

FLOODING AND AGRICULTURAL PRODUCTIVITY: THE COPING STRATEGIES OF FARMERS IN RINGIM, NORTHERN NIGERIA

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Abstract

Flood is a natural phenomenon that is manifesting in Ringim and its environs which needs to be investigated. The study determined flood effects on agricultural productivity in the study area. Five study sites were purposively sampled based on the previous records of flood events in the areas. Judgmental sampling was used in selecting respondents. Survey research method involving the use of observation, questionnaire and interview were adopted in data collection. Descriptive statistics, t test and Likert scale were employed in data analysis. The finding revealed that flood disaster has serious effect on agricultural productivity with 93.0%. Results shows that farm lands damage is higher in Ringim mean index (MI) 2.48 and mean deviation (MD) 0.1. Highest degree of crop damage is recorded in Kyrama with MI and MD 1.6(-5.27). Findings also indicated that there is no significant difference among the areas in terms of flood effects on crop types ($P=0.99$). The level of flood damage on animal habitat is higher in Dabi with MI and MD of 2.43(0.49). The degree of damage of animals' sources of food is higher in Ringim with MI and MD of 1.74 (0.20). The result further revealed that, flood reduced crop yield with 88.75%. Hence, farmers are faced with insufficient farm investments after flood and they commonly adopted selling of household livestock as their coping strategies. Therefore there is the need to educate the community members on more flood prevention, mitigation and coping strategies for effective agriculture in the area.

Keywords: Flood, Farmers, Coping-strategies, Crop-yield, Ringim

Introduction

Flood is one of the oldest and most devastating catastrophes that causes enormous damage and loss of life on a global scale. Upon all environmental hazard, flood is considered to be one of the most common and highly damaging, and it is predicted that flood may likely become more prevalent, more frequent and more serious in the years to come (Muchtar and Bashir, 2010). Abam (2006) defined flood as a large volume of water which arrives at and occupy the stream channel and its flood plain in a time too short to prevent damage to economic activities including homes. The nature of flood disasters and their impacts depend on the natural and man-made conditions on floodplains, economic development and the installation of flood protection measures which has political, economic and social dimension as well as engineering aspects. In some catchments flood monitoring and control devices are completely lacking, particularly in the rural areas. Flood is in most rural areas results from ungauged river systems which are very common all over the globe that amounted to damage on agricultural produce, animal and other landed properties (Roy and Mistry, 2013). To reduce the impact of flood disaster, victims used to

adopt some means that are called coping strategies, depending on disaster type and location. Coping strategies are processes or mechanisms disaster victims employed or adopted to withstand the danger of the calamity. In response to natural disasters like floods, different vulnerable households and victims adopted different coping strategies to reduce the impact (Samaraweera, 2018). Thus, flood disaster can be described by various parameters including flood extent, water depth, flow velocity, duration, preparedness and vulnerability among others (Nigerian Hydrological Services Agency, 2013). Flood effect on agricultural productivity is a serious disaster of global concern that is capable of damaging crops and results in alarming decline in yields. The frequent occurrence of floods and droughts affect agriculture and socioeconomic conditions of rural households and increases rural poverty which may even lead to suicide in countries like India (Parida, *et al.*, 2018). Over 30% of rice cultivated in India like in the other parts of the globe is damaged by flood disaster almost every year (Dar, *et al.*, 2013). In Ghana like in the wider world, floods are among the most frequent and devastating natural disaster that affects the livelihood of the people (Musah, Abayomi and Jibrel, 2013). Effect of flood on livelihood is becoming serious and need to be investigated for economic and social wellbeing. Study of flood risk mitigation strategies can be undertaken through different methods. Flood-risk on agriculture, socioeconomic and livelihood can be managed through either flood-risk assessment or flood-risk mitigation (Rimba, *et al.*, 2017). For that studies of the effect flood on agricultural productivity particularly in rural areas is very vital for significant and meaningful development.

Incidents of flood are not a recent phenomenon to people of Ringim as they have been living in flood prone areas for decades. The area has suffered floods for three (3) consecutive rainy seasons (2001, 2005 and 2012). These seasons have been described by the community as the worst in terms of the amount of rainfall received and level of impact. The flood submerged houses, schools, clinics and roads among others causing severe damages and inconveniences to human and societal well-being. The incidence of flood disasters in Ringim LGA is becoming more severe and devastating in recent times due to the effects of climate change and other hydro-meteorological parameters (Umar, 2016). Some of the recent flood disasters in Ringim LGA that were highly devastating in nature include the floods of 2012, 2013, 2014, 2015, 2018 and 2019. Despite the expected increase in frequency and magnitude of flood in the Nigeria and invariably Ringim. Most of the studies undertaken in and around the study area are to do with impact of flood on the socio-economy and livelihood. Studies on flood impact on agricultural productivity are lacking in the area. These amounted to scarcity of comprehensive data on effect of flood on agricultural productivity for effective planning and development in the area.

