



Perceived Effects of Climate Variability on Food Crop Agriculture in Uhumwode Local Government Area of Edo State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author MON designed the study, and wrote the protocol and first draft of the manuscript. Author FO performed and managed the analyses of the study. Author AO managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

This study examined the perceived effects of climate variability on food crop agriculture in Uhumwode Local Government Area of Edo State. It adopted the survey research design. The local government area was first stratified into nine (9) based on existing towns in the area; after which four (4) villages were randomly selected from each town using the geographic cardinal points. On the basis of this stratification, 180 copies of a questionnaire were administered in the area. The simple percentage analysis was adopted for data analysis. Results showed that 78% of the respondents observed that there are changes in patterns of weather/climate variables such as rainfall and temperature: While rainfall is decreasing, the temperature is increasing. Also, the

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majority of farmers (83%) said that planting periods have changed due to shifting in the onset of rain. This climate variability is adversely affecting yield of food crops, and has been attributed to man's activities by 45% of the farmers interviewed; 23% believed that the god's are angry. To improve crop yields, 38% of respondents said that they have increased their farm sizes; 12% are using fertilizers; and 25% are appeasing the gods etc. This implies that many farmers are yet to understand what is happening to weather/climate. Therefore, the study recommends that the farmers should be made to be aware of the changing patterns of weather/climate. Seeds and seedlings that suit the changes should be introduced and the farmers re-orientated to adapt to the situation.

Keywords: Agriculture; food crop; variability; weather; climate; Uhumwode.

1. INTRODUCTION

In Nigeria, as it is in most parts of the world, agriculture largely depends on climate [1]. In Nigeria, food crop agriculture is rain-fed as it is in most developing countries. As a result food crops are often in abundance during the rainy season. The dry season is usually a period of lack for most crop farmers because only very few are privileged to have access to irrigation facilities. Even with the known dry and rainy seasons, the amounts of rainfall and duration vary from year to year. The extent of variation from the previous seasons will determine the amount of locally produced food that will be available.

Food crop agriculture remains one of the major ways to alleviate poverty in the developing countries, restore their economies and ensure economic sustainability [2]. Thus, Agriculture may as well become not only a way to revamp the Nigerian economy but also improve the economic wellbeing of rural dwellers. Factors responsible for these negative impacts of weather on food crop agriculture at least in Nigeria have been long enumerated to include, lack of information to assist the local farmers in carrying out their farm practices [3], continuing with seeds that have become out dated due to changes in climate [4], lack of climate information and other data for farmers [1] etc.

But going into agriculture, in particular food crop production in a changing climate may be an effort in futility if prevailing climate and weather were not seriously taken into consideration [5-11]. The relationship between climate variability and crop yield has been documented and includes: moderate temperature influencing crop growth and providing food for crops in a process known as photosynthesis; and rainfall onset and cessation significantly affecting crop yields [12-19]. Therefore, countries where agriculture is climate dependent, as it is in Nigeria, there is the

need to advise the farmers continually on the way forward in the face of climate variability [20,21,4,22,3].

Uhumwode Local Government Area (LGA) of Edo State, Nigeria is by no means immune to the effects of climate variability especially with regard to food crop production which is a common sight in the area. The way the farmers view these effects matters a lot in determining measures they may take to mitigate the adverse ones and on how to take advantage of the favourable ones. This would determine the level of food crop production in the area. As a result, it is therefore compelling to investigate how crop farmers in the LGA perceive the effects of climate variability.

2. MATERIALS AND METHODS

Uhumwode LGA is situated in Edo state and has its headquarters at Ehor. It is bounded by Latitudes 6°31' to 6°32'N and Longitudes 6°02' to 6°32'E (Fig. 1) and occupies a total area of 2033 km²; with a population of 120,813 [23]. The area enjoys the tropical climate with average annual rainfall of 1475 mm. Rainfall is double maxima with the peaks occurring in the months of July and September. Mean temperature ranges between 29°C in the hottest months of December through February and 26°C in the coolest months of June and July. This climate type thus, encourages the tropical rainforest and agriculture in the area. The climate of the state is changing due to the influence of man on the climate of the area through anthropogenic activities such as bush burning, deforestation, oil exploration and exploitation etc [24]. This is thought to be having some effects on food crop agriculture in the area. Incidentally, the major employer of labour in the LGA is agriculture, which provides more than 70% of the food such as maize, cassava, potato, yam, vegetables etc that is consumed in the area [24].

