

PROCEEDINGS OF THE NIGERIAN METEOROLOGICAL SOCIETY CONFERENCE 2024

25 – 28 November 2024

Olusegun Agagu University of Science and Technology
Okitipupa, Ondo state, Nigeria

EDITORS

Professor G. C. Ufoegbune, Federal University of Agriculture, Abeokuta

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Theme:

**SUSTAINABLE DEVELOPMENT
IN A CHANGING CLIMATE:
THE ROLE OF METEOROLOGY**

NIGERIAN METEOROLOGICAL SOCIETY (NMetS)

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OKITIPUPA, ONDO STATE, NIGERIA

BOOK OF PROCEEDINGS

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URBAN FARMING AND CLIMATE VARIABILITY IN OYO TOWN, NIGERIA

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ABSTRACT

Climate in urban areas is synonymous to high temperature and affects agricultural productivity in a relative terms. This study examined how variability in urban climate affects agricultural production in urban area of Oyo town. Both primary and secondary data were used for this study. The primary data were collected through questionnaire administration while secondary data (climate variables) were collected from Nigeria Meteorological Agency. The data were analyzed using both inferential (correlation, and regression analysis) and descriptive (mean, standard deviation, tables, and charts) statistics. The study showed that, the mean lowest temperature in the area was 22.5 oC, the mean rainfall was 126.44 mm, the mean wind speed was 5.09 m/s, the mean relative humidity was 79.7%, and the mean maximum temperature was 31.7 oC. The results also showed that groundnut yield decreased by 13.4 per hectare on average, the cowpea yield decreased by 12.95 per hectare on average, while tomato yield increased by 22.46 per hectare on average. In addition, there was an inverse relationship between (-0.029) wind, (-0.063) rainfall, and (-0.078) rainfall with groundnut, cowpea, and tomato. The climatic variables accounted for increase of 13.4% of the yield of tomatoes, 12% of cowpeas, and 1% of groundnuts. The study concluded that local climate significantly affects the productivity of the selected crops. The study however recommended that urban farmers need to save water during rainy season for irrigation agriculture in the dry season. Hence, Nigerian Meteorological Agency and other agencies should provide farmers with adequate weather information for sustainable urban farming.

KEYWORDS: Farming, Climate, Relationship, Urban, Crop-yield

INTRODUCTION

The two-season system of weather, known as the wet and dry seasons, together with their constant long-term behavior, is called a climate. While the climate is constant throughout a region, it varies throughout distinct geographical areas. An excellent example is how the seasons across Asia are winter and summer, but the seasons in Africa are rainy and dry, occurring year after year. The main cause for concern is the increased frequency of extreme weather occurrences linked to climate change. These consist of prolonged dry seasons, long period of rainfall, and unnecessarily extended harmattan period. Any alteration in the climate that may be directly or indirectly linked to human activity is referred to as climate change. It has an impact on Earth's atmospheric conditions, which causes global warming (UNFCCC, 2003). Global agricultural practices, particularly the production of food crops, are influenced by climate. Any modification to the optimal plant requirement may have an impact on the crop's total yield and productivity. People engage in agricultural practices in cities and other urban areas to supplement rural supplies of food for the urban population and to generate revenue. Urban agriculture, urban farming, or urban gardening is the practice of cultivating, processing and distributing food in or around urban areas. Urban agriculture can also involve animal husbandry, aquaculture, agro-forestry, urban beekeeping, and horticulture. These activities occur in peri-urban areas as well. It can also be

regarded as the growing of crops and rearing or raising of animals within and around the cities (Bailkey& Nasr. 2000).

However, recent climatic variations have resulted in significant adjustments to agricultural productivity. Urban agriculture is an activity that produces, processes, and markets food and other products in urban areas, according to the United Nations Development Programme (1996). To produce a variety of crops and livestock, this entails adopting intensive production techniques, recycling natural resources, and repurposing urban garbage. Urban agriculture encompasses more than just cultivating food crops and fruit trees in urban areas; it also involves raising animals and planting decorative and therapeutic plants. It has been established that the activity raises urban residents' salaries and increases the availability of food. (Mougeot, 2000). Urban farming aims to increase diversity, increase awareness of health and wellness, inspire and educate adults, youth, and elderly people to create an economically sustainable system, and uplift agricultural communities worldwide in addition to producing an abundance of food for people through the establishment of gardens on unused land and space. Climate change significantly hinders both the purpose and the vision.

