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The Impacts of Floods on Crop Production in Kilosa District, Tanzania

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Abstract

Floods pose a major threat to agricultural production in Kilosa District, Tanzania, with the Mkondoa River being a primary source of flooding. This study aimed to assess the impacts of floods on crop production in Kilosa District. A cross-sectional research design was employed, involving a household survey of 120 respondents, focus group discussions and key informant interview with various stakeholders. The results show that floods have had significant negative impacts on crop production in the district. Over 80% of the population in Kilosa depend on agriculture, and this sector is affected by floods. Respondents reported substantial losses in crop yields and damage to farmland due to recurring flood events. The study also identified several initiatives conducted by the local community, organizations and the government to reduce the impact of floods. However, more effort is needed to minimize the impact on crop damage. The insights from this assessment can inform policymakers and development practitioners in designing and implementing effective flood management strategies for Kilosa District

Keywords: Flood, impacts, crop production, agriculture

1.0 Background information

Flooding is the leading cause of losses from natural hazards worldwide, responsible for a greater number of damaging events than any other type of natural event. At least one third of all losses due to natural forces can be attributed to flooding. Asia is the most flood-affected region, accounting for nearly 50% of flood-related fatalities in the last quarter of the 20th century (Doocy, 2013), with major flood events in China (1996, 1998), India, Nepal and Bangladesh (1998) attracting great attention worldwide (Loster et al., 1998).

The impact of floods on agriculture and rural populations in many parts of the developing world is detrimental and serious. In 2006, the Commodity Risk Management Group (CRMG) of the World Bank's Agriculture and Rural Development (ARD) department started to explore solutions for transferring flood risk for agriculture (Dick W et al., 2009).

The African continent is not immune to floods either. A UNEP report (2006) showed that many people in Africa are more vulnerable to climate change-related hazards, including floods. Countries prone to flood disasters in Africa include Mozambique (2000), Nigeria, Uganda, Ghana and Tanzania. According to the flood portal of the European Commission's Joint Research Center, Institute for Environment and Sustainability (2010), more than one million people were affected in over 20 African countries, with approximately 500 lives lost and over 1.2 million people displaced from their homes (Sokona and Danton, 2001). Moreover, with the increasing frequency of floods associated with climate change, agricultural

production is likely to decline, and the state of food insecurity and malnutrition will increase (Kumsa and Jones, 2010).

Similarly, in Tanzania, floods are on the rise in various parts of the country, and the projected changes in rainfall patterns are also likely to exacerbate this trend. Flood-prone regions in Tanzania include Tanga, Dodoma, Mbeya, Morogoro (Kilombero and Kilosa), Pwani, Arusha, Dar es Salaam, Rukwa, Iringa, Kigoma, and Lindi (Senga, 2007). In Kilosa, records show that there have been frequently occurring floods in the district since 1935, with the Mkondoa River being one of the main reasons (UNICEF, Tanzania, 2013). At the time, the colonial government built water reservoirs and levees along the river to prevent the floods, but due to a lack of regular maintenance, the levees and dams broke, leaving the surrounding community vulnerable to the recurring floods (URT, 2005). Although there have been incidents of floods in Kilosa, the impact on crop production has not been evaluated. More than 80 per cent of people in Kilosa depend on agriculture (KDC, 2010), growing a variety of crops, including maize, rice, millet, cassava, beans, bananas, and cowpeas. Besides food crops, the main cash crops are sisal, cotton, coffee, wheat, cashew nuts, coconuts, sugar cane and tobacco. Some of the food crops are also used as cash crops. However, the trend of frequently occurring floods in Kilosa District has had a significant impact on the agricultural sector, which is the main source of livelihood for the population.

Although various government projects, such as the Tanzania Social Action Fund (TASAF), are taking place in Kilosa District to address the problem of floods, as reported in the International Federation of Red Cross and Red Crescent Societies' report (2010), there is limited information about the impact of floods on crop production in Kilosa. This study aims to assess the impacts of floods, with a focus on crop production, in Kilosa District.

