CLIMATE CHANGE, FOOD SECURITY, NATIONAL SECURITY and ENVIRONMENTAL RESOURCES

GLOBAL ISSUES & LOCAL PERSPECTIVES

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PUPLISHED BY:

Society for Agriculture, Environmental Resources & Management (SAEREM)

SAEREM BOOK CHAPTERS2023: First published 2024 ISBN 978-978-60709-9-5

First published 2024

SAEREM World

Nigeria

Typeset in Times New Roman

Climate Change, Food Security, National Security and Environmental Resources

Global Issues & Local Perspectives

ISBN 978-978-60709-9-5

Printed at: SAEREM World

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SAEREM BOOK CHAPTERS2023: First published 2024 ISBN 978-978-60709-9-5

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Preface

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This book adopts an exegetical approach as well as a pedagogic model, making it attractive agriculture and environmental economics teachers, professional practitioners and scholars. It is eschews pedantry and lays bars the issues in such clarity that conduces to learning. The book elaborates on contemporaneous climate change, food security, national security and environmental resources issues of global significance and at the same time, is mindful of local or national perspectives making it appealing both to international and national interests. The book explores the ways in which climate change, food security, national security and environmental resources issues are and should be presented to increase the public's stock of knowledge, increase awareness about burning issues and empower the scholars and public to engage in the participatory dialogue climate change, food security, national security and environmental resources necessary in policy making process that will stimulate increase in food production and environmental sustainability.

Climate Change, Food Security, National Security and Environmental resources: Global issues and Local Perspectives is organized in four parts. Part One deals with Climate Change with Six Chapters, Part Two is concerned with Food Security with Nine chapters, Part Three deals with National Security with Five Chapters, while Part Four pertains Environmental Resources, has Five Chapters.

Ahmed Makarfi / Eteyen Nyong

April 2024

SAEREM BOOK CHAPTERS2023: First published 2024 ISBN 978-978-60709-9-5

CHAPTER 7

Trend of Climate Change Variables: Food Security and Perception on Arable Crop Farmers in South-South Nigeria.

Eteyen Nyong

Abstract

The study was conducted in South-South Nigeria and analyzed the trend of climate change variables and perception on arable crop Farmers in South-South, Nigeria. A total 180 Arable Crop farmers was sampled from two States (Akwa Ibom and Rivers) in the Southeast. Trend analyses of (rainfall and temperature), the major driving forces of the climatic variables for a period of 46 years (1970 – 2023), revealed that there was high inter – annual variability in volume of rainfall in the area with insignificant correlation (R2= 0.051), the coefficient of correlation between temperature and time was 78. 7% which was significant (P = 0.02), with (R2 = 0.063) and coefficient of 0.049. These findings were corroborated with farmers' perception of changes in climate variables. The paper recommends creating adequate awareness to farmers on periodic weather forecast and synergy between farmers and researchers/government or stakeholders for better understanding of weather dynamics and how best to cope with the challenges.

Key words: Trends, climate variables, arable crops, south-south and perception.

Introduction

Annual cycles of rainfall are strongly determined by the position of the inter-tropical convergence zone. Many studies have characterized the trend of rainy season in Nigeria; most of them were based on decadal, monthly or total annual rainfall analysis (Nwajiuba*et al.*, 2008; Onyeneke, 2010; Nwajiuba and Onyeneke, 2010; WACDI, 2011) while others studies described the start and end of rainy season (RULIN, 2011; Apata*et al.*, 2009; Omotosho*et al*., 2000); Nyong *et al.* (2012). A good understanding of seasonal variability patterns is of critical importance because of the highly unstable onset of the rainy season and the high frequency of dry spells. Rural communities in south-south Nigeria have always managed their resources to face the challenge of variable environmental and socio-economic conditions (Onyeneke, 2010); Nyong *et al.* (2012) but the question is whether they will be able to continue to do this under a changing climate.