The IPCC (2001) predicts that climate change will have both positive and negative effects, but the adverse effect will be predominant with greater rate of global warming. It is not scientifically possible to assign individual weather events to the current climate change. However, it can be statistically proven that global warming will increase the probability of extreme weather events.

The direct consequences of man-made climate change includes the rising maximum temperatures, rising minimum temperatures, rising sea levels, higher ocean temperatures, an increase in heavy precipitation, heavy rainfall and shrinking glaciers, while the indirect consequences of climate change will directly affect humans and our environment, includes an increase in hunger and water crises, health risks through rising air temperatures, increasing spread of pests and pathogens, loss of biodiversity due to limited adaptability, ocean acidification due to increased HCO₃ and the need for adaptation in all areas e.g. agriculture (UNFCCC 1992).

In Nigeria, as in many other developing nations, urban agriculture faces several challenges in addition to climate variability, which is defined as variations in the climate that are typically above or below a long-term average value. These factors are man-made, according to Okunmadewa (2006) and Adekanye (2004). They include competitive pressure from other land uses, inadequate access to land, poor financing, and expensive urban produce. Previous research in a wide range of human pursuits has predicted how climatic variability and change will affect agricultural productivity. Ayoade (2003) noted that variations in temperature and rainfall brought on by climate change will have a direct impact on agricultural productivity, while changes in soil quality, pests, and diseases will have an indirect effect.

In addition to other limitations on urban agriculture, Yaro (2010) suggested that climatic variability might be the primary reason of the drop in food crop productivity. Farmers' adaptive behaviour and coping methods are based more on their understanding of the climate than on human environmental variables. According to Ajadi et al. (2011), changes in a few meteorological indicators correspond to changes in agricultural productivity. Others pointed out that farmers are conscious of how climate change affects their way of life, and that their perceptions have a big impact on the coping mechanisms they use. Adelekan (2001), for example, noted that although arable farmers were more aware of climate change and how it affected their livelihood, their methods of coping with and lessening its effects were still antiquated due to ignorance and poverty. In a similar vein, Apata et al. (2009) observed that temperature decreases, rather than temperature increases, affect the likelihood of switching from mono-cropping to mixed cropping systems.

Therefore, this study attempts to assess the effect of climate variability on a few selected crops in Oyo town, Nigeria, in order to provide additional insight into the relationship between climate variability and urban farming.

STUDY AREA.

The town is in Oyo state, in the southwest of Nigeria, and is situated about between longitudes 30° 54'E and 30° 59'E and between latitudes 7° 47'N and 7° 55'N (Figure 1). Its area is roughly 28,454 square kilometres, ranking it 14th in Nigeria in terms of size. (Rafiu and others, 2018). The land area is 28,454 km² (10,986 sq mile), with a population of 5,580,894 as of 2006. The hills climb gradually from 500 metres in the southern region to 1,219 metres in the northern region above sea level. This highland is the source of several major rivers, including the Ogun, Oba, Oyan, Otin, Ofiki, Sasa, Oni, Erinle, and Osun rivers (Altman 2006).

The study area has an equatorial climate, which is characterised by dry and rainy seasons with comparatively high humidity. The wet season begins in April and finishes in October, whereas the dry season runs from November to March. The average daily temperature is between 25 °C (77.0 °F) and 35 °C (95.0 °F) (Michael Hogan 2009). Vegetation is composed of guinea savannah in the north and rain forest in the south. In the north, grassland with scattered trees replaces thick forest in the south. This area's vegetation is located inside the lowland rainforest zone's northern border in western Nigeria (James, 2003).

