

Perception of impact of climate variability on farming and coping strategies adopted by farmers and residents of Ikwerre local government area, Rivers State, Nigeria

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ABSTRACT

This study was conducted to assess the perception of the impact of climate variability and coping strategies adopted by farmers and residents of Ikwerre Local Government Area, Rivers State, Nigeria. Using a well-structured questionnaire, a total of 382 respondents were analysed using standard procedures. The results revealed that the majority of the respondents were less than 60 years old and had a household size of less than 10 people. About 29.22% of the respondents indicated that they are highly aware of the climatic variations and fluctuations in their environment and also of their effects. Only 5.32% of the respondents were aware of any climate variability. The results further show that fluctuations in the annual rainfall pattern have greatly affected farmers and residents in the area, as 43.78% of the respondents indicated that the effects are severe. The majority of the respondents (63.66%) indicated that coping strategies like increasing water conservation practices and the use of irrigation, planting different crops, using improved varieties, appropriate use of agrochemicals and fertilizers, planting shades and shelters, agroforestry practices, adopting soil conservation methods, changing farm enterprises, and using farm rotational methods are some strategies adopted by the farmers as coping strategies. These results, if properly harnessed, could help more farmers, even outside of the study area, adopt strategies that could mitigate the effects of climate variability.

Keywords: Adoption, climate variability, coping strategies, farmers, Ikwerre

INTRODUCTION

Ikwerre Local Government Area vegetation is becoming sparser than it used to be because of the changes over time in temperature and rainfall patterns that have taken place. Ikwerre Local Government Vegetation is known to be rain forest vegetation, which is home to different fauna, wild animals, and bush meat of various species. Flora species include trees, shrubs, epiphytes, and climbers. The effects of climate variability on the socioeconomic lifestyle of men all over the world cannot be overemphasized (Bagherzadeh *et al.*, 2020). Different research in the past only focused on the difficulties associated with the effects of climate variability on vegetation (Adama, 2015;

Akinsanola and Ogunjobi, 2014). Climate variability in the form of variation in rainfall and temperature patterns has adversely affected vegetation cover, human activities, and especially agriculture, putting the whole world in danger of hunger (Barbosa, 2004).

The climate of Nigeria, like that of every other country in the world, has changed over the years. According to Weli *et al.* (2021), the natural vegetation of Ikwerre local government has, over time, been under considerable threat due to climate variability. Solomon *et al.* (2015) observed that the impacts of climate variability are cross-cutting, having direct impacts on agriculture, water resources, and natural vegetation and indirect effects on humans.

As the backbone of a healthy nation, it has its own share of its own impacts. These changes are evident in the rising level of temperature, the unpredictable pattern of rainfall, the sea level experiencing continuous rising, the long period of dryness, and desert encroachment, to mention a few. All these extreme weather conditions have their effects on water resources, and this has a resultant effect on biodiversity and even humans, as the case may be. Many places in Nigeria experience flooding as a result of excessive rainfall, either in terms of duration or intensity (Odjugo, 2013). Although the findings of the scholars cover many areas, none has researched variability and coping strategies adopted by farmers in Ikwerre Local Government of Rivers State. Thus, this research assesses the perception of the impact of climate variability and coping strategies adopted by farmers and residents of Ikwerre Local Government Area, Rivers State, Nigeria, to enable us to make necessary recommendations that could mitigate the impacts of climate variability in the local government area.

MATERIALS AND METHODS

Study area

The study area is Ikwerre Local Government Council, Rivers State. It is found between Latitudes 4° 47' 14" and 5° 06' 58" North and Longitudes 7° 00' 14" East and 7° 02' 47" East (Figure 1). According to Chinda (2017), the "Ikwerre" people are one of the major ethnic tribes in the Niger Delta part of Nigeria. They are traditionally farmers, fishermen, and hunters, but in recent times, the environmental degradation and urban sprawl associated with oil exploration and exploitation have caused a sharp decline in the amount of farmland, forests, and rivers available for their traditional occupations. Agriculture constitutes the major economic activity in Ikwerre society, with over 55 percent of the people engaged in it. In pre-colonial Ikwerre society, almost every member of the society was a farmer, and it was a yardstick for measuring both men's and women's social status. The chances of a man or woman getting married depended largely on his or her ability to perform farm work. Farm work attracted such high prestige that it became the people's staff of office (Mbadiwe, 2020).

