PERCEPTION EFFECTS ON VEGETABLE CROP PRODUCTION IN UDU AREA OF DELTA STATE, NIGERIA.

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Abstract
This study analyses farmers' perception on the effect of climate change on vegetable crop production in Udu area of Delta state Nigeria. A validated questionnaire was used. Descriptive statistical tools show that the farmers are matured (41-50 years), mostly females (7833%), married (83.33%), literate (90.00%) and with average household size and farming experience of 7 and 22 years respectively. The study also revealed the highest weather condition occurring in the area as variation in rain pattern and variation in humidity. Effect of climate change on vegetable crop production among others include delay in onset of rainfall, increase in temperature, undefined weather, increases in frequency and intensity of flooding and increased weed infestation. Some of the adaptive strategies include; use of drought tolerant species of vegetable crops, harvesting early when adverse weather is anticipated, early planting of vegetable crops etc. Based on these findings, farmers' perceived economic effects on climate change include; increased cost of vegetable crop production, loss of available planting land due to flood, general reduction of family income and general reduction in production of vegetables. The study therefore recommends that the government should invest on improved agricultural technology that relates to vegetable crop production which is necessary to help farmers cope with climate change.

Keywords: climate change, vegetable crop, perception, food security

INTRODUCTION

Agriculture is the basic activity by which human lives survive on the earth (Acock*et al.*, 2005). Agriculture is frequently limited by the seasonal magnitude of moisture availability (Obioha, 2009). Agricultural production is dependent on climate. Nigeria climate varies among regions in the country. The variation occurs as a result of so many factors. There are two major seasonal variations in Nigeria, the wet and dry seasons and these affect agriculture both positively and negatively. For example, a seed germinates and sprouts under specific atmospheric conditions of temperature and relative humidity. Some crops do not do well as a result of climatic variation. Vegetables are important in the human diet as they contribute to good health and longevity (FAO, 2008). A vegetable may be defined as any plant part of which is used as food (FAO, 2008). Vegetables have been part of human diet from time immemorial. Some are staple foods but most are accessory food stuffs, adding variety to meals with their unique flavours and at the same time adding nutrients necessary for health. Some vegetables are perennial but most are annuals and biennials, usually harvested within a year of sowing or planting (FAO, 2008). Whatever system is used for growing crops, cultivation follows a similar pattern, preparation of the soil by loosening it, removing or burying weeds and adding organic manures or fertilizers; sowing seeds or planting young plants, tending the crop while it grows to reduce weed competition, control pests and provide sufficient water, harvesting the crop when it is ready, sorting, storing and marketing the crop or eating it fresh from the ground (Ayinde*et al.*, 2011). Different soil types suites different crops, but in general, in temperate climates, sandy soils dry out fast but warm up quickly in the spring and are suitable for early crops.

Climate is defined as the average weather conditions of a place measured for several seasons over a long number of years (Thompson, 2005). Climate somehow controls the food we eat and even the clothes we wear. Climate change refers to the significant and lasting change in the statistical distribution of weather patterns over a period ranging from decades to millions of years (IPCC, 2008). It can be seen as change in climate composition of the global atmosphere. Climate change can seriously affect agriculture in many ways. It bringsabout change in weather pattern that can cause serious repercussion in use, up setting seasonal cycles, harnessing ecosystem and water supply, cause food shortage, land slide, drought and also increase pest and disease (IPCC, 2008). The major elements that determine the weathers includes; rainfall, temperature, insolation, wind and humidity. These weather conditions also can affect the marketing of some agricultural products mainly vegetable, which are perishable goods.Due to poor or inadequate storage facilities, farmers find it difficult to maximize profit and this result to reduction in production level. Based on these, vegetable crop farmers perceive the effects of the climate change in different ways and will look for

adaptive measures to ameliorate the condition; it therefore becomes necessary to:

- examine the weather condition occurring in the area
- find out if the vegetable crop farmers are using any adaptive strategy and also
- find out if the climate change have any economic effects on the farmers' productivity.

METHODOLOGY

The study was carried out in Udu Local Government Area (L.G.A) of Delta State which is located in the North East part of Delta State. Udu L.G.A. has it's headquarter at Otor-Udu and it consists of twelve autonomous communities. The major food crops grown in the area are cassava, oil palm, maize and vegetables. Three communities were randomly selected out of the twelve communities, and then twenty vegetable crop farmers were randomly selected from each of the three communities making a total of 60 respondents. Data were collected through the use of questionnaire and analyzed using descriptive statistics such as percentage, mean and likert type scale. To ascertain the weather condition occurring in the area, a list of different weather conditions were given to them. They were expected to rate on a 3-point Likert-type scale the extent each item occurred. The scale had three response options of, High$^{(3)}$, Moderate$^{(2)}$ and Low$^{(1)}$. The values of the scales were added to get 6, which was divided by 3 to get a mean of 2.0. Any weather condition with a mean of 2.0 and above was regarded as high while those less than 2.0 were regarded as low.

