

# The Effect of Flood on Agricultural Production and Marketing and its Engineering Solution: A case study of Abia State, Nigeria

<sup>1</sup> Opara C.T, <sup>2</sup> Arimanwa J.I, <sup>3</sup> Nwaizuzu-Daniel J.C.

<sup>1,3</sup> Department of Agricultural Technology, Federal Polytechnic, Nekede Owerri

<sup>1</sup> Department of Civil Engineering, Federal University of Technology, Owerri, Imo state, Nigeria

**Abstract:** The study was carried out to identify the effect of flood on agricultural production and marketing and its engineering solution in Abia state Nigeria. The descriptive research design was adopted for the work. Purposive sampling technique was used to select four agrarian communities namely, Ngwa-ukwu, Amaasa, Ovu-okwu and Umuoba for this research. Four research questions guided the work. The population for the study was 144 consisting of 72 agro traders and 72 peasant farmers. Data were obtained from Primary and secondary sources. The primary data were obtained from field survey using a set of 31-item researcher developed structured questionnaire in Likert scale. The data obtained were analyzed using frequency table, mean and standard deviation with a criterion mean of 2.50 and above which was the benchmark for agreement. The result revealed that the causes of flood are heavy rainfall, poor waste disposal, poor drainage system, climate change, topography etc. It was also revealed that flood affects agricultural production and marketing by destroying the plants in farms, distorting value chain, affecting harvested product and production quality. Engineering solutions to flooding were adopted which include structural and non-structural flood mitigation measures. It was recommended that farmers should be enlightened on the effects and mitigation of flooding.

**Key word:** flood, agricultural, marketing, mitigation, engineering.

## Introduction

Natural extremities are frequent phenomenon which occur around the world. Different regions of the world experience various types of natural disaster every year. However, flood disaster is more chronic as it destroys both lives and properties in most cases. According to the Office for the Coordination of Humanitarian Affairs (OCHA) 2022, the number of people affected by widespread flooding across Nigeria this year has risen to over 3.2 million, with over 600 fatalities and over 1.4 million people are displaced. It stated that thirty-four of the country's 36 states were affected and over 569,000 hectares of farmland was destroyed by floods ahead of the October harvest season and may aggravate already alarming food insecurity.

Flood incident occurs due to some activities of man such as building on drainage channels, land encroachment, poor environmental planning, blockage of inland waterways and inadequate drainage channels. The illegal structures built across water ways have detrimental consequences on rural dweller and agricultural livelihood (sohel and rayhanul 2015). More so, other natural causes of floods include nature of topography, heavy rainstorms, base water flows and global warming. Most times prolonged rainfall can also cause flood (joy *et;al* 2018). Flood occurs in Nigeria in different forms such as coastal flooding, river flooding, flash floods, urban flooding, dam spills and dam burst. Flooding in Abia State is often related to rivers in the inland areas where unexpected heavy rains can alter them into devastating violent flow in a short time (Amadi, & Aleru, 2019).

According to Azad, Hossain and Nasreen (2013) agricultural damage incurred through floods affects rural farmers negatively and spurs them to other livelihood options leaving crop and livestock production given that most of the dwellers are peasant farmer in nature and thus, do not have enough capacity to survive with the flood shock at that point of occurrence. Flooding results in the damage of agricultural produce and thereby inducing and aggravating poverty among rural farmers. The damaging effects of floods affect farmlands, markets, schools, fish farm estates, livestock, residential houses, industries and other places of economic interest. These areas are often submerged for a long time bringing economic activities to a standstill.

Seeds and seedlings regardless of crop type are living organisms and need moisture to survive. According to Umoh 2018 and Amadi &Aleru 2019, poised that farmers harvest their crop prematurely for the fear of flood. Another difficulty posed by flood is convey of farm produce home and market distribution. However, there is usually an optimum moisture requirement beyond which the presence of moisture becomes detrimental to the survival of seeds and seedlings. Flooding introduces excess moisture which adversely affects the potency of seeds and seedlings and resulting to very poor yield of agricultural produce.