The design used in this study is a case study with a descriptive survey design. A case study design is useful when not much is known about a

phenomenon. In this study, a case study of some selected communities was used as a representation of the entire Ikwerre Local Government Area. The descriptive survey design was also used because it gives the opportunity to use both quantitative and qualitative data in order to analyze data and characteristics about the population that is being studied and because it involves data collection and life experiences (Kim *et al.*, 2017). The design is considered appropriate as Nwokolo *et al.* (2018) stated that it is a research design that investigates, records, reports, and describes events, phenomena, behaviors, and characteristics as they occur in their natural setting at a particular time.

Sampling and data collection

The population of the study included farmers and residents of the forty-two villages and towns that make up Ikwerre LGA. This was narrowed down to four main towns which were purposively selected for the study. They were chosen because they have the highest projected population in 2020 by the National Population Commission. The towns are: (1) Elele 69,244; (2) Ubima 28560; (3) Ogbodo Isiokpo 15,712; and (4) Omuodukwu Igwurita 15,039.

A multi-stage sampling technique was used to select respondents for the study. Out of the forty-two communities that make up Ikwerre LGA, the four largest communities were chosen purposefully because of their population, which is almost half of the population of the entire local government area. Due to the large population of the selected communities, the population was subjected to the Taro Yamane (1967) questionnaire to be able to have an accessible sample size for this research work. After subjecting the selected population of 128,605 to the Taro Yamane questionnaire, a sample size of 400 was obtained. The formula used is stated as follows:

$$n = N / 1 + N(e)^2 \dots\dots\dots \text{Eqn.1.}$$

Where;

- n* is the sample size required
- N* is the total population,
- 1* is constant and
- e* is the level of significance.

Sampling technique used was proportional stratified random sampling (Table 1).

From the four hundred questionnaires distributed to farmers and residents in the four localities, three hundred and eighty-two were retrieved.

Interview schedules and focus group discussions were used to elicit in-depth information from the respondents.

Statistical analysis

The generated data were coded and entered into IBM SPSS Version 25 for analysis. Descriptive statistics such as means, frequencies, and ratios were determined. Comparisons of associated variables were made with inferential statistics using p-values. A p-value of < 0.05 was considered statistically significant.