Similarly, a 4-point Likert type scale of; Strongly agree$^{(4)}$, Agree$^{(3)}$, Disagree$^{(2)}$ and Strongly disagree$^{(1)}$ was used to ascertain the effects of climate change on output, adaptive strategies used and economic effect of climate change on farmers.

RESULTS AND DISCUSSION

Personal characteristics of the respondents

Majority (78.33%) of the farmers were females. This implies that more females are involved in vegetable crop production in the study areas than males. The dominance of females in this study could stem from the fact that vegetable crops are mostly produced by women, who also carryout most of the farm activities like bush cutting, cultivation, planting and weeding. This agrees with the findings of researchers on socio-economic characteristics in the study area; (Nwaru, 2000; Adaugo, 2011; Hans *et al.*,2008) who opined that women are responsible for most of the vegetable crop production in their study areas.

Data in Table 1 shows that half of the respondents (50.00%) were within the age range of 41-50. The mean age of the farmers was 46years. This shows that the farmers are still within their active and productive age. This therefore implies that they will be able to respond to climate change. Majority of the respondents (48.33%) attended secondary school while only (20.00%) of them did not go to school. This implies that most of the farmers are literate and so can adopt innovations on climate change and also get information on way forward from the televisions and radios.

Most of the respondents are married (83.33%) and this makes them more responsible and hard working as the table also shows that (61.67%) have household size of 1-5 persons while (21.67%) have 6-10 persons, so they will do anything between their reach to maintain their source of income. A greater proportion (56.67%) of the respondents had been farming for 11-20years followed by 1-10years (35.00%) and (8.33%) for 21-30years. This implies that the farmers have acquired much experience in farming and can conveniently perceive a change in climate.

Table 1: Percentage Distribution of Respondents According to Socio-economic Characteristics

Socio-economic characteristics	Frequency	Percentage (%)	Mean
Sex			
Male	13	21.67	
Female	47	78.33	
Age (Years)			
<30	5	8.33	
30-40	9	15.00	
41-50	30	50.00	
51-60	11	18.34	
61 and above	5	8.33	46years
Educational level			
Non	12	20.00	
Primary	29	48.33	
Secondary	19	31.67	
Marital Status			
Single	5	8.33	
Married	50	83.34	
Widowed	5	8.33	

Farming experience		
1-10	21	35.00
11-20	34	56.67
21-30	5	8.33
Farmland size		
Less than 1 hectare	39	65.00
1-2 hectares	16	26.67
3-4 hectares	5	8.33
Household size		
1-5	37	61.67
6-10	13	21.67
11 and above	10	16.66

Source: Field survey, 2015

Perceived Weather Condition occurring in the area

Table 2: shows the degree of weather condition occurring in the area as perceived by the farmers. Using a discriminating index of ≥2.0 for high and <2.0 for low. The respondents perceived variation in rain pattern ($\bar{x}$=2.9) and variation in humidity ($\bar{x}$=2.5) to be high, while they generally perceived variation in precipitation ($\bar{x}$=1.9), variation in atmospheric temperature, ($\bar{x}$=1.7), drought ($\bar{x}$=1.7) and variation in sunlight ($\bar{x}$=1.3) as low. This is in line with the findings of Thompson (2005) on weather variation who opined that the rain pattern in his study area is drastically changing as a result of climate change.

Table 2: Distribution of farmers based on weather condition occurring in the state

Weather condition	High	Moderate	Low	Mean	Remark
Variation in rain pattern	55(19.67%)	5(8.33%)	0(0.00%)	2.9	H
Variation in atmospheric temperature	20(33.33%)	0(0.00%)	40(66.67%)	1.7	L
Variation in humidity	40(66.67%)	10(16.67%)	10(16.67%)	2.5	H
Drought	0(0.00%)	40(66.67%)	20(33.33%)	1.7	L
Variation in sunlight	0(0.00%)	19(21.67%)	41(68.35%)	1.3	L
Variation in precipitation	15(25.00%)	28(46.67%)	17(28.33%)	1.9	L