Banerjee (2010) studied impact of flood on agricultural productivity in Bangladesh from 1978 to 2000 using secondary data and survey methods. Finding of that research revealed that agricultural productivity are higher in more flooded areas and when flood become extreme the yield of crops declined. But this study compared two sets of areas and failed to concentrate on the negative site of the flood. Marcellinus and Joseph (2015) conducted a study on the assessment of the impact of flood events in Makurdi, Nigeria. The study used information sourced from questionnaire and personal observation. The results of the analyses show that floods in Makurdi occur at the event of high rainfall intensity and mostly between September and October. Their study centered more of residential area flood rather than on effect of flood on agricultural productivity. Ajibade, Babatunde, Ajibade and Akinsola (2019) Undertook study on adaptation strategies employed by small holder rice farmers in Kwara State using survey research. Their study reported that 79.5% of the rice farmers adopted the planting of early-maturing rice seedling variety so as to ensure early harvest before the peak of rainfall when floods are usually occurred. The study concentrated on one single crop not on agricultural productivity. Kaugama and Ahmed (2014) Conducted

research on challenges of farming and prospects along Hadejia-Nguru wetland using Focus Group Discussion (FGD) and reported that flood is one of the determining factor of agricultural output and rural livelihood in the study areas. That study recommends for further studies on the effect of flood on agricultural productivity in areas along river Hadejia of which Ringim is one of them.

The scope of most of the existing studies is limited to causes and extent of flood and its effects on infrastructures. Moreover, there is the need for more studies on the effects of flood on agricultural productivity in Ringim local government area. Hence, this study assessed the effects of floods on agricultural productivity and determined whether there is significant difference or not among the areas in terms of flood effects on crop types in Ringim Local Government Area of Jigawa State for effective flood control and food production.

Materials and Methods

The Study Area

Ringim Local Government Area is part of the Hadejia-Jama'are River Basin (HJRB) which is part of the Lake Chad Basin Hydrological Area identified as HA-VIII by the Nigeria Hydrological Services Agency (NIHSA), situated in the Sudano-Sahelian zone of Northern Nigeria. The study area is located between latitude 12°N and 12.20°N and between longitude 8.53°E and 9.20°E. The study area has a total land area of approximately 1,057Km². The area is bordered by Kano State to the west, Garki Local Government Area to the north, Dutse Local Government Area to the south-East, and Taura and Jahun Local Government Areas to the east (figure 1). The population is projected to be 257,100 as at 2016 (NPC, 2006). Majority of the population are Hausa and Fulani. The working population of Ringim local government area are mostly farmers, livestock/poultry farmers, marketers and other administrative civil servants with rich cultural values.

