International Journal of Latest Research in Humanities and Social Science (IJLRHSS)
Volume 06 - Issue 06, 2023
www.ijlrhss.com || PP. 285-291

The existing Sustainable Land Management Technologies employed by Farmers in Western Region, Kenya

Opilo B. Nasambu[*1], China. S. Soita[2], Nyandiko. N. Omoyo[3,]
[123]*Department of Disaster Management and Sustainable Development Masinde Muliro University, Kenya*

Abstract: In the recent past there has been dramatic increase in frequency and intensity of floods all over the world, both in developed and developing nations due climate change. Crops, settlements and infrastructure have been destroyed wherever flooding occurs. But Sustainable Land Management Technologies (SLMT) is the cornerstone of formalized action for reducing such natural hazard. The severity of damage as a result of floods has been documented to have a relationship with the land management technologies. Overuse on the Land resource has been increasing and limited capacity to practice SLMT led onto land degradation and enhancing flood risk in Western region Kenya. Similarly due to lack of determining the type and extent of the existing SLMT has affected efforts to design and plan for proper intervention measures. Descriptive design was employed and Data collected using Questionnaires, interview schedules and Focus group discussion guide. Data analyzed using Scientific Package for Social Scientists (SPSS). Descriptive statistics was in the form of percentages and frequencies. Results indicated: 37.5% Nyando (25), Busia (121) acknowledged practicing cropping management, 29.2% Nyando (19), Busia (92) practiced Water management, 25% Nyando (17), Busia (79) crop slope barriers, 6.3% Nyando (4), Busia (19) forest management and Grazing management 2.1% Nyando (1), Busia (7). The Chi-square test indicated ($X^4_{0.00}$= 22.21) which showed highly significant ($P < 0.01$) variation among existing SLMT. The area requires more emphasis on practicing SLMT in control of flood risks. Policy makers to enforce the laws on SLMT practices along the Flood prone areas to reduce impacts
Keywords: SLMT, Flood risks and Flood risk reduction

1. Introduction

Flooding has been recognized as one of the worst disasters (Chan et al., 2019). Hundreds of millions of people around the world have been affected by floods leading to social and physical losses and may have significant impact on the economic condition of a nation (Changnon *et al.*,2000). The worldwide distribution of natural disasters in the last decade, categorized by disaster type, was depicted in this literature. It was noticeable that flooding was the most chronic natural disasters in terms of the number of occurrences and the impact on humans,(Ogie *et al*.,2020). There has been a dramatic increment of floods all over the world, both in developed and developing nations due climate change (Berndtsson *et al*.,2019). Presently, floods are the most common hazards with the highest death toll economic misfortunes because of floods being higher than other hazards, (Cornia *et al*.,2016). Poor groups are more at risk because their livelihoods are vulnerable due to limited access to services and infrastructure (Richmond *et al*.,2018). Disaster Risk Reduction (DRR) strategies are the cornerstone of formalized action for reducing natural hazard-related disaster risk and setting the strategic direction for a district, country or region to become more resilient to disasters (Peters *et al*.,2019). The substantial reduction of disaster loss and damage and the increase of local Disaster Risk Reduction strategies by 2030 has become a target of the Sendai Framework for Disaster Risk Reduction Vision 2015-2030, (Aitsi-Selmi et al.,2015).

However, the number of strategies in place did not guarantee a reduction of risk at local scale. Yields for African countries are well below the global average, and are almost one third of the yield levels of Asia and half that of South America. Most irrigation development projects in semi-arid parts of Africa ended up displacing poor farmers and pastoralists from their traditional sources of water and land, thus forcing them to move to more fragile environments prone to Land and Resource Degradation (Bhattarai, 2019).

Literature pointed out that, adoption rates of sustainable land management technologies by farmers at the flood risk prone area and understanding flood risk perception was conducive to the implementation of effective flood risk management and disaster reduction policies.

According to World Cooperation Disaster Risk (WCDR) all states were called upon to adopt and requests the international community to continue assisting developing countries in mitigating effects of natural disasters and integrate Disaster Risk Reduction strategies into development planning. With Sustainable Land Management Technologies integrated into DRR and properly constituted into comprehensive development plan may help reduce flooding and enhance food security in the flood prone area.

FAO has been addressing since the early 1970s various needs in relation to food and agricultural emergencies and has been developing numerous initiatives related to Disaster Risk Management different areas (for example early warning systems; vulnerability assessments; Agricultural relief operations; drought management strategies; Pastoral Risk Management; soil and water conservation practices; improving safety at sea for small scale fishermen, wild land forest fire management). More recently, FAO also launched activities to better integrate aspects of proactive Disaster Risk Management into ongoing agricultural sector development work, and assist member countries in their efforts of shifting from reactive emergency relief operations towards better planned, long term Disaster Risk prevention and preparedness strategies, (Sarmiento *et al.*,2015). Public participation in the planning process was critical to reducing Disaster Risk. This was particularly true in rural areas, where almost all actions required the direct involvement of stakeholders from various sectors and community from the affected area, (Li *et al.*,2020).

