



## EFFECT OF CLIMATE CHANGE ON COWPEA PRODUCTION IN KUJE AREA COUNCIL, ABUJA, NIGERIA

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**Abstract:** *Agriculture is one of the sectors that directly depend on climate factors. During the last 10 years, the climate of Nigeria has undergone various changes especially in terms of rainfall and sunshine. This has large consequence for the poor resource farmers depending mainly on rain fed agriculture. This study was carried out to examine the effect of climate change on cowpea production in Kuje Area Council of Abuja in Nigeria. Multistage sampling technique was adopted in selection of eighty respondents for the study, while structured interview schedule was used to obtain necessary information from the sampled cowpea farmers in the area. Data collected were analyzed with both descriptive and inferential statistical tools. The sampled farmers were of different age groups and majority (76.3%) was married with different educational background, while 22.5% did not have formal education. Most (53.8%) engages in farming as primary occupation with different years of farming experience, while majority (61.2%) had above 30 years of farming experience and cultivates large white cowpea type (100.0%) and they indicated low crop yield as major effect of climate change on cowpea production. The farmers adopted different varieties of adaptation measure against climate change effects with majority (100.0%) indicated crop rotation, irrigation, manipulation of planting and harvesting date, shifting cultivation (98.8%), fertilizer application (91.3%) and they indicated extension services as major source of information (97.5%). Farmers need to be educated on production systems that have the ability to adjust or recover from the negative impacts and take advantage of positive impacts of the current climate variability. The study therefore recommends that farmers should be encouraged to employ diverse adaptation strategies to effectively curb the effects of climate change, and that extension services should be encouraged as the most identified information source on climate change to the farmers.*

**Keywords:** effect, climate change, cowpea, farmers, kuje area council.abuja

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## INTRODUCTION

Cowpea, being a warm climate and drought tolerant crop is grown throughout the tropics particularly in the semi-arid and low rainfall regions. It provides food, fodder and also improves the soil fertility. It is an important staple crop in Nigeria, it contains 25% protein and 64 percent carbohydrate (Bressani, 1985). Cowpea form the major source of plant protein, vitamins to man and feed to animals, it is often called the poor man's meat. It is important mainly because it has high protein content and it adapts to different types of soil, it is also important in food security, trade and therefore in poverty reduction, but despite the importance of cowpea its production is beset with constraints such as drought, flooding, salt stress, extreme temperature all these which are expected to worsen with climate change. It can be successfully grown under a general diversity of climate, soil and cultural condition than most of the other legumes (Blackhurst and Miller, 1980), Major cowpea production in Nigeria is in the Northern part of the country, accounting for about 60 percent of the country's total cowpea produced. Due to its proximity to the Sahara Desert, Nigeria's north is particularly susceptible to drought, with the risk of increased drought growing along with the expected effects of global warming (Adejuwon, 2008). The climate of the Northern region coupled with pervasive illiteracy and high dependence on agriculture may make it difficult for the population to adapt to the expected effect of climate change in the future. (Mberu, 2007; Adejuwon, 2008).

In Nigeria, the production trend of cowpea shows a significant improvement with about 441 percent in area planted and 410 percent in yield from 1961-1995 (Ortiz 1998). Several factors account for these impressive increase over the last two decades, the International Institute of Tropical Agriculture (IITA) has made significant advances in improving the productivity of cowpea in the sub-Sahara Africa. A number of varieties have been developed combining diverse plant type, different maturity periods and resistance to several disease, insect pests and parasitic weeds, and possessing other good agronomic traits (Singh *et al.*, 1997). According to Rachie (1985), low cowpea yield is a significant attribute of production estimates, particularly in Africa and Asia where 240-300kg/ha is cultivated. He enumerated some of the factors contributing to low yield as insect pest and diseases, drought, moisture, poor soil properties, low soil fertility, poor weed control and mixed cropping. Climate change is the result of global warming due to release of green house gases such as methane, carbon



dioxide, nitrogen oxide etc which trap heat in the atmosphere thereby making the earth's temperature warmer than it normally would. These gases are released from industrial activities which include burning of fossil fuels etc and deforestation of lands to develop urban settlements and activities such as land clearing (bush burning) for farming. Africa is one of the areas of the world, most exposed to global warming (WOFAN, 2008).