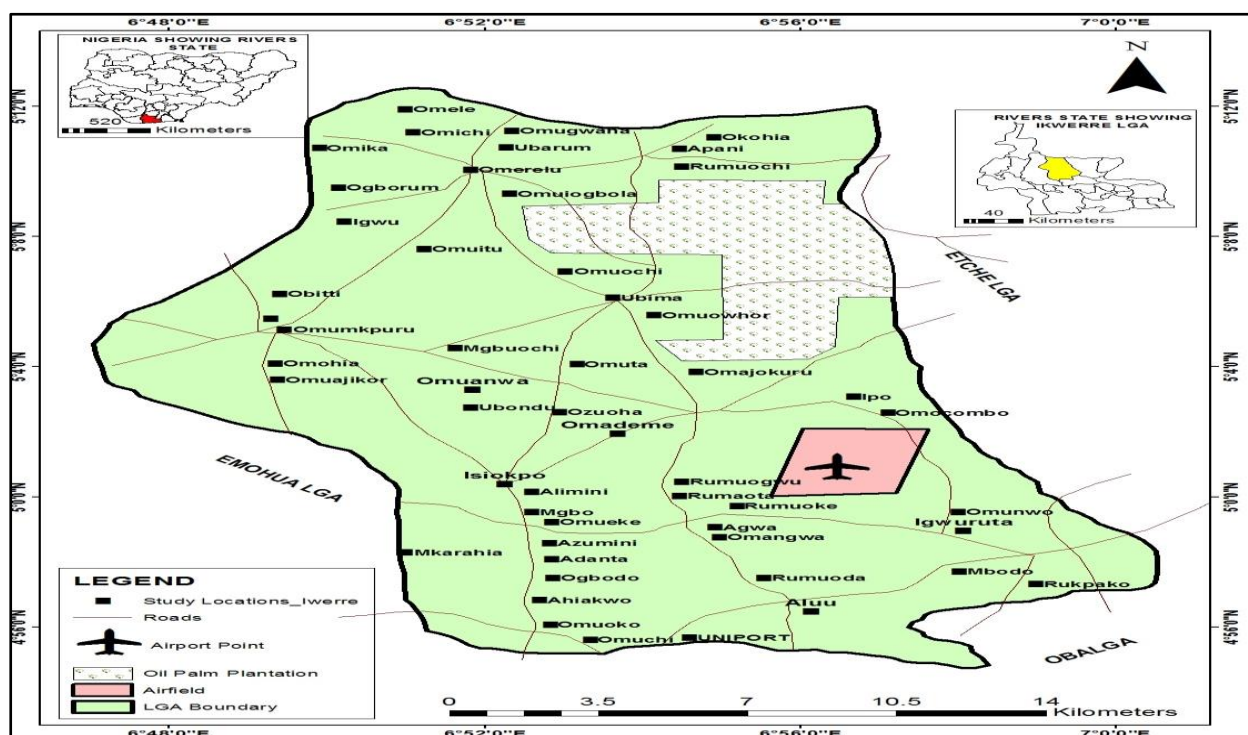


Figure 1: Ikwerre LGA showing the communities

Source: River State Ministry of Lands and Survey, 2019

Table 1: Composition of the sample size through proportional stratified random sampling

Town	Elele	Ubima	Ogbodo	Isiokpo	Omuodukwu Igwurita	Total
Population	69,244	28,560	15,712		15,039	128,605
Proportion	0.54	0.22	0.13		0.11	1.00
Sample size	216	88	52		44	400

RESULTS

Socio-economic characteristics of residents and farmers in the study area

Table 2 shows the socio-economic characteristics of the respondents. Out of the 382 respondents, 52.9% of them are females while 47.1% are males. Majority of the respondents were less than 60 years. The highest age bracket is 30-40 years while the least is 70 years and above. The marital status of the

respondents shows that 65.2% of them are married and 30.6% are single persons. 29.8% of the respondents attained primary school education, 29.1 % attained a vocational education and 18.3% had a secondary education, while 14.9% of the respondents had no formal education and a few (7.9%) had a BSC/HND/OND/PhD degree. Farmers are more among the respondents (42.7%). This was, followed by self-employed individuals (25.7%),

students were (19.4%), civil servants (10.2%) and a few of them are teachers (2.1%). The household size of most of the respondents consists of less than 10 persons with the highest household size bracket of 1-5 and the least, 11 and above. 85.4% of the respondents have a farm size of 1ha and below while the rest of the respondents have a farm size of more than 1ha. 68.1% of the respondents engage in crop

production and 19.4% in animal production while 7.6% sells farm products. The respondents are experienced farmers as about 55% of them have a farming experience of 6 years and above while 45% have a farming experience of 0-5 years. Majority of the respondents are residents of Elele community followed by Ubima, Isiokpo and the least number of respondents was in Igwuruta community.

Table 2: Socio-economic characteristics of respondents (n, 382)

Parameters		Frequency	Percentage (%)
Gender	Female	202	52.9
	Male	180	47.1
Age	<29 years	90	28.6
	30-39 years	130	34.0
	40-49 years	71	18.6
	50-59 years	79	20.7
	60-69 years	10	2.6
	70- above	2	0.5
Marital status	Married	249	65.2
	Single	117	30.6
	Divorced	6	1.6
	Widow	10	2.6
Educational Level	Primary school	114	29.8
	Secondary school	70	18.3
	BSc/HND/OND/PhD	30	7.9
	Vocational education	111	29.1
	No formal education	57	14.9
Primary Occupation	Teacher	8	2.1
	Civil Servant	39	10.2
	Students	74	19.4
	Farmers	163	42.7
	Self Employed	98	25.7
Household size	1-5	256	67.0
	6-10	114	29.8
	11- above	12	3.1
Farm size (Ha)	Less than 1ha	181	47.4
	1ha	145	38.0
	2ha	46	12.0
	3ha and above	10	2.6
Farming experience (Years)	0-5	172	45.0
	6-10	122	31.9
	11-16	46	12.0
	17- above	42	11.0
Farming Activities	Crop production	260	68.1
	Animal Production	74	19.4
	Non timber Forest products	19	5.0
	Sales of farm products	29	7.6
Community	Elele	206	53.9
	Ubima	82	21.5
	Isiokpo	52	13.6
	Igwuruta	42	11.0

Farmers' awareness of climatic variability and its effect on farming activities in Ikwerre Local Government Area, Rivers State

Table 3 shows the awareness of climate variability in Ikwerre Local Government Area, Rivers State where 29.22% of the respondents indicated that they are highly aware of the climatic variations and fluctuations in their environment and also of their effects. About 45.86% and 19.6% of the respondents indicated 'aware' and 'fairly aware, respectively, while 5.32% responded that they are not aware of any climate variability.

