

Effects of Climate Change on Okra (*Abelmoschus esculentus*) Production Among Women Farmers in Ikwerre Local Government Area, Rivers State, Nigeria

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Abstract

*The study evaluated the effects of climate change on Okra (*Abelmoschus esculentus*) production among women farmers in Ikwerre L.G.A of Rivers State, Nigeria. The specific objectives of the study were to; describe the socio-economic characteristics of women Okra farmers in the study area, perceived effects of climate change on Okra production in the study area, identify adaptation strategies employed by women Okra farmers on climate change effects. Simple random sampling technique was used to select respondents for the study. Data were analyzed using simple descriptive statistics (percentage, frequency and mean). The result of the study showed that majority of the respondents (33.3%) were within the age bracket of 41 – 50 years with an average age of 48 years, majority were married (80.0%). A large proportion of the respondents had formal education (83.3%). Reduced yield of vegetable crop and reduction of family income were among the major effects of climate change on vegetable crop production. Diversifications (farm and non – farm) and mixed cropping and intercropping were among the most widely used adaptation strategies by respondents. Therefore, it was recommended that Women Okra farmers should be assisted to procure innovations (technology) and secure loans to enable them in their climate resilience, since majority of the farmers are educated, efforts should be geared towards the effective use of information and communication technology (E – extension) in enlightening and educating the women Okra farmers about climate smart agricultural practices to enable them increase their adaptive capacity and women Okra farmers should be encouraged to go into other viable income generating agricultural and non agricultural activities to cushion the effects of climate change on their means of livelihood.*

Key words: Climate change, Effects, Okra Production, Adaptation strategies

INTRODUCTION

Agriculture is a very significant sector in the economy of Nigeria as it provides employment for over 70% of the population, which practice subsistence agriculture that is dependent on climate variables and extremely vulnerable to climate variability and change (IPCC, 2014). Agriculture and Climate change are correlated processes, both of which take place on global scale. The relationship between agriculture and climate change is twofold: Firstly, agriculture affects climate through the emissions of greenhouse gases (GHGs) such as carbon (IV) oxide, methane and nitrous oxide. These emissions come directly from use of fossil fuels, tillage operations, fertilized agricultural soils and livestock manure in large proportion (Tasie and Wilcox, 2021).

Secondly, climate change can disrupt food availability, reduce access to food, and affect food quality (United States Department of Agriculture (USDA), 2015). According to World Bank (2017), women are major players and backbone in the rural economy especially the agricultural sector, and in comparison with the men, they have less access to farm resources and often have tendency to be impacted negatively by adverse effects of worsening climate change. Women participate significantly in food production, producing 60% to 80% of the food in most low-income countries and are responsible for 50% of the world's food production, but their significant role as food producers and providers and their contribution to household food security has gained recognition in recent time (FAO, 2015). Women engage in vegetable crops production amongst other crops to make food available for their families and for the markets, generate income and increase

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their family standard of living. Okra (*Abelmoschus esculentus*) is among the most essential vegetable crops grown extensively by women in Nigeria, especially in South East and South South, Nigeria. Okra is a very important source of fibre, iodine, vitamins A, B and C, protein and other essential nutrients (Loko, Mohammed, Jubrin, Mohammed, Muhammed, Usman and Husseini, 2020). The fruits of Okra contain about 85% water and it is an important source of income for the women farmers and used in human diets. It is a tropical and sub – tropical vegetable crop belonging to the malvaceae family and is sensitive to climate change variables; irregular rainfall patterns, high and low temperature effects, flooding, drought conditions and salinity of soils.

