ENVIRONMENTAL IMPACT ASSESSMENT STUDIES OF FLOOD DISASTERS ON FARMERS IN NIGER STATE.

(A Case Study of Mokwa local Government Area)

BY

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CERTIFICATION

This is to certify that this Thesis Environmental Impact Assessment Studies of Flood Disasters on Farmers in Niger State. (A Case Study of Mokwa Local Government Area) has been presented by Kolo Abdullahi H. of the Department of Agricultural Engineering, School of Engineering and Engineering Technology, Federal University of Technology Minna, Niger State.

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DEDICATION

This project work is dedicated to my entire family.

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Praise and thanks be to the Almighty Allah (Subhana – huwatala) for keeping me fit to face the challenges throughout the duration of my course in Federal University of Technology, Minna. This project would not have been what it is today, without the untiring effort of my project supervisor Mr. B. A. Alabadan, who not only accorded me unreserved co-operation in the course of my project work but whose quality of understanding I admire. To him I remain grateful.

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ABSTRACT

Flood disaster often occur in different parts of Nigeria especially in areas close to river bank resulting in damages to farms, houses and infrastructural facilities.

This study attempt to assess the environmental impacts of the 1999 flood disaster in Mokwa Local Government on the social and economic life of inhabitants of this area. The study show the extent of damage to farms, houses and infrastructural facilities. Details of damages based on type of crops, area of farm land destroyed and expected yield/ha and naira (₦) value identified. The most susceptible area to flood disasters within the Local Government area were estimated in hectares. The study recommends some measures on how to prevent future occurences.

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CHAPTER ONE

1.0 INTRODUCTION

Flood is environmental phenomena that is wide-spread in Nigera. It is progressively causing devastating ecological havoc by destroying lives, property, agricultural land and social infrastructure.

The incidence of flood disaster is becoming a common occurrence in Nigeria during the rainy season. In the 1980's flood disaster occurs mainly in cities like Ibadan, Lagos, and Abeokuta but today we have reports of flooding in areas hitherto regarded as dry like parts of Zamfara, Sokoto and Kebbi State (Ogundiran, 1999).

Generally, river flooding may occur due to high rainfall, melting snow in spring or the emptying of lakes when a natural or artificial dam is breached (Kelvin and Lewis, 1994). The region that experience large floods occurs where there are little vegetation steep slopes and many gullies. Flood disaster occurs in Nigeria due to combination of factors. Floods in urban area are due to vegetational and land use practices where the river banks are left bare of vegetation and blocking of channels and drains with urban waster (Oguntala, 1982). In some area, changes in rainfall pattern (number of rainy days), when rainfall has been shortened it resulted in higher rainfall per day increases water flow into dams, thus they have to be open to avoid collapse.

1.1 STATEMENT OF RESEARCH PROBLEMS

Flooding is a serious calamity that threatened some settlements in the flood plains of the state. The phenomenon have had devastating effects on the environment causing people to migrate leaving their heritage. The seasonal rain-storm cause river water level to rise far above the low level and overflow the bands of rivers and streams in low flat lying land as experienced in Borgu and Mokwa Local Council Areas.

In 1997 and 1998 properties worth over N500 million were destroyed by flood disaster in these Local Government Areas of Niger State. This was as a result of the resurgence of the Kainji and Jebba Hydro-electric Dam to an unimaginable level. The affected Councils were Borgu and Mokwa. Several houses and farm lands were submerged by the surging water. The span of the damage covered several hundreds of kilometres extending from the border town of Babanan in the Borgu Local Government Area in the fringes of Benin Republic to Kede Tako (Kpata – Katcha) in the Mokwa Local Government in the fringe of Kogi State. The victims were forced to moved from their houses to primary schools and other public buildings disturbing their economic, social and educational life. Worst affected are the children whose education have abruptly stopped. The famous Kpata-Katcha fish market in Mokwa Local Government Area was completely submerged forcing the traders to seek refuge at the primary school. These necessities the need to know about the Environmental Impacts of flood Disasters on farmers in (Mokwa Local Government Area of Niger State).

1.2 JUSTIFICATION OF THE STUDY

Considering the effects of Flood Disasters on farmers to the economy of the local government area and the country in general, the work will assist the individual farmers and government to have more information about flood with the aim of planning towards improving production in riparian communities.

1.3 OBJECTIVES OF THE STUDY

i.) To determine the cause(s) of flooding

ii.) To know the extent of damages

iii) To know the socio-economic effect of damages on live of the people in the area.

iv) Make need suggestion in prevention of future occurrence.

1.4 SCOPE OF THE STUDY

The result of this research work will be based on data collected in Mokwa Local Government Area of Niger State.

1.5 LIMITATION

Inadequate funding, un-co-operative attitude of the respondent and delay in submission of questionnaire are some of the factors that affect and delay the process of collecting data.

CHAPTER TWO

2.0 LITERATURE REVIEW

The seasonal variation in the volume of water in a river is known as the regime. A knowledge of the ~~of the~~ regime of a river is important to man in controlling possible floods, storing up water for Irrigation and human consumption, and also in planning hydro-electric production. The regime of a river will depend on a number of factors, such as the seasonal distribution of precipitation (both snow and rain), the nature of the rock (whether they are permeable or not), the size of the catchment area (a very large catchment area such as that of the Niger benefits from rainfall occuring in different parts of the basin) and the vegetation cover (Okafor,1986).

The Niger, which is 4160 km long (2600 miles), passes through nearly all the climate zones of West-Africa from a wet region through a semi-desert into a wet climate again. It rises from Guinea, an area of heavy rainfall, where it is joined by the Niantan, the Milo and the Tinkisso rivers which, apart from the rains of Southern Mali, add to it's volume. The flood waters of the Niger reach their highest in May – June in this upper course and then flow into Mal and arid country, where are spread over the level inland delta and delayed until October when they reach Timbuktu. Much of the flood is lost in the delta through evaporation and use for Irrigation. The slackened floods continue their journey and reach Niger Republic in January when that country is experiencing a dry season, a blessing to the Niger farmers along the banks of the river. (Tanaka, 1981).