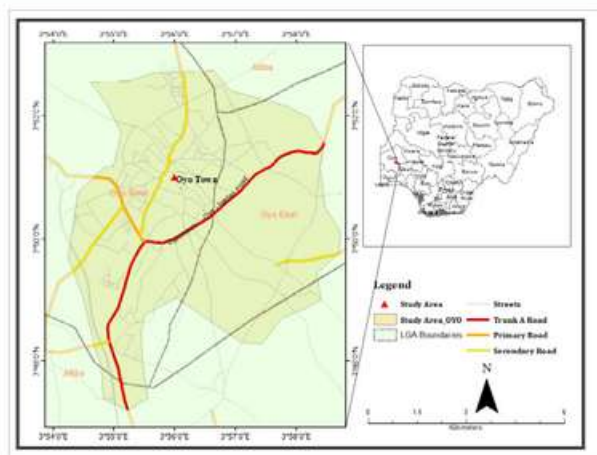


Figure 1: Oyo Town Showing the Four Local Government Areas
Source: Oyo State Ministry of Physical Planning and Urban Development

MATERIALS AND METHODS

Primary and secondary data were used for this study. The main sources of data were the respondents' socio-demographic traits, their opinions about how climate change is affecting agricultural yields (particularly tomatoes, cowpeas, and groundnuts), and the strategies farmers use to manage crop yields during the growing season. Climate variables (rainfall, temperature, relative humidity, and sunshine) from 1979 to 2019, agricultural data on the yearly yields of tomatoes, cowpeas, and groundnuts, and an administrative map of the research area comprise the secondary data used. The meteorological data from 1979 to 2019 were obtained from the Nigeria Meteorological Agency (NIMET), Lagos. The data will include rainfall, temperature, relative humidity, and sunshine.

RESULTS AND DISCUSSION

Patterns of Climate Variables and Crop Yield in the Study Area

The pattern of maximum temperature for the period under study is presented in Figure 2. The lowest maximum temperature of 30.9°C was recorded in 2002, 2008 and 2010 respectively while the highest of 33.3°C was recorded in 1998. The mean maximum temperature during the period under study was 31.7°C.

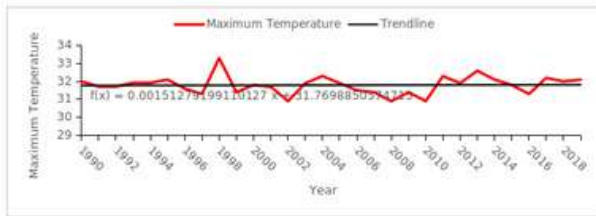


Figure 2: Pattern of Maximum Temperature
Source: Authors Computation (2023)

The trend of maximum temperature in the area for the period under study is upward sloping; meaning that there was an increase in maximum temperature in the area during the study period. This increase in temperature could be as result of increase in the emission of greenhouse gases through increased burning of fossil fuels in the area. It could also be due to pollution, urbanization and deforestation in the area.

Pattern of Minimum Temperature

The pattern of minimum temperature in the area during the period under study is presented in Figure 3. The lowest minimum temperature of 21.4°C was recorded in 2009 and 2010 respectively while the highest of 23.7°C was recorded in 2005 and 2015 respectively. The mean minimum temperature recorded in the area during the period of study was 22.5°C.

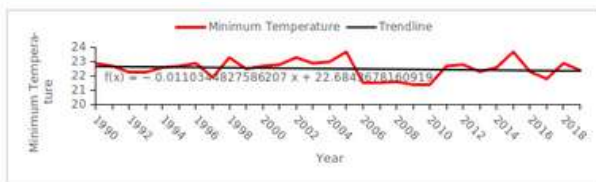


Figure 3: Pattern of Minimum Temperature
Source: Authors Computation (2020)

The trend of minimum temperature in the area is downward sloping; meaning that there was a decrease in minimum temperature recorded in the area during the period of study. The trend line equation $y = 0.011x + 22.684$ shows a predictive decrease rate of 0.01% per annum.

Pattern of Wind speed in the area

Figure 4 shows the pattern of wind speed in the area during the period under study. The lowest wind speed was recorded in 1996 with 4.5m/s while the highest wind speed was recorded in 2002 with 5.5m/s. The mean wind speed in the area during the period under study was 5.09m/s.

