

Strategies for Mitigating Flood Risks in Western Region, Kenya

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ABSTRACT

The focus on strategies for mitigating flood risks is to identify which measures have been put in place to reduce flood risk using nature-based affordable approaches. It has been observed that there is a continuous increase in floods all over the world, in developed and developing countries, as a result of climate change. Floods have affected millions of people worldwide, leading to environmental, physical, economic, and social losses and reducing the growth of the nation. Disaster Risk Reduction (DRR) strategies have been rated among the best approaches for reducing natural hazard-related risks and setting the strategic direction for a sub-county, country, or region to become more resilient to hazards. However, the adoption level of the technology is still very low, creating a gap between the adoption of the technology and flood risk reduction. Dynamics in land use and cover have been increasing, thus enhancing flood risk in the western region of Kenya. This study therefore aimed at evaluating strategies for mitigating flood risks using a nature-based approach. The evaluation design was adopted, and both qualitative and quantitative data were utilized. A sample size of 384 was calculated using Fisher's formula from a sample population of 63,025 households and Data was collected using questionnaires, interview schedules, and a focus group discussion guide. Secondary and quantitative data were analyzed using MS Excel and Statistical Package for Social Scientists (SPSS) version 26. Qualitative data was analyzed using narration techniques to support quantitative data, while quantitative data was presented using tables, graphs, and charts. The findings on the evaluation of the strategies for mitigating flood risks revealed that extension service as an informational strategy was 92% (353) of the best measure, whereas the existence of project meetings at 80% (307) benefited a lot from them. The study recommends the adoption of holistic management of the Sustainable Land Management Technologies (SLMT) policies and increased training areas to create environmental equity for sustainable development. The study is expected to assist in strengthening extension services with the involvement of both the county and the national government.

Keywords: Adoption, Extension Services, Floods, SLMT, Strategies

I. INTRODUCTION

The focus on strategies for mitigating flood risks is to identify which measures have been put in place to reduce flood risk using the nature based affordable approaches. Floods have affected millions of people worldwide leading to environmental, physical, economic and social losses hence reducing growth of the nation (Changnon *et al.*,2000). Flooding is among the deadly natural hazards in terms of occurrences and the influence on humans (Ogie *et al.*,2020). It has been observed that there is continuous increase in floods all over the world, in developed and developing countries as a result of change in climate (Berndtsson *et al.*,2019). Disaster Risk Reduction (DRR) strategies have been rated among the best strategies for reducing natural hazard-related risks and setting the strategic direction for a sub county, country or region to become more resilient to hazards (Peters *et al.*,2019).

Consequently, the measures put in place never guaranteed a reduction of risk. Mostly irrigation projects in semi-arid parts areas especially in Africa ended up displacing poor farmers and pastoralists from their homesteads hence forcing them to move to more fragile environments prone to Land and Resource Degradation (Bhattarai, 2019). The encouragement of farmers in adopting the Sustainable Land Management Technologies at the flood hazardous area and knowledge about flood risk reduction will enhance the implementation of flood risk management and disaster reduction policies.

The international community during the World Conference on Disaster Reduction (WCDR) urged all government to adopt and implement the policies in Disaster Risk reduction to lessen the impact due to natural hazards by in cooperating them into their development plans (Seddiky *et al.*, 2022). Food and Agriculture Organization (FAO) since 1970 has been working on a number of projects related to Disaster Risk Management in various fields (such as early warning systems, vulnerability analyses, agricultural relief operations, drought management plans, pastoral risk

management, soil and water conservation techniques, and improving small-scale fishermen's safety as well as managing wild forest fires (Muricho *et al.*, 2019).

From the literature review it was observed that effective flood risk reduction would be implemented if farmers in flood hazardous area understood the strategies that could help them in accepting and adopting Sustainable land management technology as nature based approach (Koutsovili *et al.*, 2023). The ecosystem based-adaptation being a strategy for adapting to climate change harnessing nature-based solutions according to united nation Environmental program 2016

Measures for flood Risk Reduction employed by people in Western region, Kenya therefore highlighted the aspects to be improved in the DRR and inspired the National and county government consequently, (Tiepolo & Braccio, 2020). Therefore, the purpose of this study was to evaluate the strategies for flood risk reduction, in the study area and how the community has conceptualized and used them in the reducing the impact due to floods. This research used various measures in enhancing adoption of holistic management of the Sustainable Land Management Technologies (SLMT) policies and increased extension training areas to create environmental equity for Sustainable Development (Kull *et al.*, 2013).