Experts see Sub-Saharan Africa as being especially prone to the effects of climate change with the possibility of displacing and killing millions. In Nigeria for instance, agriculture is the main source of food and employs about 70% of its population (WOFAN, 2008). The problem is that a majority of farmers depend on rain fed agriculture alone. In the semi-arid regions of Northern Nigeria, farmers struggle to grow food in a harsh environment characterized by sparse and varying rainfall and changes in weather. The impacts of climate change are first felt by those people whose livelihoods depend on rain fed agriculture. Smallholder farmers in Nigeria, particularly resource poor farmers, are highly vulnerable to the impact of climate change. While Nigerian farmers are adapting and developing some coping strategies independently, there is need to produce and disseminate information that helps farmers adapt their farming methods and mitigate the impact of climate change on their livelihoods. This study therefore examined the effect of climate change on cowpea production in Kuje Area Council of Abuja in Nigeria. Specifically, it identifies socio-economic characteristics of cowpea farmers; investigate the varieties of cowpea cultivated in the area, major climatic factors associated with cowpea production; examine the effects of climate change on cowpea production; identify different climate change adaptation measures employed by the respondents in the area.

## **METHODOLOGY**

The study was carried out in Kuje Area Council of Abuja which is one of six Area Councils in the Federal Capital Territory, Abuja, Nigeria. The study employed multistage sampling technique. First stage involve purposive selection of ten (10) wards that are rural based, in each of this ward one (1) village was randomly selected making a total of 10 villages selected for the study in the council area, second stage involve random selection of eight (8) cowpea farmers from each of the selected village in the council which make a total of eighty (80) respondents that constituted the sample size of the study. The descriptive statistical tools



employed include frequency counts and percentages, while chi-square was used as inferential tool to test for the formulated hypothesis of the study.

## **RESULTS AND DISCUSSION**

### **Socio-economic characteristics of the respondents**

Result in Table 1 shows that majority (33.8%) of the respondents were between the age range of 31-40 years, 25.0%, 18.6% and 17.0% were between the age ranges of 41-50 years, less/equal to 30 years and 51-60 years respectively, while 5.0% were above 60 years of age. This implies that all the farmers sampled for the study are mature and they are expected to have adequate knowledge about the respective effects of climatic changes. Also in the table 85.0% of the respondents were male, while only 15.0% were female. This indicate that most cowpea farmers are male in the area which may be due to the fact that farming activities require much energy which the female counterpart farmers may not meet up with. Majority (76.3% of the respondents were married, with 17.5% single, 5.0% were widow/widowers while only 1.3% were separated. This implies that most farmers are married; this is an indication that they should be responsible and have the ability to adopt appropriate climatic change adaption measures. About 37.5% of the respondents indicated primary education, 30.0% indicated secondary education and 10.0% indicated tertiary education, while 22.5% did not have formal education. It implies that most farmers sampled are literate though with different education background. The farmers' literacy level is expected to guide them to adopt best and appropriate climatic change measure in order to encourage cowpea production in the area; 53.8% and 23.8% indicated farming and civil service as their primary occupation, 15.0% were traders, while 7.5% were artisans. Most (47.5%) cultivate less/equal to 2 ha of cowpea farm, 38.8% and 13.8% cultivates 3-4ha and above 4ha of cowpea farmland sizes respectively. The variation in the size of cowpea farm may be due to differences in choice of individual farmers sampled, need to cultivate other crops and considered market demand of cowpea itself. Majority (61.2%) of the farmers had above 30 years of farming experience, 30.0%, 25.0% and 8.8% indicated 11-20 years, less/equal to 10 years and 21-30 years of farming experience respectively. The farmers' years of farming experience are expected to serves as a guide to know the appropriate measures against the effect of climate change on cowpea production in the area. This conform with Molua,(2008) Apata ,et al (2009) that farmers have a large extent being able



develop their livelihood strategies in a way which enables them to constantly cope with and adapt to an erratic climate change, due to many years of farming experience.