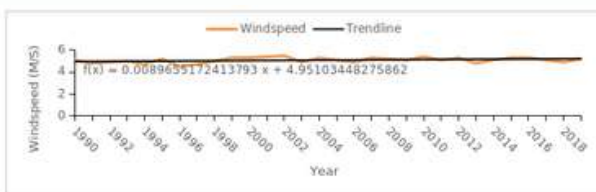


Figure 4: Pattern of Wind speed
Source: Authors Computation (2023)

The trend line equation $y = 0.009x + 4.951$ is positive; this implies that there was an increase in the speed of wind in the area during the period of study. It has showed a predictive increase of 0.009m/s per annum.

The Pattern of Rainfall

Figure 5 presents the pattern of rainfall in the area for the period under study. The lowest rainfall of 75.5mm was recorded in 1994 while the highest rainfall of 173.2mm was recorded in 2006. The mean rainfall in the area for the period of study was 126.44mm.

The trend of rainfall as presented in Figure 5 is upward sloping; this implies that the area experienced an increase in rainfall during the study period. The Trend line equation $y = 1.7507x + 99.304$ Further implies that the area is expected to have an annual increase in rainfall of about 1.7% per annum. Increase in annual rainfall could be attributed to climate change which has led to an increase in rainfall in southern part of Nigeria.

The Pattern of Relative Humidity

The pattern of relative humidity in the area is presented in Figure 6. The lowest relative humidity of 75.6% was recorded in 1993 while the highest of 85.2% was recorded in 2010. The mean relative humidity in the area during the period under study was 79.7%.

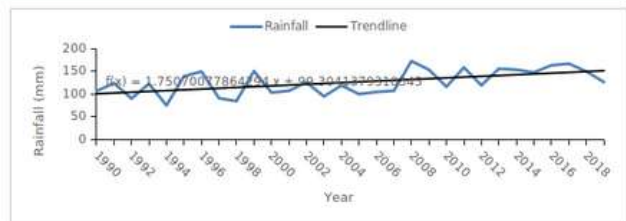


Figure 5: Pattern of Rainfall
Source: Authors Computation (2023)

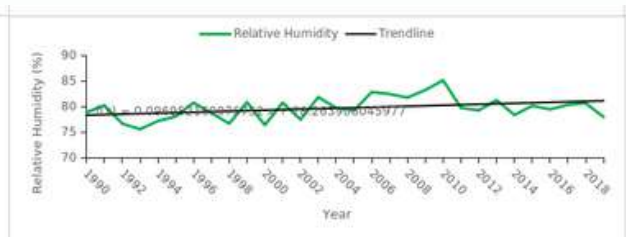


Figure 6: Pattern of Relative Humidity
Source: Authors Computation (2023)

As shown in Figure 6, the trend of relative humidity in the area during the period under study was upward sloping; meaning that relative humidity in the area increased during the period of study. The trend line equation $y = 0.097x + 78.264$ shows a predictive increase of 0.9% per annum. The increase in relative humidity could be attributed to increase in rainfall in the area. High rainfall will leave a high moisture content in the atmosphere.

Yield of Groundnut between 1990–2019

Figure 7 presents the pattern of the yield ground in the area during the period under study. The lowest Yield of 1.44y/ha was recorded in 1990 while the highest of 30.36y/ha was recorded in 2019. The mean yield of groundnut for the period under study was 13.4y/ha.

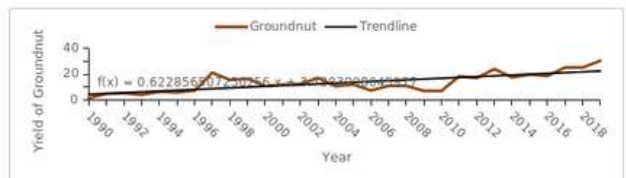


Figure 7: Yield of Groundnut
Source: Authors Computation (2023)

The trend line equation ($y=0.6292x + 3.7384$) in Figure 7 is positive; this implies that there was an increase in the yield of groundnut in the area during the period under study. The equation further shows a predictive increase of 6% per annum. Factors responsible for the increase in the yield of groundnut could be attributed to better agriculture practices, favorable weather, improved groundnut seeds among others. The implication of this was that rainfall was not in favourable state with cowpea.