SAEREM BOOK CHAPTERS2023: First published 2024 ISBN 978-978-60709-9-5

Adaptive capacity is widely recognized as a vital component of policy response to climate change. Without adaptation, climate change will hit the agriculture sector hard (Adger*et al*., 2003; Rosenzweig and Parry, 1994), but adaptation can soften the impacts (Waha*et al*., 2013). The type of adaptation adopted is determined to a large extent by farmers' perceptions of climate change (Roncoli*et al*., 2001; Thomas *et al*., 2007). Bhrusal (2009) defines perception as the process by which we receive information or stimuli from our environment and transform it into psychological awareness that influence the way we act. A certain situation or phenomenon can be inferred differently by most people using the same or different sets of information. Perception can be influenced by age, education, experience, type of economic organization. Indigenous people have values, which play part in addressing climatic change, specifically, on the way they think towards climatic change. For example, Daninga (2011); Nyong *et al.* (2012) analyzed farmers perception about climatic change indicators affecting agriculture in Morogoro region and the study revealed that weather variability patterns like changes in March – May rain season (*Masika*) and October – December rain season (*Vuli*)were perceived by indigenous people in Morogoro as the punishment from angry gods because people have stopped making sacrifices to gods and due to increase in evil deeds. Although the capacity to deal with climate change is still low, but some smallholder farmers in rural areas have some knowledge, ideas and information on how to cope and adopt strategies to mitigate the climatic change impacts.

Local knowledge and perceptions are not incompatible with more formal, scientific insights (Cleveland and Soleri, 2007). Rather, evidence suggests that farmers' perception based on their local knowledge must be integrated with research information and proposed technologies in order to successfully improve the adaptive capacity of arable crop farmers (Mutiso, 1997; Sillitoe, 1998), Little is known about farmers' perceptions of climate variability and change, and how these perceptions determine what farmers consider the best adaptation options (Vedwan, 2006) and how that affects the actual adoption of appropriate adaptation options.

Methodology

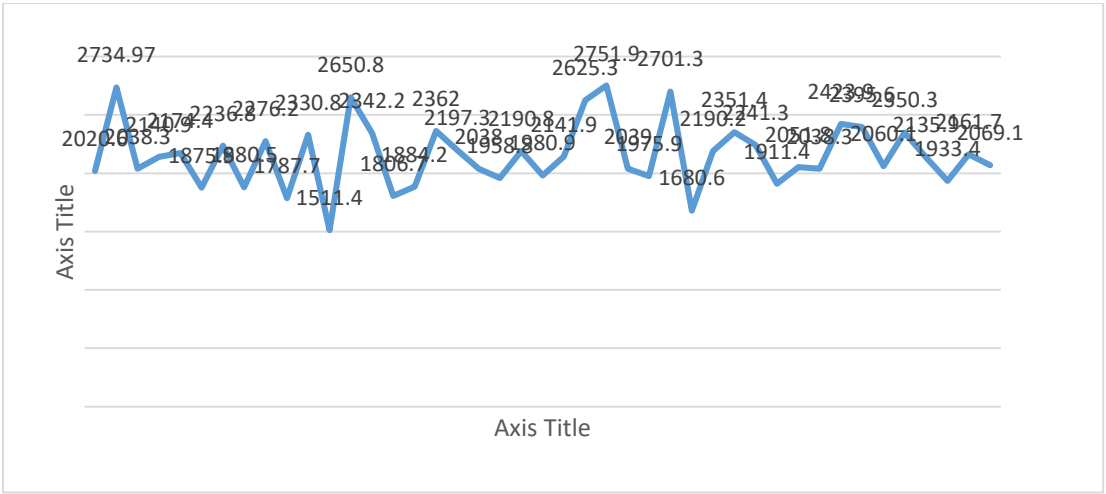
The study was conducted in South-south Nigeria which is one of the six geopolitical zones of Nigeria and made up of six states (Akwa Ibom, Bayelsa, Cross River , Delta, Edo and Rivers. The zone is situated between latitudes $4^{0}32^{1}$ N and $5^{0}3^{1}$N and longitude $7^{0}25^{1}$ S and $8^{0}25^{1}$ S . The inhabitants of South-south Nigeria are predominantly Arable crop farmers and practice mainly on

subsistence level agriculture. A total of 180 Arable crop farmers was sampled and used for the study. Weather forecast from NRCRI, Umudike and validated questionnaire aided by oral interview schedule with the farmers, served as tools/sources of data collections. Data on trend analyses were for a period of 46 years (1970 – 2023).