### **Varieties of cowpea cultivated and identified major climatic factors associated with cowpea production**

Table 2 shows the multiple responses of the farmers and 50.0% of the respondents indicated small white cowpea variety, 61.2% indicated medium, all (100.0%) indicated large white variety, 65.0% and 6.7% indicated brown and black variety. This implies that there are different cowpea varieties cultivated by the farmers in the study area. All the respondents (100.0%) indicated temperature as part of major climatic factors affecting cowpea production in the area, 97.5%, 65.0% indicated rainfall, wind, as the factor affecting cowpea production in the area, while 61.2% indicated relative humidity. This implies that these factors are the major climatic factors affecting cowpea production as perceived by the respondents. This result conform with Lobell,(2008), Ayanwuyi et al (2010)who reported that 89.0%,72.0% and65.0% of the respondents respectively indicated higher temperature, water evaporation from the ground is fast and delayed and irregularity rainfall as the factors that can have effects on farming outputs at any stage from cultivation through the final harvest.

### **Effects of climate change on cowpea production and adaptation measure employed**

Table 3 revealed the multiple responses of the farmers that all (100.0%) indicated low crop yield, 98.8%, 96.3% 75.0%, and 42.5% indicated incidence of pest/diseases, wilting, poor seed formation and late emergence of seed respectively, 15.0% indicated retarded growth and 5.0% indicated late maturing of crop. It implies that climate change have adverse effects on cowpea production in the area. Farmers employed varieties of adaptation measure and most (98.8%) farmers indicated shifting cultivation, 91.3%, 83.8% and 57.5% indicated application of fertilizer, planting of improved seed varieties and cowpea/cereal intercropping, while all (100.0%) indicated others measured such as manipulation of planting and harvesting date, crop rotation and use of irrigation. This implies that farmers employed varieties climatic adaptation measure in order to cope with the different effects of climate change in the area. This agree with Spore, (2008), BNRCC,(2008),Ole, et al (2009)who reported that in srilanka precipitation increases results in a positive and significant impact on farmers revenue, where as temperature has a strong negative impact.



In Cameroon net revenue fall as precipitation decreases or as temperature increase, while in SouthAfrica climate change has significant effects on net revenue per hectares of sugarcane with higher sensitivity to future increase in temperature than precipitation and production systems which are most resilient to climate variability need to be identified and adopt to mitigate effect of climate change on crop production.

#### **Information sources on climate change**

Table 4 indicated that majority (97.5%) of the farmers claimed that they received information related to climate change through extension services, 96.3% indicated friends/relatives; 63.8% and 13.8% indicated co-farmers and mass media respectively. This implies that majority of the farmers received climatic change related information through extension service.

#### **Test of hypothesis**

There is no significant relationship between socio-economic characteristics of the respondents and adaptation measured employed on the climate change.

According to Table 5, there are significant relationship between age ( $X^2= 68.25$ ), sex ( $X^2= 85.333$ ), marital status ( $X^2= 277.042$ ), educational level ( $X^2=30.042$ ), primary occupation ( $X^2= 79.458$ ), secondary occupation ( $X^2= 202.906$ ), farm size ( $X^2= 123.833$ ), years of farming experience ( $X^2= 31.073$ ) and adaptation measured employed on the climate change .This implies that adaptation measures adopted by the cowpea farmers is part of the crop production practices they have being using. This agree with Barbier,(1990) Babbington,(1992),Blaikies et al (2002) Butterworth et al (2003)who stated that sustainable crop production practice rely on crop rotation, off –farm organic waste, crop residues, animal manures,legumes,green manures and appropriate mechanical cultivation and minerals bearing rocks to maximize soil biological activity and to maintain soil fertility and productivity.

#### **CONCLUSION AND RECOMMENDATIONS**

The study shown that farmers cultivated different cowpea varieties. Temperature and rainfall were the prominent climate factor that affects cowpea production in the area. Farmers adopted different adaptation measures such as shifting cultivation, planting of improve seed variety, fertilizer application, cowpea/cereal intercropping, crop rotation, shifting cultivation, planting of leguminous crop, were adaptation measured employed by



the farmers to curb the effects of climatic change on cowpea production in the area. Farmers received information related to cowpea production mostly through the extension services. There was significant relationship between socio-economic variables considered and adaptation measured employed by the cowpea farmers on climate change in the study area. Farmers should be encourage to employed diverse adaptation strategies that would effectively curb the effects of climate change on crop production in the study area, also extension services should be encouraged been the most identified information source on agricultural practices and climate change to the farmers. Well trained enumerators were employed to administered interview schedule in 3 villages that is gbagyi, Gade and gwari out of 8 villages selected for the study, due to their cultural belief that stranger cannot come into their communities because they don't wear cloth, they only always cover their private part with cloth /wrapper.