II. METHODOLOGY

2.0 introduction

The study adopted evaluation research design, as this catered for both qualitative and quantitative data.

2.1 Study Area, Design and Population

The study targeted the Household heads, local administration, leaders from the various farmers groups, extension officers, disaster respondents, community-based organization, Non-Governmental Organization and County executive from KALRO, Kenya met and Disaster unit. These categories of respondents were sampled from various Sub-counties within study area.

2.2 Sampling Procedure:

The sample size for the households' heads was determined based on Fishers *et al.*, (1983) cited in Mugenda and Mugenda, (1999). Since the target population is greater than 10,000, the desired sample population was calculated using fisher's formula:

$$n = \frac{Z^2 pq}{d^2}$$

Where: n= desired sample size if the target population is above 10000).

Z= the standard normal deviate at the confidence level of 95% is 1.96.

p = the proportion of the target population estimated to have characteristic being measured is set at 50%

d = level of statistical significance set at 0.05

$$n = \frac{(1.96)^2 0.05 \times (1-0.05)^2}{(0.05)^2}$$

n= 384

From target population of 63025, simple random sampling method was used to select 384 household from Western region (Budalangi and Nyando). Since 384 households represent only a very tiny subset of the total population a sampling range of 10–30% was used (Mugenda & Mugenda, 2003). Purposive sampling was used to sample information from KIs.

2.3 Methods of Data collection:

Primary data was collected using questionnaires, interview schedules, and Focus group discussions (FGDs). Data from household heads included both open-ended and closed-ended questionnaires, as they captured a significant amount of data in a short period of time. The interviewing technique helped in obtaining in-depth information and enabled the researcher to clarify issues that were not clear immediately. Focus Group Discussion used the views of the small-scale farmers to justify or reinforce the views collected from other small-scale farmers through the questionnaires and secondary was obtained from periodicals and journals.

2.3.1 Methods of Data Processing and Analysis

Processing of data was through coding and editing organizing and sorting from research instruments. The study generated both quantitative data which was analyzed using descriptive statistics inform of frequency distribution and percentages while qualitative were through narrations.

III. FINDINGS

3.1 Strategies for Flood Risk Reduction in Western Region, Kenya

The study evaluated strategies for mitigating flood risk in Western region. Findings shown in Figure 1

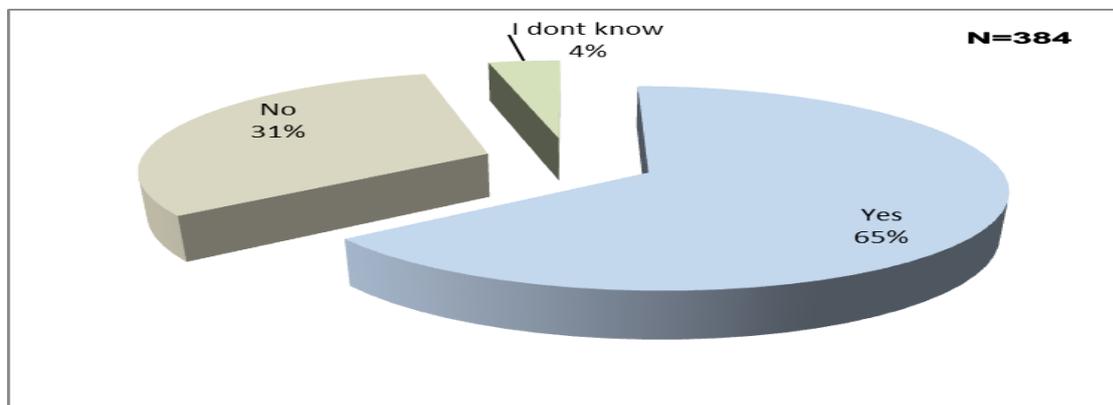


Figure 1

Households' response on community self-help groups existence in Western Region Kenya