2.0. Materials and methods

2.1 Study area

Kilosa District lies between 6°S and 8°S, and 36°30'E and 38°E. It borders the Tanga Region to the north and Morogoro District to the east. In the south, it is bordered by the Kilombero District and part of Iringa Region (KDC, 2000). Kilosa District comprises mostly flat lowland that covers the whole of the eastern part, known as the Mkata Plains. Four villages (Kiyangayanga, Mbwamaji, Mbumi A, and Mbumi B) in Kilosa District, Morogoro region (Tanzania), were involved in this study. The selection of the study area is based on the fact that the district is one of the areas within Tanzania that is highly affected by floods almost every year during the rainy season.

The climate of Kilosa District is semi-humid, with an average annual rainfall of 800 mm. The temperature ranges between 25 and 28 degrees Celsius, and the district is divided into three zones: flood plain zones, located at an altitude of around 550 meters and consisting of black, cracking clays with poor drainage in the center that are prone to seasonal floods; plateau zones consisting of sandy soils that are highly erodible, well-drained, and fairly fertile, situated at an altitude of around 1,100 meters (Burgess et al., 2007); and a highland zone consisting of mountains that rise to a height of 2,200 meters (Kilosa District Council, 2010). The population of Kilosa District was 438,175 in 2012 (URT, 2012), with over 80% of the population relying on agriculture and forest-based resources for their livelihoods (Kilosa District Council, 2010).

2.2. Research Design

This study used a cross-sectional research design by collecting data at one point in time (Mugula, 2016). The stakeholders in this study include farmers in the selected locations, local government leaders, institutions, and the community as a whole. They were targeted because these people are located in

different agro-ecological zones, practice different production systems, and are adversely affected by floods in crop farming. Local government leaders are also important because they can provide information on the government and institutional structures available within the district that are responsible for managing floods

2.3. Household survey

The researchers and their field assistants administered questionnaires to 120 respondents through in-person interviews. This approach allowed them to gather both qualitative and quantitative data.

Prior to the main data collection, the questionnaires were pre-tested to check the wording, clarity, and layout. The researchers also recruited four local field assistants to help with the data collection.

The questionnaires covered a range of issues, including the respondents' socio-economic backgrounds, the available governance and institutional structures for managing and controlling floods, as well as the effectiveness of those structures in addressing flood-related challenges.

2.4. Focus group discussions

The researchers organized formal group discussions, involving a diverse set of participants. This included local leaders, as well as male, female, and student representatives. Each discussion group had three members. The focus of these group discussions was on the governance and institutional structures related to flood management and control. The participants explored the level of coordination and collaboration between the local community, the government, and the various institutions engaged in flood-related activities and decision-making. The group discussions provided a platform for the participants to share their perspectives, experiences, and insights on the existing arrangements for flood management and the interactions between the local people, authorities, and relevant institutions. This allowed the researchers to gain a deeper understanding of the community's views on the strengths, gaps, and opportunities for improvement in the current governance and institutional frameworks for addressing flood-related challenges.

2.5. Key informant Interviews

In addition to the group discussions, the researcher conducted formal interviews with a range of individuals who had relevant knowledge and firsthand experience related to the community and floods in the area. Key informants also included (ward and village leaders, agriculture extension officers, official from NGOs) and, the study aimed to select two wards and only four villages will be selected. Moreover, the selection key informants will be purposive sampling. Key informants including village extension officers and village leaders will be interviewed for administrative and technical issues regarding impact of floods on crop production, mitigation and adaptation strategies

2.6. Field site visits

The researcher and field assistants visited all of the study villages to get a comprehensive understanding of the effect of flood on crop production and control measures. During these visits, the researchers observed various issues, such as effects of flood on crops, flood management control practices implemented in the villages and economic activities and resources available in the communities.