The Niger comes into another region of comparatively heavy seasonal rainfall i Nigeria. local rains as well as it's tributaries, particularly the Benue, swell it's water. Th flood-waters that left Guinea in May – June reach Nigeria between February and April th following year. That is, it takes the flood-waters about 8 - 10 months to reach Nigeria fron Guinea. The Niger thus experiences a very low water level in Nigeria from April to June/July where local rains will begins to swell its water level again.

In any season of the year, some where in the world, river floods cause the loss of life and the devastation of agricultural land. In mid-September 1992, three days of torrential Monsoon rains caused many rivers to swell, such as the Indus, resulting in extensive flooding in northern Pakistan and India, leaving more than 2,000 dead and hundreds of thousands of people homeless. (Kevin and Lewis, 1994).

River flooding may occur due to high rainfall, melting snow in spring, or the emptying of lakes when a natural or artificial dam is breached. The amount of water overspilling a river bank is a measure of the magnitude of the flood. Hydrologists who study flooding also refer to the magnitude of floods in terms of recurrence intervals. The area of land that is naturally flooded, often annually, is called the "flood plain" of the active river channel.(Okafor,1986b). The hazard of flooding is measured as a function of it's destructive capacity in terms of life and property. hydrologists advising engineers and Planners in the design of structures and buildings will provide information on the size of a possible flood that they may be expected to occur with a recurrence interval of 10, 25, 50, or 100 years (Kevin and Lewis, 1984). Floods produced by the breaching of dams and melting snow tend to be "upstream floods which are confined to smaller areas, and their effects are more limited downstream".

Flooding may be particularly disastrous along coastal areas if high river discharges coincide with high tides. The high tides prevent the river from releasing the large quantities of water so that coastal areas are flooded. This was the case in 1953 in the Netherlands, when 1,835 people were drowned as a result of a high seas swell in conjunction with rivers discharging large quantities of flood water into the North sea. (Ogundiran, 1999). In most developed countries, water height in rivers is monitored using stream gauges. If the water level rises to a critical height, then flooding is imminent and a flood warning may be issued.

Amongst the most recent devastating flooding in the United States of America (USA) was that of the Mississippi river in mid-July 1993, the worst on record in the past 20 years. Following a period of torrential rainfall, the Missouri river rose to it's highest recorded level at St Louis of more than 15m above normal, in the early hours of Monday 19th July, causing very extensive flooding of the farmlands and settlements, and leading to the death of more than 30 people. In Iowa, one of the worst affected states, more than 50,000 people were flooded out of their homes. More than 250,000 people were left without clean drinking water. As a result, President Clinton promised large amounts of Federal aid to mitigate the effects of this flooding (Lawal, 1999).

Flood hazards of intolerable magnitude occur annually. The Niger Delta, a vast plain exposed to flooding, is criss-crossed by many rivers and creeks whose banks are made of levees bordered by areas mainly consisting a back swamps and numerous lake-like water logged depressions where surface flow can hardly be drained by gravity. Thus, in the delta, the river Niger and it's tributaries flood, erode, transport, sediments and continuously reshape their channels. Over 700,000 hectares of land which otherwise could be used for agriculture and human settlements are rendered useless due to annual floods. The flooding which lasts from 2 to 5 months each year submerged forests and agricultural lands, towns and villages m be up to 3 metres high in some localities. In the coastal zone, the sea on it's part scour floods and breaks on the beaches causing severe loss of soil. Thus, no significa development, in terms of infrastructure, agriculture and industrialization can occur in Nige Delta unless the menace and havocs of annual floods is controlled (Fubara, 1983b).

From the above, over 850,000 hectares of land in Nigeria are badly affected annuall or rendered useless for agricultural purposes and human settlements by floods.

Incidents of floods in Nigeria have been associated with problems arising from th destruction of forests. When the moderately effects on surface run off is removed (Oguntala 1982). Storms and floods have increased in different parts of Nigeria particularly in southern Nigeria where most towns have experienced devastating storms. In recent times, the Ogun river which flows from Oyo State, through Ogun State and empties into the Atlantic through Lagos has been over-flowing it's bank, causing serious flooding in Abeokuta and Lagos. The vegetation and land-use practices of Lagos and Ogun States have been studied in order to explain the problem of flood in Lagos State (Oguntala, 1987). The results of the land-use patterns carried out in Nigeria with the United Nation assistance indicate that Ogun State, is the least forested. Nigeria has within it's forest reserves only 8.3% in Ogun, 42.7% in Ondo 41.7% in Oyo and 24.7% in Edo State. This poor forest cover is responsible for the over-flowing of Ogun river, which flow through Lagos into the Atlantic. A massive afforestation programme is urgently needed in Ogun State to ensure adequate land cover in the state. This will reduce the volume of water flowing through Ogun river, it will also reduce siltation in the river and thus prevent further flooding in Lagos and Abeokuta.

Furthermore, bad environmental sanitation practices such as indiscriminate disposal or dumping of refuge block both natural and artificial water flow channel. This blockage diverts and riases the height of water flow, leading to flooding. This human contribution was one of the main causes of the intensity and havoc of the Ogunpa flood which claimed nearly 200 lives ad over 50,000 people were displaced in Ibadan, Oyo State, in 1980. High population density aggrevate these human contributions to accelerate flood. In spite of several million naira already spent, another N40 million will still be spent to make Ibadan flood (Oguntala and Oguntoyinbo, 1977)

It is clear, however, that a long-term solution to the problem involves land-use planning that would incorporate adequate protection for natural phenomena like rivers, hills and forests, especially in rapidly developing and densely populated urban areas.