Respondents were asked if they belonged to any community self- help group. The results were summarized in Figure 1. The study results for Western Kenya revealed that 65% (230) the respondents belonged to at least a community self-help group, 31% (119) did not belong to self -help group and 4% (15) didn't even know the existence of self-help. For individual sub county response indicated 53.7% (190) Budalangi, 11.3% (40) Nyando respondents acknowledged they belonged to the group; 25.5% (98) Budalangi, 5.5% (21) Nyando had no group identity; 3.2% (12) Budalangi and 0.8% (3) Nyando said they had no knowledge on the existence of the group. The results were backed up by the one FGD participant who said that:

Belonging to a community group, they had acquired more knowledge and skill including use of the new skills among others in practicing agriculture (Male FGD participant during an FGD held on August 23, in Mukami village)

Women participated more in the groups; indeed, the number of women in a group was higher in the mixed sex group. There were also women exclusive project groups, no men project groups were found. The project groups may be the solution to certain cultural constraints, which hinder adoption of the SLMT, (Munyua, 2010). The information from one of the Key informants from Nyando indicated that group projects were in existence in the area. However, the organization of the groups was in-adequate and hence they could not achieve the desired objective. The findings agree with those from Busia where one member of FGDs revealed that:

Projects had good intentions but due to inconsistency and poor organization the objective was never met

(Male FGD farmer from during an FGD held on September 2, 2022 at Bukoba village)

The study findings agree with that of (Ribot *eta l*, 1996) who in her study showed that community self-help group was a solution to most of the SLMT adoption and acceptance.

3.2 Project meetings on Flood risk reduction

Households were asked whether they attended project meetings as informational strategy for mitigating flood risks. Results for western Kenya are shown in the Figure 2. Majority of respondents 80% (307) gave a yes response that they were in attendance to the project meetings, 16% (61) said they could not attend the project meetings and 4% (15) did not know at all whether people were attending project meetings. Response for Each result of the sub county

determined, 66.2% (254) Budalangi, 13.8% (53) Nyando attended project meetings; 13.1% (50) Budalangi, 2.9% (11) Nyando never attended and 3.2% (12) Budalangi, 0.8% (3) Nyando did not know at all.

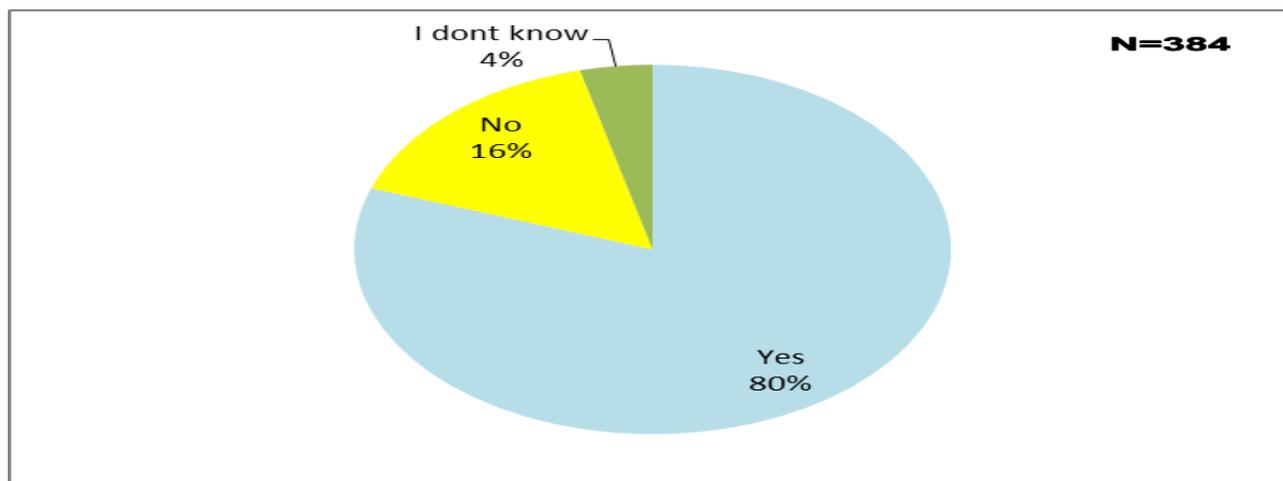


Figure 2
Household Respondents on Project Meeting Attendance in Western region Kenya

