FLOOD AND ITS IMPACT ON FARMLANDS IN ITIGIDI, ABI LOCAL GOVERNMENT AREA, CROSS RIVER STATE, NIGERIA

Eni, Devalsam I, Atu, Joy E, Oko,Comfort..O,Ekwok,Innocent
Department of Geography and Regional Planning
University of Calabar, Calabar, Nigeria
Tel: 234-703-198-5619. E-mail: devimoke@ yahoo.com

Abstract

Flooding has significant impacts on global and regional food production particularly the common stable food crops performance in tropical sub-humid climatic zone. In this study farm land was divided into fifteen (15) plots for easy analysis. A quadrant of 5Oni x 50m was demarcated and the different types of crop cultivated in the study area were identified. The depth of inundation of river water was measured a meter rule of 100ml. Soil samples were collected and taken to the laboratory to determine the soils physical properties. A semi Structured interview was held with 50 farmers. The interview covered topics such as farm characteristics causes of floods, types of crops destroyed and factors influencing flood. The result reveals that plot 8 with degraded vegetables covered a total area. 175 hectare, also the crops was inundated to a depth of 15m. Crops such as water leaf, tomatoes, melon and cucumber were highly devastated. Cassava, pepper, potatoes and tomatoes were cu1tivated in soils with 69% sand content and has a textural class known as sandy loam. The mean of sand, silt and the clay content in the study area was 494.5, 18 and 15.8 respectively. PH value ranged from 5.10 -6.70. The above result showed that flooding had a significant impact on soil physio-chemical properties because organic matter and nutrients were leached down the soil. It was recommended that plant species that are tolerant to excess water inundation should be improved within the study area to ensure large scale crop production.

Key Words: Crop productivity, floods, catchment, farmland, topsoil.

INTRODUCTION

Floods are purely environmental hazards of meteorological phenomena, but very often induced by man's improper utilization or abuse of the physical environment. Floods are among the most dramatic forms interaction between man and its environment. They occur both in the developed or developing are always associated with heavy loses of life and property, misery hardship disease and at times famine. The type of flooding predominant in the study area is perennial flooding caused by heavy rainfall and overflow of river banks. Growing plants in wet and poorly drained soil can be quite difficult except for few crops. Heavy rainfall accompanied by flooding cannot only cause tremendous damage to buildings and homes, but also kill woody and herbaceous plants. The ability for plant roots to tolerated long period of being submerged m flood water depends on the period of year the flood event occurred, duration of the flood event, species sensitivity to flooding and type of soil the plants grow on (dormant plants are more tolerant to flooding than actively growing plants). The Itigidi people depend on `Evien` which is a wetland for farming of different crops. Vegetable crops such as potatoes, cabbage, Onions, carrots, lettuce and Amaratus

Were highly destroyed due to flooding caused by Itigidi River. The floods have removed significant amount of topsoil large area of farm land. While some parts of the landscape have, lost significant amounts of topsoil both from the sheet erosion as rain falls wet soils. However, the removal of topsoil is always a loss to agricultural productivity as topsoil is the part of the soil horizon with higher level of organic matter and nutrients and generally better structure (USDA, 1993).Excessive moisture in the soil causes oxygen levels in the soil to decrease, thus impeding proper root respiration. Besides the obvious killing of submerged branches and foliage, many plants are intolerant to having their roots submerged for long periods of time. As a result of reduction in oxygen, carbon dioxide, methane hydrogen and nitrogen gas levels around the roots increase suffocate and die (Ayoade, 2008). Toxic compounds such as ethanol and hydrogen sulphide, as well as numerous other harmful compounds, can build up in saturated soils. Photosynthesis is inhibited and plant growth slows or even stops. Nigerians in several parts of the country are lamenting the devastating effect of farmlands caused by flooding. It has inundated several farmlands across the country, destroyed property worth millions of naira,and rendered thousands of people, including farmers, w homeless. A reconnaissance survey in some states of the country revealed that heavy rainfall and resultant flooding also destroyed agricultural produce running into billions of naira.