In a few cases, the boundary of a plot can be defined by some irregular natural features such as river or a stream. In this case, only the points where the irregular feature cease to be a boundary are demarcated. In fig 10 which shows the areas bounded by a survey line AB and an irregular boundary DC. The survey line is divided into a number of small equal intercepts of length X, and offsets y_o, y_1 ...... y_n measured either directly in the field or by scaling from the plan. The area bounded thus i.e. ABCD can be calculated by either the trapezoidal rule or Simpson's rule (William et al, 1981).

In many problems it is necessary to compute an area before the volume can be calculated and, for this reason, the main methods of determining areas of irregular shape are summarised below:-

1. **Trapezoidal rule method**

$$\text{Area of ABCD} = X\left[\frac{(y1 + yn)}{2} + y_2 + y_3 + y_4 + y_5 + y_6\right]$$

2. **Simpson's rule method**

Area of ABCD

$$= {}^{x}/_{3}\ [(y1 + yn) + 2\ \text{(sum of odd ordinates)} + 4\ \text{(sum of even ordinates)}$$

CHAPTER THREE

3.0 METHODOLOGY

AREA OF STUDY

This study was conducted in Mokwa Local Government Area of Niger State. It lies on latitude 9" 21"N and longitude 5° 18"E the local government area is made of six districts, Mokwa, Muwo, Kede Tako, Kede Tifin, Takuma and Kudu. Inhabitants are predominantly farmers. Four (4) out of six (6) districts were flooded during the 1999 flod disaster.

3.1 SOURCES OF DATA

The primary and secondary sources were used to acquired data for this study.

3.11 PRIMARY SOURCES

The primary sources was through the administration of the "structured or coded" questionnaires.

3.12 SECONDARY SOURCES

In order to have more information and meaningful interpretation, the researcher uses relevant literatures and the report of the Flood Disaster Committee submitted to Mokwa Local Government Area of Niger State.

3.2 SAMPLING TECHNIQUES

Mokwa Local Government Area was purposively chosen for the work because it was more devastated in Niger State. Selection of affected villages was done through sampling techniques. This involve the random selection of twenty one (21) villages from four districts.

The villages includes:- Sarki-giwa, Lyafu, Patizhiko, Tunga-Hajiya, Bukka, Jebba-North, Rabba, Edogi, Tatabu, Sunti, Sunlati, Dzangu, Kpashafu, Kpatsuwa, Kusogi, Egbagi, Shegba, Wadata, Dutsun, Kpata-Katcha and Cegungi. The list of villages was obtained from the Flood Disaster Committee in Mokwa Local Government Area to serve as the sampling frame. Respondent were selected from the sampling frame using random sampling. The questionnaire were distributed among the villages.

3.3 ANALYTICAL TECHNIQUES

The questionnaires were collated on the master response sheet from where the level of destruction to farm building and physical infrastructure were estimated by districts. Estimation of farm destruction were done with use of expected average yield for the crop typess and the average price for 1999 farming season as obtained fron Agricultural Extension & Management Department, Niger State College of Agriculture, Mokwa.

Table 3.1: Average Yield & Market Price of selected Crops.

Crop	Average Yield/Ha	Average market Price/Kg (₦)
Rice	2000 kg/ha (paddy)	₦20 (40,000/ha)
Maize	1000 kg/ha	₦17 (17,000/ha)
Beans	700 kg/ha	₦55 (38,500/ha)
G/Corn	800 kg/ha	₦15 (12,000/ha)
Cassava	600 kg/ha	₦15 (9000/ha)

Source:- Field estimate of selected crop in Niger State.

Estimate of building and other physical infrastructure was done with the help of Works and Service Department and use of the report of Flood Disaster Committee of Mokwa Local Government Area.

Table 3.2: Average estimate of building and social infrastructures.

Building/Physical Infrastructure	Average Cost
Permanent building	₦40,000
Semi-permanent building	₦15,000
Temporary farm building	₦2,500.00
Health Clinic	₦1.7 million
Classroom block	₦1.2 million
Basic Centre	₦2.4 million

Source:- Field estimate of building & social infrastructures.

CHAPTER FOUR

4.0 RESULT AND DISCUSSION

4.1 DATA ANALYSIS AND INTERPRETATION

The data collected were collated and analysed carefully. The results of the analysis were used in determining the check list of impacts and their magnitude on the socio-economic life of the people and environmental degradation caused by the negative impacts. 210 questioonaires were distributed in the 21 villages selected. Summary of questionnaires distgributed and those returned are shown below:-

Table 4.1:- Questionnaire Distribution Pattern

District	No. of Questionnaire Distributed	No Returned	Percentage (%)
Mokwa	50	47	94
Muwo	50	43	86
Kede Tifin	60	56	93
Kede Tako	50	50	100
TOTAL	210	196	

Table 4.2:- Farm Destroyed by flood in selected villages

District	Crop Type	Area Destroyed
Mokwa	Maize	102
	Rice	53
	G/Corn	62
	Cassava	37
Muwo	Maize	68
	Rice	86
	G/Corn	56
	Cassava	36
Kede Tifin	Maize	112
	Rice	168
	G/Corn	110
	Cassava	65
Kede Tako	Maize	90
	Rice	106
	G/Corn	70
	Cassava	60

Table 4.3:- Building Destroyed by flood in selected villages

District	Permanent Buidling	Semi-Permanent building	Temporary farm build
Mokwa	178	52	40
Muwo	213	38	42
Kede Tifin	286	48	53
Kede Tako	253	43	47

Table 4.4:- Infrastructure destroyed by flood in selected villages

District	School	Primary Health Clinic	Basic Health Centre	Market
Mokwa	4	2		
Muwo	3	3		
Kede Tifin	6	5		2
Kede Tako	4	3	1	1
TOTAL	17	13	1	3

Showed that social infrastructures in these communities was greatly distributed during the flooding. 17 out of 28 primary school representing 60.7% of the primary school was flooded. This prevented the children from attending school during the period. Also, 13 out of 30 Primary Health Care Centre was flooded. The only Basic Health Centre at Sunlati was flooded. All this made access to Health Care very difficult during period, which endanger the life of the inhabitants of this sampled area. The famous Kpata-Katcha and Sunlati Fish Market were completely submerged.