Project or group membership has always boosted knowledge on the side of the members (Castellani *et al.*, 2021). The research was supported by:

One Focus group discussion member who acknowledged that households that were font of attending meetings and trainings had an upper hand since they could reason and agree to disagree on the issues of flood risks as opposed to those who never attended meetings (Youth FGD Participant during an FGD held on September 2, 2022 Bukoba village)

An interviewee from ministry of Water and environment pointed out that:

They had easy time dealing with members who were captured in various projects since they understood what was required and that the only opposing factor in the implementation was limited finances on the side of the farmers (one of the participants during an interview held on September 2, 2022 Bukoba village)

At the same time, a group that never attended project meetings and when they were interrogated as to why they never attended project meetings majority of respondents 84.3% (322) indicated they completely lacked information from their end, 5.9% (23) felt the venue of the meetings were unsuitable (Attarzadeh & Ow, 2008). results shown in Figure 3.

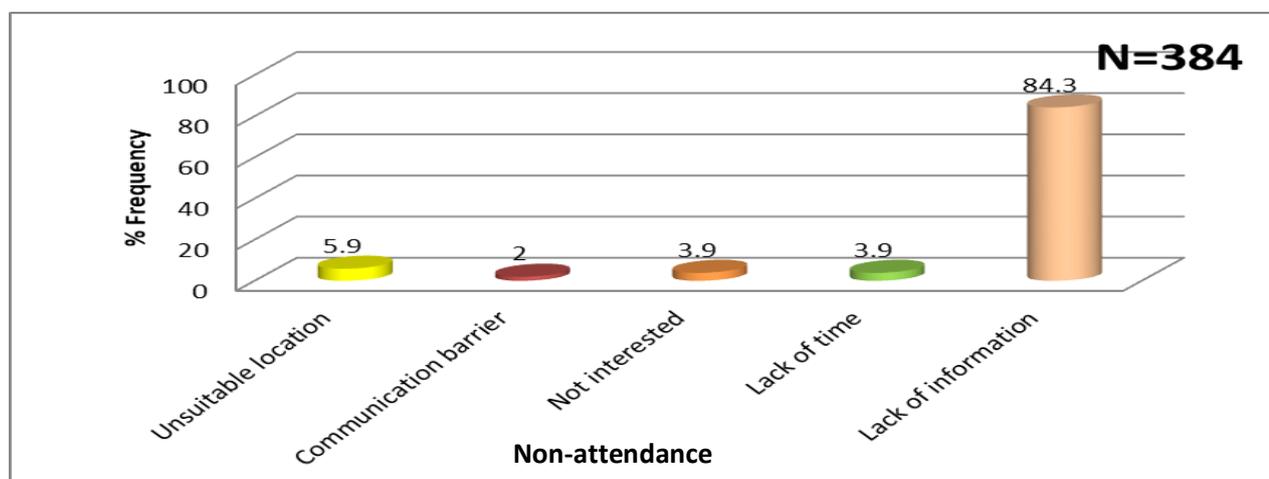


Figure 3
Household Respondents on Non- Attendance to Project Meeting in Western Region Kenya

Lack of scientific and technical information among the respondents especially farmers can be attributed to the wide –ranging low levels of education in the study area emanating from lack of training facilities for farmers (Odini, 2014). Similar research was also reported in research by Asian Foundation, 2012 in which majority of the respondents 56% (215) not knowing what to do was the foremost reason for not engaging in the trainings this was perceived by most household as a barrier to successful mitigation in the area.

Other responses on non-attendance to the project meetings Figure 3 were communication barrier at 2.0% (7) those who lacked time due to poor planning for the project meetings were at 3.9% (15) and those who had no interest 3.9% (15). All this point out on the issue of community preparedness and education through sensitization were still wanting and therefore more empowerment is required for any success to take place.