Perceived effects of variability in annual rainfall and temperature on farming activities in Ikwerre Local Government Area, Rivers State

Tables 4 and 5 show the effects of variability in annual rainfall and temperature patterns, respectively, and to what extent they have affected farmers and residents in Ikwerre Local Government Area, Rivers State. The results revealed that fluctuations in the annual rainfall pattern have greatly affected the farmers and residents in the area, as 43.78% of the respondents indicated that the effects are at a high extent and 33.36% indicated a very high extent, while 18.15% responded that the variation in the rainfall pattern has affected the farmers and residents to a low extent and 4.73% indicated no extent'.

The results for the effect of fluctuations in the annual temperature pattern as seen in Table 5

shows that 28.59% of the respondents indicated that the fluctuations have affected the quantity of crops and animals harvested, reduced the yield of farm produce, affected planting seasons, decreased the availability of natural resources, caused farmland erosion, flood, draught, longer periods of dry season, extreme temperature, humidity, excessive dryness, increased soil depletion, and have caused changes in harvesting period to a very high extent. 46.69% indicated 'high extent, while 20.96% and 3.76% indicated 'low extent' and 'no extent, respectively.

Coping strategies adopted by farmers and residents of Ikwerre Local Government Area of Rivers State due to climate variability

Table 6 shows the coping strategies adopted by farmers due to climate variability to mitigate its effects. The majority of the respondents (63.66%) indicated that coping strategies like increased water conservation practices and use of irrigation, planting of different crops, use of improved varieties, appropriate use of agrochemicals and fertilizers, planting of shades and shelters, agroforestry practices, adopting soil conservation methods, changing farm enterprises, and farm rotational methods are some strategies adopted by the farmers, while about 7.71% of the respondents indicated that these strategies are not adopted. The mean value for all the coping strategies was above the average mean of 2.5, but 'the use of insurance' had a low rating with a mean value of 2.46.

Table 3: Farmers' awareness on climatic variability and its effects on farming activities in Ikwerre Local Government Council, Rivers State

S/no	Parameters	Highly Aware	Aware	Fairly Aware	Not Aware	Mean
1	Variation in rainfall pattern/flooding	217 (56.8%)	117(30.6%)	39(10.2%)	9 (2.4%)	3.42
2	Fluctuations in temperature pattern/Excess heat	137 (35.9%)	180(47.1%)	49 (12.8%)	16 (4.2%)	3.15
3	Changes in humidity pattern	96 (25.1%)	210(55.0%)	66 (17.3%)	10 (2.6%)	3.03
4	Variation in wind pattern	70 (18.3%)	213(55.8%)	75 (19.6%)	24 (6.3%)	2.86
5	Variation in weather pattern and harmattan	104 (27.2%)	185(48.4%)	71 (18.6%)	22 (5.8%)	2.97
6	Depletion of wild animals/bush meat	64 (16.8%)	179(46.9%)	109(28.5%)	30 (7.9%)	2.73
7	Decrease in farm output/yield in crops and timber	110 (28.8%)	177(46.9%)	69 (17.5%)	28 (7.3%)	2.97
8	Decreased performance of livestock breeding and production	100 (26.2%)	168 (44%)	86 (22.5%)	28 (7.3%)	2.89
9	Decline in livelihood system/standard of living	99 (25.9%)	159(41.6%)	100(26.2%)	24 (6.3%)	2.87
10	Declining farm income	119 (31.2%)	164(42.9%)	87 (22.8%)	12 (3.1%)	3.02
	Mean	29.22%	45.86%	19.6%	5.32%	2.99

Table 4: Effects of variability in rainfall on farming activities in Ikwerre Local Government Council, Rivers State