Table 4.5:- Estimate of farm destroyed by flood.

Districts	Crop Type	Area destroyed/Ha	Value (₦) 000
1. Mokwa	Maize at (₦17,000/ha)	102	1734
	Rice at (₦40,000/ha)	53	2120
	G/Corn at (₦12,000/ha)	62	744
	Cassava at (₦9,000/ha)	37	333
TOTAL		254	4,931
2. Muwo	Maize at (₦17,000/ha)	68	1156
	Rice at (₦40,000/ha)	86	3440
	G/Corn at (₦12,000/ha)	56	672
	Cassava at (₦9,000/ha)	36	324
TOTAL		246	5,592
3.Kede Tifin	Maize at (₦17,000/ha)	112	1904
	Rice at (₦40,000/ha)	168	6720
	G/Corn at (₦12,000/ha)	110	1320
	Cassava at (₦9,000/ha)	65	585
TOTAL		455	10,529
4.Kede Tako	Maize at (₦17,000/ha)	90	1530
	Rice at (₦40,000/ha)	106	4240
	G/Corn at (₦12,000/ha)	70	840
	Cassava at (₦9,000/ha)	60	540
TOTAL		326	7,150

From table 7 above, Kede districts were the most devastated during the flood disaster, about 881 hectares of farm land valued at 17.679 million were destroyed. Mokwa district was the least affected during the period under study. Only 254 hectares of farm land valued at 4.931 million was destroyed. The flood of 1999 not only prevented access to their home, farms and ponds but also flooded their growing crops.

Table 4.6:- Estimate of Building destroyed by flood

District	Building	No Destroyed	N value 000
1. Mokwa	Permanent building at (₦40,200	178	7120
	Semi-permanent building at (₦15,000)	52	780.00
	Temporary farm building at (₦2,500)	40	100.00
TOTAL			**8000**
2. Muwo	Permanent building at (₦40,200	213	85626.00
	Semi-permanent building at (₦15,000)	38	570.00
	Temporary farm building at (₦2,500)	42	105.00
TOTAL			**8.630,1.00**
3. Kede Tifin	Permanent building at (₦40,200	286	11,497,2.00
	Semi-permanent building at (₦15,000)	48	720.00
	Temporary farm building at (₦2,500)	53	132,5.00
TOTAL			**11,701,7.00**
4. Kede Tako	Permanent building at (₦40,200	253	10,170,6.00
	Semi-permanent building at (₦15,000)	43	645.00
	Temporary farm building at (₦2,500)	47	117,5.00
TOTAL			**10,352,6.00**

The table above revealed that flood was more devastating at Kede Tifin and Kede Tako districts of the Local Government. These districts were either totally submerged in water or most of the building flooded. During this period, the inhabitants were left in the open with no shelter, food, and access to health care facilities. These wards were unable to attend school during the period. In the villages sampled about 539 permanent building and 91 semi-permanent building valued at 22.0543 million were destroyed.

Table 4.7:- Estimate of infrastructure destroyed by flood

Type of Infrastructure	No of Flooded	(N) Value 000
Classroom Block at 1.2 million	17	20.4
Primary Health Clinic at 1.7 million	13	22.1
Basic Health Centre at 2.4 million	1	2.4
TOTAL		**44.9**

The above table show that social infrastructures in these communities was greatly during the period. Infrastructures valed at 44.9 million were destroyed.

DETERMINATION OF AREA HIGHLY SUSCEPTIBLE TO FLOOD

As mentioned earlier, one of the principal tasks of cadastral surveying is the determination of the sizes of the plots involved. It is customary to express areas in hectares and decimals of a hectare. It should be noted, however, that there are other methods of determining areas from plotted plan. These include the use of squared paper and by machanical means using the planimeter.

In general, then, Simpson's rule method was used in calculating the total areas of local government liable to flood.

$A = {}^{x}/_{3}$ $(y_1 + y_n + 2$ (sum of odd ordinates) + 4(sum of even ordinates)

Where:-

X = is the axial distance between two sections.

Y_1 and y_2 etc are the areas of the sections.

1, Area of Zone 'A' that is liable to floods

From the map, the length of the land = 8.05cm

If 1cm = 5000m on the ground, then 8.05 x 5000m

Total length = 40250m

By Simpson's rule

If 40250m = Total length of land,

7 = No of ordinates on the map.

$$X = \frac{40250}{7} = 5750\text{m}$$

and $$x = \frac{5750}{5000} = 1.7\text{cm on map.}$$

Ordinates readings on map

$y_1 = 0.4 = 2000m$ $y_4 = 0.8 = 4000m$ $y_7 = 0.2 = 1000m$

$y_2 = 0.41 = 2050m$ $y_5 = 0.19 = 950m$

$y_3 = 0.2 = 1000m$ $y_6 = 0.18 = 900m$

$^x/_3 [(y_1 + y_7) + 2(y_3 + y_5) + 4(y_2 + y_4 + y_6)]$

$A = {}^{5750}/_3 [(2000 + 1000) + 2(1000 + 950) + 4(2050 + 4000 + 900)]$

$= {}^{5750}/_3 [(3000) + (3900) + (27800)]$

$= (1916.7)(34700) = 66509490 m^2$

A = **6,650.9Ha**

Area of Zone 'B'

From the map the length of the land = 12.7cm

1cm = 5000

12.7 = 5000m

= 12.7 x 5000

Total length = **63500m**

By Simpson's rule

If 63500m = Total length of the land

5 = No of ordinates on land

$x = {}^{63500}/_5 = 12700m$

and $^{1270}/_{5000} = 2.54cm$ on the map.