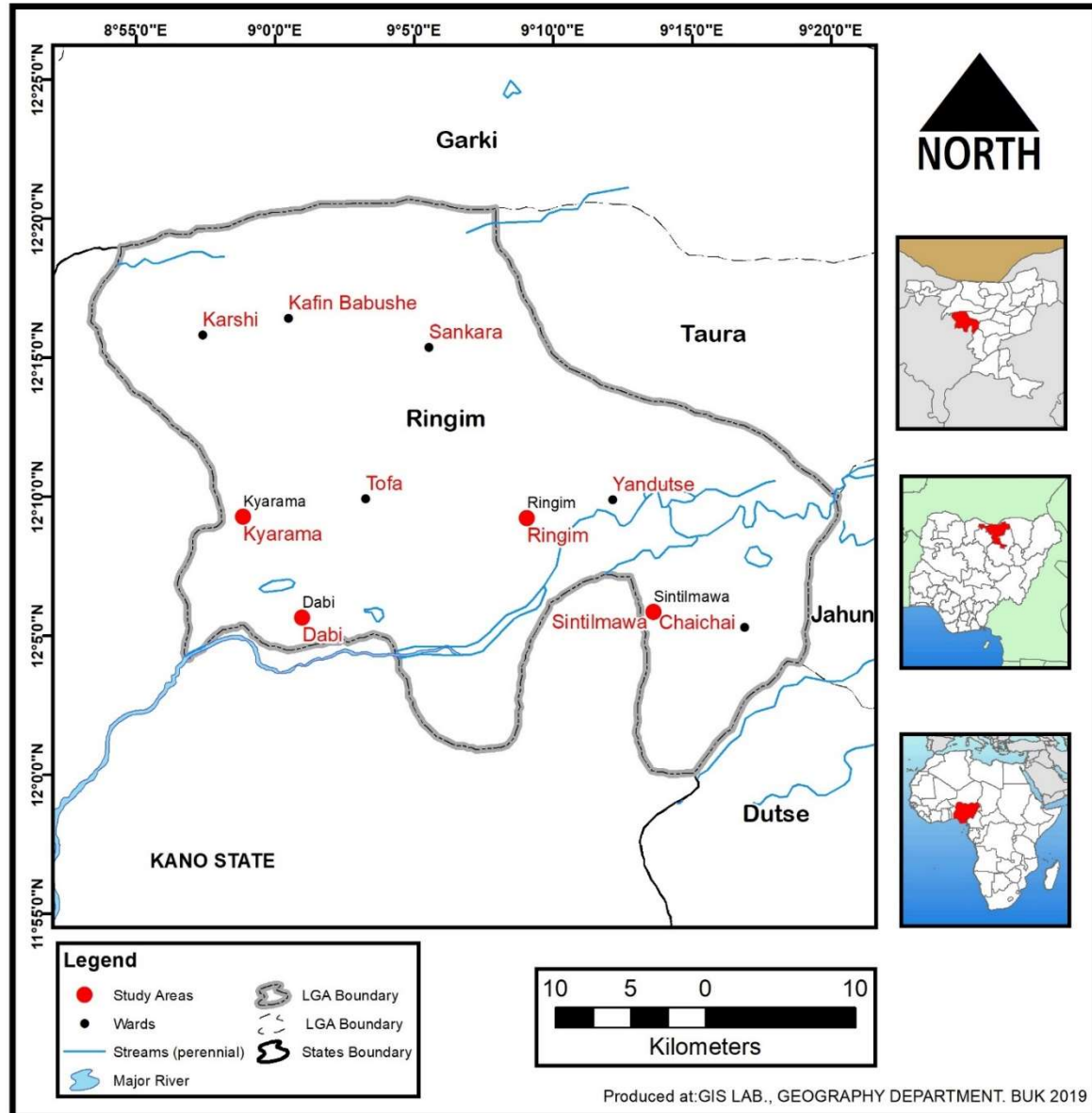


Figure 1. Ringim Local Government Area in Jigawa State

Source: Google Earth (2020).

Data Collection

A reconnaissance survey was carried out before the actual field work, to investigate flood prone areas and the sampled areas for the study in order to evaluate the feasibility of the study and to get necessary information for the study. The study adopted the methodology of Atu and Okon (2018) in selecting sample sites. Thus, 5 wards were purposively chosen out of the existing 10 wards to form the sample, based on their dominance in agricultural activities and flood events. This study areas are Dabi, Karama, Ringim, Sintilmawa and Yandutse. These areas are considered the most flood prone in the study area. Field observation, interview and household (HH) questionnaire were utilized in collecting data. A total of 400 questionnaire were administered by adopting the Yaro Yamane's formula given as:

$$n = \frac{N}{1 + N(e)^2}$$

Where: n= sample size required

N = number of households (28,210)

e = allowable error (%)

Substitute numbers in formula:

$$n = 28,210 \div 1 + 28,210 (0.05)^2$$

$$n = 400$$

Data Analysis

The study used statistical techniques in analysing the data obtained from the research respondents. The statistical techniques involved the use of descriptive statistics, t-test and Likert scale of analysis. The data collected from the research respondents were represented statistically, using frequency distribution, tables, percentage and figures. The statistical analyses were carried out using the Statistical Package for Social Sciences (SPSS) and Microsoft Excel soft wares.

Results and Discussion

Occupation of the Respondents

Responses on occupation shows that more than half of the respondents (53.5%) were farmers, they relied-on farming as source of their livelihood. Followed by 34.8% respondents who are public servants with experience in farming, and 8.8% respondent's practice trading and farming while 3% of the respondents are students (table 1).