S/no	Parameters	VHE	HE	LE	NE	Mean
1	It has affected the size of crops we harvest	187 (49%)	153(40.1%)	39 (10.2%)	3 (0.8%)	3.37
2	It has affected the maturation time of crops	151 (39.5%)	158(41.4%)	63 (16.5%)	10 (2.6%)	3.18
3	The yield of our farm produce has reduced	147 (38.5%)	186(48.7%)	45 (11.8%)	4 (1.0)	3.25
4	It has affected planting seasons which are no more consistent	131 (34.3%)	180(47.1%)	55 (14.4%)	16 (4.2%)	3.12
5	It has not affected farming activities at all	96 (25.1%)	138(36.1%)	92 (24.1%)	56 (14.7%)	2.72
6	It has caused fluctuations in rainfall pattern and flooding leading to relocation	108 (28.3%)	181(47.4%)	81 (21.2%)	12 (3.1%)	3.01
7	There is now increased use agrochemicals in farms	116 (30.4%)	163(42.7%)	87 (22.8%)	16 (4.2%)	2.99
8	It has increased the use of fertilizers	117 (30.6%)	200(52.4%)	53 (13.9%)	12 (3.1%)	3.10
9	It has led to decreased labor efficiency	108 (28.3%)	139(36.4%)	103 (27%)	32 (8.4%)	2.85
10	There is now Rural–urban migration due to fluctuations in temperature	113 (29.6%)	174 (45.5%)	75 (19.6%)	20 (5.2%)	2.99
	Mean	33.36%	43.78%	18.15%	4.73%	3.06

Foot note: VHE = Very High Extent; HE = High Extent; LE = Low Extent; NE = No Extent

Table 5: Perceived effects of variability in annual temperature on farming activities in Ikwerre Local Government Area, Rivers State

S/No	Parameters	VHE	HE	LE	NE	Mean
1	It has affected the quantity of crops and animals harvested	149 (39%)	177(46.3%)	44 (11.5%)	12 (3.1%)	3.21
2	The yield of our farm produce has reduced	111 (29.1%)	203(53.1%)	60 (15.7%)	8 (2.1%)	3.09
3	It has affected planting seasons which are no more consistent	100 (26.2%)	191(50%)	83 (21.7%)	8 (2.1%)	3.00
4	Decrease in availability of natural resources	94 (24.6%)	198(51.8%)	80 (20.9%)	10 (2.6%)	2.98
5	Farmland erosion and flood	96 (25.1%)	162(42.4%)	106 (27.7%)	18 (4.7%)	2.88
6	Drought and longer period of dry season	85 (22.3%)	172(45%)	107 (28%)	18 (4.7%)	2.85
7	Extreme temperature	123 (32.2%)	147(38.5%)	92 (24.1%)	20 (5.2%)	2.98
8	Humidity and excessive dryness	109 (28.5%)	180(47.1%)	71 (18.6%)	22 (5.8%)	2.98
9	Increase in soil depletion/plant nutrition	120 (31.4%)	168(44%)	84 (22%)	10 (2.6%)	3.04
10	Changes in harvesting period	105 (27.5%)	186(48.7%)	73 (19.1%)	18 (4.7%)	2.99
	Mean	28.59%	46.69%	20.96%	3.76%	3.00

Foot note: VHE = Very High Extent; HE = High Extent; LE = Low Extent; NE = No Extent

Table 6: Coping strategies adopted by farmers due to climate variability in Ikwerre Local Government Area, Rivers State

S/No	Parameters	HA	A	FA	NA	Mean
1	Increased water conservation practices and use of irrigation	131(34.3%)	129(28.3%)	108(28.3%)	14 (3.7%)	2.99
2	Planting of different crops	146(38.2%)	151(39.5%)	73 (19.1%)	12 (3.1%)	3.13
3	The use of improved varieties	112(29.3%)	173(45.3%)	83 (21.7%)	14 (3.7%)	3.00
4	Appropriate use of agrochemicals and fertilizers	96 (25.1%)	164(42.9%)	104(27.2%)	18 (4.7%)	2.88
5	Planting of shades and shelters	92 (24.1%)	122(31.9%)	128(33.5%)	40 (10.5%)	2.70
6	Agroforestry practices	74 (19.4%)	136(35.6%)	138(36.1%)	34 (8.9%)	2.65
7	Adopting soil conservation methods	75 (19.5%)	160(41.9%)	117(30.6%)	30 (7.9%)	2.73
8	Change of farm enterprise	87 (22.8%)	166(43.5%)	107(28%)	22 (5.8%)	2.83
9	Use of insurance	78 (20.4%)	99 (25.9%)	126(33%)	79 (20.7%)	2.46
10	Moving to different farm area (Rotational method)	113(29.6%)	128(33.5%)	110(28.8%)	31 (8.1%)	2.85
	Mean	26.28%	37.38%	28.63%	7.71%	2.85