Ordinates reading on map

$y_1 = 0.1 = 500m$ $y_4 = 0.3 = 1500m$

$y_2 = 0.1 = 500m$ $y_5 = 0.3 = 1500m$

$y_3 = 0.2 = 1000m$ $y_6 = 0.2 = 1000m$

$A = {}^{x}/_{3}\ [(y_1 + y_8) + 2(y_3 + y_5 + y_5) + 4(y_2 + y_4 + y_6)]$

$A = [(500 + 1000) + 2(1000 + 1500) + 4(500 + 1500)]$

$A = [(1500) + (5000) + (8000)]$

$= (4233.3)\ (14500)$

$= 61382850\ m^2$

A = **6,138.3Ha**

Area of Zone 'C'

From the map the length of the land = 14.9cm

If 1cm = 5000m on the ground

14.9 x 5000m

Total length = 74500m

By Simpson's rule

If 74500m = Total length of the land

5 = No of ordinates on the map

$x = {}^{74500}/_{5} = 14900m$

and ${}^{1490}/_{5000} = 2.98cm$ on the map

Ordinates reading on the map.

$y_1 = 0.3 = 500m$ $y_4 = 0.6 = 3000m$

$y_2 = 0.6 = 500m$ $y_5 = 0.5 = 2500m$

$y_3 = 0.61 = 3050m$ $y_6 = 0.1 = 500m$

$= {}^{14900}/_{3}\ [(y_1 + y_6) + (y_3 + y_5) + 4(y_2 + y_4)]$

$= {}^{14900}/_{3}\ [(2000) + (11{,}100) + (24000)]$

$= (4966.7)\ (37100)$

$A = 184264570m^2$

$=$ **18426.5Ha**

Area of Zone 'D'

From the map, the length of the land = 13.6cm

If 1cm = 5000 on the ground

Then 13.6 x 5000m

Total length = **68000m**

By Simpson's rule

If 68000m = Total length of land

8 = No of ordinates on the map

$x = {}^{68000}/_{8} = 8500m$

and ${}^{8500}/_{5000}$ = 1.7cm on the map.

Ordinates readings on the map

$y_1 = 0.4 = 2000m$ $y_4 = 0.8 = 4000m$ $y_7 = 0.2 = 1000m$

$y_2 = 0.41 = 2050m$ $y_5 = 0.19 = 950m$

$y_3 = 0.2 = 1000m$ $y_6 = 0.18 = 900m$

$A = {}^{x}/_{3}\ [(y_1 + y_8) + 2(y_3 + y_5 + y_5) + 4(y_2 + y_4 + y_6)]$

$= {}^{8500}/_{3}\ [(500 + 1500) + 2(3000 + 2500 + 2000) + 4(500 + 2500 + 2000)$

$= {}^{8500}/_{3}\ [(2000) + (15000) + (20,000)$

$= (2833.3)(37000)$

$A = 104832100m^2$

$A =$ **<u>10,483.2Ha</u>**

<u>Area of island 'A'</u>

From the map the length of the land = 1.2cm

If 1cm = 5000m on the ground

1.2 x 5000m

Total length = **<u>6000m</u>**

<u>By Simpson's rule</u>

If 6000m = Total length of the land

3 = No of ordinates on map

$x = {}^{6000}/_{3} = 2000m$

and ${}^{2000}/_{5000} = 0.4cm$ on the map.

Ordinates readings on the map.

$y_1 = 0.1 = 500m$ $y_3 = 0.1 = 500m$

$y_2 = 0.15 = 750m$ $y_4 = 0.025 = 125m$

$A = {}^{x}/_{3}\ [(y_1 + y_4) + 2(y_3) + 4(y_2)]$

$= {}^{2000}/_{3}\ [(500 + 125) + 2(500) + 4(750)$

$= {}^{2000}/_{3}\ (625 + 1000 + 3000)$

$= (666.7)\ (4625)$

$= 3083487.5m^2$

$=$ **308.3Ha**

Area of Island B

From the map the length of the land = 1.3cm

If 1cm = 5000m on the ground

1.3 x 5000m

Total length = **6500m**

By Simpson's rule

If 6500m = Total length on the land

3 = No of ordinates on the map

$x = {}^{6500}/_{4} = 1625m$

Ordinates readings on the map

$y_1 = 0.1 = 500m$ $y_4 = 0.1 = 500m$

$y_2 = 0.11 = 550m$ $y_5 = 0.025 = 125m$

$y_3 = 0.15 = 750m$

$A = {}^{x}/_{3}\ [(y_1 + y_5) + 2(y_3) + 4(y_2 + y_4)]$

$= {}^{1625}/_{3}\ (500 + 125) + 2(750) + 4(550 + 500)$

$= {}^{1625}/_{3}\ (625) + (1500) + (4200)$

$= {}^{1625}/_{3}\ (6325)$

$= (541.7)\ (6325)$

$= 3426252.5m^2$

$=$ **342.6Ha**

Area of island C

From the map the length of the land = 0.7cm

If 1cm = 5000m on the ground

0.7 x 5000m

Total length = 3500m

By Simpson's rule

If 3500 = Total length of the land

2 = No of ordinates on the map.