2.7. Documentary review

Secondary data were accessed through books, journals, and official reports. Documentary review was used to identify the link between governance and/or institutional structures and flood

management and control practices. The review was also used to get an understanding of the issues related to the thematic research area.

2.8. Data analysis

Collected data were cleaned, coded and for the quantitative data they were analysed through the usage of the Statistical Package for Social Sciences (SPSS) 20.0 computer programs, for windows. Qualitative data were analysed by using the content analysis technique, which mainly involved the transcription of he recorded note books and then clustering information into subthemes.

3.0. Results and discussion

3.1. Demographic characteristics

The study had a total of 120 respondents, of which 75 (62.5%) were male and 45 (37.5%) were female. The number of male respondents appeared to dominate the number of female respondents, likely because the males were more actively involved in responding to the household survey questions compared to the females.The marital status of the respondents in the study area was also examined, with the intent of identifying the proportions that were married, single, divorced, or widowed. However, the majority of the respondents were married (Fig 1)

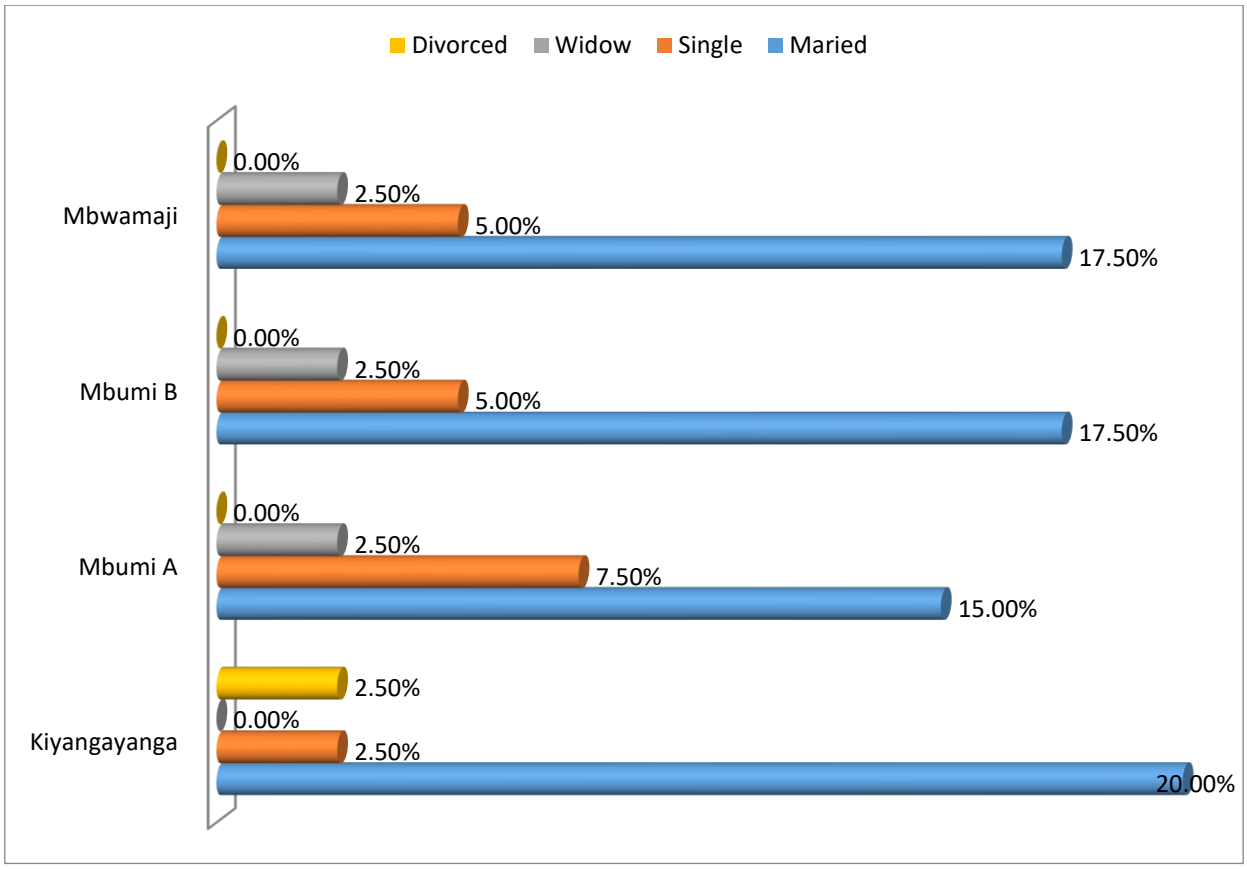

Figure 1: Marital Status of the Respondents

Majority of respondents were attained primary education (Fig 2) and therefore the majority of the respondents are able to read and write, also response and answers obtained from the field.

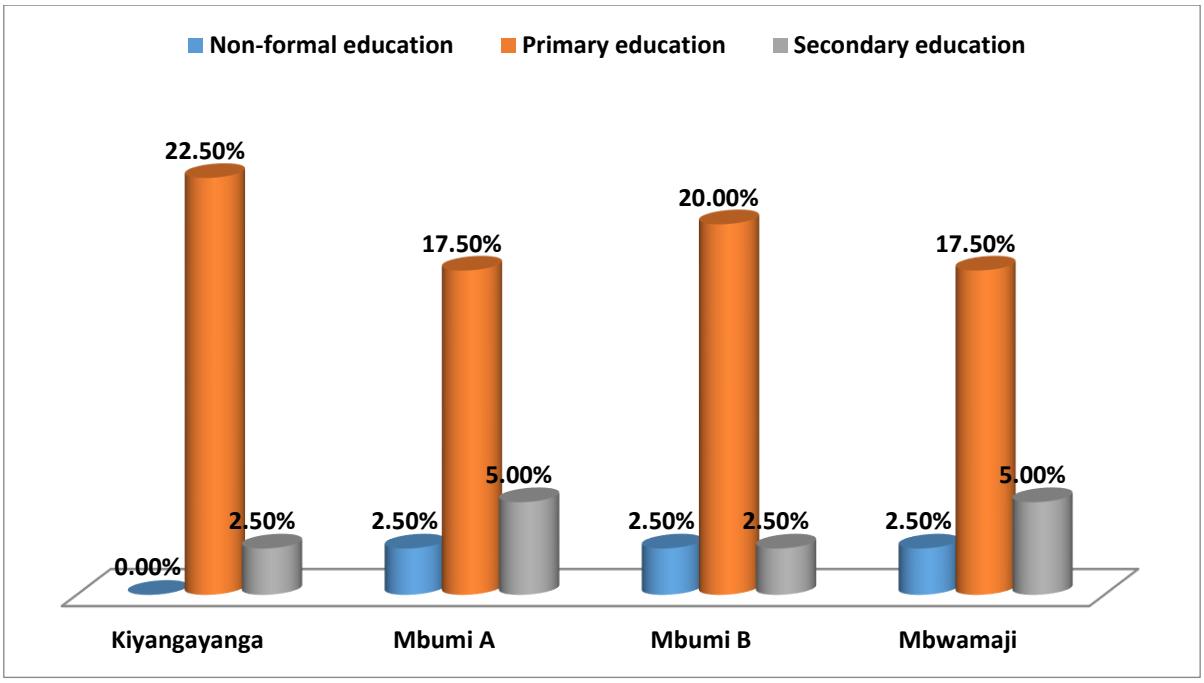

Figure 2: Education level of the respondents

3.2. Awareness on floods occurrence

This part aiming at assessing if the community aware on the occurrence of floods in their location, on this study 120 respondents were interviewed of which all respondents said "yes" that they have awareness on occurrence of floods in their locations.