Foot note: HA = Highly Agree; A = Agree; FA = Fairly Agree; NA = No agreement

DISCUSSION

Socio-economic characteristics of residents and farmers in Ikwerre Local Government Area, Rivers State

The results of the socio-economic characteristics of the respondents in the study area are similar to those reported by other authors (Deekor and Sunday, 2019; Sennuga *et al.*, 2020). More of the respondents were female. This is in line with the report of Deekor and Sunday (2019), who reported 59.96% of females. Mbadiwe (2020) also reported on the gender classification of farm crops and labor in Ikwerre communities. This is expected as women participate more in farming activities in this part of the country. Palacios-Lopez *et al.* (2017) declared that in many African countries, rural women account for 60 percent of the agricultural labor force and up to 80 percent of total food production. The highest age bracket is 30–40 years, while the least is 70 years and above. This could be because those younger in age are still busy with their school activities or trying to learn a trade, and the older ones might not be strong enough for farm work (Mbadiwe, 2020). More of the farmers were married, in line with their age group. This is in line with the report of Sennuga *et al.* (2020). Most of them had primary and secondary education and are self-employed with a household size of less than five people. 85.4% of the respondents have a farm size of 1 hectare or less, while the rest of the respondents have a farm size of more than 1 hectare and are more into crop production with farming experience of 6 years or more. Similar results were reported by Deekor and Sunday (2019). The problem of land tenure systems has contributed most to the size of land owned by farmers.

Farmers' awareness of climatic variability and its effect on farming activities in Ikwerre Local Government Area, Rivers State

This result on the awareness of respondents on climatic variability and its effects is in line with the findings of Banerjee (2014), who reported that the farmers indicated that there had been significant changes and variations in the quantity and distribution of rainfall and changes in temperature over the years and the observable effects it has on them. Odjugo (2013) stated that 34.2% of the respondents in the urban areas of some selected states in Nigeria indicated that they knew much about climate change, and 47.2% indicated they knew a little about it.

Perceived effects of variability in annual rainfall and temperature on farming activities in Ikwerre Local Government Area, Rivers State

Climatic variability, like fluctuations in rainfall and temperature patterns, has a negative impact on farmers and residents, as seen in the responses of the respondents. This is in corroboration with the findings of Somboonsuke *et al.* (2018), who reported that the negative impacts of climate change on Para-rubber production, rice production, and oil palm production are relatively high, while 'most' was used to show the level of the negative impact of changes in climate on fruit production and fisheries. This result is also in accordance with the work of Agbo *et al.* (2015), where using the mean ratings of the perception of the effects of climate variability, they observed that 14 out of 20 effects of climate variability perceived by the farm households were above the average mean of 2.55, indicating 'very severe' (with a mean score of 3.18–3.49).

Coping strategies adopted by farmers and residents of Ikwerre Local Government Area of Rivers State due to climate variability

This is in corroboration with the findings of Banerjee (2014), who reported similar coping strategies adopted by the farmers, like water management practices, the use of shades (shed-nets), planting different crops, and adopting soil conservation methods to curb the effects of climate variability. The results are also in accordance with Nzeadibe *et al.* (2011), who listed different adaptive measures farmers adopt to reduce the impact of climate change on them. Some of these include planting cover crops, zero tillage, constant weeding of farms, early planting with the first rain, mulching and use of organic manure, preservation and selection of seeds for the next planting season, and mixed farming practices.

CONCLUSIONS

The vegetation dynamics in Ikwerre local government of Rivers State, Nigeria, over the past 40 years were well explored, which revealed significant variation over the years. Similarly, climate variability was observed as a result of global climate change, which has negatively impacted farmers and residents of the local government area, who now have different strategies to cope with the trend.

A significant relationship between vegetation dynamics and climate variability in the Ikwerre local government area of Rivers State, Nigeria, was observed. The study revealed that most of the farmers and residents in the study area were aware of the variation in climate and vegetation cover, and they confirmed that it has affected the quantity of crops and animals harvested, planting seasons, and the availability of natural resources. Other effects emphasized were farmland erosion and flooding, draughts, and longer periods of dry weather. Some of the major coping strategies adopted by these farmers and residents included increasing water conservation practices and the use of irrigation. While some resorted to mixed cropping and the use of improved varieties, others now use agrochemicals and fertilizers, as well as adopting soil conservation methods.

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