Climate change therefore, can be precisely defined as all changes in climate due to human activities or natural events. IPCC (2007) concluded that Africa is one of the most vulnerable continents to climate change owing to “multiple stresses and low adaptive capacity”. In Nigeria, just as in many African countries, climate is an important factor in agricultural production because our agriculture is still climate dependent (rain fed). Unfortunately, the climate is no longer what it is used to be. Farmers have encountered losses following the signals of weather in their agricultural activity. Also the low infrastructural capacity of the farmers contributes to their high dependency on rain fed agriculture. Bearing in mind the contributions of the agricultural sector to the economy and wellbeing of the citizenry, government as well as different agencies has put in reasonable effort in combating climate change and its menace. The poor result gotten from all these efforts is a vivid indication that the effort of the government and other agencies is yet to be adequate. Studies have indicated that the effects of this climate change on African agriculture are mainly negative (Nest, 2011 and Onyeneke and Madukwe, 2010). Several adverse effects of climate change in Nigeria at large and Rivers State in particular have been identified by researchers which includes; flooding, off-season rains, drying up of lakes, increasing incidence of disease, declining agricultural productivity, and rising number of heat waves, changes in the frequency and intensity of droughts, water shortages, worsening soil conditions, disease and pest outbreaks on crops and livestock, rise in sea level due to melting of ice caps; changes in dates of onset and end of the rainy season; reduced rainfall amounts in some areas and increased rainfall amounts in others, increase in intensity of atmospheric disturbances such as thunderstorms and line squalls (Orebiyi, Tasie, Onyemauwa, and Emeya (2014),

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Ifeanyi-obi, Asiabaka, Matthews – Njoku, Nnadi, Agumagu, Adesope, Issa, and Nwakwa (2012) and Ogbo, Lauretta, and Ukpere (2013)).

Okra (*Abelmoschus esculentus*) is an important vegetable crop to Ikwerre people in Rivers State. It is used primarily in soups (human diet) and is a rich source of vitamins and minerals, carbohydrate, salts, protein and fat and contribute to the balanced diet of many people (Adeoye, 2020). Okra production provides smallholder women farmers with much higher income and more jobs per hectare than most staple crops. Any improvement in the production of Okra will surely enhance the standard of living of the people of the study area. Over the past 100 years, the earth’s average surface temperature has risen by about 0.74°C (Direct Gov., 2010). Most researchers agree that global temperatures will rise further (by how much depends on future emissions of greenhouse gases), and if the temperature rise is high, changes are likely to be so extreme that it will be difficult to cope with them (Ozor, 2009 and Nest, 2011). Eboh (2009) noted that countries in Sub-Saharan Africa, including Nigeria are likely to suffer the most because of their geographical location, low incomes, and low institutional capacity, as well as their greater reliance on climate-sensitive renewable natural resources sectors like agriculture.

In Ikwerre Local Government Area, agricultural production is largely non-mechanized; therefore weather/climate assumes significance in every stage of production. Farmers depend on climate signals as major determinant of their farming activities. This makes climate very significant in the production of crops like Okra. Unfortunately, climatic conditions are no longer predictable as they used to be in the past and as a result farmers have encountered a series of losses as a result of change in climate (Apata, Samuel and Adeola, (2009), Ozor, 2009). Vegetable crops like Okra are known to tolerate drought to a reasonable extent, and are still adversely affected by the variations in climate.

All stages of production of vegetable crop (Okra) are affected by the variations in climate. Scientists have it that variations in climate may not be avoided entirely because of inability of countries to stop the emission of greenhouse gases (IPCC, 2021). Therefore the basic way to mitigate it is by building up resilience or adaptation strategies to help farmers cope with the effect of this change. Bearing the commercial and nutrition importance of vegetables in the study area, it becomes very imperative to inquire on the extent and aspect these variability in climate affect the production of Okra as well as identify the viable adaptation strategies used by

the women farmers. This will surely help them to cope with the vagaries of climate thereby enhancing their production activities. It is against this background that this study evaluated the perceived effects of climate change on Okra production and women farmers' adaptation measures in Ikwerre Local Government Area, Rivers State, Nigeria.

Objectives of the study

The broad objective of the study was to ascertain the perceived effects of climate change on vegetable production and women farmers' adaptation measures in Ikwerre Local Government Area, Rivers State, Nigeria. The specific objectives are to:

1. describe the socio - economic characteristics of women Okra farmers in the study area;
2. perceived effects of climate change on vegetable crops production in the study area;
3. identify adaptation strategies employed by women Okra crop farmers on climate change effects.