The flood which occurred in Kwara State recently claimed no life, but left victims with no food to eat, no sleeping material and caused other basic necessities to be inadequate as to meet the populace high demand. Foods are related to climatic change. The damage caused by floods depends on the rainfall duration, heights of water level, topography, and use of flood plains, defence measures and the awareness of the population likely to be affected by flooding (Odermeho, 2008). Flooding causes damage to infrastructures such as like roads and bridges in urban areas. Itigidi date recently a devastating flood incident which destroyed about 1000 hectares of farmland. Vegetables, yam, cassava, cocoa yam etc were inundated and destroyed. Villagers were also rendered homeless and famine took over the village. Based on this the need for this paper was necessitated.

LITERATURE REVIEW

Floods have benefits but also cause multiple problems. Floods occur world wide, often after heavy rains in an area. Once the flood waters clear away, it leave behind a variety of different effects on the land, animals and people. While many people view fl9oding as having a solely negative effect, positive things can also result in aftermath of a flood. Flooding causes structural and environmental damage to landscape (Akoroda, 2004). Floods erode soil, often on a large scale bases. This displacement of soil leads to the weakening of structures like houses and bridges. Ebisemiju (2008), opines that the most significant impact of flooding arises from urbanization, because it involves deforestation, landuse changes, precipitation, temperature modification of soil physical properties and structures and the exposure of bare soil surfaces especially of construction sites all of which bring about changes in the morphological and hydrological state of water.

Flood waters can destroy homes and business; disrupt road, rail and communication lines, and rain crops and agricultural land. Floods also disrupt in drainage and sewage systems, presenting a serious health hazard resulting from pollution and water borne-disease. Flooding of river is a natural phenomenon. The damage caused by flooding however has increased due to decreasing space for rivers and growing population pressure on valley grounds and wetlands (Olaniran, 2007). It is now generally accepted that increasing urban coverage and other development have led to a worldwide increase in both the risk and economic burden of floods (Mudetsee, 2003). The spectre of climate change is also causing international concern. Although no studies have conclusively shown how climate change have been a significant contributor to flood events to date (Douglas, 2008), future prediction suggest that the frequency of severe weather occurrences, including high-intensity and long-duration of rainfall events, is likely to increase. There is also a perception that agricultural intensification and other changes in land management practices may have increased the risk of flooding (Printer, 2009).

The researcher has observed that, flooding in Itigidi is a direct consequence of unbridled urbanization characterized by absence of a well-articulated and comprehensive planning and development control. Urbanization influences all phases of hydrological cycle from precipitation to infiltration rates and the hydraulics of overland flow. Finally, due to flooding harvests have been delayed, crops and pastures have been submerged and killed, and farm produce destroyed. Whenever soil is removed from actively propped lands, the fertilizer that has been applied by the farmer is equally washed away. These attributes are slow to replace and ultimately reduce crops yield unless higher levels of input are applied, particularly in the short term. Flooding and excessive rainfall have caused massive erosion, landslides and loss of nutrient rich top soil, this have caused the rich red clay soils of the Itigidi area to be more acidic with increased depth. As the more neutral surface soil is lost through erosions, and flooding farmers may need to apply extra lime and nutrients before new crops can be planted.

