

## Effects of Seasonal Floods on Households' Livelihoods and Food Security in Tolon/Kumbungu District of the Northern Region, Ghana

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### Abstract

The study focused on how flood disasters affected livelihood systems in Tolon/Kumbungu District. The study was carried out in six sampled communities namely Tampia No. 1 and No. 2, Nawuni, Adayili, Afayili, Kuli and Shegbini. It examined the nature of floods, damage caused and their effects on livelihoods and food security and their coping mechanisms after floods. Twenty-two disaster prone communities were purposively selected and the simple random technique was applied to select the six communities out of the twenty-two and descriptive statistics was used in the analysis using SPSS version 17. The study discovered that floods in the district were seasonal occurring in August/September every year and mainly caused by the opening of the Bagre Dam in Burkina Faso. It was also realised that floods destroyed farmlands of the people in the study area every year leading to instances of total crop destruction and failure. Few respondents 21.7% out of 120 indicated that floods caused erosion that resulted in the creation of galleys in the communities and on their farmlands or wash away soil nutrients which led to crop failure. A chi square test shows a significance level and relationship of 0.001 of the variables of yields before and after flooding which contributes to low crop productivity and food security. The study recommended that the disaster response committee should be equipped and resourced adequately to respond quickly to any disaster occurrence. It is further recommended that the committee should embark on mass sensitisation and advocacy programmes to create awareness in the vulnerable communities and advising people to live distant away from the river banks and flood prone areas. Importantly, the Government of Ghana should dialogue its Burkina Faso counterpart to ensure that people living around the Volta basin be warned ahead of time of spilling the Bagre dam in Burkina Faso.

**Keywords:** Floods, disasters, livelihoods, effects, agriculture Tolon/Kumbungu, Northern Region and Ghana

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## Introduction

Globally, disasters are seen to have one of the most devastating effects on economic development, livelihoods, agriculture, and health, social and human life. Disasters are said to be sudden, accidental event that causes many deaths and injuries. Many natural disasters in the world today result in significant lost of live and property. These natural disasters include floods, hurricanes and typhoons, earthquakes and tornadoes. Tsunamis, wildfires, volcanic eruptions and landslides are among the other natural forces that sometimes cause disasters. However, not all disasters are caused by the natural forces. Many disasters are caused by activities of man which include accidents of airplanes, ships, or railways, collapse of buildings, bridges, tunnels, and mines, as well as fire explosions triggered by humans (Dolcemascoco, 2004). Natural disasters can have significant economic and food security impacts, especially on the poorest households. In the last three decades, there has been a significant increase in the number of natural hazard events in the world, the size of affected populations and the extent of economic losses. According to Sena (2006), a lot of victims have suffered homelessness, disaster induced ill health, severe economic losses and personal tragedies.

Agriculture is the main occupation of rural communities in Northern Ghana and also an important source of livelihoods. In Africa, about 70 per cent of the population resides and earn their living in rural communities, 40 per cent of all exports earnings come from agriculture, and about one-third of the national income is generated by agriculture. Yet, it remains one of the most vulnerable sectors to climate change in terms of decline in agricultural production and uncertain climate that significantly affect food security. The most vulnerable or the poorest people of society in Africa are those who depend on rain-fed subsistence agriculture for food, jobs and income, and hence the most vulnerable to climate changes (Frederick, A. David O. Genesis T. Justice O. and Ernest K. A. Afrifa, 2010) Again, Frederick posited that in some parts of Northern Ghana, heavy rainfall during the months of August and early September 2007, led to severe flooding, loss of lives, displacement of vulnerable persons and the destruction of key infrastructure, food stocks and livestock. The floods coincided with the most critical time of the year, the lean (minor) farming season when Ghanaian families faced food insecurity.

The focus of the research was on communities along the White Volta basin in the Tolon/Kumbungu District of Northern Region of Ghana. In this area, excessive rainfall coupled with the spillage of excess water upstream from the Bagre Dam in Burkina Faso results in incessant flood. The adverse effect of this has caused death to humans and animals as well as destruction of agricultural crops. Some amenities such as residential and farm buildings, bridges, schools and dispensaries, portable water and irrigation facilities as well as food storage and processing facilities were also significantly affected. Since floods