3.3 Soil Water Conservation strategy

The respondents were asked if SWC as a strategy benefited them in any way. The responses are in Table 1. Most of the respondents indicated that benefits were by sharing knowledge (36%) Nyando (24), Budalangi (114); training on conservation methods (20%), Nyando (13), Budalangi (64) demonstration of use at (32%) Nyando (21), Budalangi (102) and others at (12%) Nyando (8), Budalangi (38). This study is supported by (Edgar *et al.*, 2022) in which it says disappearance of African Indigenous Knowledge of Water Conservation and Management in Limpopo Province of South Africa where the research elaborates that the indigenous knowledge was disappearing among the communities due to lack of sharing knowledge with those who understood how the mechanisms were accomplished. The training to members was a major plus to achieving the goal.

In the study area most groups took the initiative to welcome agricultural extension officer to teach them on soil and water conservation measures, for facilitation they contributed to pay the extension officer travel expenses from the savings they had obtained from the group farming produce. Further, the group member ship facilitated the ease of demonstration of SLM practices there by increasing their adoption rate. The invitation of agricultural officer is an illustration of willingness to learn and adopt the sustainable land management technology. According to FGDs response from Busia the group members who were attending the training had knowledge and the will power to adopt the technologies and practice them. This study concurs with the diffusion of innovation theory by Rogers which stipulates that a technology is a design for instrumental action that reduces the uncertainty in the cause-effect relationships involved in achieving a desired outcome (Rogers, 2003, p.13). It is composed of two parts: hardware and software. While hardware is the tool that embodies the technology in the form of a material or physical object, software is the information base for the tool (Sahin, 2006).

Adoption is a decision of full use of an innovation as the best course of action available and rejection is a decision not to adopt an innovation (Campbell, 1966). Rogers define innovation as an idea, practice, or project that is perceived as new by an individual or other unit of adoption (Rogers, 2003, p. 12) An innovation may have been invented a long time ago, but if individuals perceive it as new, then it may still be an innovation for them (Vargo *et al.*, 2020). Rogers claimed there is a lack of diffusion research on technology clusters.

An innovation's consequences may create uncertainty: Consequences are the changes that occur in an individual or a social system as a result of the adoption or rejection of an innovation (S. Heidenreich & Talke, 2020). To reduce the uncertainty of adopting the innovation, individuals should be informed about its advantages and disadvantages to make them aware of all its consequences which may be functional or dysfunctional in this case undergoing the training on SLMT.

Table 1

Household response on Soil Water Conservation strategy in Western Kenya

Assistance	Western Region		Budalangi		Nyando	
	(%)	(f)	(%)	(f)	(%)	(f)
Knowledge sharing	36	138	29.7	114	6.3	24
Demonstration	32	123	25.5	102	5.5	21
Training	20	77	16.6	64	3.4	13
Other	12	46	9.9	38	2.0	8
Total	100	384	82.8	318	17.2	66

Income strategies are determined by access to land at the household level, and land management decisions are influenced by several factors operating at various sizes (Sahin, 2006). Biophysical characteristics that determine agricultural potential, population density, and proximity to markets and infrastructure are just a few examples of how

location-specific strategies and land management methods can be advantageous (Glatte, 2015). Soil conservation strategies, cropping systems, commodity production technologies, and inputs used are all examples of how these variables can have either broad or narrow effects on Sustainable land management Technology in a given village (Glatte, 2015)

Table 2

Correlations Analysis between Group Membership on SWC and Rating Most Adopted Technology on Flood Risk Western Region Kenya

Spearman's rho			Group membership on SWC	Rating on most adopted technology
	Group membership improvement on SWC	Correlation Coefficient	1.000	
		Sig. (2-tailed)		
		N	384	
	Rating on most adopted technology	Correlation Coefficient	.186**	1.000
		Sig. (2-tailed)	.001	.
		N	384	

** Correlation significant at the 0.01 level (2 tailed).

The result above shows that group membership on SWC had a weak positive significant correlation ($r_s = 0.186$, $p = 0.001$) with rating on most adopted technology on Flood risk in Western region Kenya. The results suggested that group membership on SWC played less significant role on adopting the technology on handling flood risk in Western region. This study is supported by (Mwaura, 2014), findings, where it indicates farm group membership did not necessarily influence the adoption of the technology and that it had insignificant representation. The findings present a major shift in the study area where by households that had groups and those who lacked had no influence on determining which technology to be adopted. This therefore depends on how the technology has been received, adopted and what benefits the people are likely to get from the technology. All this depends on communication to concerned parties and how they perceive the technology.

