FUDMA Journal of Agriculture and Agricultural Technology
ISSN: 2504-9496
Vol. 9 No. 4, December 2023: Pp.76-82

https://doi.org/10.33003/jaat.2023.0904.11

THE ASSESSMENT OF THE FACTORS OF RESILIENCE TO CLIMATE CHANGE AMONG ARABLE CROP FARMERS IN DELTA STATE. NIGERIA.

***[1]Giweze, E.A. and [2]Ighoro, A.**
Department of Agricultural Extension and Rural Development, Dennis Osadebay University, Anwai, Asaba, Delta State, Nigeria,
[1*]Alex.giweze@dou.edu.ng, giwebest@gmail.com/https://orcid.org/0000-0002-1372-197x/08037946731
[2]Alexander.ighoro@dou.edu.ng/https://orcid.org/0000-0002-1914-9425

ABSTRACT

Climate change is real and overwhelmingly affecting farming activities in Delta State. Objectives of the study are to identify arable crops that the farmers in Delta State cultivate, identify agricultural practices that are resilient to climate change and constraints affecting the choice of agricultural practices in Delta State. Arable crop farmers in Delta State formed the population from which sample was drawn. A multi-stage sampling technique was used to sample the farmers to get the sample size of 225. Data were analyzed with frequency, percentage, mean and standard deviation. Majority of arable crop farmers (55.4%) were female. Maize, cassava, vegetables, beans, cowpea and yam are major arable crops engaged. The results indicated that mixed cropping ($\bar{x}$=3.18); planting of trees ($\bar{x}$=3.13); increase use of organic fertilizers ($\bar{x}$=2.57); mulching of crop ($\bar{x}$=2.93); planting pest and disease resistant crops ($\bar{x}$=2.92) were considered serious resilience factors. Factors such as high cost of improved planting varieties ($\bar{x}$=3.35); poor funding of agricultural rural development program ($\bar{x}$=3.32); lack of information ($\bar{x}$=3.34); low capacity of extension agents to boost and build farmers resilience ($\bar{x}$=3.02) were agreed constraints affecting the choice of agricultural practices. The study revealed that arable crop farmers in Delta State engaged many practices as resilience factors to climate change but many factors affecting their choice of agricultural practices

Keywords: Arable crops**;** Climate change; Delta State; Resilience factors

INTRODUCTION

Climate change is real and its impacts on smallholder farming systems as well as poor rural households in developing countries who bear the brunt of the burden. Climate change contribute a cascade of risks to ecosystems, agro-ecosystems, agricultural activities, food chains, income and trade, social impacts, food security and nutrition. Climate change produces a significant doubt about future water in numerous regions. Climate change is overwhelmingly impinging the circumstances that farming activities are carryout. In all area of the world, plants, animals and ecosystems are adapted to the existing climatic surroundings. Climate change encompass together physical and negative influence on agricultural production systems (Food and Agricultural Organization, 2015). Global warming is introducing unparalleled stress on food producers, predominantly arable crop farmers that rely on natural sources for production of arable crops, a lot of the crops are under intimidation from varying climatic and environmental circumstance. Some researchers have been raising new climate-resilient crop varieties to cushion the effect of climate change and ameliorate the huge loss made by millions of arable crop farmers in Nigeria, especially cereals and legume crops, which provide the most needed staple food in the tropics (Bunu, 2021).Building resilience call for a change in the conservative approach toward disaster and prioritization of the lessening and vigorous management of risks fairly than restricted to reacting to severe actions (UNISDR/ OECD, 2013). Resilience could be regarded as the ability of a systems, communities, households or persons to stop, mitigate or manage risks and recuperate from shocks. A system is said to be resilient if it is less susceptible to shocks from corner to corner over time and be able to get better in a timely way. Resilience puts a larger importance on the capability of a system to get better and change itself in the extended time, to acclimatize to its altering environment in a forceful standpoint (Gitz and Meybeck, 2012).

Delta State of Nigeria is at the rain forest zone putting the entire state at climatic variation risk, characterized by excessive rainfall and unpredictable weather conditions at the beginning of the raining season with serious wind storm in some locality damaging farmlands, buildings, crops, electricity and endangering living things. Arable as a term means every land consider appropriate enough for crops growth. These comprise all land where soil fertility and climate is appropriate for cultivation, forests and normal grasslands, areas falling under human settlement. Crops grown on such land are regarded as arable crops. Arable crops included crops that are planted on plough

soil and served as feed, food, fiber, fuel and reclamation. Arable crops mean annual crops such as legumes, cereals and root crops. The amount of arable lands varies irregularly due to climatic and human factors for example desertification, irrigation, terracing, deforestation, landfill, erosion and urban sprawl (FAO, 2007: Onu et al, 2014).