are a common feature in Ghana, local coping strategies are required to reduce the shocks. The combination of cumulative events such as the prolonged dry spell, abnormal torrential rains and the spillage of the Bagre Dam in Burkina Faso all aggravated the humanitarian situation in Northern Ghana. Vulnerable communities are also severely affected because of the timing and magnitude of the flood. The Government of Ghana and her development partners provided some of the much needed life saving assistance to affected populations in the most devastated areas. However, owing to the vulnerability of socio-economically, the floods triggered a rapid deterioration of existing vulnerabilities. In the aftermath of flooding, many of the flooded areas were inaccessible due to breakdown of key infrastructure, including bridges and roads. Initial assessments by the Ministry of Food and Agriculture (MoFA) estimated that 70,500 hectares of farm lands were affected, resulting in an estimated production loss of about 144,000 Metric Tonnes (MTs) of food crops (including maize, sorghum, millet, ground nuts, yam, cassava and rice). This resulted in acute food shortage in the affected communities. An estimated 50,000 people in Northern Ghana were expected to remain vulnerable to food insecurity and at risk of malnutrition for at least 15 months beyond the early harvest in October 2008 (Frederick, *et al.* 2010).

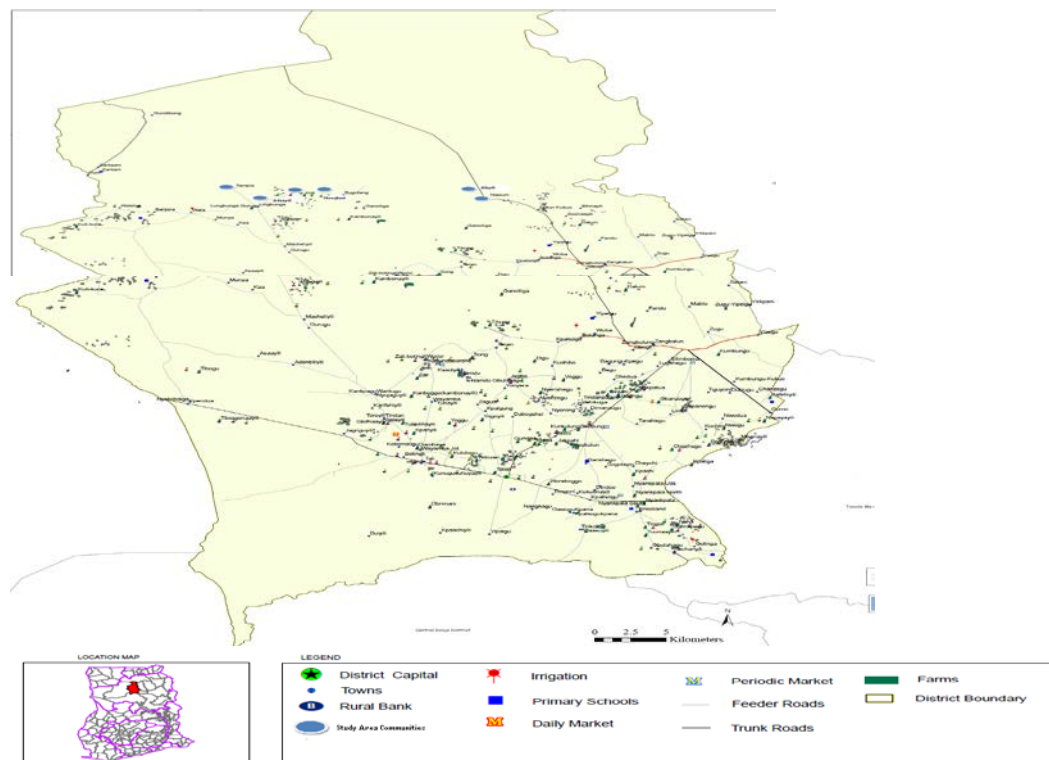
In Ghana, floods are among the most frequent and devastating natural disaster that affects the livelihood of the people. According to the National Disaster Management Organisation (NADMO) which is in charge of disaster management, Government and other stakeholders like Non-Governmental Organisations (NGOs), donor agencies and philanthropic organisations over the years provided some kind of relief services, rehabilitation and resettlement to flood victims (NADMO, 2007). Flooding in the country mostly occur during the rainy seasons in the months of May, June, July and August. Floods of various magnitudes hit some of the districts and its surroundings in the country.

People have always found ingenious ways to overcome adverse conditions like floods, earthquakes and tsunamis among others, but because of lack of wider dissemination, these initiatives have remained localized to limited areas. Government and development organizations the world over, have tried to deal with flood situations in their countries, but their initiatives have been more of settling victims after the occurrence of the said floods (relief oriented) and short period targeted as it is always within a short time frame. As a result, there have been no long-term solutions to the people's problems nor have such initiatives had a positive impact on the people's coping mechanisms and capacities (Brahmi and Pumphone, 2002).