Pattern of Yield of Cowpea

Figure 8 presents the pattern of the yield of cowpea in the area during the study period. The lowest yield of cowpea of 8.82y/ha was recorded in 2013 while the highest yield of 29.54y/ha was recorded in 2011. The mean Yield of cowpea in the area during the period under study was 12.95y/ha.

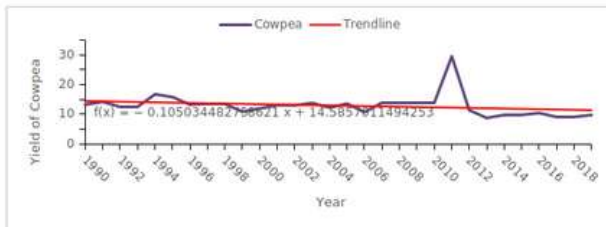


Figure 8: Pattern of Cowpea
Source: Authors Computation (2023)

The trend of cowpea for the period under study is downwards sloping; meaning that cowpea experienced a decrease in yield during the period under study. The trend line equation $y=-0.105x + 14.586$ shows a predictive decrease rate of 1.5% per annum. Factors that could be responsible for the decrease in yield of cowpea include harsh/unfavorable weather conditions, poor farming practices, low quality seedlings among others.

Pattern of Yield of Tomatoes

The pattern of the yield of tomatoes is presented in Figure 9. The lowest yield of tomatoes was recorded in 1993 with 6.33y/ha while the highest of 30.05y/ha was recorded in 2011. The mean yield of tomatoes in the area during the period under study was 22.46y/ha

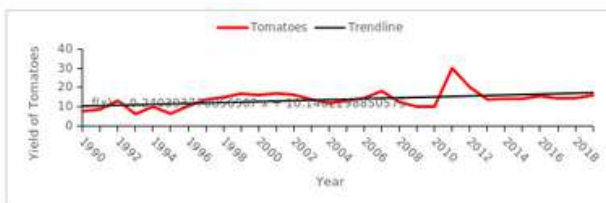


Figure 9: Pattern of Tomatoes
Source: Authors Computation (2023)

DEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

As shown on Table 1 majority (82.5%) of the respondents (farmers) are male, while only 15.7% of the respondents are female. This may be due to people's old perception of agriculture as an occupation meant for male, due to its nature as an energy intensive. Also, in most African societies, males are more accessible than females who are usually confined indoor for domestic chores. It was also shown that most (75.0%) of the respondents are married, while less than 20.0% are widowed and single. Only 2.5% of the respondents are divorced. Similarly, majority (42.5%) of the respondents are above 45 years, while 25.0% and 22.5% of the respondents are between 20-25 years and 41-50 years respectively. Few (2.5%) of the respondents are below 20 years.

It can be observed from this that most of the respondents fall within the economic active groups and therefore, are capable of supporting their families. The educational distribution of the respondents shows that more than one-quarter (42.5%) of the respondents have secondary education, while 30.0% and 15.0% of the respondents have tertiary and primary education respectively. None of the respondents have any formal education. These data show that all the respondents are literate and therefore will be able to respond adequately to the questionnaire and supply correct information useful for this study.

Regarding the income of the respondents, Table 1 reveals that majority (82.5%) of the respondents earned above N10,000 per month, while only 17.5% earned between N5,000 and N10,000. None of the respondents earned below N5000 in a month. This shows farming as a lucrative occupation in the study area. As further seen from the Table, a little more than half of the respondents had an extended family type, while 45.0% have a nuclear family.