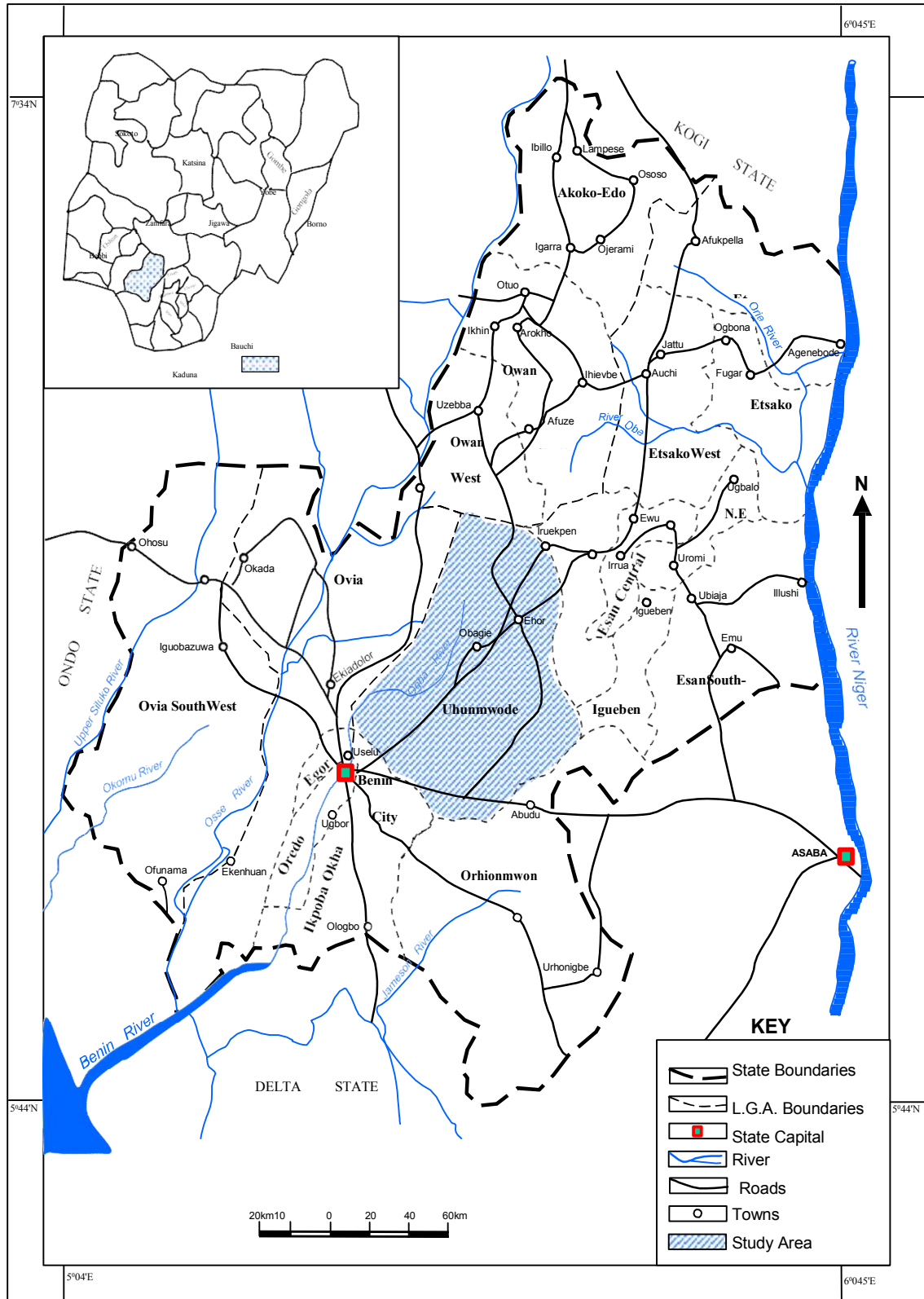


Fig. 1. Study Area: Uhunmwode Local Government Area, Edo State

Table 1. Systematic selection of sample locations for the study

Towns	Villages	Selected villages
Ehor	Abumwenre, Ehor, Okemue, Ugbiyaya, Ugbiyokho, Ugiamwen, Ukpogo	Ugbiyaya, Ugbiyokho, Ukpogo, Ugiamwen
Irhue	Ekpan-Irhue, Irhue, Oke-Irhue, Orhua, Umokpe	Umokpe, Ekpan-Irhue, Irhue, Oke-Irhue
Isi South	Ekae, Erhuan, Evbowe, Evguogho, Iguagba, Iguagbe, Iguezomo, Iguiyase, Ilobi, Izikhiri, Obanisi	Erhuan, Evbowe, Izikhiri, Iguezomo
Uhi	Egbisi, Irhiborhibo, Obagie, Obazagbon, Ugueghudu, Uhi, Uhimwento	Egbisi, Ugueghudu, Uhi, Obazagbon
Umagbae North	Azagba, Ekuigbo, Igueuwangue, Iguevbiahianwen, Iguevbiobo, Iguezevbaru, Iguomo, Ikhueniro, Irighon, Ogheghe, Ogueka, Okhuo, Okpaga, Uma, Urhokuosa	Ekuigbo, Igueuwangue, Iguomo, Ikhueniro
Umagbae South	Agiyamu, Ahor, Ayen, Egba, Ekoken, Ekomufua, Evboikhuendo, Ewedo, Eyeam, Idumwugha, Iguosula, Ikiyete, Orio, Ute, Uzalla	Ayen, Egba, Idumwugha, Iguosula
Isi North	Eguaholor, Igueoke, Iguesogban, Iguomo, Ike, Iyanomo, Oghada, Okhuokhuo, Ugbezee, Urbenisi	Eguaholor, Oghada, Ugbezee, Iguesogban
Egbede	Aduhanhan, Ekhoneidunolu, Ekhoneguokuen, Ekhoneiro, Ekhoneuwaya, Ekhuaihe, Emuhu, Evbosawe, Igbogiri, Okekpen, Okeze, Okogo, Ugboyon, Ugomoson, Ugoneki, Ugonoba, Uvbe	Igbogiri, Ugomoson, Evbosawe, Uvbe
Igieduma	Erhua-Nokhua, Igieduma, Irhiwe, Obagie, Otofure, Ugha, Uteni	Igieduma, Otofure, Ugha, Irhiwe

The study adopted the survey research design which involved the use of questionnaire in the area. The area was first stratified into nine (9) based on existing towns in the LGA; after which four (4) villages were randomly selected from each town using the geographic cardinal points (See Table 1).

On the basis of this stratification 180 copies of questionnaire (5 for each village) were administered in the area. However, for a farmer to be selected the following criteria were adopted: a) farmer must have cultivated land in the area for 10years or above; b) have the habit of cultivating 5 plots of land or more per year; c) must have experience of the cultivation in more than one food crop. However to carry out the data analysis, simple percentage was adopted.

3. RESULTS AND DISCUSSION

The age distribution of respondents (Table 2) reveals that very few young people are engaged in agriculture. In the table, respondents in the age group of 25-30 are only 6.7% of the total respondents, while the largest proportion of the respondents (64.4%) belongs to above 40 years age group.

Table 2. Age distribution of respondents

Age group	Frequency	%
25-30	12	6.7
31-35	17	9.4
36-40	35	19.4
Above 40	116	64.4
Total	180	100