From the result, most of the respondents with cumulative percentage of 97% practice farming (table 1). As such, the respondents are in the right position to give account on the effects of flood on agricultural productivity and livelihood. Even the remaining 3% of the respondents who happens to be students have experience in farming because they work in their family farms during holidays or vacation to assist their parents. This goes in line with the findings of Myint (2018) who find out that, all sample farm households in the study area mainly relied on agriculture for their main household income, followed by livestock production, handicraft making and working as casual labour.

Table 1 Respondent's Occupation

Occupation	Responses	Percentage (%)
Farming	214	53.50
Public servant	35	8.75
Farming/Trading	139	34.75
Students	12	3.0
Total	400	100.0

Source: Field Survey, 2019

Respondents Experience in Farming

Findings indicated that 92.3% of the respondent are in farming system for over 10 years, 3.3% respondent for about 6-10 years, 3% for about 3-5 years and 1.5% for less than 2 years (table 2). This means majority of the respondents have more than ten years of experience in farming. Their experience in farming equipped them with knowledge of flood occurrences and its effects on farming and livestock. Thus, it supports the findings discussed under table 1 that the research respondents are in the right position to give information on the effects of flood disaster on crops and livestock farming and its effects on the quality of the environment of the affected areas.

Table 2 Respondent's Years of Experience in Farming

Years	Responses	Percentage (%)
0-2years	6	1.5
3-5years	12	3
6-10years	13	3.3
Over 10years	369	92.2
Total	400	100.0

Source: Field Survey, 2019.

Level of Damage on Farmland

The result shows that 32.75% of the respondent indicated that, farmlands are seriously damaged by flood disaster, 18.25% indicated moderately damage, while 27.25% indicated less damage. However only 21.75% of the respondent indicated no damage (Table 3). The category of serious damage on farmland is high (32%) compared to others and it has affected Dabi, Kyarama, Ringim, Sintilmawa and Yakasawa. Though, the effect is higher in Dabi 7.25% and lowest in Ringim 6.0 % (Table 3). From the transit visit of the study area it was found that, farmlands are made unproductive by flood through river erosion, inundation and leaching through siltation. The degree of damage of farmlands is higher in Ringim with Mean index and mean deviation of 2.48(0.1) and lower in Dabi with mean index and mean deviation of 2.45 (-0.1) (Table 4). The analysis therefore revealed that the level of damage flood disaster causes to farmland is serious as indicated by majority of the respondents. That is to say, whenever the disaster occurs, it causes serious damage to farmlands by way of erosion, degeneration leaching and siltation. This finding is in line with the finding of Esohe (2012) that flood disaster destroyed several thousands of hectares of farmlands.

Table 3 Level of Damage on Farmland

Level of Damage	Study Areas					Total (%)
	Dabi	Kyarama	Ringim	Sintilmawa	Yakasawa	
Serious damage	7.25%	6.25%	6.0%	7.0%	6.25%	32.75%
Moderate damage	4.0%	3.5%	3.25%	4.0%	3.5%	18.25%
Less damage	4.75%	5.5%	6.0%	5.75%	5.25%	27.25%
No damage	4.0%	4.75%	4.75%	3.25%	5.0%	21.75%
Total	20.0%	20.0%	20.0%	20.0%	20.0%	100%

Source: Field Survey, 2019

Table 4 Degree of farm lands damage by flood according to areas

Areas	1	2	3	4	Ef	SWV	MI	MD	Rank
Ringim	24	13	24	19	80	198	2.48	0.1	1
Yakasawa	25	14	21	20	80	196	2.45	0.07	2
Kyakarma	25	14	22	19	80	195	2.44	0.06	3
Sintilmawa	28	16	23	13	80	181	2.26	-0.12	4
Dabi	29	16	19	16	80	182	2.28	-0.1	5

1= serious damage, 2= moderate damage, 3= less damage, 4= no damage

Source Data Analysis, 2019

Level of Damage on Crops

Majority of the respondents (78.75%) indicated that flood disaster causes serious damage to crops production, 8.5% indicated moderate damage, while 6.25% indicated less damage. From the analysis, only 6.5% of the respondents indicated that flood has not damaged crops (table 6). It is a well-known fact that 97% of the respondents are directly or indirectly dependent on crop production, this by implications means crop production is the mainstay of the study area. The results from the analysis revealed that, the level of damage flood disaster causes to crops is serious as indicated by the majority of the research respondents. The most seriously damaged area in terms of crop production is Yakasawa area with 16.50% and the effect has resulted to loss of crops produce affecting food availability and livelihood earning causing hunger and poverty to the people in the area. Thus, serious damages by flood to crops production is higher (78.75%) compared to seriously damage of flooding on farmlands (32.75%) (Table 6).