3.4 Governance Actors in SLMT Technology Diffusion and Adoption

Respondents were to name the strategic institutions that were best in mitigating flood risks. Findings tabulated in Table 4. Majority of respondents, 26% (100) revealed that the Non-Governmental organizations were best in providing the mitigation, 22% (84) felt that the active community participation and involvement improved the community way of perception on the whole issue of flood risk and technology adoption, 20% (76) commented that the Government had made major efforts in ensuring that flood risk is under control and SLMT technology enhanced; 2% (7) depicted that mainstreaming also played a role in ensuring that farmers had some knowledge in flood risk management and SLMT practice in the community. The highest percentage response indicated that all the above-mentioned organization had played a role in mitigating flood risks at 30% (116). The sub county representations 21.6% (83) Budalangi, 4.4% (17) Nyando acknowledged NGO were best in providing the mitigation; 18.3% (70) Budalangi, 3.7% (14) Nyando showed Community participation and involvement improved the perception on flood risk reduction; 16.6% (63) Budalangi, 3.4% (13) Nyando recommended the government efforts in flood risk control; 1.7% (6) Budalangi, 0.3% (1) Nyando mainstreaming was recommended as an option to flood risk reduction; 24.6% (95) Budalangi and 5.4% (21) Nyando opined that all the above strategies had influence of flood risk reduction.

Table 4

Common Strategic Organization for Mitigating Flood Risks in Western region Kenya

Strategies for mitigating flood risk	Western Region		Budalangi		Nyando	
	(%)	(f)	(%)	(f)	(%)	(f)
NGO	26	100	21.6	83	4.4	17
Active Community participation	22	84	18.3	70	3.7	14
Government efforts	20	77	16.6	64	3.4	13
Mainstreaming	2	7	1.7	6	0.3	1
All of the above	30	116	24.6	95	5.4	21
Total	100	384	82.8	318	17.2	66

Results were backed up by the focus group discussion which supported that actually the major organization that had played a major role in flood risk mitigation was the NGOs and that those who were involving the community to participate made it easier during the engagement. The government also played a good role but the language used was technical and that understanding was a challenge to the farmers this was manifested when the KIs from extension service in Nyando, stated that:

Normally the technical language used by specialist was tough for the community. Lack of information was also single out by some member who said that most of the people lacked early fast hand information hence knowing when and where demonstration was done was not easy (an extension officer during an interview held on August 3, 2022 at County agricultural offices).

One of the FGDs informed the researcher that:

The information availed to the respective authorities and especially extension officers was not reaching the intended audience hence some of the communities suffered miss in the information required (Female FGD participant during an FGD held ON September 2, 2022).

This study is supported by the diffusion innovation theory by Rogers who said that sometimes technology might be good for adoption but if it lacked proper communication channel to reach the intended group then it is bound to be rejected on the basis of improper communication due to communication barriers. Similar study was done in the Eastern region of Kenya by (Ribot *et al*, 1996), on an evaluation of potential sustainable land management practices where the study showed that the acceptance of the SLM practices depended on proper training and active community involvement which bore fruits otherwise adoption was not guaranteed. Generally, it is agreed that adaptive capacity will be higher in cases where social institutional arrangements governing allocation of power and access to resources within a community ensures resources are equitably distributed, (Ribot *et al*, 1996). In the current study several institutions and organizations were identified as major strategies used in mitigating flood risks and ensuring that the SLMT are adopted and implemented.

IV. CONCLUSION & RECOMMENDATIONS

4.1 Conclusion

From the study evaluation of the strategies for mitigating flood risks it was evident that NGOs, community participation and government efforts were the best in mitigating flood risks

4.2 Recommendations

Based on the findings to promote SLMT, it is crucial to start national extension programs or integrate the pre-existing agricultural and natural resource management initiatives. Consequently, the communities should be encouraged to embrace measures such as Focal area approach, farmers field schools and promoting farmer innovation.

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