METHOD OF DATA COLLECTION

The total area of land use for cultivation of crops in ltigidi is about 20,000 hectare. This farmland was divided into 15 plots for easy analysis. A measuring tape of 100m was use to demarcate the farmland into small blocks of 50 x 50m. A quadrant was then employed to identity the different type of crops cultivated in the study area. A meter rule was used to measure the depth of water that has inundated the farmland by flood. The duration of flood on the farmland was calculated using the stop clock. The top soil samples were also taken to the laboratory to determine their physical composition. The soil samples were collected with an auger at a depth which range from 0-15cm. In June 2010, semi-structured interviews were held with twenty (20) farmers in the catchment to gather information on farmer’s views regarding changes in agriculture and views regarding changes in agriculture and runoff problems. In September 2011, structured interviews were held with thirty (30) farmers which sought to confirm the findings of the earlier surveys. The interviews covered topics such as farm characteristics, and management practices, impacts of reform, causes of floods, type’s crops destroyed by flood land management practices and flood generation and factors influencing management decisions.

The random sampling technique was used to contact farmers. Contact with farmers led to other introductions which were followed up and it suited the purpose of obtaining reasonable representation of farming in the catchments.

A total of 50 farmers in the catchments were interviewed.

RESULTS AND DISCUSSION OF FINDINGS

Table 1: Farmland size and the crops cultivated.

Sample plot	Crop types	Farmland size (hectare)	Area degraded (hectare)	Depth of farm inundated (m^2)
1	Cassava	275	125	10
2	Melon	200	75	5
3	Beans	160	90	4
4	Pepper	145	75	3
5	Water Yam	100	65	6
6	Water Leaf	105	40	4
7	Okro	215	125	8
8	Vegetables	240	175	15
9	Potatoes	165	55	9
10	Yam	125	45	8
11	Cocoyam	220	125	5
12	Tomatoes	175	75	4
13	Cucumber	160	55	6
14	Garden Egg	155	45	7
15	Maize	265	95	5
TOTAL		2,675	1,265	99

Table 1 above indicates the type of crops planted within the river catchment, the area degraded and the depth of farmland inundated. The table reveals that the plot of land demarcated for cassaya cultivation covered a larger area of land that is 275 hectares but plot 8 in which vegetables were planted had the largest degraded area of land with a value of 175 hectare. Also the deepest depth of inundation from flood water was observed at plot 8, it has a depth of 15m and it resulted in the total destruction of the crop because it was a creeping crop and could not withstand the stress from excess water. The monitored area of the Itigidi catchment is 16.5km lying between 195 and 325m elevation above se level, with an estimated annual average rainfall of 2200mm. The removal of topsoil is always a loss for agricultural productivity as topsoil is the part of the soil horizon with higher levels of organic matter nutrients and generally better structure. Also where soil has been removed from actively cropped lands, the fertilizer that has been applied by the farmer has also been washed away. These attributes are slow to replace and ultimately reduced yield unless higher levels of input are applied, particularly in the short term. Successful farmers have to accurately match soil type irrigation method and crop choice before decisions about next season’s crops and farm management practices are made due to the floods. It was observed that most plants can tolerate a couple of days of flooding during the growing season, but for some plants, a week or more of flooding can cause severe injury and death, such crop are water leaf, vegetables, tomatoes, cucumber and melon. Also the research revealed that some crops are intolerant to having their root submerged for long period of time, because excessive moisture in the soil causes oxygen levels in the soil to decrease, impeding proper root respiration. As a result, carbon dioxide, methane, hydrogen and nitrogen gas levels around the roots increase sharply, thus, roots can suffocate and die.

Table 2: Soil Characteristics and their textural classification

Sample plots	Crops	% Sand	% Silt	% Clay	Textural Class
1	Cassava	69	20	11	Sandy loam
2	Melon	58	12	30	Sandy clay
3	Beans	67	21	12	Sandy loam
4	Pepper	69	18	13	Sandy loam
5	Water Yam	66	17	17	Sandy loam
6	Water Leaf	65	23	12	Sandy loam
7	Okro	67	22	11	Sandy loam
8	Vegetables	68	11	21	Sandy clay
9	Potatoes	69	18	13	Sandy loam
10	Yam	65	25	10	Sandy loam
11	Cocoyam	68	21	11	Sandy loam
12	Tomatoes	69	19	12	Sandy loam
13	Cucumber	50	14	36	Sandy clay
14	Garden Egg	65	21	14	Sandy loam
15	Maize	68	18	14	Sandy loam
	Total	7418	270	237	
	Mean	494.5	18	15.8	