## REFERENCES

1. Adejuwon . J., (2008). Vulnerability in Nigeria: A national-level assessment. In N Leary, C, Conde, A Nyong, and J Pulhin (Eds.), *Climate Change and Vulnerability*. London: Earthscan.pp198-217
2. Apata T. G. Samuel, K. D. and Adeola, A. O. (2009) Analysis of Climate change perception and Adaptation among Arable Food Crop Farmers in south Western Nigeria *paper presented at the conference of International Association of Agricultural Economics pp. 2-9*
3. Ayanwuyi, E Kuponiyi, F A. Ogunlade, I. and Oyetoro, J.O.(2010) farmers perception of impact of climate on food crop production in Ogbomoso Agricultural zone of oyo State, Nigeria *Global journal of human social science*10 (7) pp33-39.
4. Barbier, E (1990) The farm level Economics of soil conservation :The Uplands of java. *journal of land Economics* 66(3)pp199-211.
5. Bebbington, A.(1992)Searching for an indigenous' Agricultural Development Indian organization and N G Os in the central Andes of Ecuador In Robert t Wilson N, Michael R, Laura, Sand Mahinda, W. (eds) *self-sufficient labour and knowledge in small- scale farming*. Earthscan publisher London pp101-106
6. Blackhurst and Miller, (1980) ) Farmer adaptation change and crisis in the Sahel *Global Environmental change Human and Policy Dimensions. Journal of*



*Environmental Management* 4(3)pp 604-616.

7. Bressani, R. (1985). Nutritive value of cowpea. Pages 353-360 in Cowpea: Research, Production and Utilization, edited by S.R. Singh and K.O. Rachie. John Wiley & Sons, New York, USA.pp89-102 Barbier E. (1990) The farm level Economics of soil conservation: The uplands of Java. *Journal of Land Economics* 66(3); 199-211.
8. Building Nigeria's Response to Climate change (BNRCC) (2008)
9. The Recent Global and Local Action on Climate change *paper presented at Annual Workshop of Nigerian Environmental Study Team (NEST) held at Hotel Millennium, Abuja, Nigeria 8-9<sup>th</sup> October 2008 p. 2-4*
10. Blaikie, P. Cameron J and Seddon D (2002) understanding 20 years of change in west central Nepal : continuity and change in lives and ideas: *Journal of World Development* 30 (4); 1255 – 1270.
11. Butterworth, J. Adolph B and Reddy, B. C (2003) how farmers manage soil fertility: A Guide to support innovation and livelihoods In Robert , T. Catherine, Caleb, M. Nelson, M. Wilson, N. Piyadasa, V.H. Michael, R. Laura, S. and Mihinda, W. (eds) Self-sufficient agriculture labour and knowledge in small-scale farming. Earthscan, Publisher London. 115-120.
12. Lobell, D. B. Burke, M. B, Tebaldi C Manstrandrea, M. D, Fakon, W. P. & Naylor R. L. (2008) Prioritizing Climate change adaptation needs for food security in 2030 *International Journal of Science* 31 (9) pp. 60-71
13. Mberu.B.U (2007). Household structure and living conditions in Nigeria. *Journal of Marriage and Family*, 69(2): pp 513-527
14. Molua, E. L. (2008) Turning up the heat on African Agriculture: The impact of climate change on Cameroon's agriculture, *African Journal of Agriculture and Resource Economics* 2 (1) pp 45-64.
15. Ole, M. Cheikh, M. Anette, R. and Awa, D. (2009) Farmers Perceptions of Climate Change and Agricultural Strategies in Rural Sahel. *Journal of Environmental Management* 4(3) 804-816.
16. Ortiz, R., 1998. Cowpea from Nigeria: A silent food revolution. *Outlook on Agriculture*. 27(2):pp 125-128.