Results and Discussion: Trend of Rainfall Volume in South-South Nigeria

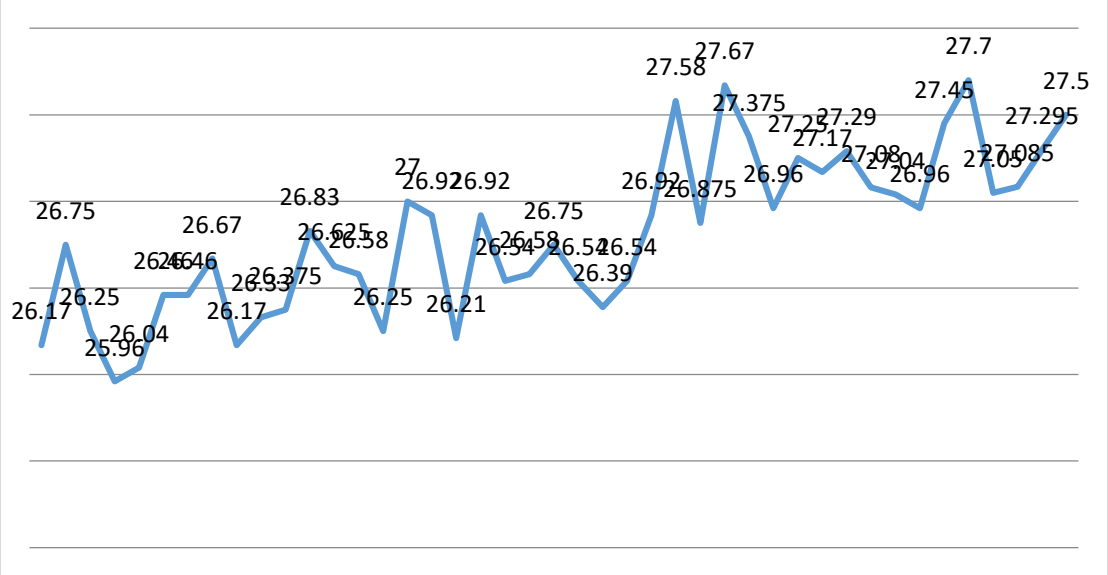
Aggregate volume of rainfall in the area shows that there is high inter-annual variability in volume of rainfall from 1972 to 2023 which also resulted to a very low and insignificant correlation (0.049) between rainfall volume and time. Volume of rainfall in the area experienced increasing but insignificant trend. This result is in line with the findings of Onyeneke and Mmagu (2015); Babatunde*et al.* (2011) Nyong *et al.* (2012) and who asserted that aggregate rainfall in the rainforest and coastal regions of Nigeria will not change but the intensity and pattern will change.

Figure 1: Trend result of rainfall volume in south-south Nigeria from 1970 – 2023



Nb: ns is not significant

Figure 2: Trend result of temperature in south-south Nigeria from 1970 – 2023



Nb ** is Significant at 1% level of probability

Trend of Temperature in South-south Nigeria

Data on temperature from 1972-2023 shows an increasing and statistically significant trend(Figure 1). The coefficient of correlation of temperature and time is 78.7% and is statistically significant implying that temperature has significant positive relationship with time. Therefore, time is a major determinant for temperature changes. This means that warming is real and significant in southeast Nigeria. This is in line with the findings ofOnyeneke and Mmagu (2015); Chidiebere-Mark *et al.* (2014); Nwaiwu*et al.* (2013a); Nwaiwu*et al.*, (2013b); Nwaiwu*et al.* (2013c); Okorie *et al.* (2012); Babatunde*et al*. (2011); Women and Children Development Initiative (WACDI) (2011); Nwajiuba and Onyeneke (2010); Nyong *et al.* (2012) who observed that the evidence of variation in the climate of south-south Nigeria is seen on steady increase in surface temperature. The impact is very obvious as many crop farmers will record decreased yield and scorching of crops.