$X = {}^{3500}/_{2} = 1750m$

and ${}^{1750}/_{5000} = 0.35cm$ on the map.

Ordinates readings on map

$y_1 = 0.1 = 500m$ $y_2 = 0.15 = 750m$ $y_3 = 0.025 = 125m$

$A = {}^{x}/_{3}\ [(y_1 + y_3) + 2(0) + 4(y_2)]$

$= {}^{1750}/_{3}\ (500 + 125) + 0 + 4(750)$

$= (583.3)\ (625) + (3000)$

(583.3) (3625)

2114462.5m^2

Combined area of Mokwa Local Government that is susceptible to floods

= Area of Zone ABCD + Area of Islan ABC

= (66509490 + 61382850 + 104832100) + (3083487.5 + 342652.5 + 2114462.5)

= 425,613212.5m^2

Total area of land liable to flood = **<u>42,561.3Ha</u>**

4.2 ESTIMATE OF AREA LIABLE TO FLOOD IN NAIRA

Assumption : Assume the whole area liable to flood is planted with rice.

Expected revenue from an hectare of rice = ₦40,000

Estimated area liable to flood = 42,561.3Ha

= ₦40,000 x 42,561.3Ha

= **<u>₦170,245,2000</u>**

CHAPTER FIVE

5.0 CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

Kede tako and kede Tifin districts were so devastated during the flood mainly because they are riparian community and the high rate of water released from Kainji and Jebba Dam easily overflows it's bank and readily flood these communities. We should note that these communities do not benefit from compensation on building of the dams but now reap negative multiplier effect of the dam(s). the success story of Kpatsuwa community that relocates after 1994 floods should serve as a case study. From our analysis, area under high flood risk is estimated at 42,561.3Ha.

From the discussion above, I realised that farmers in Mokwa Local Government went through trauma during 1999 flood disaster. He has no roof over his head, his stock of food was flooded, his farm washes away, his children cannot attend schools and the entire family has no access to safe water and health care facilities. It was indeed bad experience which we should all strive to prevent it's reoocurence.

5.2 RECOMMENDATION

Base on the findings of the research work, the following recommendations and suggestions are drawn with hope that if implemented it would help to ease the problems of flooding in the riparian communities of the state.

1. To prevent annual reoccurence of the flood in the riparian community down stream of Kainji and Jebba dams, there is an urgent need to resettle all the communities along the path of river Niger to upland area adjacent to them. This should be undertaken with the ecological fund and if necessary their should be a special grant to undertake the resettlement exercises.

2. Deforestation of area around the dam should be prevented as they expose the dam to higher flow of water, siltation, erosions and preventable collapse of the dam.

3. Government should produce a flood hazard map to know the extent of likely damage and the areas that need to be evaluated during the flood.

4. Early warning to the riparian community by the management of Dam to prevent loss of life and allow for evacuation of valuable assets before flooding.

5. Prompt response of all levels of government in production of assistance to affected community, and proper monitoring of the assistance provided so that it gets to it's target population.

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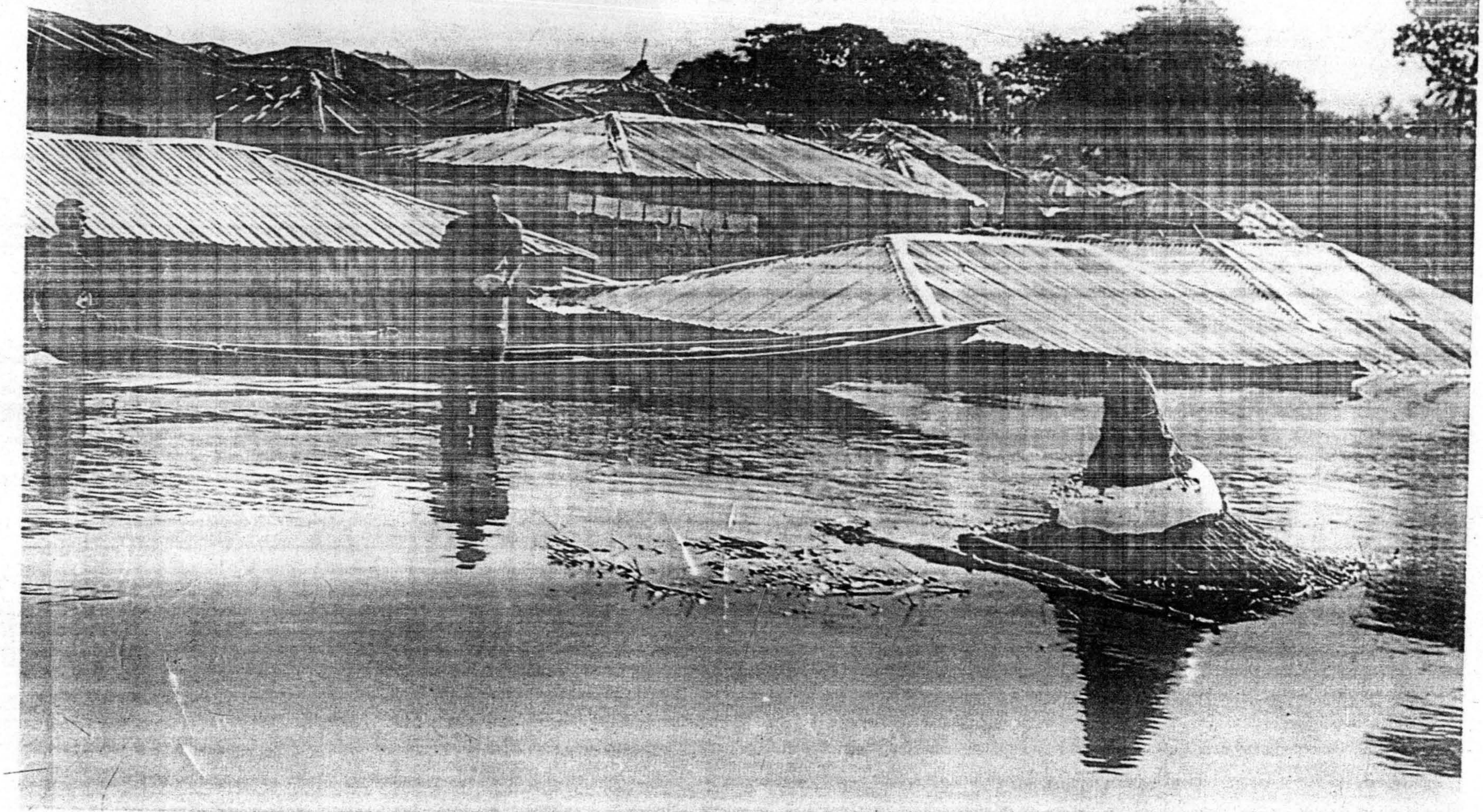