Tolon/Kumbungu District in the Northern Region of Ghana is flood prone, during the months of July – September in 1995, 1997, 2004, 2007, 2008, 2009 and 2010, the District was hit by floods. The worst flood in August 2007 resulted in six human deaths, lost of property, with more than 1,300 households rendered homeless. Again, many buildings were submerged and over 3,000 hectares of farmlands destroyed. Additionally, the floods caused outbreak of water-borne diseases including diarrhoea, cholera and malaria particularly, among children. This called for more support from Government and other development partners (NADMO, 2007). The objective of the study was therefore to Access the nature of floods in the study area, examine the effects of floods on livelihoods and food security in the area their coping mechanisms.

## Materials and Methods

Tolon/Kumbungu District was among the forty-five (45) districts created by the PNDC Law 207 in 1988 with Tolon as its Capital. The people of the district are predominantly Dagombas with few migrants of Gonjas and Bato along the White Volta. The people are mostly Muslims. Other religions include traditional and Christian religions. Tolon/Kumbungu is bounded to the North by West Mamprusi district, to the South and West by West Gonja District. While Tamale Metropolitan and Savelugu/Nanton districts share the Eastern boundaries with it (figure 1). It lies between latitudes  $9^{\circ}$  –  $20^{\circ}$  North and longitude  $10^{\circ}$ - $50^{\circ}$  West. The area experiences single rainy season from April/May to September/October with a peak season in July/August. The district records a mean annual rainfall of 1,100mm within 95 days of rainfall. Staple crop farming is highly restricted by the short rainfall duration. The dry season starts from November to March with day temperatures ranging from  $33^{\circ}\text{C}$  to  $39^{\circ}\text{C}$  while mean night temperature range from  $20^{\circ}\text{C}$  to  $26^{\circ}\text{C}$ . The mean annual day sunshine is approximately 7.5 hours. The high temperatures in the day could be exploited for the drying of agricultural produce as a source of economically sustainable solar energy.



**Figure 1. The Study Area.**

The main agricultural activity in the district is crop farming with cereal crop farming dominating. The main crops grown in the area (figure 1) are maize, rice, millet, yam, cowpea, pigeon pea and Soya beans. Vegetable crops grown include tomatoes, pepper,

okra, onion and garden eggs. Cash crops include cotton, tobacco and cashew in small scale. Other agricultural activities include livestock and poultry production. Fishing is also done at Bontanga irrigation dam and along the White Volta basins (Tolon/Kumbungu District Profile and Poverty Mapping, 2005).

A statistical formula was used to determine the sample size of 111 from the population of 2,501 of the six selected communities with 0.095 margins of error and a confidence level of 90.5%. The sample size calculation and distribution are shown below (table 1). The sample

size formula is given by:  $n = \frac{N}{1 + N(e)^2}$  Where n = sample size; N = sample frame and e = error margin (About Surveys, 2008) <http://www.aboutsurveys.com/determining-a-proper-sample-size/>.  

$$\frac{N}{2,501} = (e) = 0.095;$$

therefore:  $n = \frac{2,501}{2,501 + 1(0.095)^2} = 110.759 \approx 111$ . But the researchers reached out to 120 respondents (table 1) to ensure a larger sample for more representation. The target population for the study was the households with the household heads being the sampling units of the study. Proportional sampling was used to determine the sample size per community. This was used for the purpose of achieving equity in representation (Sarantakos 1997). Simple random sampling was then used to select the respondents for the study. This technique was used to ensure that every household head stood the chance of being selected. The target population for the study was the households with the household heads being the sampling units of the study. Proportional sampling was used to determine the sample size per community. This was used for the purpose of achieving equity in representation. Simple random sampling was then used to select the respondents for the study.

**Table: 1 Population and Sample Size**

NO.	COMMUNITY	POPULATION	SAMPLE SIZE
		N	N
1.	Afayili	348	17
2.	Adayili	86	4
3.	Nawuni	642	31
4.	Kuli	1,083	52
5.	Tampia No. 1 and No.2	235	11
6.	Sheegbuni	107	5
<b>Total</b>		<b>2,501</b>	<b>120</b>

Source: Field Survey 2012

Direct observation was also done in addition to the interviewing of respondents in the study area.

## Results and Discussion

The study area has male-dominated household heads. The study showed that out of 120 respondents, majority of households 92.5% are headed by males while few 7.5% are headed by females. This supports the general belief that in Northern Ghana, households are predominantly headed by men except in some few cases where the household heads are females. The studies also showed that majority 79.2% of the respondents in the study area are farmers suggesting that farming is the main occupation of the people.

