ISSN 2229-5518

Covid-19: Climate Change and Food Security in Southwest Nigeria

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Abstract— This study assessed the impacts of climate change on agricultural productivity in Oyo State, Southwest Nigeria. The study sourced primary data from a total of 411 households who are mainly farmers and it also used different methods and approaches including Standardized Anomaly Index (SAI), Coefficient of variation (CV), Adaptation Decision Matrix (ADM), Multi Criteria Analysis (MCA) Social Analysis System (SAS^2) among others. The secondary data was obtained from credible publications and institutions including the Nigerian Meteorological Agency (NiMet). The primary data obtained was triangulated with the secondary data and the information on Covid-19 to arrive at the findings of this study which covered a period of 31 years from 1985 to 2015. The findings from this study showed that both crop and livestock productivity had drastically decreased due to several climatic factors such as temperature increase, increase relative humidity and erratic rainfall pattern with some degree of variability. The adverse situation is further exacerbated by Covid-19. The study showed a continuous decreasing trend in the duration of the rainfall. It als0 found a higher level of variability and intensity in the rainfall pattern (CV>30) in the region as well as higher inter annual rainfall variability with different degree of anomalies observed.

Index Terms— Climate variability, climate change, rainfall, adaptation, anomalies, impacts, food security, covid19

1 Introduction

The year 2020 remain a year the world will never forget in a hurry and would be remembered for so many reasons depending on which side of the divide nations decided to pitch their tent. It is the year countries that are signatory to the Paris (Climate) Agreement were expected to communicate their reversed or updated Nationally Determined Contributions (NDCs) with the aim of raising ambition to reduced greenhouse gass emissions for the world to stay within the global temperature target of 1.5^{O}C/2^{O}C set out in the Paris Agreement by 2030. It is also the year the global community was caught off-guard with the emergence of the coronavirus popularly refer to as Covid-19 when it appeared on the global stage and subsequently declared a public health emergency and pandemic. Already, food security is under threat from the impacts of climate change and now overlaid with the impacts fo Covid-19 that has hampered the food production especially by smallholder farmers due to various Covid -19 movement restrictions/lockdown during the farming seasons. Already the IPCC Special Report on 1.5^{O}C confirmed that climate associated risks with negative impacts on health, livelihood, food and water security and economic growth will increase under the 1.5^{O}C scenario [1]. The Cyclone IDAI in Southern Africa in 2019 and the locust invation in the East and Horn of Africa in 2020 as well as cases of flooding in parts of West Africa with all its attendant consequencies are manifestations of the increasing impacts of climate change in Africa. Heavy flooding contributed to the the desert locust invasion in Eastern Africa regarded to be one of the wosrt recorded in 25 years that left about 10 million people in the affected region with food crisis situation [2]. Africa continue to remain the vulnerability hotspot to the impacts of climate change and the agriculture sector that constitute over 80 percent of smallholder farmers continue to be hardest hit by the impacts due to low capacity to adapt and heavy depent on rain-fed system of agriculture which is climate sensitive [3]; [4]; [5]; [6]. The Nigerian situation mirrored what is obtained at the Africa continental level in terms of agricultural practices and impacts of climate change on the sector. In Nigeria, small scale farmers account for approximately 95 percent of total agricultural output with crop yields that are in the range of 0.6 to 1.5 tons per hectare against the expected yield of 7.44 tons per hectares [7]. Smallholder farmers constitute majority of the food producers in the Nigerian agriculture sector. Unfortunately, food production in Nigeria is on the decline and documented evidence shows that the food production (supply) in Nigeria has not matched the food consumption (demand). Rainfall, temperature, solar irradiation, relative humidity among other climate variables continue to play a big role in the Nigeria agriculture sector as a nation and southwest Nigeria in particular. This then means these factors have to be considered indepently or in combination with others to fully understand how the farming system and smallholder farmers are thriving under the current and projected impacts of climate change for better planning and adaptation in Covid -19 and post Covid-19 era to ensure food security and livelihood. As at the third quarter of 2020, the southwest region of Nigeria tops the list of the most Covid-19 impacted region in Nigeria. This has adverse social, economic, health and food security implications for Nigeria with the growing population of 200 million people.