From the local interview, it was found *“that during any flood event, the most affected sector is crop production”*. There are a number of impacts of flood in crop production as shared by the farmers during the interview. *“Due to flooding and inundation, in majority of the cases, farmers were unable to plant crops and transplant paddy on time”*. This delayed the harvesting of crops as well as plantation of winter season crops. The delay in planting and harvesting of crop is responsible for the change in the cropping pattern which in turn reduces the total crop

production. From the result Kyarama has the highest degree of crop damage and Yakasawa with lowest with mean interval and mean deviation of 1.6(-5.27) and 1.3(-5.63) respectively (Table 7). This finding is in line with the finding of Atu and Okon, (2018) that reduction in the crop production and changes in cropping pattern are immediate impacts of flood on the livelihood of farmers.

Table 6 Level of Damage on Crops Production

Level of Damage	Study Areas					Percentage (%)
	Dabi	Kyarama	Ringim	Sintilmawa	Yakasawa	
Serious damage	16.0%	14.25%	16%	16.25%	16.50%	78.75%
Moderate damage	2.25%	1.25%	1.50%	1.75%	2.0%	8.5%
Less damage	1.0%	2.0%	0.75%	0.75%	1.0%	6.25%
No damage	0.75%	2.50%	1.75%	1.25%	0.5%	6.5%
Total	20.0%	20.0%	20.0%	20.0%	20.0%	100.0

Source: Field Survey, 2019.

Table 7 Degree of crops damage by flood according to areas

Areas	1	2	3	4	Ef	SWA	MI	MD	Rank
Kyarama	57	5	8	10	80	131	1.6	-5.27	1
Suntulmawa	65	7	3	5	80	108	1.4	-5.56	2
Dabi	64	9	4	3	80	106	1.3	-5.58	3
Ringim	64	6	3	7	80	105	1.3	-5.60	4
Yakasawa	66	8	4	2	80	102	1.3	-5.63	5

1=serious damage, 2= moderate damage, 3= less damage, 4= no damage

Crop Species Affected by Flood

The analysis shows that majority of the respondents (63.75%) indicated that grains are the most affected crops by flood disaster in the study area, 9.5% respondents indicated spices, 8.5% indicated vegetables, 8.25% indicated legumes while 5.5% indicated tubers as the most affected crops in the study area. (Table 8), 4.5% of the respondent indicated that fruits are the most affected crops by flood disaster in the study area (table 8). The analysis revealed that, the major crop species affected by flood disaster listed on table 15 revealed that grains (Corn, Maize, Millet and Rice among others) are the most affected crops in the study area. Vegetables, tubers, spices and legumes are the least affected crops in the study are because they are cultivated by most of the famers during dry seasons. Findings also indicated that there is no significant difference at 0.05 level among the areas in terms of flood effects on crop types (P=0.99) (Table 9). This finding is in line with that of Atu and Okon (2018) who stated that household food staples are at most risks. These food staples include: vegetables, spices, legumes, tubers, grains, and fruits.

Table 8 Crop Species Affected by Flood in the Study Area

Crop Types	Study Areas					Percentage (%)	
	Dabi	Kyarama	Ringim	Sintilmawa	Yakasawa		
Fruits	2	2	3	6	5	18	4.5%
Grains	51	54	53	48	49	255	63.75%
Legumes	7	8	6	8	4	33	8.25%
Spices	8	6	4	11	9	38	9.5%
Tubers	4	3	5	3	7	22	5.5%
Vegetables	8	7	9	4	6	34	8.5%
Total	80	80	80	80	80	400	100%

Source Field survey, 2019.