It therefore follows that, most young men with high ambitions have either migrated out of the local government area in search of white-collar jobs or a better source of income or have changed their source of livelihood due to poor return on investment in agriculture.

Of the total respondents (180), 92.8% (that is, 167 respondents) were males whereas the female respondents were 7.2% (that is, 13 respondents) (Table 3). This means that there are more men engaged in agriculture in the area than women.

Table 3. Gender distribution of respondents

Gender	Frequency	%
Male	167	92.8
Female	13	7.2
Total	180	100

Table 4 shows the level of education of the respondents. From the table it can be deduced that the farmers are mostly not well educated. This is because the majority (51.7%) of the respondents had as their highest qualification Basic 6.

Table 4. Highest education qualification of respondents

Education	Frequency	%
Basic 6	93	51.7
Basic 9	76	42.2
First degree	11	6.1
Total	180	100

Similarly, those with Basic 9 represented 42.2% of the total respondents while only 6.1% of the total respondents had First Degree. This indicates the extent to which farmers would be able to have access to current information on how to practice food crop agriculture in the face of a changing climate. A person with more education will likely have more access to information and/or sources of information than those without or with less education.

Table 5 reveals that the farmers have noticed some changes in weather variables. This is because 78.3% of the total respondents (that is, 141 respondents) said that they were aware of changes in climate/weather parameters. Only 21.7% stated otherwise.

Table 5. Farmers perception of changes in weather variables

Aware of weather change	Frequency	%
Yes	141	78.3
No	39	21.7
Total	180	100

This implies that the farmers are beginning to notice the impacts of climate variability on their food crop production. This is consistent with the findings of [19]. They found out that climate variability/change has caused poor crop yields, reduced soil fertility, increased flood, poverty and food shortage in the rural areas of Cross River State, Nigeria.

In Table 6, 76.7% of the total respondents said that they have observed changes in air temperature patterns. The remaining 23.3% of the respondents stated that they have not noticed any changes in air temperature patterns.

When the respondents were asked to identify the direction of changes in air temperature, 69.4% of the total respondents said that it was rising, 21.7% of the total respondents indicated that air temperature has been the same over the years (Table 7).

The remaining 8.9% stated that it was reducing. A rising air temperature could mean much trouble for food crop farmers. This is corroborated by [16]. He noted that farmers' crop yield was being adversely affected by higher temperatures in Idanre L.G.A., Ondo State, Nigeria.