2 Material and Methods

This study adopted combination of methods that are both quantitatively and qualitatively as well as the use of other tools such as the second generation of Social Analysis System (SAS^2). The study focused on three categories of smallholder farmers namely, those whose occupation are only farming, those combining farming with livestock rearing and those who combine farming with trading. A total of 411 household heads was surveyed for the primary data using designed questionnaires, SAS^2 tools, Adaptation Decision Matrix (ADM), Multi Criteria Analysis (MCA), Standardized Anomaly Index (SAI), Coefficient of variation (CV), Focused Group Discussions and Key Informant/In-depth Interviews while the secondary data was sourced from credible publications as well as agencies. The data obtained from primary and secondary sources was triangulated using other analytical tools and interpretation using the SAS^2 tool, Statistical Package for Social Sciences (SPSS). Analysed data was presented in graphs, charts, and other pictorial format. A social engagement, participatory and collaborative tool of Social Analysis System (SAS^2) in combination with other approaches of stakeholder input of knowledge generation for a challenging problem through joint sharing of knowledge [8] and a comprehensive joint solution finding methods [9] was used in this Transdisciplinary (TD) research study.

3 Discussions and Results

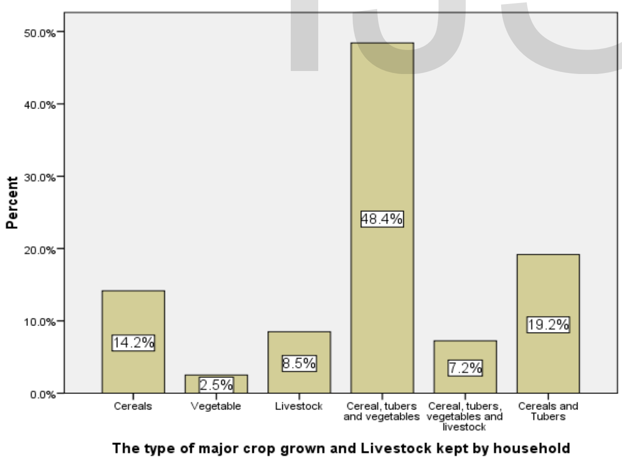

Fig.1: Combination of crop grown and livestock kept by household

Source: Field survey, 2018/2019

The following were the results obtained from household heads on the combination of crop grown and livestock kept in the study area: Cereals, tuber and vegetable (48 percent); cereals only (14 percent); cereals and tuber (19 percent); only livestock (9 percent); cereal, tuber, vegetable and livestock (7 percent) and only vegetables (3 per cent) (Fig. 1).

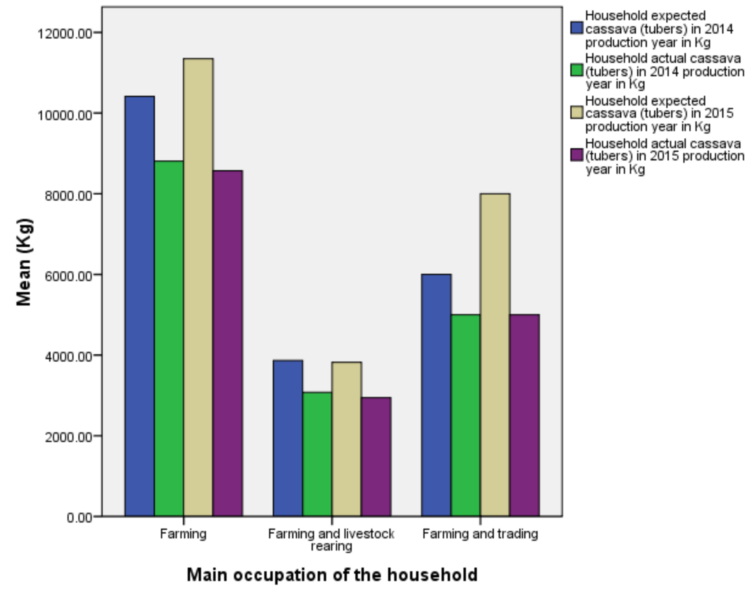

Fig. 2: Household's actual versus anticipated cassava harvest (mean in kg)

Source: Field survey 2018/2019

The result obtained from the analysis as computed (Fig. 2) showed the averages for 2014 and 2015 both for the expected and actual cassava harvest per hectare of land for the three group of farmers thus: Farming only (expected harvest 21,763 kg and actual harvest 17,381 kg); farming combined with livestock (expected harvest 7,687 kg and actual harvest 6,020 kg) while farming combined with trading (expected harvest 14,000 kg and actual harvest 10,000 kg).