Table 9 Level of Differences of crop types damage among the areas

Source of Variation	SS	Df	MS	F	P-value	F crit
Between Groups	2.64	4	0.66	0.001631	0.999994	2.866081
Within Groups	8092.4	20	404.62			
Total	8095.04	24				

Level of Damage on Animal's Habitat

Flood makes things incredibly difficult when it comes to animal husbandry. From the field study, it was observed that annual flooding has impacts on livestock like goat/sheep, chicken, and cow among others. It indicated that 51.75% of the respondent indicated that flood disaster causes serious damage to animal habitat, 19.5% indicated moderate damage, while 13.5% indicated less damage. From the table only 15.25% indicated no damage (table 10). This revealed that, the level of damage flood disaster causes to animals' habitat is serious as indicated by more than half (51.25%) of the respondents. Besides constant access to food and water, the most things to have for good animal husbandry, is shelter. On average, the analysis revealed that flood disaster causes serious damages to agriculture in the affected areas, with farmlands crop produce and animals being exposed to highest level of risk. It is pertinent to note that the damage to animal's habitat is also of great concern to the fishermen, farmers and peoples in the areas. This is because destruction of animal's habitat will amount to the reduction in the availability of animals in the area as well as their produce. All the above-mentioned issues will lead to shortage of animal's species that serve as sources of foods leading to hunger and starvation, poverty, problems to economic activities. The level of flood damage on animal habitat is higher in Dabi while lower in Kyarama with mean index and mean deviation of 2.43(0.49), 1.69(-0.25) respectively (Table 11). This finding is in line with that of Saleh (2014) that damage of the animal house is one of the major problems for the flood. According to his finding "they suffer a lot to save their cattle from flood water. Some time they sent their cattle to the embankment".

Table 10 Level of Damage of Flood Disaster on Animal Habitat

Level of Damage	Study Areas					Percentage (%)
	Dabi	Kyarama	Ringim	Sintilmawa	Yakasawa	
Serious damage	11.75%	9.75%	7.75%	11.0%	11.0%	51.75%
Moderate damage	4.50%	4.0%	2.75%	4.25%	4.0%	19.5%
Less damage	2.0%	3.25%	2.75%	2.75%	3.25%	13.5%
No damage	1.75%	3.0%	6.75%	2.0%	1.75%	15.25%
Total	20.0%	20.0%	20.0%	20.0%	20.0%	100.0

Source Field Survey, 2019

Table 11 Degree animal habitat of damage by flood according to areas

Areas	1	2	3	4	EX	EFX	MD	SWA	Rank
Dabi	31	11	11	27	80	194	2.43	0.49	1
Suntulmawa	39	16	13	12	80	158	1.98	0.04	2
Ringim	44	17	11	8	80	143	1.79	- 0.15	3
Yakasawa	44	16	13	7	80	143	1.79	- 0.15	3
Kyarama	47	18	8	7	80	135	1.69	- 0.25	5

1= serious damage, 2= moderate damage, 3= less damage, 4= no damage

Level of Damage on Animal's Sources of Food

The most important to have for good animal husbandry is constant access to food, water and shelter. Livestock farming requires pasture that will allow the animals to move freely and fed.

It can be seen that 65% of the respondent indicated that flood disaster causes serious damage to animals' sources of food, 20.5% indicated moderate damage, while 10.25% indicated less damage. From the table only 4.25% of the respondents indicated that flood causes no damage to animals' sources of food (table 12). This is an indication that whenever there is flood, food for livestock was a great problem. Similar to damage of animal's habitat, food crisis of the livestock is one of the major problems during any flood. From the transit visit of the study area it was found that, the open land and the grassland was under water. During the interview, some respondents said

that “to manage food for the livestock was a very challenging issue, because the open field and grassland were under water”.

The aforesaid result revealed that the level of damage flood disaster causes to farmland is serious as indicated by majority of the respondents. It is however, important to note that damage to animal’s sources of food has great effect to the availability of animals and their productivity which will affect food price, level of livelihood and earning as well as change in the nature of economic activities, causing poverty and hunger. The degree of damage of animals’ sources of food is higher in Ringim and it is lower in Dabi with mean index and mean deviation of 1.74 (0.20), 1.35(0.19) respectively (Table 13). This finding is in line with the finding of Saleh (2014) that food crisis during flood for cow, goat/sheep was the main complaint of the respondents.

Table 12 Level of Damage on Animal’s Sources of Food

Level of Damage	Study Areas					Percentage (%)
	Dabi	Kyarama	Ringim	Sintilmawa	Yakasawa	
Serious damage	14.25%	12.5%	11.75%	13.0%	13.5%	65.0%
Moderate damage	4.75%	3.75%	3.75%	4.0%	4.25%	20.5%
Less damage	0.75%	2.75%	2.5%	2.25%	2.0%	10.25%
No damage	0.25%	1.0%	2.0%	0.75%	0.25%	4.25%
Total	20.0%	20.0%	20.0%	20.0%	20.0%	100.0

Source Field Survey, 2019.