Trend of Rainfall Intensity in South-south Nigeria

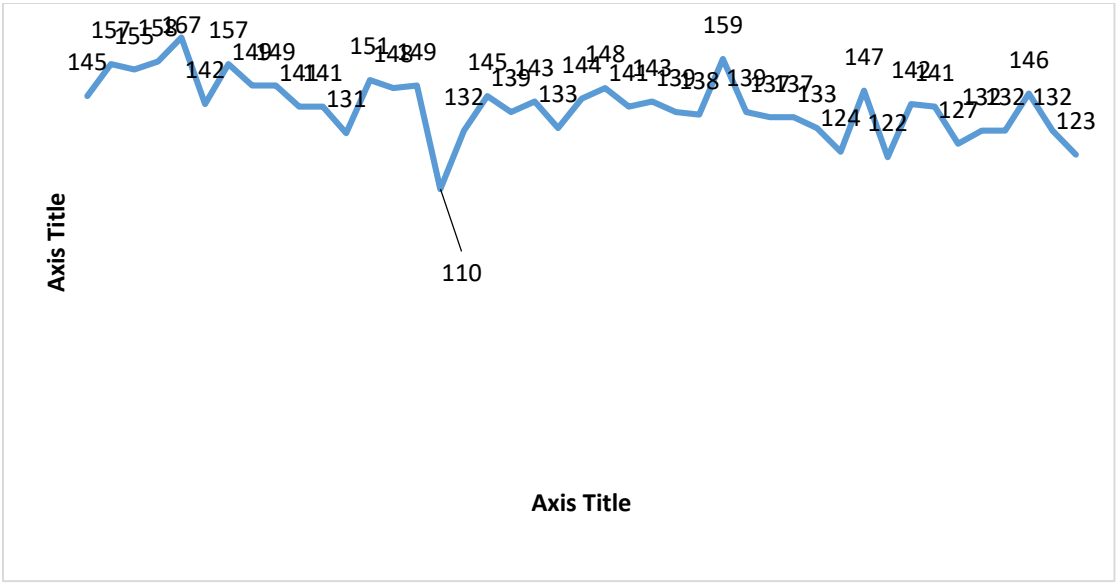
Figure2 demonstrates that there has been significant reduction in number of rainy days between 1970 and 2023. However, the trend is very significant as well as the correlation (0.54). The trend coefficient is 0.48 implying that number of rainy days is likely to reduce by 4.8 days every ten years. This record supports Onyeneke and Mmagu (2015) and Babatunde*et al.* (2011) who observed that the pattern of rainfall in southeast Nigeria in terms of number of rainy days is

experiencing and will continue to experience a decreasing and significant trend. This result implies that there could be increased occurrence of flood in the area because increasing volume of rainfall in decreasing number of rainy days will lead to hazards like flood and erosion as being experienced in the area.

Perception of farmers' on Climate Change

Mudzonga (2011) indicated that farmers hold specific perceptions regarding the effect of an adaptation or innovation and these subjective evaluations can be significant factors in the adoption decision. For this reason, the study investigates the perceptions and attitudes of households to climate change as it has an effect on whether households adopt strategies or not. It is important for households to realize and appreciate that there is climate change in the area before adjusting to the perceived changes.

Figure 3: Trend result of rainfall intensity in south-South Nigeria from 1970 – 2023



Nb ** is Significant at 1% level of probability

Perception of farmers' on changes in temperature

Farmers' perception regarding changes in temperature is presented in Table 1. Perception on long-term temperature changes is divided into three categories each, namely "decreased", "unchanged" and "increased". The result indicates that most farmers (78.33%) perceived that temperature is increasing while 12.22% perceived that temperature is decreasing. This findings is line with the findings of Chidiebere-Mark *et al.* (2014), Nyong *et al.* (2012), Onumadu and Okore (2012) and WACDI (2011). Chidiebere-Mark *et al.* (2014) found that 77.50% of food crop farmers in Imo State perceived temperature as increasing for the past 30 years. Nyong *et al.* (2012) found that 58.33% of farmers in Orlu agricultural zone of Imo State perceived increasing temperature in the area. Onumadu and Okore (2012) reported high increase in temperature by farmers in Oron Local Government Area of Akwa Ibom State. WACDI (2011) reported that people in Akwa Ibom, Edo, Cross River, Rivers and Bayelsa States perceived harsh temperature in their States.