Agricultural practices resilient to climate change among arable crop farmers in Delta State are; crop rotation, inter cropping, multiple cropping, agro forestry, variation of planting date, reduced the burning of residues, the application of wood ash, tree planting, planting early and early maturing crop varieties, mixed cropping, mulching of crops, increased in land size cultivation, reduced land size cultivation, undertake non- farm economic activities, planting crop varieties that are resistant to pest and disease, monitoring of crops, increase use of inorganic fertilizer, contour cropping across hills and slopes, changes in harvesting date, adoption of zero or minimum tillage, agricultural insurance, increase use of organic manure, cover cropping, bush fallowing (Solomon and Edet, 2018; Ifeanyi-Obi and Henri-Ukoha, 2022). The Objectives of the study are to describe the socio-economic characteristics of arable crop farmers in the study area; identify arable crops that the farmers in the study areas cultivate; identify the agricultural practices that are resilient to climate change used by the farmers to mitigate climate change in the study area and constraints affecting the choice of agricultural practices in the study areas.

MATERIALS AND METHODS

The research area is Delta State of Nigeria. Delta State is in the South South geopolitical zone of Nigeria and among the Nine (9) States in the Niger Delta region of Nigeria. Its capital is Asaba. The State consists of Twenty-five (25) Local Government Areas; The Delta State Agricultural Development Programme (DADP) categorized the state into three agricultural zones namely Delta North, Delta Central and Delta South. Delta State covers a landmass of about 18,050km^2 where over 60% are arable land. Delta State is bounded in the north with Edo State, on the south east with Anambra State/ River Niger and in the south west with Bayelsa State. Delta State is by and large low-lying exclusive of notable hills. Delta State has a tropical climate noticeable with two distinguishing seasons, the dry season and rainy season. The dry season take place by November to March, while rainy season begins in April and last till October. Irregular rainfalls are experienced all through the dry season. The State is blessed with fertile soil and good climate that support the production of arable crops.

***Sampling procedure and Sample size*:**

Delta State consists of three (3) agricultural zones. The three (3) zones were sampled. Arable crop farmers in Delta State formed the population from which sample was drawn. A multi-stage sampling technique was used to sample the farmers used for the study. In the first stage, three (3) local government areas were purposively selected from each zone due to their excessive arable crops production, this gave a total of nine (9) local government areas. In the second stage, five (5) communities were randomly selected in each of the nine local government areas to give a total of 45 communities. In the third stage, five (5) arable crop farmers were randomly selected from 45 each of the community to give a total of 225 respondents.

***Data collection* and analysis**

Data collection were done with the used of validated questionnaire and structured interview schedule. The questionnaire was used for arable crop farmers that can read and write. While the structured interview schedule was used for the farmers that cannot read and write. The data collection for this study was done in May to August 2022. Trained field assistants chosen in each location and researchers collected the data. In retrieving the questionnaire sent out, one was loss and 224 was retrieved and worked with as sample size. To assess the factors of resilience to climate change among arable crop farmers, a list of 20 potential resilient factors were drawn from literature review. The responses on the level of importance to these resilience factors were measured on a 4-point Likert-type scale with values of very serious =4; serious =3; less serious =2; and not serious =1. A cut off mark of 2.50 was used to establish resilience. Therefore, a mean score of ≥2.50 portray serious resilience. Data analyzed with frequency, percentage, mean and standard deviation and result presented in tables.

RESULTS AND DISCUSSIONS

Socio-economic characteristics of respondents

Table 1; shown the socioeconomic characteristics of all the respondents. Greater part of arable crop farmers (55.4%) was female. This indicated that arable crop farmers in Delta State are predominantly women due to men migration and search of preferred office job. A great number of the respondents (48.2%) were in the active productive age brackets 41-50 years. Meaning that young people of good productive age are into arable crop farming in the study area. The result also revealed that (67.0%) of the respondents are married people, meaning they have family responsibilities and uses arable crops as extra income source as well as provision of food for their household. 22.3% of the respondents had informal