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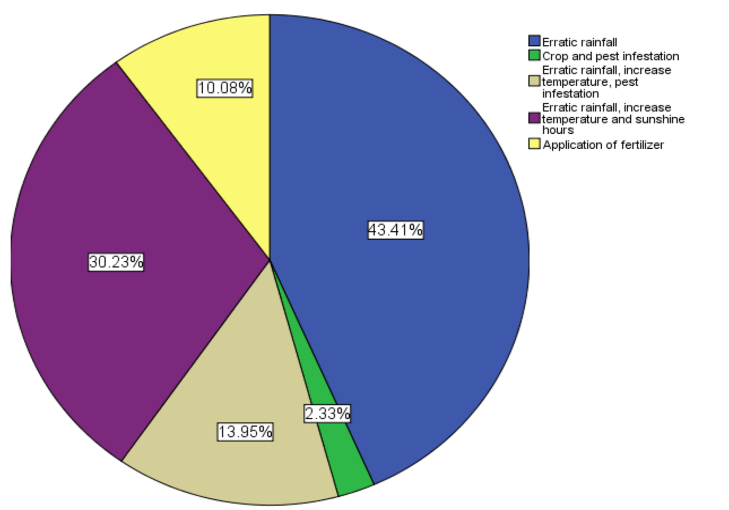

Fig. 3: Household's perceived reasons for variation in cassava harvest

Source: Fieldwork, 2018

On the reasons that led to the variations in the quantities of harvested cassava (Fig. 3), many of the farmers (43%) attributed it to erratic rainfall, 30% said it was a combination of erratic rainfall, increase in temperature and sunshine. Others 14% attributed the

ISSN 2229-5518

variation in yield to erratic rainfall and increase in temperature and pest infestation, while 2% stated it was due to crop pest infestation and 10% said it was due to application of fertilizer.

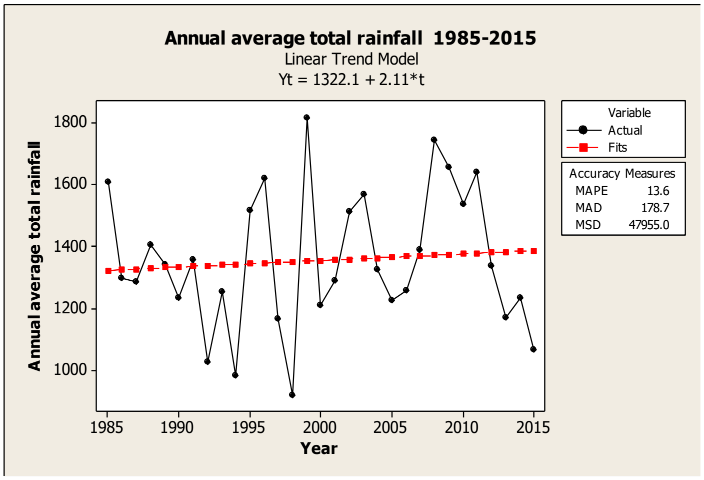

Fig. 4. The Average Rainfall for Oyo state (1985-2015)
Source: NiMET data 2018/2019

Fig. 4 showed a high level of variability which can also lead to erratic rainfall pattern as observed by smallholder farmers in the study areas. This meteorological information (Fig. 4) corroborated the findings from the farmers that the rainfall pattern has changed in recent time and this gave credence to the reasons in the variations in the quantity of harvested crop and crop yield in the region.

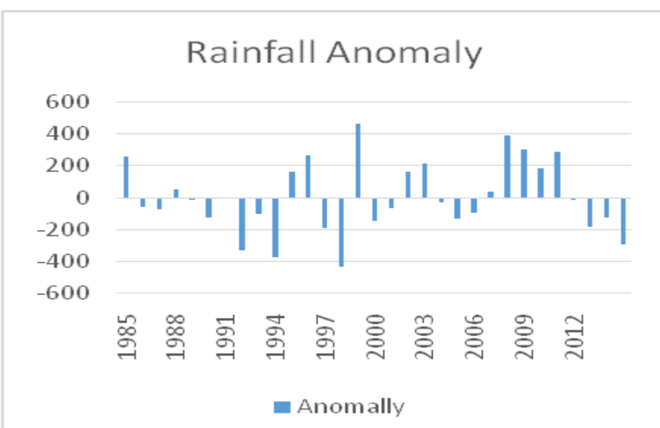

Fig. 5. Rainfall anomaly for Oyo State (1985-2015)
Source: NiMET data 2018/2019

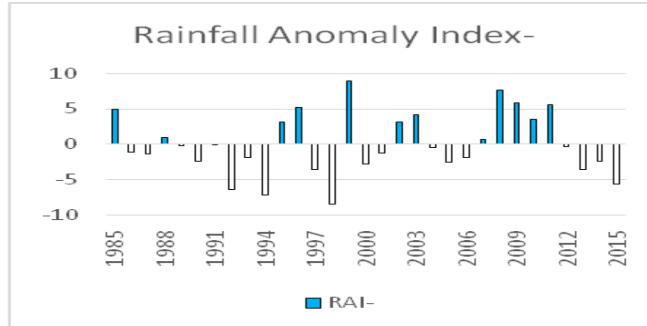

Fig. 6. Rainfall anomaly index (-ve) for Oyo State (1985-2015)
Source: NiMET data 2018/2019