METHODOLOGY

The study was carried out in Ikwerre local government area of Rivers State, with headquarters in Isiopko town. Ikwerre Local Government Area covers an area of 1380km². The Local Government Area is made up of 12 communities; Elele, Isiopko, Omerelu, Apani, Omagwa, Omademe, Aluu, Igwuruta, Ubima, Omuanwa, Ozuaha and Ipo. All the 12 communities in the study area were used for the study. A random sampling technique was employed to select 10 farmers from each of the communities. This is to ensure an equal number of respondents from each of the communities. This gave rise to 120 women vegetable farmers used in the study.

Data for this study were collected from women vegetable crop farmers to determine the effects of climate change and the adaptation measures adopted by the women vegetable crop farmers. A well structured questionnaire was used to collect primary data. The entire women vegetable crop farmers (respondents) were administered a structured questionnaire each relating to their socio-economic characteristics, effects of climate change on vegetable production and adaptation strategies adopted. Data were analyzed using simple descriptive statistics (percentage, frequency and mean). The responses on the perceived effects of climate change on okra crop production and the adaptation strategies adopted by women vegetable crop farmers were weighted on a 4- point Likert- type rating scale of agreement (Strongly agree (SA) – 4, Agree (A) – 3,

Disagree (D) – 2, Strongly disagree (SD) – 1). The values of the scale (4,3, 2 and 1)were summed up to obtain 10. The mean value or score of the sum gave 2.50 which served as the cut – off mean. This became the bench mark for accepting any item as a perceived effect of climate change on vegetable crop production and an adaptation strategy to climate change.

RESULTS AND DISCUSSIONS

Socio-economic characteristics of women vegetable farmers

Table 1 shows the age distribution of women vegetable farmers in the study area. The Table indicates that 12.5 % of the respondents fall within the age range of 21 – 30, 14.2% within 31 – 40, 33.3% within 41 – 50, 20.8% within 51 – 60, and 19.2% within 61 – 70. This result indicates that majority of the women vegetable farmers fall within the ages of 41 – 50 years and that women of different age brackets are involved in vegetable production. This finding is in line with Olooto, Yusuf, Ayanda and Salawu (2018). Also it was shown that majority of the women vegetable producers were married (80%). This implies a higher level of responsibility and commitment by the women to vegetable production, because marriage confers on the married a sense of responsibility whereby couples are expected to have a means of livelihoods to cater for the needs of their households. Women as caregivers to families and communities provide food and nutrition and are human link between the farm and the table (World Bank, 2017).

The percentage distribution of respondents by household size shows that 49.2% maintained a household of 1-5 persons, 34.2.% had household of 6-10 persons, 12.5% had 11-15 persons, while only 4.1% maintained household size of 16-20 persons. The average household size is seven (7) persons. This implies that majority of the producers maintain small household size. This agrees with Tasie and Kalio (2019), who found that fluted pumpkin (*Telfairia occidentalis*) farmers in Ahoada East L.G.A have small household sizes.

The table further shows the distribution of respondents by level of education attained. It was revealed that 16.7% of the respondents have no formal education while the remaining 83.3% of the respondents are educated at different level and this implies that majority of farmers in the study area are literate enough to adopt new technologies easily since they can read and write. Experience is very important in every enterprise, especially in smallholder vegetable farming. Table 1 shows that majority of the respondents (89.2%) have

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over 6 years of experience. This indicates that women vegetable farmers in the study were well experienced because the more the years, the more the experience a person acquires in a given activity. With these years of experience, the farmers would be able to use climate smart indigenous and agronomic means to cushion the effects of climate change.

Perceived effects of climate change on vegetable production

Table 2 shows that reduced yield of vegetable crops (3.40), reduction of family income (3.30) and stunted growth (3.20) were the major effects of climate change on vegetable production. Also, inability to grow at the

right time (3.00), pest and disease incidence (3.05), ineffectiveness of agricultural chemical (2.95), low maturity of crop (3.05), discoloration of leaves (3.06), increase cost of production (2.95), loss of farm land due to flood and erosion (3.05), weed infestation (2.90) and water shortages (2.85) were also shown to be significant effects of climate change on vegetable crop production. This finding is in agreement with Tasie and Kalio (2019). In their study of effects of climate change on *Telfairia occidentalis* (Fluted pumpkin) production, they found the above effects of climate change significant in Fluted Pumpkin production.