3.3. Frequency of floods occurrence

During an interview with the Kilosa District crop officer on April 26, 2023, the following was stated: "Apparently, floods occur at approximately two-year intervals, and according to evaluations from the local district, ward, and village offices, the floods in the study areas have caused harm to agriculture, particularly to the maize and rice crops."

The household survey also revealed that the majority of respondents mentioned that, in most cases, the floods occur every two years. (Fig 3)

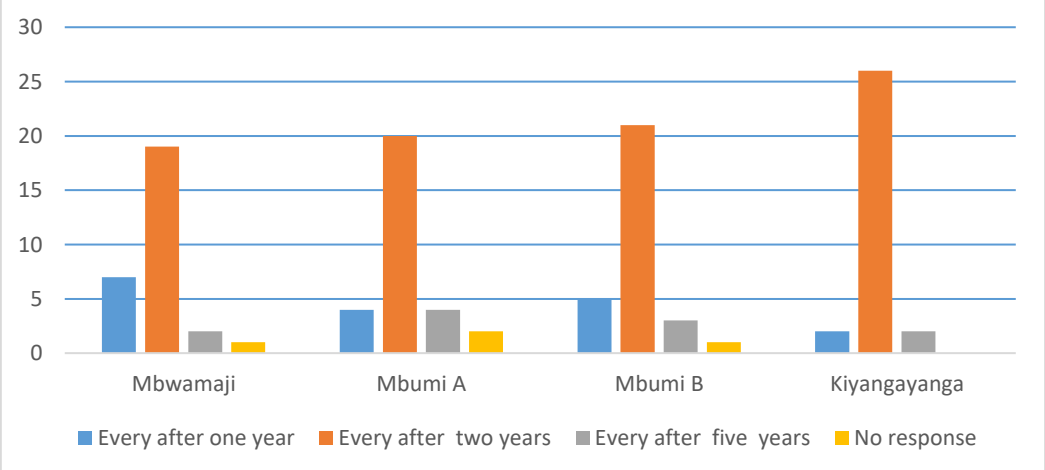

Fig 3: Frequency of floods occurrence Kilosa

During focus group discussion, participants reveled that, the floods occur during heavy rainfall during December and January (Fig 4)

3.4. Assessing the impact of floods on crop production in Kilosa District.

More than 85.00% of the respondents were farmers who grew a variety of crop types, including paddy, maize, cassava, sesame (Sesamum indicum), sunflower, groundnuts, millet, coconut, and banana, among others. However, a few crops were selected (paddy, maize, sesame, and beans) under the study because they were cultivated by every household.

It was revealed that the maize crop was affected much more by the floods compared to the other crops. However, it was also noted that all the crops were impacted by the floods. (Table 1)

Types of crops	**Percentage**	**Frequency**
Paddy	18	15
Maize	47	39
Simsim	15	13
Beans	12	10
All crops	27	23
No response	2	1
Total	**100**	**120**

Table 1: The level of impact of flood on various crops

3.5. Estimation of loss by last floods in crop production

Respondent were asked to estimate the crop loss caused by last floods at household level (in kgs/bags) in the study area, majority were able to estimate the loss during floods of the last year as indicated in table 3 below.

Estimation of maize loss in bags				Estimation of paddy loss in bags		
	Percent	Frequency			Percent	Frequency
No response	5	6		No response	6	6
Less than 10 bags	7.5	9		Less than 10 bags	7	9
More than 10 bags	87.5	105		More than 10 bags	87	105
Total	100	120		Total	100	120
Estimation of simsim loss in bags				Estimation of beans loss in bags		
	Percent	Frequency			Percent	Frequency
No response	7.5	7		No response	1	1
Less than 10 bags	5	6		Less than 10 bags	10	12
More than 10 bags	87.5	107		More than 10 bags	89	107
Total	100	120		Total	100	120

Table 2: Estimation of the crop loss caused by last floods at household level (in bags): 1 Bag =50-100 kgs

3.6. Strategy to reduce impacts of floods by local community on crop production

The data from field survey revealed that majority of the respondents (Fig 5) mentioned "planting reeds and tree along the river Mkondoa" as one among the local community strategies to reduce the impacts of floods on crop production. Other strategies were provision of education, engage in building embankment of the river Mkondoa and evacuate to another areas.