Flooding is a threat to agro-economy in Nigeria. It is therefore, imperative that flooding is mitigated. Proper flood management practices improve agricultural production and marketing. This paper explores engineering solution to flooding which are structural and non-structural flood mitigation measures. Structural flood mitigation measures involve modification to the built environment to curtail or eliminate flood damage. Structural flood mitigation measures include flood embankment, flood levees and dykes, dams, good drainage network, stone-pitching etc. Non-structural flood mitigation measures do not involve physical construction but use knowledge and practice to reduce flood and its negative impacts. Nonstructural measures include building codes, land-use planning laws and their enforcement, proper waste disposal, the use of sandbags, research and assessment, information resources and public awareness programs. The study carried out by Amadi & Aleru 2019, concluded that construction of adequate drainage network and proper waste disposal are positive measure to flood mitigation.

### **The Objective of the Study**

The broad objective of this study is to identify the effect of flood on agricultural production and marketing and its engineering solutions: A case study of Abia state, Umuahia.

The specific objectives are

- 1) Identify the causes of flood in the study area.
- 2) Identify the effect of flood on agricultural production in the study area.

- 3) Identify the effect of flood on agricultural marketing in the study area.
- 4) Determine the engineering solution in the mitigation of flood in the study area.

### Research Questions

Four research questions guided the research. They are:

- 1) What are the causes of flood in the study area?
- 2) What are the effects of flood on agricultural production in the study area?
- 3) What are the effect of flood on agricultural marketing in the study area?
- 4) What are the engineering solutions to flooding in the study area?

### Methodology

The study was conducted in Umuahia Agricultural zone of Abia state Nigeria. The zone is made up of five local government areas (LGAs) namely: Ikwuano, Isialangwa north, Isialangwa south, Umuahia north, Umuahia south. This zone is known for tropical rainfall, vegetation, and waving terrain. Umuahia is renowned for being a railway and agricultural market center, which attracts traders and farmers from neighboring town to sell their produce, such as yam, cassava, corn, citrus fruit, and palm oil and kernels. The local government is predominantly an agrarian community with good vegetation and agrarian weather that enhance agricultural production. Thus, majority of inhabitants depend on optimal production of farm produce for food security and livelihood of the families. The study was a descriptive survey research design. The target population was all peasant farmers in Umuahia agricultural zone. A multistage sampling was adopted. At the first stage Isialangwa north and isialangwa south was purposively selected. The second stage, two communities were selected randomly from each of the selected LGAs making a total sample of four autonomous communities. The selected communities were Ngwa-ukwu, Ama-asa, Ovu-okwu and Omba. This was followed by a random selection of three villages from each of the selected communities, making a total of 12 villages. From each of the selected village, a random selection of 6 farmers and 6 agrotraders, making up a total of 72 farmers and 72 agro traders. The total sample size summed up to 144 from the agrarian communities in the study area. The instrument for data collection was a self-structured questionnaire designed in a 4-point likert scale of agreement which elicited information on each research questions. Interviews were scheduled for those who could not respond to the questionnaire item properly. Data were analyzed using frequency table, mean and standard deviation with a criterion mean of 2.50 and above which was the discriminating index for agreement, while any item with a mean score below 2.50 was disagreement.

## Findings and Discussion

Research Question 1: What are the causes of flood in Umuahia agricultural zone?

**Table 1: Mean response of farmers and agro-traders in Umuahia agricultural zone.**

Causes of flood	Farmers			Agro- traders		
	X	SD	Remark	X	SD	remark
Heavy rainfall	3.44	0.76	Agreed	3.27	0.61	agreed
Soil nature	3.18	0.84	Agreed	3.19	0.79	agreed
Poor waste disposal	3.23	0.91	Agreed	3.10	0.53	agreed
Blockage of drainage channel	2.93	0.63	Agreed	3.00	0.73	agreed
Heavy rainstorm	3.21	0.67	Agreed	3.11	0.89	agreed
Illegal structure across water way	3.06	0.58	Agreed	3.10	0.63	agreed
Inadequate drainage channels	3.23	0.91	Agreed	3.17	0.59	agreed
Poor environmental planning	3.04	0.86	Agreed	2.97	0.86	agreed
Land encroachment	3.12	0.84	Agreed	3.04	0.86	agreed
<b>Grand mean</b>	<b><u>3.16</u></b>	<b><u>0.78</u></b>	<b><u>Agreed</u></b>	<b><u>3.11</u></b>	<b><u>0.72</u></b>	<b><u>agreed</u></b>