Table 1: Socio-Demographic Characteristics of the Respondents

Socio-demographic characteristics	Frequency	Percentage
Sex		
Male	99	82.5
Female	21	17.5
Total	120	100.0
Marital Status		
Single	12	10.0
Married	90	75.0
Divorced	3	2.5
Widowed	15	12.5
Total	120	100.0
Age		
Less than 20 years	3	2.5
20-30 years	30	25.0
31-35 years	6	5.0
36-40 years	24	20.0
41-50 years	27	22.5
Above 45 years	51	42.5
Total	120	100.0
Education		
No formal Education	0	0.0
Primary Education	18	15.0
Secondary Education	51	42.5
Tertiary Education	36	30.0
Vocational	15	12.5
Total	120	100.0
Income		
Below N5,000	0	0.0
N5,000-N10,000	21	17.5
Above N10,000	99	82.5
Total	120	100.0
Family Type		
Nuclear	54	45.0
Extended	66	55.0
Total	120	100.0
Farming Years		
0-10	45	37.5
11-20	60	50.0
21-30	15	12.5
31-40	0	0.0
Above 40	0	0.0
Total	120	100.0

The implication of the dominance of extended family type among the respondents is that there would be more hands to support work on family farms. Early traditional African farmers married many wives and maintained a polygamous family in order to use family labour for farm activities. Then, the worth of a farmer was measured by the number of children and wives, as well as farm sizes he had. The number of years of farming experience presented on Table 1 shows that half (50.0%) of the respondents have between 11 to 20 years of farming experience, while 37.5% had been farming for about 10 years. Less than 20.0% of the respondents have been farming for about 21 to 30 years. Given many years of farming experience among majority of the respondents, they are expected to possess a better understanding of climate change and provide reliable information on their perspectives on meanings and effects of climate change on crop yield in the study area.

PERCEPTION OF FARMER ON CLIMATE VARIABILITY

Table 2 shows the average quantity of tomatoes, cowpea and ground harvest per season. Among the tomatoes farmers, most (67.5%) harvest about 6-10 bags per acre, while only 12.0% harvest between 10-15 bags per acre. For cowpea, more than half (60.0%) of the respondents indicated that they harvest between 6-10 bags per acre in a season while about 20.0% indicated between 1-5 bags and 6-10 bags per acre. Most (62.5%) of the groundnut farmers indicated that during a typical harvest period, they gathered about 6-10 bags of groundnut per acre, while 22.5% and 15.0% indicated between 1 and 5 bags and 10 and 15 bags respectively. This reveals that most of the respondents made bountiful harvests of tomatoes, cowpea and groundnut every season.

Table 2: Agriculture Yield in the Area

Yield in bags/basket	Crops					
	Tomatoes		Cowpea		Groundnut	
	Frequency	%	Frequency	%	Frequency	%
1-5bags/acre	20.0	24	20.0	24	22.5	27
6 - 10 bags/acre	67.5	81	20.0	24	62.5	75
10 - 15 bags/acre	12.5	15	60.0	72	15.0	18
Total	100	120	100	120	100	120

Source: Authors Computation (2023)

Other Methods of Controlling Crops Yield

Figure 10 shows other suitable methods of controlling crop yields adopted by the respondents. 37.5% employed a combination of methods such as fertilization of plants, irrigation practices and constructing drainage for excessive rainfall from their farmlands. Also, 15.0% preferred to cultivate crops which can survive in any season, while 5.0% could not identify any suitable method to adopt. However, most (42.5%) delayed cultivation until next season. This in the long-run could lead to scarcity and high cost of food crops in the study areas.

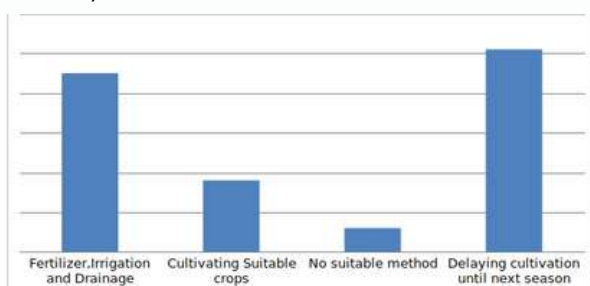


Figure 10: Methods of Controlling Crops Yield

Relationship between Climatic Variables and Crop Yield

The relationship between agricultural yield and climate variables in the area throughout the study period is shown in Table 3. The results for the lowest temperature (0.095), maximum temperature (0.282), relative humidity (0.025), wind speed (0.061), and rainfall (0.349) indicate that all the meteorological factors and groundnut are directly related. This suggests that a rise in these variables will result in a higher groundnut yield and a fall in these variables would result in a lower groundnut yield.