education while 31.3%, 26.8% and 19.6% of respondents had primary education, secondary education and tertiary educational levels in that order. The high number of marginally educated respondents in arable crop farming implies that they are aware of climate change and resilience factors to cushion the effects. Most of the respondents (34.8%) had about 11-20 years experience of arable crop farming and 12.1% of the respondents had above 31 years experience in arable crop farming. While 30.8% of the respondents had 1-10years experience, meaning a lot of people are venturing into arable crop farming to support themselves and provide for their family food needs. The results also showed that 70.5% of the respondents cultivated between 1-3 hectares of farmland with arable crops, this mean that greater part of them had small farm size. 29.5% had 4-6 hectares of farmland, meaning a small number of respondents had big farm size; it could be those that are full time farmers. Most of the respondents 26.8% of respondents are full time farmer and artisans respectfully, meaning most of the artisans or craftsmen also engaged fully in farming to have extra source of income and enough food for their family, while the full time farmers probably were not satisfied with farming alone and decided to diversify into other income sources 19.6% are civil servants, 22.3 are business men and women who are trading of goods and services. 4.4% are involved in other businesses such as transportation, security guards, gardener etc.

Table 1: Socio-economic Characteristics of Respondents

Variables	Frequency	Percentage
SEX		
Male	100	44.6
Female	124	55.4
Age		
25 - 30	9	4.0
31 - 40	17	7.6
41 – 50	108	48.2
51 – 60	54	24.1
61 and above	36	16.1
Marital Status		
Single	30	13.4
Married	150	67.0
Widow	26	11.6
Divorced	18	8.0
Educational Level		
Informal education	50	22.3
Primary	70	31.3
Secondary	60	26.8
Tertiary	44	19.6
Farming Experience		
1 – 10	69	30.8
11 – 20	78	34.8
21 – 30	50	22.3
31 and above	27	12.1
Farm Size (ha)		
1 – 3	158	70.5
4 – 6	66	29.5
Primary Occupation		
Farming	60	26.8
Artisan	60	26.8
Civil servant	44	19.6
Business	50	22.3
Other	10	4.4

Source: Field Survey, 2022.

Arable crops that farmers cultivate

Table 2; the results of table 2 shows the list of arable crops farmers are farming in the study area and the level of the farmers involvement. All the respondents are producing maize (100%) and cassava (100%) revealing the importance of the crops in meeting the daily stable food of families and widely consumed in different forms in Delta State. Maize and cassava are high in calories. The results are in line with; FAO, 2004 reported that Nigeria is the World largest cassava producer with over 30 metric tons annually. FAO, 2015 stated that cereals occupy the highest crop areas for all of Africa but with significant variation across regions. Groundnut (37.9%), beans (45.0%), cowpea (46.9%) respectively was well engaged by respondents to meet family needs, as the grain legumes supply dietary protein to man and livestock. Potato (37.9%) and yam (44.6%) were respectfully responded, the demand for the crops are no time bound and always consumed in different forms in the study area. Vegetables (98.2%) revealed that almost all the respondents had vegetables in their farm and of different varieties. Vegetables are source of alternative income and supply essential vitamins and minerals to the body. FOA, 2015 opined that climate change is intensely modifying the situation in which agricultural activities are executed, that enough food are produced globally but there are still almost 800 million hungry citizens but that everybody has access to it in the right quantity and quality at all time. World Food Summit 1996; FAO, 2015 stated that food security exist when all people at all times have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. They further appraised that, to please the rising demand obsessed by population enlargement and nutritional changes, our food production should be enhance by 60% before 2050.

Table 2: Arable crops that farmers cultivate

Arable crop	Frequency	Percentage
1 Maize	224	100
2 Groundnut	85	37.9
3 Beans	101	45.0
4 Cowpea	105	46.9
5 Potato	85	37.9
6 Yam	100	44.6
7 Cassava	224	100
8 Guinea corn	-	-
9 Vegetables	220	98.2
10 Sugar cane	45	20.1

Source: Field Survey, 2022. Multiple responses

Resilience factors to climate change

Table 3; data in this table shows the scores of mean and standard deviations on factors of resilient to climate change among arable crop farmers in the study area. The result indicated that ten (10) out of the twenty (20) resilient factors examined were considered severe resilience factors, their mean scores ranged between 2.57 and 3.18 on 4-point scale and ten (10) were considered not severe resilience. Practicing mixed cropping ($\bar{x}$=3.18); planting early and early maturing crop varieties ($\bar{x}$=3.06); Planting of pest and disease resistant crop ($\bar{x}$=2.92); mulching of crops ($\bar{x}$=2.93); changes in planting date ($\bar{x}$=2.99); planting of trees ($\bar{x}$=3.13); drainage/ flood barrier construction ($\bar{x}$=3.10); multiple cropping ($\bar{x}$=2.93); increase use of organic fertilizers ($\bar{x}$=2.57) and irrigation practices ($\bar{x}$=2.57) were believed to be severe resilience factors to climate change by the respondents. The results agreed with Malua 2008; Rudolf and Hermann 2009; Apata et al 2009 opined that the major strategies for plummeting climate change risks is to expand