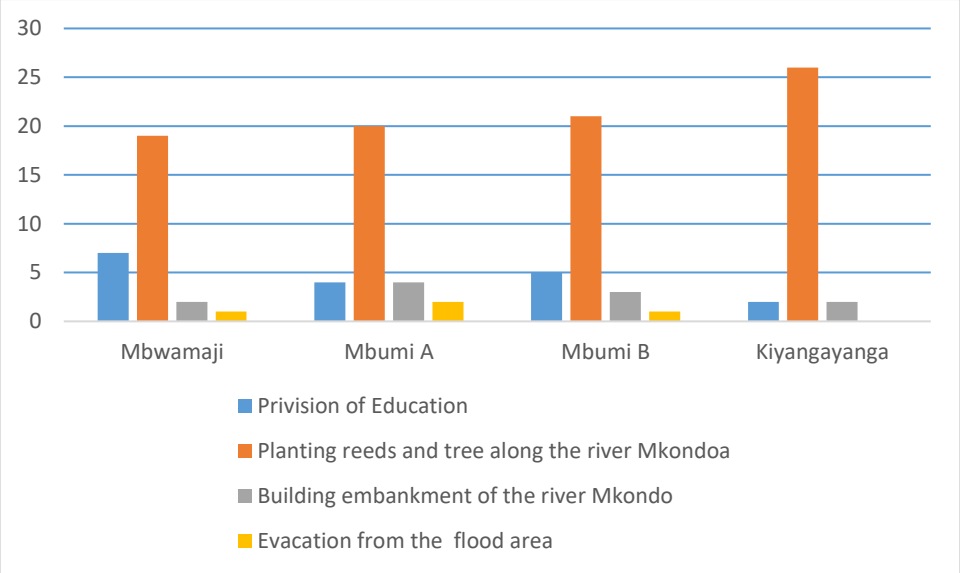

Figure 5. Strategy to reduce impacts of floods by local community

3.7. Efforts by government and organization to minimize impact of floods in crop production.

The study also assessed the government's efforts to minimize the impact of floods on crop production in the study area. The investigation uncovered several initiatives undertaken by the government to address the flood impacts, such as:Construction of embankments along the Mkondoa River, Relocation of people from areas heavily affected by floods, particularly the lowland areas including Mbwamaji and Kiyangayanga. Furthermore, government collaborate with the community to provide information and warnings, preventing agricultural activities within 100 meters of the Mkondoa River banks and also plant reeds along the banks of the Mkondoa River. These measures were aimed at mitigating the adverse effects of the recurring floods on crop production in the study area

4.0. Conclusion

Floods are a major threat to agricultural production in Kilosa District, Tanzania, with the Mkondoa River being a primary source of flooding. This study aimed to assess the impacts of floods on crop production in Kilosa District. A cross-sectional research design was employed, involving a household survey of 120 respondents and focus group discussions with local various stakeholders. The results show that floods have had significant negative impacts on crop production in the district. Over 80% of the population in Kilosa depend on agriculture and this sector is affect by food. Respondents reported substantial losses in crop yields and damage to farmland due to recurring flood events. The lack of proper flood management infrastructure, has exacerbated the vulnerability of farming communities to floods. Overall, the findings of this study highlight the urgent need to address the impact of floods on crop production in Kilosa District, in order to ensure food security and enhance the livelihoods of the local farming communities. The insights

from this assessment can inform policymakers and development practitioners in designing and implementing effective flood management strategies for the region.

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