Table 8 reveals that there is a change in patterns of rainfall in the area. This is because the majority of respondents (78.3%) indicated that they have noticed changes in rainfall patterns while only 21.7% stated otherwise.

Table 6. Noticed changes in air temperature

Noticed changes in temperature	Frequency	%
Yes	138	76.7
No	42	23.3
Total	180	100

Table 7. Direction of changes in air temperature

Temperature	Frequency	%
The same	39	21.7
Reducing	16	8.9
Rising	125	69.4
Total	180	100

Table 8. Noticed changes in rainfall

Noticed changes in Rainfall	Frequency	%
Yes	141	78.3
No	39	21.7
Total	180	100

However, when respondents were asked to state the direction of changes in rainfall, 70% of respondents indicated that, there is an increase in rainfall amounts (Table 9). Of the total respondents, 21.7% said that rainfall amounts have remained the same. The remaining 8.3% stated that rainfall amounts are reducing.

This finding confirms that the present climate variability/change varies from one area/region to another. Whereas most respondents in the study

area said that rainfall was increasing in amounts, [2] stated that rainfall was reducing in Nepal.

Table 9. Direction of change in rainfall

Rainfall/Rain days	Frequency	%
The same	39	21.7
Reducing	15	8.3
Rising	126	70
Total	180	100

Table 10 shows the perceived causes of climate variability by respondents in the study area. In the table, only 11.6% of the total respondents (that is 21 out of 180) stated that the changes in climate pattern are as a result of gods being angry. On the other hand, greater number of respondents, that is 138 out of 180 (76.7%), listed 'man's influence' via bush burning, altering of the atmospheric gases and other anthropogenic activities as the factor responsible for changes in patterns of climate.

Table 10. Perceived factors responsible for changes in climate patterns

Perceived causes of climate variability	Frequency	%
The gods are angry	21	11.6
Man's influence	138	76.7
Over cultivation	128	71.1
Natural change	37	20.6

Next to man's influence as a factor of climate variability is 'over cultivation of land' is with 128 out of the 180 respondents (that is, 71.1%). This finding is consistent with those of [17,18].

Table 11 shows the perceived effects of climate variability on food crop production in the study area. From the table, only 32 respondents (17.8%) out of 180 said they now farm elsewhere as a result of recent climate variability. The highest number of the respondents that is 150 (83.3%) said climate variability is causing changes in planting season.

In Table 12, 141 farmers (respondents) (78.3%) being the highest stated that they have increased the sizes of their farmland as a strategy to reduce the adverse effects of climate variability in the study area. On the other hand, only 21 respondents (that is, 11.7%) listed 'Appeasing the gods' as a means to find a solution to the effects of climate variability.

Table 11. Perceived effects of climate variability on crop production

Effects	Frequency	%
Farming elsewhere	32	17.8
Poor crop yields	128	71.1
Multiple planting	132	73.3
Increase in cost of farming	138	76.7
Change in occupation	109	60.6
Changes in planting season	150	83.3

Table 12. Coping strategies with changes in climate patterns by farmers

Options	Frequency	%
Use of fertilizer	138	76.7
Increase in size of farm land	141	78.3
Mixed cropping	127	70.6
Appeasing the gods	21	11.7

4. CONCLUSION AND RECOMMENDATIONS

Food crop agriculture in Uhumwode LGA does not only provide food for the inhabitants of the area, but also for nearby local government areas and cities. However, the recent changes in patterns of climate/weather elements are a huge challenge to food crop production in the area. For the crop farmers in the LGA, climate has greatly varied over recent years with rainfall decreasing and air temperature increasing. This combination is not in any way healthy for crop production, especially for farmers who are dependent on rain for their farming, as in the study area. Also, onset of rain in the area, according to the farmers has shifted. This also in no small measure will adversely affect food crop production, as adjustment may be difficult, especially where what will happen the next farming season is not known.

Therefore, it is expedient that Nigerian Meteorological Agency (NIMET) as a body should improve on the network density of weather stations for the monitoring of climate/weather elements. As such, a weather station should be established in the LGA. This would help generate climate information that would help agro-climate scientists advise the farmers on the implication of climate data so generated. Similarly, farmers should be educated on best ways to carry out food crop agriculture in the face of changing climate pattern. Adaptation strategies should be taught them. Therefore, a

team of agriculturists and climatologists should be deployed to the area via the Edo State Ministry of Agriculture and Natural Resources to create awareness on changing climate among the food crop farmers. Farmers should be provided new seedlings that suit the current climate pattern of the area, and the need to shift planting dates. Equally, Farmers should be exposed to information regarding what over cultivation would do to crop yield. This is because; in the face of a changing weather pattern it would be very important to approach agriculture with the best practice. Finally, more studies should be carried out to ascertain the severity of the effects (in particular the adverse ones) of climate variability on food crop agriculture in the area.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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