Table 1: Socio – economic characteristics of respondents

Age	Frequency	Percentage (%)
21 – 30	15	12.5
31 – 40	17	14.2
41 – 50	40	33.3
51 – 60	25	20.8
61 – 70	23	19.2
Total	120	100.0
Marital Status		
Single	24	20.0
Married	96	80.0
Total	120	100.0
Household Size		
1 – 5	59	49.2
6-10	41	34.2
11- 15	15	12.5
16-20	5	4.1
Total	120	100.0
Level of Education		
No formal education	20	16.7
Primary education	30	25.0
Secondary education	48	40.0
Tertiary education	22	18.3
Total	120	100.0
Farming Experience (years)		
1-5	13	10.8
6-10	23	9.2
11-15	45	37.5
15-above	39	32.5
Total	120	100

Source: Field survey, 2022

Adaptation strategies used by Vegetable crops farmers

Table 3 shows the adaptation strategies used by the vegetable crop farmers in Ikwerre local government area. The table shows that diversification to other sources of income (farm and non-farm activities) (3.65) and mixed cropping/intercropping (3.60) are the most adaptive strategies adopted by vegetable crop farmers in Ikwerre local government area. Other significant adaptive strategies adopted by vegetable crop farmers in the study area are late planting (2.80), harvesting early (2.91),

changing of planting location (3.26), Fertilizer application (2.87), Herbicides application (2.75), engage in irrigation practice (2.56), use of organic manure (2.82), mulching to reduce water loss (2.79), use of relative shade with trees on farms (2.88), increase land cultivated (2.74), weather forecast technology (2.55), drought tolerant species (2.75), information from extension agents (2.50) and securing loans to purchase relevant innovation or technology (2.98)

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Table 2: Effects of climate change on vegetable production

S/N	Effects of climate change	Mean score
1	Reduced yield	3.40
2	Reduction of family income	3.30
3	Stunted growth	3.20
4	Inability to grow at the right time	3.00
5	Pest and diseases incidence	3.05
6	Ineffectiveness of agricultural chemical	2.95
7	Low maturity of crops	3.03
8	Discoloration of leaves	3.06
9	Increased cost of production	2.95
10	Loss of farm land due flood and erosion	3.05
11	Weed infestation	2.90
12	Water shortage	2.85

Mean Score - 2.50 is significant Source: Field survey, 2022

Table 3: Adaptation strategies used by vegetable crops farmers

S/N	Adaptation strategies used by vegetable crops farmers	Mean
1.	Late planting	2.80
2.	Harvesting early	2.91
3.	Change planting location	3.26
4.	Fertilizer application	2.87
5.	Herbicides application	2.75
6.	Irrigation practice	2.56
7.	Drought tolerant species	2.75
8.	Use of organic manure	2.82
9.	Mulching to reduce water loss	2.79
10.	Relative shade with trees on farms	2.88
11.	Mixed cropping/Inter cropping	3.60
12.	Diversify to other sources of income (farm and non - farm)	3.65
13.	Increase land cultivated	2.74
14.	Weather forecast technology	2.55
15.	Early planting	2.50
16.	Securing loans to purchase relevant innovation or technology	2.98

Mean Score - 2.50 is significant Source: Field survey, 2022

CONCLUSION AND RECOMMENDATIONS

There is no doubt that the climate is changing and as well exerting some negative effects on the environment and man's activities. Okra crop production due to its dependence on climate variables and low infrastructural and technological development is significantly affected by climate variability. This study concludes that women Okra farmers in Ikwerre Local Government Area of Rivers State are already adapting to climate variability.

To increase the women farmers' resilience, the following recommendations are made to help the farmers tackle this menace that is slowly eating up their means of livelihood.

- i) Women crop farmers should be assisted by relevant agencies (public and private) to procure innovations (technology) and secure loans to enable them in their climate resilience.
- ii) Since majority of the farmers are educated, efforts should be geared towards the effective use of information and communication technology (E – extension) in enlightening and educating the women vegetable crop farmers about climate smart agricultural practices enable them increase their adaptive capacity.
- iii) Women farmers should be encouraged to also go into other viable income generating agricultural and non agricultural activities to cushion the effects of climate change on their means of livelihood.

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