commitment to mitigating results of climate change.

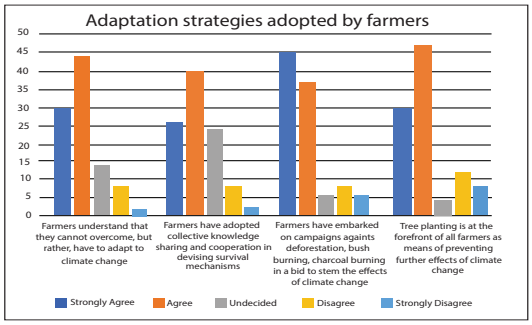

Figure 4: Adaptation strategies adopted by farmers (Borges, 2020)

Additionally, the planting of trees emerged as the primary method that farmers employed for preventing further change within climate impacts.

Survey results indicate that a majority of respondents agreed with the adoption of drought-resistant crop varieties, rainwater harvesting, regional irrigation systems, and collaboration with government organizations to secure funding for adaptation of climate change. These findings demonstrate the acceptance and effectiveness of various

adaptive strategies employed by indigenous farmers in Kaduna State.

Influence of variation of change within climate and adaptation strategies concerning agricultural production

The findings on change within climate variation impact concerning agricultural production show that change in climate variation influence predictability of planting

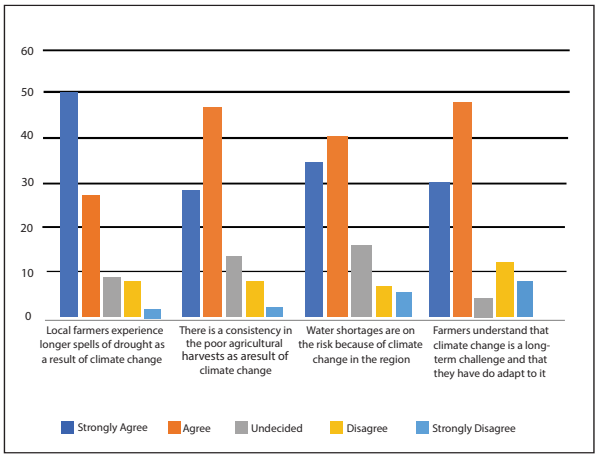

Figure 5:Adaptation strategies adopted by farmers (Cooper, 2008)

seasons, that change within climate variation results in poor agricultural harvests due to poor rains, that reduced rainfall increases the need for a constant water supply for irrigation, that loss of vegetation cover increases soil fertility loss rate through sand storms and water runoff, and that loss of vegetation cover increases the rate of soil fertility loss through sand storms and water runoff, that the use of artificial fertilisers raises the cost of production, that high prices for improved/drought-resistant seeds raises the cost of agricultural production, that the need for water harvesting equipment raises agricultural production costs, and that change within climate raises the need for training in adaptation techniques, thus the need for extension workers.

According to the respondents on the influence of change within climate variation and adaptation techniques on agricultural productivity, 81 % of respondents agreed, 12 % were indifferent, and 7% disagreed that change within climate variation affects the predictability of planting seasons. When asked if change within climate variation results in low agricultural harvests due to poor precipitation, 78% agreed, 13% were neutral, and 10% disagreed. When asked whether a decrease in rainfall enhances the requirement for a consistent water supply for irrigation, 74 % agreed, 16 % were neutral, and 10 % disagreed. And, when asked whether the loss of vegetation cover increased the rate of soil fertility loss through sand storms and water runoff, 66 % agreed, 24 % were neutral, and 10% disagreed. Also, on whether the use of artificial fertilisers raises the cost of production by reducing soil fertility, 82 % of respondents agreed, 5% were neutral, and 13% disagreed. On questioned whether high costs for improved/drought-resistant seeds raise the cost of agricultural production, 75% agreed, 16% were neutral, and 9% disagreed. When asked if the requirement for water harvesting technology raises agricultural production costs, 86 % of respondents agreed, while 14 % disagreed.

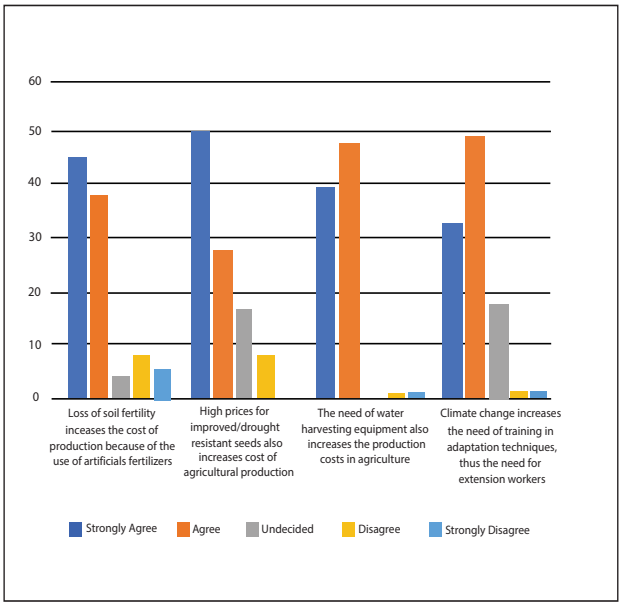

Figure 6: Strategies adopted by farmers (Apata, 2019)

When it came to whether change within climate enhances the need for training in adaptation techniques and, as a result, the demand for extension workers, 81 % agreed, 15% were neutral, and 4% disagreed. This implies that variations of the climatic change and strategies with respect to adaptation have various impacts on agricultural production in Kaduna state, Nigeria.

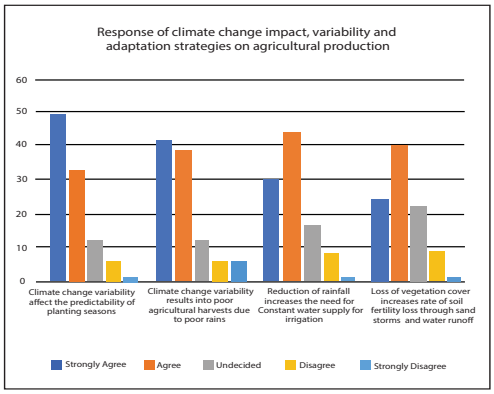

Figure 7: Response on climate change impact, variability and adoptation startegies on production (Ojo, 2021)

4. CONCLUSION

Climate change has serious consequences, according to the report, and farming groups are amid the most sensitive to it. It is big concern because smallholder farmers employ the largest number of people worldwide and provide most the world's staple foods. As a result, farmers must adapt to change within climate to save their livelihoods' enduring and lasting viability and food security. Farmers experienced difficulties in obtaining government institutional support due to information lack and enhance level of poverty for naming a few factors. Hence, study shows that presented broad awareness concerning enduring and lasting challenge of climate change, adaptation is method for farming communities in Nigeria's Kaduna state to ensure livelihood sustainability.

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