production and livelihood systems by adopting strategies such as plant protection measures, water and soil management procedures that are diverse to uphold sufficient yields of crops. Also, FAO (2015) stated that agricultural systems can be made further resilient through putting into practice measures that are extremely system and neighborhood specific. Individual farmers and persons alongside the supply chain will want to adopt a suite of measures that will be contingents on individual state of affairs.

Table 3: Resilience factors to climate change

Resilience factors	mean ($\bar{x}$)	standard deviation (SD	Remarks
1 Practicing mixed cropping	3.18	0.82	S
2 Planting early and early maturing crops	3.06	0.74	S
3 Planting of tress	3.13	0.88	S
4 Drainage / flood barrier construction	3.10	0.92	S
5 Changes in planting date	2.99	0.95	S
6 Multiple cropping	2.93	0.87	S
7 Mulching of crop	2.93	0.87	S
8 Planting of pest and disease resistant crop	2.92	0.80	S
9 Increase use of organic fertilizers	2.57	0.97	S
10 Irrigation practices	2.57	0.97	S
11 Increase in land size cultivation	2.23	0.92	NS
12 Contour cropping across hills and slopes	2.36	0.95	NS
13 Change of harvesting date	2.41	0.92	NS
14 Reduce burning of residues	2.37	0.82	NS
15 Adoption of zero or minimum tillage	2.17	0.95	NS
16 Crop rotation practices	2.36	0.95	NS
17 Bush fallowing	2.32	0.87	NS
18 Planting of cover crops	2.37	0.82	NS
19 Increase use of inorganic fertilizer	2.48	0.91	NS
20 Agricultural insurance	2.36	0.95	NS

Source: Field Survey, 2022. NS= not serious: S= serious.

Constraints affecting the choice of agricultural practices

Table 4; the results shows that High cost of improved planting varieties ($\bar{x}$=3.35); Poor funding of agricultural rural development program ($\bar{x}$=3.32); Lack of information ($\bar{x}$=3.34); lack of knowledge on irrigation farming ($\bar{x}$=3.02); Low capacity of extension of agents to boost and build resilience of farmers ($\bar{x}$=3.02); Non availability of credit facilities ($\bar{x}$=3.47); Deprived information on early warning about climate/weather ($\bar{x}$=3.47); Bad leadership ($\bar{x}$=3.30); Inconsistent agricultural policies and programmes ($\bar{x}$=3.15); Shortage of working materials and human resources ($\bar{x}$=3.12) were all agreed to be constraints by the respondents. Government neglect to agricultural sector subjected farmers to inadequate and lack of credit facilities, irrigation facilities, inconsistent agricultural policies and programmes, inadequate working material and human resources. Agricultural inputs are not distributed to farmers but are left in the hands of individual dealers who charge farmers exorbitant prices because they fixed and controlled prices of agricultural inputs The findings is in agreement with Nwachukwu (2018) reported that government failure to invest in agricultural sector for rural development and increase agricultural output is a problem that need urgent attention and these issues of farmers need to be given

proper attention for sustainable agricultural development such as credit, inputs, agricultural policies and programmes, extension services and capacity building. The findings agreed with Ozioko *et al* (2022) who stated that there are inadequate human and material resources necessary for effective coverage of the farming population in Delta State, hence dependable and actionable agro-meteorological services to enable farmers to make strategic climate change resilience decisions. Ebenehi *et al* (2018) asserted that lack of financing put a stop to extension agents from using research based resilience solutions meant for farmers. Olorunfemi *et al* (2020) reported that provision of enabling working environment and high-quality institutional structure will increase extension workers motivation, boost ability and enhance overall productivity

Table 4: Constraints affecting the choice of agricultural practices

s/n	constraints	mean	std
1	High cost of improved planting varieties	3.35	1.01
2	Poor funding of agricultural rural development program	3.32	0.85
3	Lack of information	3.34	0.94
4	Lack of knowledge on irrigation farming	3.02	1.02
5	Low capacity of extension of agents to boost and build resilience of farmers	3.13	1.03
6	Non availability of credit facilities	3.47	0.79
7	Deprived information on early warning about climate/weather	3.47	0.79
8	Bad leadership	3.30	0.81
9	Inconsistent agricultural policies and programmes	3.15	0.97
10	Shortage of working materials and human resources	3.12	0.92