Table 3: Relationship between Climatic Variables and Crop Yield

Variables	Minimum Temp	Maximum Temp	Relative Humidity	Windspeed	Rainfall
Groundnut	0.095	0.282	0.025	0.061	0.349
Cowpea	0.041	0.046	-0.029	-0.063	-0.078
Tomatoes	0.080	0.098	0.062	0.284	0.146

Source: Authors Computation (2023)

Table 3 illustrates that the yield of cowpea is directly correlated with the minimum temperature (0.041) and maximum temperature (0.046), whereas the yield of cowpea is inversely correlated with (-0.029) relative humidity, (-0.063) wind speed, and (-0.078) rainfall. Additionally, the yield of tomatoes is directly correlated with the minimum temperature (0.080), maximum temperature (0.098), relative humidity (0.062), wind speed (0.284), and rainfall (0.146). Similarly, the yield of groundnuts is directly correlated with the values of relative humidity (0.025), wind speed (0.061), maximum temperature (0.282), and rainfall (0.349).

Effect of Climatic Element on Crop Yield

The result of a multiple regression analysis between the rainfall and agricultural yield indices is shown in Table 4. Crop production is a dependent variable, and rainfall, minimum and maximum temperatures, wind speed, and relative humidity are independent variables. With five explanatory variables, the multiple linear regression model for "groundnut" has a R squared value of 0.238, meaning that the model can account for 23.8% of the groundnut production. For example, the area's minimum and maximum temperatures, wind direction, relative humidity, and rainfall all contribute to 9.4% of the peanut yield. Other factors, such as soil type, farming practices, and fertilizers, account for 76.2% of the cassava yield.

Table 4: Effect of Climatic Element on Crop Yield

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
Groundnut	0.487	0.238	0.079	7.0461
Cowpea	0.100	0.010	-0.196	4.05377
Tomatoes	0.386	0.134	-0.046	4.63189

Source: Authors Computation (2023)

The R squared value of the multiple regression for the variable "cowpea" with five explanatory variables is 0.010, indicating that the model can explain 1% of the crop yield. Specifically, the minimum and maximum temperatures, wind speed, relative humidity, and rainfall in an area all contribute to 1% of the yield of cow pea. Other factors, which can include soil type, farming practices, and fertilizers, among others, account for 99 percent of the production of cowpeas. The R squared value of the multiple linear regression model for "tomatoes" with five explanatory variables is 0.134, meaning that the model can account for 13.4% of the tomato yield. i.e., 13.4% of the tomato output is determined by the local minimum, maximum, wind, relative humidity, and rainfall. Other factors, which can include soil type, farming practices, and fertilisers, among others, account for 86.6% of the maize yield.

IMPACT OF CLIMATE ON YIELD OF GROUNDNUT

The correlation between climate indices and groundnut yield is seen in Table 5. The groundnut yield increases by 0.324, 5.174, 0.211, 2.600, and 0.096 metric tons for every increase of 0.129 oC minimum temperature, 1.699 oC maximum temperature, 29.6% relative humidity, 0.452 km/h wind speed, and 1.908mm rainfall respectively. This implied that climatic indices examined are considered favorable to the growth and development of groundnut production in the study area.

Estimated Model is

Groundnut = -200.645 + 0.324 min temp + 5.174 max temp + 0.211 humidity + 2.600 wind speed + 0.096 rainfall.