### Nature of Floods

On the nature of floods in the study area, five parameters including the knowledge of respondents on floods, causes of floods, month of occurrence, duration of the flood and the worst hit year in the study area was examined. Two main forms of floods occur in the study areas thus: torrential rain and Bagre dam spillage with 25% and 75% responses respectively (table 2).

**Table 2 Causes of Flooding in the Study Area**

Responses	Frequency	Percentage
Spillage of the Bagre Dam	90	75.0
Torrential Rains	30	25.0
Total	120	100.0

Source: (Field Survey, 2012)

The study reveals that floods occur normally from August to September with other minor occurrences in the early part of July and late part of October (table 3). The August and September period is the main rainfall period for the Northern Region as espoused by the respondents. This means that control spilling of the Bagre dam could reduce flood disaster on people along the White Volta basin through sensitization. For torrential rains, respondents could only prepare and cope with it as they cannot control the intensity of the rains.

**Table 3 Month of Flood Occurrences**

Month	Frequency	Percentage
July/August	22	18.3
August/September	78	65.0
September/October	20	16.7
Total	120	100.0

Source: (Field Survey, 2012)

Flash floods, stream flooding, and landslides were seen as being caused by serious torrential rains in the area whilst that of the dam spillage caused serious gully erosion, crop and property damage.

### **Impacts of Flood on Livelihoods and Environment**

Effects and damages of floods on livelihoods in the area were enormous. For 2012 alone, 2,000 households were affected in the entire district including the study communities according to the District NADMO Officer. Damage and destruction of crops and farmlands, houses, bridges, schools and health facilities were pronounced in their responses as effects of the floods on their livelihoods. Other impacts enumerated by the respondents include; damage to the water supply system to their communities (streams and rivers), irrigation systems in the area, food storage and processing facilities (grinding mills). The floods therefore triggered a rapid deterioration of existing vulnerabilities of the people especially on hunger and health.

Reports from the Ministry of Food and Agriculture estimated that an area of 24,300 hectares was affected resulting in an estimated production loss of 75,000 Metric Tonnes (MTs) of food crops (including maize, sorghum, millet, ground nuts, yam, cassava and rice) for 2012 alone for the region and the study area was part of this disaster.

Clustering the adverse impacts into property, human lives and food stuff/farm lands, from the findings, it shows that 59.2% of the respondents said in during the 2012 floods they lost almost all their food reserves during which resulted in an extended period of hunger from two to six months (table 4). The result also showed that 29.2% lost their property (household utensils and clothing) whilst 11.6% indicated that they lost their livestock. The lost of personal property, soil fertility, crop loss, erosion, livestock, food reserves and their effects as in (Table 4) confirmed LeDuc (2006) study who documented that disasters have massive human and economic cost. The writer further indicated that floods may cause deaths, severe injuries and food shortages. He added that injuries and deaths occur during the time of impact, whereas disease, outbreaks and food shortages often arise much later, depending on the nature and duration of the disaster.

A chi square test shows a significance level and relationship of 0.001 of the variables of yields before and after flooding (Table 5). This further adds up to the low agricultural productivity in the study area especially cereal crops during flooding which builds up to the low food security situation at the household level in the study area.

**Table 4 Effects of Floods in the study area**

<b>Effects on Livelihoods</b>		
<b>Response</b>	<b>Frequency</b>	<b>Percentage</b>
Food stuff loss	71	59.2
Loss of Properties	35	29.2
Livestock	14	11.6
<b>Total</b>	<b>120</b>	<b>100</b>
<b>Effects on Environment</b>		
<b>Response</b>	<b>Frequency</b>	<b>Percentage</b>
Destruction of farm land	46	38.3
Creation of erosion	26	21.7
Wash away of soil nutrients	21	17.5
Polluting of water bodies	16	13.3
Others	11	9.2
<b>Total</b>	<b>120</b>	<b>100</b>
<b>Effects on Agriculture</b>		
<b>Response</b>	<b>Frequency</b>	<b>Percentage</b>
Crop Production	75	62.5
Crop and Livestock Production	16	13.3
Vegetable	11	9.1
Crop, Livestock and Fish Production	8	6.7
Crop and Fish Production	5	4.1
Sole Livestock Production	5	4.1
<b>Total</b>	<b>120</b>	<b>100</b>

Source: (Field Survey, 2012)