FIGURE A1 : Houses compeletely submerged in the flood.

fig. A2

FIGURE A2: Flood victims scavenging for reminants of their property.

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Fig A8

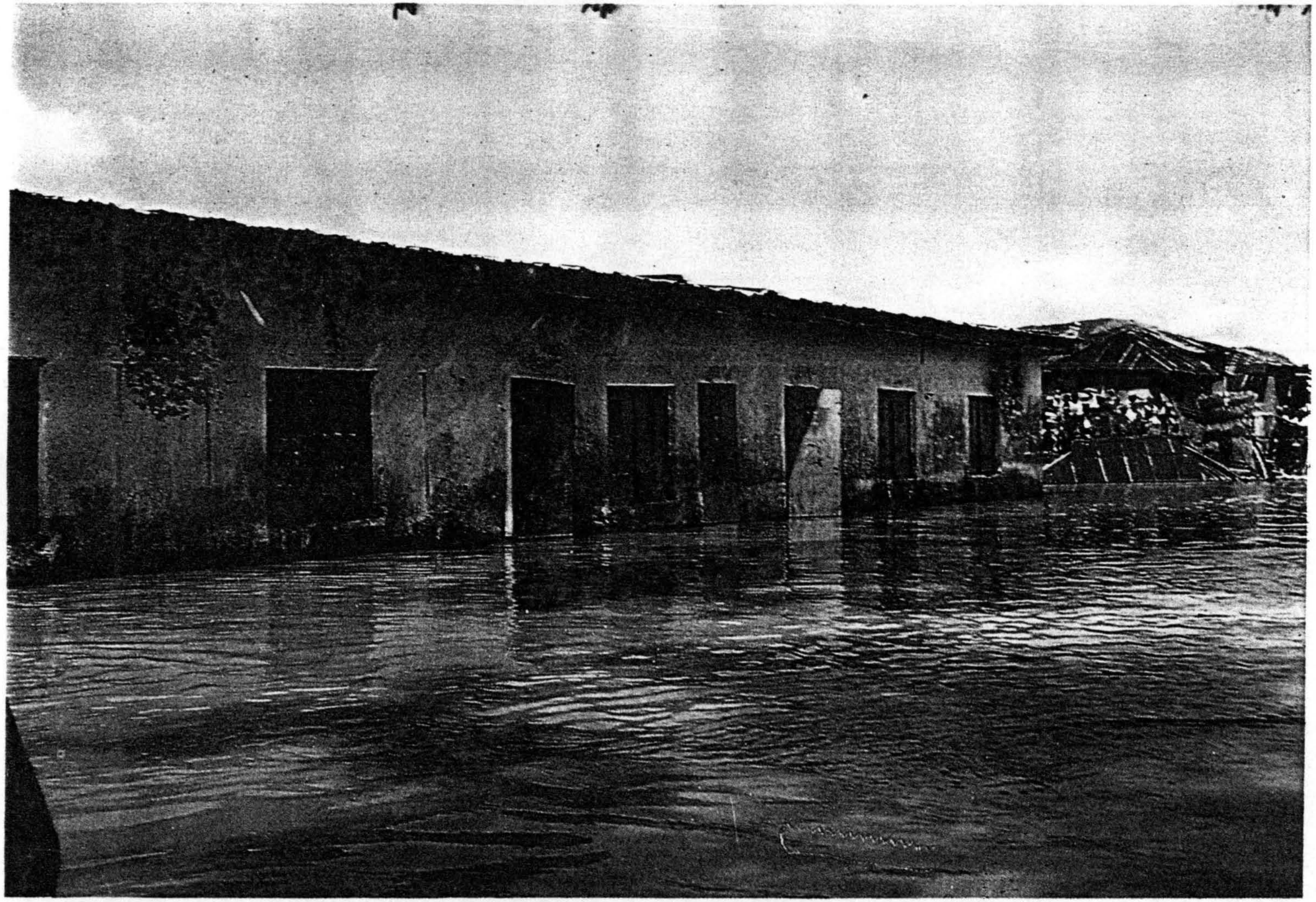
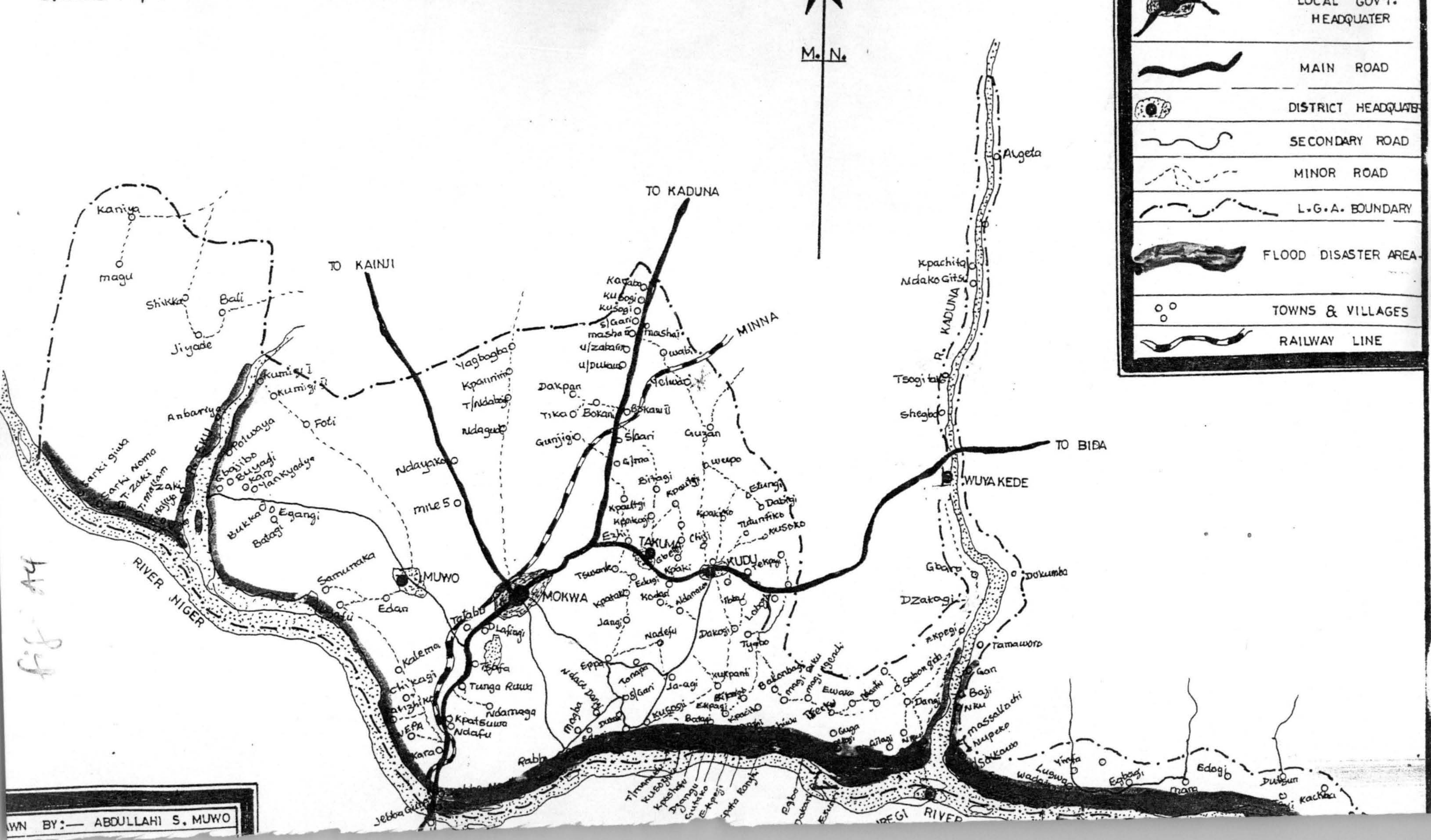