Source: Field Survey, 2015

≥ 2.0 = High

< 2.0 = Low

x = Mean

Perceived effect of climate change on the production of vegetable crop

Table 3 shows the perceived effect of climate change on vegetable crop production. These were rated in a 4-point Likert Scale of strongly agree, agree, disagree and strongly disagree with a discriminating mean of 2.5. Using the discriminating mean ≥ 2.5 for agreement and <2.5 for disagreement, the result indicated that the respondents agreed that onset of rainfall is now delayed ($\bar{x}$=2.8), increase in earth surface temperature ($\bar{x}$=2.6). There is generally undefined weather ($\bar{x}$=2.9), increase frequency and intensity of flooding ($\bar{x}$=2.8), unusual flood now occurs ($\bar{x}$=2.9), vegetable yield have reduced significantly ($\bar{x}$=2.6), planting time of vegetable is unpredicted ($\bar{x}$=2.5) and increase weed infestation of vegetable crop ($\bar{x}$=3.1) are all affecting vegetable crop production as a result of climate change.

The respondents however rejected and disagreed that unusual rainfall ($\bar{x}$=2.3), fast evaporation ($\bar{x}$=2.4), prolonged season of drought ($\bar{x}$=2.4), increase heat stress of vegetable crop ($\bar{x}$=2.3) and increase incidence of destructive wind storm ($\bar{x}$=2.4) as having effect on vegetable crop production. In a similar work by Ayinde*et al.* (2011) and Obioha (2009) they also discovered that delay in onset of rainfall and undefined weather have drastically reduce the yield of arable crops.

Table 3: Effect of climate change on vegetable crop production

Items	S/Agree (%)	Agree (%)	Disagree (%)	S/Disagree (%)	Mean	Remark
Onset of rainfall is now delayed	16(26.66)	23(38.33)	12(20.00)	9(15.00)	2.8	A
Increase in earth surface temperature	9(15.00)	20(57.67)	31(51.67)	0(0.00)	2.6	A
Unusual rainfall	0(0.00)	39(65.00)	0(0.00)	21(35.00)	2.3	D
Fast evaporation	0(0.00)	25(41.67)	35(58.33)	0(0.00)	2.4	D
There is generally undefined weather	12(20.00)	23(63.00)	15(55.00)	0(0.00)	2.9	A
Prolonged season of drought	8(13.33)	12(20.00)	33(55.00)	7(11.67)	2.4	D
Increase in frequency and intensity of flooding	14(23.33)	21(30.00)	22(36.67)	3(5.0)	2.8	A
Unusual flood now occurs	23(38.33)	18(30.00)	6(10.00)	13(21.67)	2.9	A
Vegetable yield have reduced significantly	9(15.00)	24(40.00)	20(33.33)	7(11.67)	2.6	A
Stunted growth of vegetable crop	7(11.67)	10(16.66)	37(61.66)	6(10.00)	2.3	D
Planting time of vegetable is unpredicted	7(11.67)	24(40.00)	21(35.00)	8(13.33)	2.5	A
Increase heat stress of crop	7(11.67)	16(26.67)	26(43.33)	11(18.33)	2.3	D
Increase incidence of destructive wind storm	0(0.00)	32(52.33)	17(28.33)	11(18.33)	2.4	D
Increase weed infestation of vegetable crop	25(41.67)	15(25.00)	20(33.33)	0(0.00)	3.1	A

Source: Field Survey, 2015
Number in parenthesis are the percentage
≥ 2.5 =A
< 2.5 = D
X = mean

Adaptative Strategies Used By Farmers To Cope With Climate Change

The result in Table 4 showed the various adaptative strategies adopted by farmers to cope with climate change. Using a discriminating index ≥2.5 for agreed and <2.5 for disagree. The result indicated that the respondents generally agreed that they are using the following adaptative strategies: Increase in farm size ($\bar{x}$=2.7), increase of quantity of material for mulching ($\bar{x}$ =2.6), planting of different vegetables ($\bar{x}$=2.5), early planting of vegetable crops ($\bar{x}$=2.7), treating seed with fungicides before planting ($\bar{x}$=3.0), application of pesticides to plant ($\bar{x}$=2.9), using available irrigation facilities ($\bar{x}$=2.5), use of drought tolerant species of vegetable crop ($\bar{x}$=2.7), use of more pest and disease resistance species to plant ($\bar{x}$=2.5), harvesting early when adverse weather is anticipated ($\bar{x}$=2.8) and increase planting by the river side.