**Source: Field Survey 2023**

Results in Table 1 show the mean response of farmers and agro traders on causes of flood in Umuahia agricultural zone of Abia State. The study revealed that heavy rainfall (3.44 & 3.27), soil nature (3.18 & 3.27), poor waste disposal (3.23 & 3.19), building on drainage channel (2.93 & 3.00), heavy rainstorm (3.21 & 3.11) and poor environmental planning (3.04 & 2.97) are some major causes of flood in Umuahia agricultural zone, Abia state. These findings are in corroboration with the work of study as stated in the second paragraph of the introduction, who opined that heavy rainfall and nature of topography have unfavorable conditions on agricultural livelihood of rural dwellers. Also the result revealed that inadequate drainage channel (3.23 & 3.17), land encroachment (3.12 & 3.11) increases flooding on farmers' production land in Umuahia agricultural zone. The finding is in line with the work of study as stated in the fourteenth line of the introduction, that floods are outcome of prolonged rainfall and melting snow which are exacerbated by the geographical location and human activities of a place.

**Research Question 2:** What are the effects of flood on crop farmers’ production and marketing in Umuahia agricultural zone in Abia State?

**Table 2: Mean response of crop farmers on effects of flood on farmers’ production in Umuahia agricultural zone.**

	<b>X</b>	<b>SD</b>	<b>Remark</b>
<b>Effect of flood on agricultural production</b>			
Affect growth of cultivars	3.20	0.56	agreed
Affect production quality	2.98	0.85	agreed
Affect harvesting operation	3.00	0.61	agreed
Causes premature harvest	3.24	0.73	agreed
Destroy root crop	3.42	0.68	agreed
Hinders transportation of agricultural produce	2.87	0.78	agreed
Damage seed/seedlings	3.46	0.76	agreed
<b>Grand total</b>	<b>3.16</b>	<b>0.71</b>	<b>agreed</b>

**Source: field survey 2023**

Results in Table 2 show the mean response of the farmers on effects of flood on agricultural production in Umuahia agricultural zone, Abia State. The respondents agreed that flood affects growth of cultivars (3.20), affect production quality (2.95), and causes premature harvest (3.24). The study also revealed that flood destroys root crops (3.42), affects harvesting operation (3.00) and hinders transportation of agricultural produce (2.87). The finding was also supported by the work study stated in the fourth paragraph of the introduction who asserted that rural farmers harvest crops at a premature stage to avoid crop loss due to flood disaster.

**Research Question 3:** What are the effects of flooding on agricultural marketing in Umuahia agricultural zone in Abia State?

**Table 3: Mean response of agro-traders on the effects of flooding on agricultural marketing in the study area.**

	X	SD	Remark
<b>Effect of flood on agricultural marketing</b>			
Destroy agricultural products	3.17	0.68	agreed
Hinders products processing	2.98	0.63	agreed
Causes low revenue generation	3.13	0.56	agreed
Restrict movement of farmers and traders	3.07	0.73	agreed
Destroy markets	3.24	0.63	agreed
Distort value chain	2.95	0.70	agreed
<b>Grand total</b>	<b>3.09</b>	<b>0.66</b>	<b>agreed</b>

**Source: Field survey 2023**

Results in Table 3 show the mean response of agro traders on the effect of flood on agricultural marketing in Umuahia agricultural zone in Abia State. The respondents agreed that flood destroy agricultural products, (3.17), hinders products processing (2.98), causes low revenue generation (3.13), restrict movement of farmers and traders (3.07), destroy market areas (3.24), and distort value chain (2.95). These findings are in agreement with the conclusion drawn by a researcher in the fourth paragraph of introduction, who posited that flood pose difficulty for farmers in conveying farm produce home and market distribution.