FIGURE A8 :- Another Primary School affected by the flood.

...OF MOKWA LOCAL GOVERNMENT AREA

FIGURE A4: SHOWING AREAS PRONE TO FLOODING



DRAWN BY:— ABDULLAHI S. MUWO

Fig A4

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APPENDIX 1

ENVIRONMENTAL IMPACT ASSESMENT STUDIES OF FLOOD DISASTERS ON FARMERS IN NIGER STATE.

(A Case Study of Mokwa Local Government Area)

QUESTIONAIRE

Please answer the following question correctly. Your answer will be treated as confidential as possible.

1 Name of the Village --

2 District: --

A Demographic information --

3 Age of the respondent: --

4 Level of Education (i) Primary --

(ii) Secondary --

(iii) Post Secondary--

(iv) Non-informal--

5 Marital status: (i) Single --

(ii) Married

6 No in the household --

7 Major occupation: (i) Farming --

(ii) Fishing--

(iii) Artisan --

(iv)C/servant --

(v) other occupation --

8 How long have you been farming? --

17 What other properties do you loss in the flood

(i) --

(ii) ---

(iii) --

18 Did the flood affect the social infrastructure in the village? Yes or No

19 Which social infrastructure (s) do you think is a affected?

(i) School ---

(ii) Clinic --

(iii) Market --

(iv) All of above---

20 How do you adjust to the breakdown of this infrastructure?

(i) Government provide alternative ---

(ii) No alternative arrangement by Government ---

21 Did Government respond fast relief operations/ yes or no

22 If Yes, what relief items get to you and measures of the household?

(i) ---

(ii) --

(iii) ---

(iv) --

23 would you be inherited in resettlement outside this village? Yes or No

24 If No, why? ---

25 If Yes, what do you considered important before your resettlement in a new location? ----

----

----

9 Fill the crop planted in 1999 season in hectares

	Creop Planted	Area in hectares
(i)		
(ii)		
(iii)		
(iv)		

B Flood loss Assesment

10 How long have you live in this village ---

11 Have you ever experience flooding in this village before this season? Yes or No

12 If yes, how many times and the years ---

13 What is the cause (s) of the flooding ---

----

14 Where are you during the 1999 flooding disaster?

(i) in the village

(ii) out of the village

(iii) on the farm

15 Did the flood affect your farm? Yes or no

16 If yes, fill the space provided below

	Crop (s) affected by flood	Area (ha)	level of destruction (Partial/Total)
(i)			
(ii)			
(iii)			
(iv)			
(v)			