Table 13 Degree of animal fodder damage by flood according to areas

Areas	1	2	3	4	EX	EFX	MD	SWA	Rank
Ringim	47	15	10	8	80	139	1.74	0.2	1
Kyarama	50	15	11	4	80	129	1.61	0.07	2
Sintilmawa	52	16	9	3	80	123	1.54	0.00	3
Yakasawa	54	17	8	1	80	116	1.45	- 0.09	4
Dabi	57	19	3	1	80	108	1.35	- 0.19	5

1=serious damage 2=moderate damage 3= less damage 4= no damage

Difficulties of Farming Faced by Flood Victims after Flood event

Almost all the respondents (88.75%) indicated low yield in the agricultural production as the main difficulties faced by the flood victims of the study area after flood, about 69.25% indicated that famers faced insufficient farm investment and 57.50% faced pest or disease infestation due to flood. Simultaneously; about 55.25% of the research respondent indicated that the flood victims had to face labour scarcity for farm after flood and 51.25% of the respondent had inadequate amount of quality seeds as the main difficulties in their faming too (Figure 2).

The analysis revealed that, the effects of flood highly reduced yields of the main cultivated crops in the study area. Therefore, low yield in the agricultural production was the main difficulties faced by farmers as indicated by almost all the respondents (88.75%). As result, majority of the farmers had to faced insufficient farm investments, pest or disease infestation due to the flood. Low yield in agricultural production couple with pest or disease infestation and insufficient farm investments leads to scarcity of labour and lack of quality seeds. This by inflictions means farmers had to face labour scarcity for farms and inadequate quality seeds after flood because of migration and damage of the seed respectively. This finding is also in line with the finding of Myint (2018). San Myint revealed that, farmers are faced with disease infestation, poor yield, lack of quality seeds and insufficient farm investments after flood.

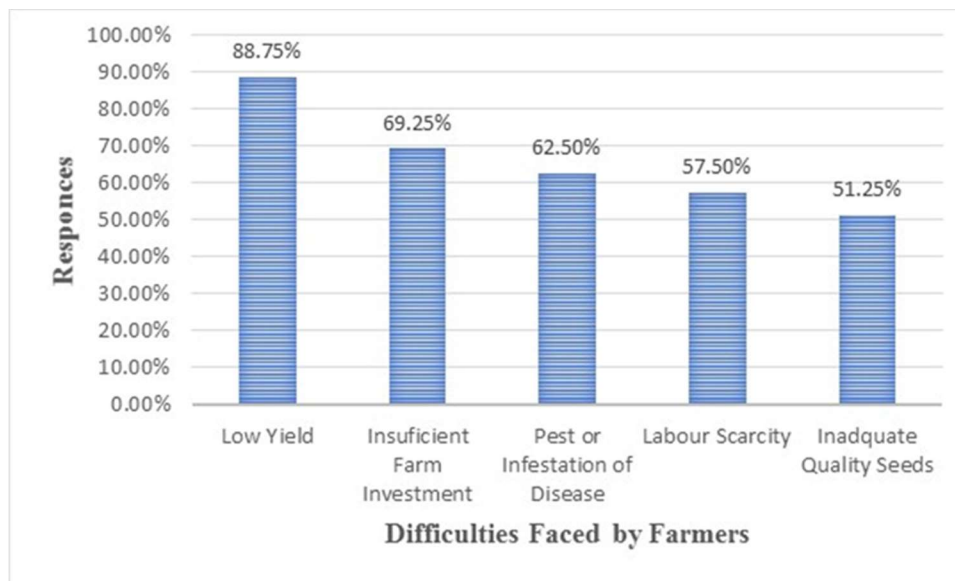


Figure 2 Difficulties in farming faced by famers after flood:

Source Field survey, 2019

Coping Strategies Used by Farmers after Flood

Coping strategies in the study area can be divided into two: immediate and aftermath. "Immediate" refers to actions that are undertaken during the flood events. "Aftermath" refers to action taking after food events. Some of the most common coping strategies adopted by famers in the study area after flood include the following: reduce expenditure, selling of livestock, irrigation farming, borrowing money and out-migration among others. The result from the analysis shows that, all (81.25%) of the respondents indicated that, farmers reduce their expenditure after flood as a coping strategy, 63.50% indicated famers adopted selling livestock

while 71% of the respondents indicated that, famers adopted irrigation farming as coping strategy and 31.75% of the respondents indicated that farmers adopted borrowing money and 21.50% of the respondents indicated migration (figure 3).