The result further indicated that there were other adaptative strategies used by the respondents although disagreed by them based on the rating. They are; use of herbicides to reduce the high rate of weed infestation ($\bar{x}$=2.4), increase the use of farm yard manure to improve soil fertility ($\bar{x}$=2.3), and secure insurance for vegetable farm enterprise ($\bar{x}$=2.4). This findings agree with the study of Rose *et al.* (2010) who was of the view that farmers in his study area use different adaptative measures like application of pesticides to plant, harvesting early, early planting, etc.

Table 4: Distribution of Farmers According to their Adaptative Strategies

Adaptative Strategies	S/Agree (%)	Agree (%)	Disagree (%)	S/Disagree (%)	Mean	Remark
Increase in farm size	0(0.00)	42(70.00)	18(30.00)	0(0.00)	2.7	A
Move to better farm land	0(0.00)	32(53.33)	28(46.67)	0(0.00)	2.5	A
Increase of quantity of material for mulching	0(0.00)	37(61.67)	23(33.33)	0(0.00)	2.6	A
Planting of different vegetables	0(0.00)	28(46.67)	32(53.33)	0(0.00)	2.5	A
Early planting of vegetable crops	7(11.67)	28(46.67)	27(45.00)	0(0.00)	2.7	A
Treating seed with fungicides before planting	16(26.67)	30(50.00)	14(23.33)	0(0.00)	3.0	A
Application of pesticides to plant	22(36.67)	11(18.53)	27(45.00)	0(0.00)	2.9	A
use of herbicides to reduce the high rate of weed infestation	0(0.00)	26(43.33)	34(56.67)	0(0.00)	2.4	D
increase the use of farm yard manure to improve soil fertility	0(0.00)	26(43.33)	34(56.67)	0(0.00)	2.3	D
Using available irrigation facilities	0(0.00)	35(58.33)	25(41.47)	0(0.00)	2.5	A
Use of drought tolerant species of vegetable crop	9(15.00)	31(51.67)	15(25.00)	6(10.00)	2.7	A
Use of more pest and disease resistance species to plant	0(0.00)	35(58.33)	17(28.33)	8(13.33)	2.5	A
Harvesting early when adverse weather is anticipated	8(13.33)	32(53.33)	19(31.67)	0(0.00)	2.8	A
Secure insurance for vegetable farm enterprise	0(0.00)	21(35.00)	39(65.00)	0(0.00)	2.4	D
Increase planting by the river side.	0(0.00)	32(53.33)	28(46.67)	0(0.00)	2.5	A

Source: Field Survey, 2015
Number in parenthesis are the percentage

Economic Effect of climate change on Farmers

Analysis of data on Table 5 shows that (55.55%) of farmers agreed that there is increase cost of vegetable crop production, loss of available planting land due to flood, general reduction in family income and reduction in productivity of vegetable crop while (44.45%) of the farmers in the area disagreed on reduction in cost of vegetable crop production and increase in productivity of vegetables. This shows that climate change has an adverse economic effect on vegetable crop production and the farmers actually perceive it as it is actually affecting their productivity.

Table 5: Distribution of farmers according to perceived economic effect of climate change

Economic Effect	S/Agree (%)	Agree (%)	Disagree (%)	S/Disagree (%)	Mean	Remark
Increase cost of vegetable crop production	12(20.00)	28(48.67)	20(33.33)	0(0.00)	2.9	A
Increase loss of agric land due to flooding	3(5.00)	40(66.67)	17(28.33)	0(0.00)	2.8	A
Increase productivity of vegetable	0(0.00)	40(66.67)	20(33.33)	0(0.00)	2.3	D
General reduction in family income	7(11.67)	33(55.00)	20(33.33)	0(0.00)	2.8	A
Reduction in productivity of vegetables	0(0.00)	42(70.00)	0(0.00)	18(30.00)	2.7	A
Reduction in cost of vegetable crop production	0(0.00)	27(45.00)	24(40.00)	9(15.00)	2.3	D

Source: Field Survey, 2015
Number in parenthesis are the percentage

Conclusion and Recommendations

Climate change has an adverse effect on vegetable crop production and the farmers in the area had different adaptative strategies to cope with it. Actually, for the farmers to perceive the change in climate, it is clear to them that it has come to stay and there is nothing else they can do than to adapt to the strategies. Based on the findings, the following recommendations were made;

- There is need for the government to provide training to the farmers to know more about climate and the weather condition occurring in the area. Because to be forewarned is to be forearmed.

- Improved agricultural technology which are necessary for vegetable crop production to cope with climate change should be made available to the farmers.

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