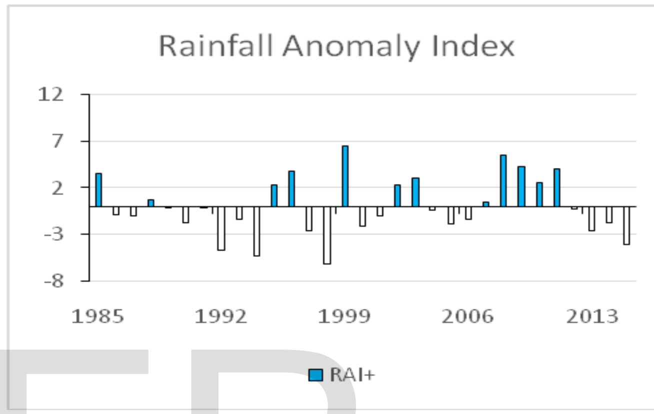

Fig. 7. Rainfall anomaly index (+ve) for Oyo State (1985-2015)
Source: NimET date 2018/2019

From the visualization of the occurrence of the annual rainfall trend and the anomalies (Fig. 4,5,6,7), 12 years are with a positive value that depict the rainy years with higher rainfall and the remaining 18 years showed negative values which indicated years of low rainfall with varying degrees of intensity both for the positive and negative values. All the years under study are with a coefficient of variability of CV>30. All the years are with the variances that showed a high deviation from the mean and from each other. In the 31 years period under study, majority, 62 percent of the total household heads indicated that rainfall had decreased between 1985 and 2015 while 38 percent maintained that rainfall had actually increased within the same period.

The above analysis point to the the fact therefore that the average annual rainfall for the 31 years (1985-2015) was 1,356 mm. The result of the annual rainfall obtained from the meteorological data from 1985 to 2015 (Fig. 4,5,6,7) showed some degree of variability in the rainfall pattern. It also showed a continuous decreasing trend in the duration between 2011 and 2015. The year 1999 recorded the highest (1816 mm) rainfall while the year 1998 recorded the lowest rainfall (921 mm). The findings also showed that there was an increase in rainfall of 2 mm per annum and this can provide a clue to the flood events recorded in the study areas in recent time and the accompanied shorter duration of rainfall as the smallholder farmers testified during the field survey and

FGDs. There was a higher level of variability and intensity in the rainfall pattern (CV>30) in the region as the study revealed which indicated higher inter annual rainfall variability and high level of intensity respectively. The month of January on the average during the period under review recorded the lowest (148 mm) amount of rainfall. This agrees with the findings of [10] which confirmed that more than half of the years' data analysed recorded below normal rainfall and with higher level of variability.

This finding also corroborates Olaniran [11]; [12]; [13]; [14] that showed that early cessation of rainfall was recorded for Southwest Nigeria in the past four decades and it has continued to spread to other part of the country.

4 Conclusion

In the light of Covid-19 pandemic which has exacerbated the impacts of climate change on farmers and the agriculture sector leading to food crisis and increase vulnerability of people and the sector to the impacts of climate change, there is urgent need to build back better, stronger and resilient during and post Covid-19 era giving attention to climate change adaptation.

All these changes, anomalies and variabilities in rainfall pattern from the finding of this study come at a huge cost to smallholder farmers who rely on rainfall for their farming activities and other means of livelihoods. This will however increase the cost of adaptation for smallholder farmers especially if irrigation measures and other Climate Smart Agriculture (CSA), Regenrative agriculture and circularity model are not urgently promoted and adopted.

There is also need for active participation of the private sector in the sector to drive the needed investment into the sector as agric-business hold a huge potential for the economic development of Africa and Nigeria. This sector also needs to be urgently digitalized as one of the lessons we have learned from Covid-19 if we must keep the sector as engine of economic growth and development especially for the developing countries.

7 Acknowledgements

The authors wish to thank the Nigerian Meteorological Agency (NiMET) that provided the meteorological data for this work; Ghana Meteorological Agency; the smallholder farmers in the research communities; National Agricultural Seeds Council (NASC) Southwest regional office; Oyo State Agricultural Development Programme (OYSADEP); National Horticultural Research Institute (NiHORT); Nigerian Environmental Study/Action Team (NEST); University of Ibadan, International Institute for Tropical Agriculture (IITA) and other institutions that provided relevant information that assisted in this research study.

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