Table 2 above shows the catchment contain a mixture of soil types raging from freely draining loamy soils in the lower part of the catchment to slowly permeable barns and clays in the central part and wet acid peaty soils in the head waters. This sandy loam soil was suppose to encourage the luxuriant growth of crops within this area but due to flooding farmers are bound to loose their crops before there are matured for harvested. The research shows that sandy soil had a higher percentage in all the plots where crops were cultivated. Crops such as cassava, pepper, potatoes, and tomatoes were cultivated in soil with 69% of sand content and the textural class was sandy loamy. The mean of sand silt and clay content in the study area was 494.5, 18 and 15.8 respectively. Flooding in this area may be attributed to the fact that during the wet season the soil is already saturated and cannot absorb water anymore.

Adefolake, (2004) is of the view that the shrinkage of the belt of food crop is traceable to poor soil quality. Most soils in Itigidi are highly weathered, low in organic matter content, hence their susceptibility to erosion, flooding and leaching. Booze-Daniel et al (2009), opines that soils whose surfaces are tampered with or are replaced with sub soils cease to be suitable for crop cultivation, because they contain relatively low organic matter and micro organism activity, lack available plant nutrient and water, have poor soil structure and therefore are often very hard to re-vegetate. This type of soil will require a sound agricultural practice and the use of crop type that will suit that environment. Mayheal and Penny (1988) have identified the inherent potentials of cassava, maize and cocoyam to withstand environmental stress as against vegetables, pepper and tomatoes. These crops are important staple food crops of the people, and have gained widespread recognition in terms of their adaptability to the humid tropical ecosystem. According to USDA (1993), it is advisable to conduct studies with crops that are readily accessible to local farmers including those with reasonable cost effectiveness and excellent germination.

Table 3: Soil physico chemical properties at the Itigidi River Catchment

Sample Plot	Crops	pH	% Orgc	% TN	Mg/kg AVP	ECEC	% BS	Mg Mg/L	Na Mg/L	K Mg/L	AL Mg/L
1	Cassava	6.50	0.98	1.00	5.3	4.75	75	1.00	0.37	0.70	0.57
2	Melon	5.20	0.75	0.90	4.2	4.25	73	1.02	0.49	0.40	0.56
3	Beans	6.00	0.65	0.80	3.4	4.55	76	1.01	0.36	0.35	0.52
4	Pepper	5.40	0.35	1.00	5.1	4.60	74	1.35	0.57	0.25	0.50
5	Water Yam	5.10	0.79	0.89	4.3	4.45	74	1.45	0.38	0.20	0.51
6	Water Leaf	6.70	0.55	0.78	3.0	4.95	77	1.25	0.47	0.10	0.52
7	Okro	5.30	0.68	1.00	3.2	4.65	78	1.15	0.45	0.60	0.53
8	Vegetables	5.30	0.59	1.10	4.0	4.35	60	1.10	0.35	0.50	0.50
9	Potatoes	5.80	0.95	0.60	2.7	4.25	63	1.30	0.65	0.70	0.51
10	Yam	6.20	0.45	0.50	2.5	4.45	62	1.40	0.10	0.50	0.52
11	Cocoyam	6.60	0.57	0.45	2.4	4.75	65	1.00	0.25	0.40	0.55
12	Tomatoes	5.30	0.89	0.70	3.6	4.85	78	1.10	0.20	0.35	0.56
13	Cucumber	5.60	0.78	0.80	3.5	4.75	75	1.15	0.15	0.20	0.57
14	Garden Egg	6.10	0.66	0.60	4.7	4.65	79	1.20	0.36	0.10	0.50
15	Maize	4.90	0.93	0.70	3.8	4.75	62	1.10	0.28	0.30	0.51