Table 5: Influence of Climatic Variables on Groundnut Yield

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error			
(Constant)	-200.645	136.404		-1.471	.154
MinT	.324	2.510	.028	.129	.898
MaxT	5.174	3.045	.360	1.699	.102
RH	.211	.713	.064	.296	.770
windspeed	2.600	5.749	.086	.452	.655
Rainfall	.096	.050	.362	1.908	.068

a. Dependent Variable: Groundnut

Source: Authors Computation (2023)

Impact of Climate on Yield of Cowpea

The correlation between cowpea yield and climate indices is seen in Table 6. The overall model explained that minimum temperature (0.196), maximum temperature (0.136), relative humidity (0.033) were proportional and directly related to the yield of Cowpea; meaning that increase in temperature and relative humidity will bring a relative increase to the yield of cowpea. On the other hand wind speed (-0.763) and rainfall amount (0.009) were inversely and indirectly related to the yield of cowpea. This means that as wind speed and rainfall increase, the yield of cowpea decreases in the research area. Moreover,

Estimated Model is

Cowpea = 6.644 + 0.196 min temp + 0.136 max temp + 0.033 humidity - 0.763 wind speed - 0.009 rainfall

It was evidently shown in Table 6 that increase in minimum temperature to 0.196oC, will produce an increase of 0.884 bag of cowpea.

Table 6: Influence of Climatic Variables on Cowpea Yield

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error			
(Constant)	6.644	78.828		.084	.934
MinT	.196	1.450	.033	.135	.894
MaxT	.136	1.760	.019	.077	.939
RH	.033	.412	.020	.080	.937
windspeed	-.763	3.323	-.050	-.230	.820
Rainfall	-.009	.029	-.068	-.314	.756

a. Dependent Variable: Cowpea

Source: Authors Computation (2023)

Impact of Climate on Yield of Tomato

The correlation between climatic indices and tomato yield is seen in Table 7. Tomato yield increases by 0.342, 1.906, 0.240, 5.853, and 0.015 for every 1% increase in the minimum temperature, maximum temperature, relative humidity, wind speed, and rainfall. This implies that climate indices examined in the study area are favourable to the production of tomato.

Although increase in the surface temperature especially in urban areas can have negative effect on nutritional level of crops planted in such areas. For instance, Ziska, et'al (2016) were in agreement with this result that rising carbon-oxide (CO) can stimulate plant growth and can also reduce the nutritional value of most food crops. Rising levels of atmospheric carbon dioxide reduce the concentrations of protein and essential minerals in most plant species, including wheat, soybeans, and rice. This direct effect of rising CO on the nutritional value of crops represents a potential threat to human health. Human health is also threatened by increased pesticide use due to increased pest pressures and reductions in the efficacy of pesticides (Ziska, 2016).

Estimated Model is

Tomatoes = -105.256+ 0.342 min temp + 1.906 max temp + 0.240 humidity + 5.853 wind speed + 0.015 rainfall.

Table 7: Influence of Climatic Elements on Yield of Tomatoes

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error			
(Constant)	-105.256	90.070		-1.169	.254
MinT	.342	1.657	.048	.206	.838
MaxT	1.906	2.011	.214	.948	.353
RH	.240	.471	.118	.509	.615
windspeed	5.853	3.796	.312	1.542	.136
Rainfall	.015	.033	.091	.450	.657

a. Dependent Variable: Tomatoes

Source: Authors Computation (2023)

Rainfall increased the amount of groundnuts, but it reduced the amount of tomatoes and cowpeas. All crops in their season thrived from increases in temperature, wind speed, and relative humidity. Each plant has its peculiar threshold level of climatic elements in which it can germinate, develop and produce fruits. A little shift from this level will spell a disaster to such a plant. This is the more reason while rainfall increase was beneficial to groundnut but reduced the yield of tomato and cowpea in the study area.

CONCLUSION

Globally felt, climate change is one of the biggest environmental challenges of our day. Global agricultural practices, particularly the production of food crops, are influenced by climate. Any modification to the optimal plant requirement could have an impact on the crop's total yield and productivity. Based on the study's findings, it is possible to draw the conclusion that the area's maximum temperature, relative humidity, rainfall, and wind speed have all increased as a result of climate change, increasing groundnut yields but decreasing tomato and cowpea yields. Thus, it is possible to draw the conclusion that while climate change has a favourable impact on groundnut production, it has a detrimental impact on cowpea and tomato yield. However, the study recommended that to help farmers maximize agricultural output for higher revenue and a higher standard of living, NiMet should be prompt in predicting and reporting weather information to the farmers and other stakeholder in every climatic zone.

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