Source: Field Survey, 2022

CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of this study, arable crop farmers in Delta State engaged many practices as resilience factors to climate change but many factors affecting their choice of agricultural practices. The farmers wanted profitable and practical prop up in addition to suitable policies from Governments that permit them become accustomed to climate change. Climate change contains physical and negative influence on our farming output systems. Pleasing environment for all farming activity will shift geographically and enhancing this environment will require changes in agricultural practices and management systems. Additional measures and strategies are required to supplemented farmers efforts in tackling the risks of climate change; these will assist farmers defeat hunger and eliminate poverty. Investment in the improvement of agricultural practices resilience is key to eradicating hunger and poverty. To eradicate food insecurity and ensure food security goes equitable, a paradigm shift towards agriculture and food production technique that are extra resilient and dynamic as well as sustainable are needed.

REFERENCES

Apata, T.G, Samuel, K.D & Adeola,A.O.(2009),Analysis of Climate Change Perception and Adaptation Among Arable Food Crop Farmers in South Western Nigeria. Paper Presentation at the International Association of Agricultural Economics Conference, Beijing, China. August 16-22, 15pp.

Bunu, M.G. (2021). The Perception of Climatic Change on Climatic Resilience Crop Cultivars Among Arable Farmers in Adamawa State, Nigeria. Asian Journal of Agricultural Extension, Economics and Sociology. 39 (12):142-152.

Ebenehi, O., Ahmed, T. & Barnabas, T. (2018). Evaluation of extension services delivery for climate change adaptation by crop farmers in Niger State, Nigeria. Asian journal of Agricultural Extension, economics and Sociology; 27(1): 1-13.

Food and Agricultural Organization (2004). The Global Cassava Development Strategy. A Cassava Industrial Revolution in Nigeria. The Potential for a New Industrial Crop.

Food and Agricultural Organization (2007). Adaptation to Climate Change in Agriculture, Forestry and Fisheries: Perspective, Framework and priorities. FAO, Rome, Italy.

Food and Agricultural Organization (2015). Climate Change and Food Security; Risks and Responses. Rome. FAO

Gitz, V. & Meybeck, A. (2012). Risks, Vulnerability and Resilience in a Context of Climate Change. In a FAO (2015) Climate Change and Food Security, Risks and Responses. Rome.

Ifeanyi-Obi, C.C. & Henri-Ukoha, A. (2022). Strengthening Climate Change Adaptive Capacity of Rural Women Crop Farmers Through Reduced Social Exclusion in NigeriaEuropean Journal of Agriculture and Food sciences.2022:4(1).436.

Malua, E.L,(2008). Turning up the heat on Africa Agriculture. The Impact of Climate Change on Cameroon's Agriculture. Africa Journal of Agriculture and Resource Economics 2(1):45- 64.

Nwachukwu, I. (2018). Sustainable Community Development. SCCDR Publishers http://sccdr.org

Olorunfemi, T.O., Olorunfemi, O.D. & Oladele, O.I. (2020). Determinants of the involvement of extension agents in disseminating climate smart agricultural initiatives. Implication for scaling up. Journal of the Saudi Society of Agricultural Sciences. 3(4). https://doi.org/10.1016/j.jssas.03.003

Onu, A.D, Tologbonse, E.B, Adeniji, O.B. & Ejechi, M.E (2014). Analysis of Determinants of Adaptation to Climate Change Among arable Crop Farmers in the Federal Capital Territory, Abuja. Africa Journal Online. 2014:45(1):56-57

Ozioko, R.I., Eze, K.C., Emordi,A.N., Okoronkwo,D.J., & Nwobodo, C.E.(2022) capabilities of extension agents in disseminating climate change information in Delta State, Nigeria. Journal of Agricultural Society of Nigeria. 26(3):74-85.

Solomon, E. & Edet, O.G. (2018). Determinants of Climate Change Adaptation Strategies Among Farm Households in Delta State, Nigeria. Current Investigation Agricultur Current Research. 2018:5(3)

Rudolf, W. & Hermann,W. (2009). Climate Risk and Farming Systems in Rural Cameroon. Institution of Development and Agricultural Economics, University of Hannover, Germany, pp21-24

UNISDR/OECD (2013). Disaster and Risks Reduction-Donor Effort. A Survey of Development Cooperation Providers, Paris