Table 3 show that soil pH ranged from 5.10-6.70. This pH level indicates that the soil may not have serious acidity problem and it may not really have influence on the nutrient level in the soil. Organic carbon content varied from 0.35-0.98 indicating that the soil is low in organic carbon content which is true for a tropical region such as Nigeria (Dunahue et al., 1990). Total Nitrogen contents value was within the rang of 0.4-1.10% the total nitrogen content value is low as they are below the minimum limit of 0.20 to 5.00 as prescribed by Holland et al 1989). Available phosphorus content ranged from 2.4-5.3mg/kg. This value suggests that soil reaction is favourable for phosphorus availability in the area (Aibom, 2000). The soil has low to moderate exchangeable bases with calcium and cation exchange capacity dominating the exchangeable complex. Potassium recorded the lowest value in the study area and it is below the threshold level.

Anova was used to test if flooding has significant impact on farmlands in Itigidi and the result was shown below;

Table 4: Summary result of the impact of flooding on soil physical properties

Source of variation	Sum of squares	Degree of freedom	Mean sum of square	f-cal	f-tab
Between Group	76534.207	11	7216.574	163.453*	1.04
Within Group	425.865	22	2.946		
Total	8079.072	33			

The ANOVA shows that f-cal>f-tab therefore the null hypothesis was rejected in favour of he alternative hypothesis which state that flooding has a significant impact on soil physico-chemical properties in the study area. (Response from fanners on the impact of flood on farmlands)

It was realized that out of the fifty (50) farmers interviewed 18 had mixed livestock and amble farms, while 32 were involved in crop cultivation at subsistence level. The average farm size was 105 hectares. 30% of the respondents agreed that they were part time farmers, while 70% were full time farmers, others have diversified their income activities undertaking non-farm activities as farm revenue decreased. Though all interviewed farmers were aware of the problem of river flooding around the Itigidi catchment, 35 out of 50 had observed overland flow on their farms, but considered this as a natural process. Since there is a limit to the infiltration capacity of the soil, overland flow was commonly thought inevitable and thus accepted. 38 out of 50 farmers had farms along a water course that flooded now and then, and they consider it to be a major problem to crop production, as water stay for a long time before receding.

However, five farmers in the lower part of the catchment said they faced problems associated with river bank erosion or debris on land caused by flooding. Finally, the factors perceived to be influencing flood could be grouped into the categories of climate, urbanization, lack of natural flood plains, land drainage and poor agricultural land management. The physical character of the catchment, that is the distribution of the water courses and the topography, cause the area to be susceptible to local river flooding in case of extreme rainfall events. It was also observed that intensive farming and inappropriate land management practices lead to soil compaction and resulted in increased surface run off on farmland thereby destroying crops.

CONCLUSION

The nature of flood and the consequence of anthropogenic activities have made floods an inherent environmental problem, which can only be controlled rather than eradicated in man's environment. Man should see himself as part of the environment and not as one created to subdue it. Man should realize that physical environmental factors are too much to be ignore, that is people can only hold forces of nature at bay to only a limited degree. In the light of this man has to harmonize his actions as much as possible with the environment and learn to cope with flood and other environmental hazards.There is need for a common approach to flood risk management which involves an assessment of the characteristics of, and linkages between sources such as precipitation, overland and sub-surface flow, and receptors such as areas where the flood impact takes place through inundation of flooding. Agricultural land use potentially has an important part to play in flood risk management in so much as runoff and subsurface drainage from farmlands acts as pathway causing flooding in downstream receptors areas. To ensure crop growth in these area recommendations such as improving drainage and aeration is critical, avoidance of areas that drains slowly after a very heavy rainfall, addition of loose organic materials, such as composted leaves, pine bark, and peat moss can improve porosity in the soil. Finally species of crops that are tolerant to long period of inundation should be planted.

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