17. Singh, B.B., S.K. Asante, D. Florini, L.E.N. Jackai, C. Fatokun, and K. Wydra. 1997. Breeding for multiple disease and insect resistance. IITA Annual Report. 1997. Project 11. P 22.
18. Spore (2008) Climate Change Spore Special Issue - August, 2009. pp. 9-13.
19. Women Farmers Advancement Network (WOFAN) (2008): The context of Climate Change. Sustainable Agriculture, October-December, 2008. A Publication Funded by CTA Netherlands context and Ideas are Opinion of WOFAN. P. 2.

**Table 1: Distribution of respondents by Socio-economic Characteristics N=80**

sSocio-economic Characteristics	Frequency	Percentage
<b>Age</b>		
≤ 30	15	18.6
31-40	27	33.8
41-50	20	25.0
50-60	14	17.5
>60	4	5.0
<b>Sex</b>		
Male	68	85.0
Female	12	15.0
<b>Marital Status</b>		
Single	14	17.5
Married	61	76.3
Separated	1	1.3
Widow/Widower	4	5.0
<b>Educational Level</b>		
No-formal education	18	22.5
Primary education	30	37.5
Secondary education	24	30.0
Tertiary education	8	10.0
<b>Primary Occupation</b>		
Farming	43	53.8
Trading	12	15.0
Civil Service	19	23.8
Artisan	6	7.5
<b>Farm Size (ha)</b>		
≤2	38	47.5
3-4	31	38.8
>4	11	13.8
<b>Years of Farming Experience</b>		
≤10	20	25.0
11-20	24	30.0
21-30	7	8.8
>30	49	61.2

Source: Field Survey, 2011.



**Table 2: Distribution of respondents by varieties of cowpea cultivated and identified climatic factor associated with cowpea production**

Cowpea Varieties*	*Frequency	Percentage
Small white	40	50.0
Medium white	49	61.2
Large white	80	100.0
Brown type	52	65.0
Black type	12	6.7
<b>Climatic Factors*</b>		
Temperature	80	100.0
Rainfall	78	97.5
Wind	52	65.0
Relative Humidity	49	61.2

Source: Field Survey, 2011.

\*Multiple responses

**Table 3: Distribution of respondents by identified effects of climate change and adaptation measure employed**

Effects *	Frequency	Percentage
Low Crop Yield	80	100.0
Incidence of pest and Diseases	79	98.8
Late Maturing of Crop	4	5.0
Late Emergence of Seed	34	42.5
Poor Seed Formation	60	75.0
Wilting	77	96.3
Retarded Growth	12	15.0
<b>Adaptation Measures Employed*</b>		
Shifting Cultivation	79	98.8
Planting of Improved Seed Varieties	67	83.8
Cowpea/Cereal Intercropping	46	57.5
Fertilizer Application	73	91.3
Others crop rotation,shifting cultivation, Planting of leguminous crop,use of crop residue,80		100 .0

Source: Field Survey, 2011.

\*Multiple responses

**Table 4: Distribution of respondents by sources of information on climate change**

Information Sources*	Frequency	Percentage
Extension Agent	78	97.5
Friends/Relatives	77	96.3
Co-farmers	51	63.8
Mass Media	11	13.8

Source: Field Survey, 2011.



**\*Multiple responses**

**Table 5: Chi-square analysis showing significant relationship between socio-economic characteristics and adaptation measures employed**

Variable	Df	X <sup>2</sup> -Calculated Value	X <sup>2</sup> -Tabulated Value	Sig.	Remark
Age	35	68.250	49.802	S	Reject Ho
Sex	1	85.333	3.8415	S	Reject Ho
Marital Status	3	277.042	7.815	S	Reject Ho
Educational Level	3	30.042	7.815	S	Reject Ho
Primary Occupation	3	79.458	7.815	S	Reject Ho
Secondary Occupation	2	202.906	5.9915	S	Reject Ho
Farm Size	3	123.833	7.815	S	Reject Ho
Years of Farming Experience	4	31.073	9.4877	S	Reject Ho

**Source: Field Survey, 2011.**