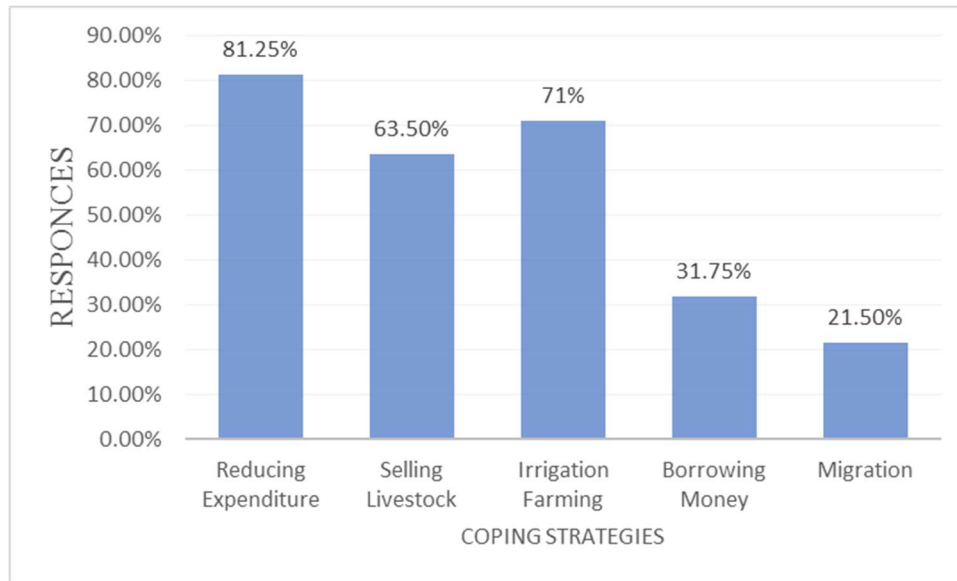


Figure 3 Coping strategies used by famers after flood:

Source Field survey, 2019

The results from the analysis shows that reducing expenditure was their first most used coping strategy by famers after flood and the second most used strategy for majority of the respondents was irrigation farming. According to majority of the respondents, they used the money they earned from selling their livestock for irrigation farming, while few of them borrow money from their relatives or neighbors.

According to some of the respondents, they only borrowed money from their families, neighbors or friends, they do not borrow money from banks or any institutions that interest, because is against their religion. And also borrowing money with various interest rate will lead to higher debt for farmers in the long term. This finding however is substantiated by that of Frederick *et al* (2010) that some of the strategies that respondents implemented to cope with the floods include the fishing, selling of livestock, out migration, weeding the farms of other individuals in return for food, trading and selling in nearby townships and obtaining loans from social contacts among others.

Conclusion

Flood disaster is the most common and most frequent occurring environmental disasters in the study area. The fact that the flood disaster occurrences are often sudden, frequent and not well prepared for, poses serious damages to agriculture and economic resources of the study area in terms of damage to farmlands, loss of crops and loss of livestock. As for crop production, the average yields of main cultivated crops were significantly reduced and are also faced with pest and disease infestation after the flood. The lower yield resulted to lower farm income which leads to insufficient farm investment for the upcoming seasons in the area. The crop type mostly

affected by flood disaster in the area are grains. It is revealed that farm lands damage, crop damage, damage on animal habitat and damage of animals' sources of food are higher in Ringim, Kyarama, Dabi and Ringim respectively. However there is no significant difference among the areas in terms of flood effects on crop types. The study identified reducing expenditure and selling of livestock after flood disaster among others as the major coping strategies in the area.

Recommendations

Based on the findings of the study it is recommended that there is the need to strengthen coordination in forecasting, preventing and mitigating the impacts of flood disasters through common initiatives, such as: creation of committees or organizations for responding to flood disasters; enhancing information and data sharing on flood disaster events; building capacity of stakeholders and local authorities for the assessment of impacts; and designing coping strategies and adaptation measures. Government through the Ministry of Agriculture and Cooperatives should, through extension services encourage communities to increase tree plantation on the upland areas in order to control flood and enhance food security at household level. There is the need to introduce interest free loan to farmers by governments and nongovernmental organisations and through World Bank farmers' loan scheme. Further studies should be conducted on effect of flooding on environmental quality, flood risk and vulnerability mapping in the area for effective development and estimation of peak flood discharge for an ungauged rivers in the area for effective flood control and mitigation.

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