Matching this result on farmers' perception on the direction of temperature change and analyzed trend of temperature in south-south Nigeria means that crop farmers in south-south Nigeria correctly perceived the direction of temperature change which is on the increase. This could also mean that the farmers have chosen local adaptation measures to counteract the negative effects of increasing temperature perceived in the area. Maddison (2006) argued that farmers' awareness of change in climate attributes (temperature and precipitation) is important to adaptation decision making.

Table 1: Perception farmers' on change in temperature

	Perception	*Frequency*	*Percentage*
	Decreased	22	12.22
	Unchanged	15	8.33
	Increased	141	78.33
	Total	180	100.0

Source: Field Survey 2023

Perception farmers' on changes in rainfall volume

Farmers' perception regarding changes in aggregate volume of rainfall is presented in Table 2. Perception on rainfall volume changes is divided into three categories each, namely

"decreased", "unchanged" and "increased". The result indicates that most farmers (55.55%) perceived that rainfall volume is increasing while 35.55% perceived that rainfall volume is decreasing. This findings is line with the findings of Chidiebere-Mark *et al.* (2014). Nyong *et al.* (2012) ; Chidiebere-Mark *et al.* (2014) found that 57.50% of food crop farmers in Imo State perceived aggregate rainfall to be increasing while 42.50% perceived aggregate volume of rainfall to be decreasing and unchanged. This slight difference in the category of farmers perceiving aggregate volume of rainfall to be increasing and the other category perceiving it to be decreasing indicates that the insignificant trend observed from meteorological data reflects crop farmers' perception of almost equal but two opposite views.

Matching this result on farmers' perception on the direction of rainfall volume change and analyzed trend of rainfall in south-south Nigeria means that crop farmers in south-south Nigeria correctly perceived the direction of rainfall change which is on the increase. This could also mean that the farmers have chosen local adaptation measures to counteract the negative effects of increasing rainfall volume perceived in the area. Maddison (2006) and Nyong *et al.* (2012) argued that farmers' awareness of change in climate attributes (temperature and precipitation) is important to adaptation decision making.

Table 2: Perception of farmers' on change in rainfall volume

	Perception	*Frequency*	*Percentage*
	Unchanged	16	8.88
	Decreased	64	35.55
	Increased	100	55.55
	Total	180	100.0

Source: Field Survey 2023

Perception of farmers' on changes in rainfall intensity

The overall perception on changes in rainfall intensity was that the number of rainy days has remained unchanged as the majority (77.44%) of the farmers reported this (Table 3). This result is similar to that of Chidiebere-Mark *et al.* (2014). Nyong *et al.* (2012) and Chidiebere-Mark *et al.* (2014) found that 84.32% and 80.83% of food crop farmers perceived rainfall intensity to be

decreasing in Akwa Ibom State and Imo State, respectively. Farmers in the area also rightly perceived the direction of change in number of rainy days implying that they must have been responding to changes in rainfall intensity.

Matching this result on farmers' perception on the direction of rainfall intensity and analyzed trend of rainfall intensity in southeast Nigeria means that crop farmers in southeast Nigeria correctly perceived the direction of rainfall intensity which is on the decrease. This could also mean that the farmers have chosen local adaptation measures to counteract the negative effects of decreasing rainfall intensity perceived in the area. Maddison (2006) and Nyong *et al.* (2012) argued that farmers' awareness of change in climate attributes (temperature and precipitation) is important to adaptation decision making.

Table 3: Perception of farmers' on change in rainfall intensity

	Perception	*Frequency*	*Percentage*
	Decreased	134	77.44
	Unchanged	13	7.22
	Increased	33	18.33
	Total	180	100.0

Source: Field Survey 2023

Conclusion: Majority of farmers especially in rural areas are not aware of weather forecasts. Their perceptions of changes in climate variable are much dependant on long -term experience in farming. Researches have shown that some matches of results of scientific trends analyzed on climate variable with farmers' perception often corroborate or coincide. However, there should be a synergy between farmers and researchers/other stakeholders for a better understanding of changes in climate variables and coping strategies to adopt.

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SAEREM BOOK CHAPTERS2023: First published 2024: ISBN 978-978-60709-9-5