**Table 5 Test Statistics of Crop yield before and after Floods**

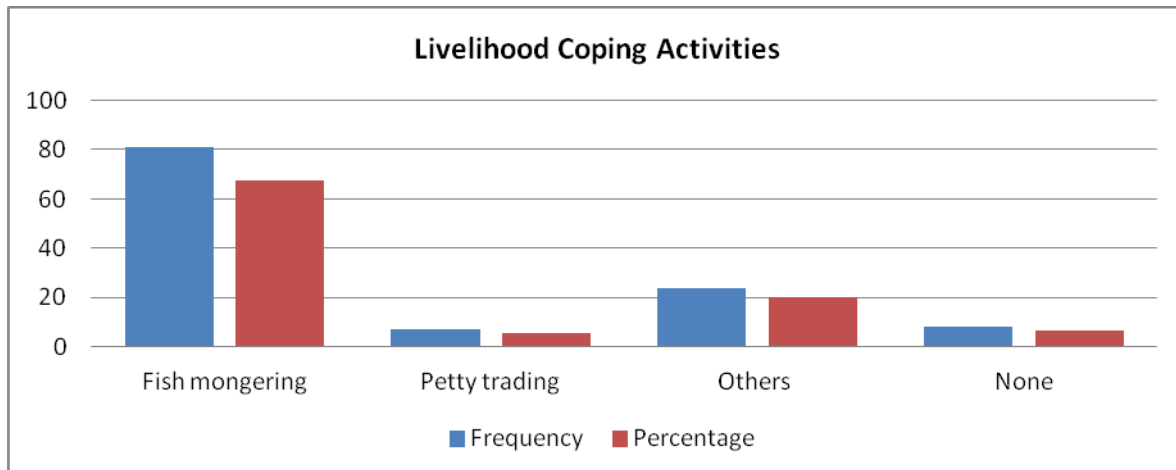
	Average yield of crops per acre before floods	Average yield per acre after flooding
Chi-Square	92.736 <sup>a</sup>	61.680 <sup>b</sup>
df	15	16
Asymp. Sig.	.001	.001

Source: (Field Survey, 2013)



## Coping Mechanisms

This part looked at the different types of livelihood coping mechanisms employed by the communities in the aftermath of flood disaster. These include: fish mongering, petty trading, *zana* mat weaving, thatch weaving for local roofing, twine weaving, fishing, weeding the farms of other farmers for food, obtaining loans from social contacts, selling of livestock, premature harvesting of crops, basketry, dependence on food from previous crop seasons, and resettlement in other towns. Figure 2 shows that most (67.5%) of the communities members engage themselves in fishing. Twenty percent (20%) said they engage themselves in other activities like; basket weaving, *zana* mat weaving, thatch weaving for local roofing and twines weaving to generate income whilst 5.8% and 6.7% engage themselves in petty trading and no income generating activities respectively. The data showed that fishing is number one coping mechanism in the events of flood disasters in the area as abundant water comes with more fish. Other coping activities are petty trading, buying and selling of agricultural produce, sale of livestock and fish processing are usually adopted as a livelihood strategy during and after flood disasters (figure 2).



**Figure 2 Livelihood coping activities other than Agriculture.**

Source: (Field Survey, 2012)

The 6.7% of respondents who said they did nothing to generate income to cope with the situation suggest that the effect of floods had always been devastating leaving them to survive on charity and aids. Use of early maturing or flood resistance crops coupled with educating respondents on early warning system on floods and the rainfall pattern could reduce the effects of floods on crop production and ensure food security that can reduce their vulnerabilities.

The absence of stronger resilience levels because of lack of better coping mechanism to vulnerable communities like this area exposes their vulnerabilities and reliance on support from friends, relatives, District Assembly, NGO's and the Government. The form of supports however varied from provision of temporal accommodation by friends and relatives to provision of relief materials such as used clothing, food stuffs, household

utensils, mattresses, roofing sheets and medicine. The respondents unfortunately had very little knowledge on the existence of local Disaster Management Committee whose responsibilities included sensitising and providing warning signals to the people of the study area on the occurrences of floods.

## Conclusion

The results of the analysis led to the conclusion that flood occur on yearly-basis which affected farming, the main livelihood activity. Floods wreaked havoc on short to medium and long term livelihoods of the inhabitants. The short-term effects of floods included destruction of farmlands, soils erosion and pollution of drinking water and fisheries resources. A chi square test shows a significance level and relationship of 0.001 of the variables of yields before and after flooding which contributes to low crop productivity and food security. In the medium-term, flood has its toll on food reserves in households which stretches hunger period from two to six months and makes household food security situation worse.

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