**Research Question 4:** What are the engineering solutions in the mitigation of flood control in the study area?

**Table 4: Mean response of respondents on the engineering solutions in the mitigation of flood in the study area.**

<b>Mitigation measures</b>	<b>Frequency</b>	<b>percentage</b>
Construction of adequate drainage network	137	95.1
The use of sand bags	129	89.6
Proper land use planning	112	77.8
Desilting of blocked drainage channels	103	72
Construction of flood embankment	109	75.7
Construction of flood levees and dykes	98	68.1
Stone Pitching	102	70.83
Proper waste disposal	138	95.8

**Source: Field survey 2022**

Results in Table 4 show the mean response of all the respondents on the engineering solutions in the mitigation of flood in Umuahia agricultural zone, Abia State. The respondents agreed that engineering solution to flood include: construction of adequate drainage network (95.1%), the use of sand bags (89.6%) proper land planning (77.8%), desilting of drainage channel (72%), construction of flood embankment (75.7%), construction of flood leaves and dykes (68.1%), Stone Pitching (70.83) and proper waste disposal (95.8). These findings are in agreement with the work done by a researcher in the last paragraph of the introduction, who posited that construction of adequate drainage network is a proper flood mitigation measure.

**Conclusion**

Based on the findings, it was deduced that flood has detrimental impact on agricultural production and marketing. Premature harvest, damaging of seeds, seedlings and cultivars were some of the identified effects of floods on agricultural production. Marketing of agricultural produce was also negatively affected because flooding resulted in destruction of markets,

distortion of food value chain and destruction of agricultural produce leading to food scarcity. These negative effects of flooding can be controlled by applying some engineering solutions such as construction of flood embankment, levees and dykes, stone pitching, proper planning of land use, provision of good drainage system and appropriate waste disposal system.

### Recommendations

Based on the findings and conclusions made, the study therefore recommend that:

1. Government should provide adequate drainage channels in order to safely discharge flood.
2. Desilting should be done occasionally to remove the silt and waste blocking water ways.
3. Engineering solutions such as structural and non –structural flood mitigation measures should be adopted.
4. Farmers should be enlightened on the effects of flood and flood mitigation measures.

### REFERENCES

- Amadi, N.S & Aleru, (2019) *effects of flood on agricultural production among peasant farmers in ahoada west local government area of rivers state*, e-mail: ndubisi\_amadi@yahoo.com & [aleruprince5893@gmail.com](mailto:aleruprince5893@gmail.com) GSJ: Volume 7, Issue 12, December 2019, Online: ISSN 2320-9186 [www.globalscientificjournal.co](http://www.globalscientificjournal.co)
- Apan, C (2010) environmental impact of flooding on agricultural produce in Cross-Rivers State International Journal of Environmental Science 3 (2) 21-31
- Azad, A. K., Hossain, K. M. and Nasreen, M. (2013). Flood-Induced Vulnerabilities and Problems Encountered by Women in Northern Bangladesh, International Journal of Disaster Risk Science 2 (4), 190199.
- Joy, E.A & Edet, M.O (2018). Flood Effects on Agricultural Productivity: Implications for Mangrove Forest Ecosystem in Akpabuyo, Cross River State, Nigeria. Global Journal of Human-Social Sciences, 18 (3) 1-8
- Nigeria Floods Response: Office For The Coordination Of Humanitarian Affairs (Ocha) 2022, Flash Update 2 Last Updated: 1 November 2022
- Sohel, R. & Rayhanul, I (2015). Impact of flood hazards on the agricultural production and livelihood shifting in rural Bangladesh: A comparative study. International Conference on water and Flood management (ICWFM) Bangladesh
- Umoh, G. S. (2018). Programming Risks in Wetland Farming: Evidence from Nigerian Flood plains. Journal of Human Ecology 24 (2) 85-92.