In Kenya Sustainable Land Management Technologies for flood Risk Reduction employed by people in Western region therefore highlighted the aspects to be improved in the DRR and inspired the National government consequently, (Tiepolo & Braccio, 2020). It was along these lines that governments needed to be more proactive in decreasing flood threat instead of being more reactive by offering post-catastrophe response and recovery, (Otieno, 2016)

Further empirical research is needed on determining the existing and extent of the SLMT employed. Such information is imperative for policy-makers who are involved in the design of flood risk management policies, insurance companies who are interested in reducing flood vulnerability of their policy holders, and households and businesses who want to reduce the flood risk to their property (Kull *et al.*, 2013). This study, therefore, aims to provide data on the existing SLMTs in the study area. Flood damage savings are estimated using inferential statistics, data gathered by means of a survey of households who have experienced floods.

2. Research Methodology

2.1 Description of the survey and methodology

This study was carried out in two sub-county of Budalangi and Nyando. Busia County that host Budalangi extends from latitude 0º to 0º 45” North and longitude 33º55’ to 34º25’ East (869.3 km^2) and has 137 km^2 of its land under wetland conditions. Nyando Sub-County lies between latitude 0° 20' -0° 50' South and longitude 33° 20' - 35° 20' East. The area has a total of approximately 163km ^{2} and a population of about 73,227 persons. The flow regime of the Nyando is varied and has occasionally been as low as 2 m3/s and with extreme floods above 850 m3/ s which indicates heavy siltation

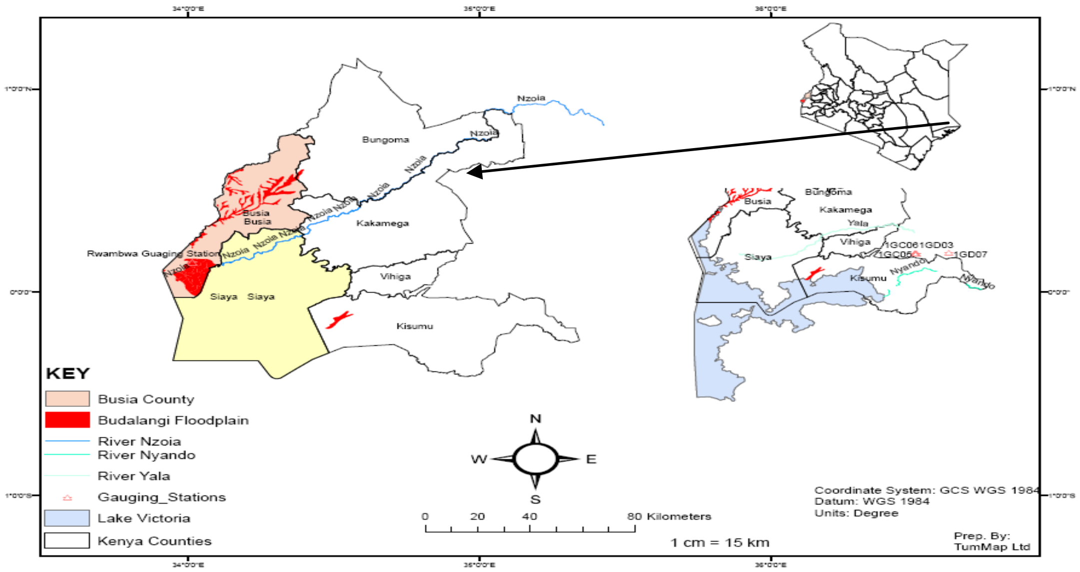

Figure 1: Study Map of Lower Nzoia River Basin and Nyando River basin showing administrative areas, rivers and elevation and Gaging derived from Digital Elevation Model (30m DEM) using ArcGIS 10.5

The research tools used in this study included structured household questionnaires, interview guides stakeholder KIs questionnaire and Focus group discussion. The descriptive survey was conducted in villages that were carefully selected on the basis of having experienced flood risks and practicing the SLMT in the past. A comparison between the demographic statistics and the socio-economic characteristics of the respondents who experienced flood risks was sought and results obtained. The sample is approximately representative with respect to certain characteristics, such as residence, gender, education, marital status and age in relation to existing SLMT and flood risk reduction.

3. Results

3.1 The existing Sustainable Land Management Technologies employed by Farmers in Western Region, Kenya

The study sought to determine the existing SLMT and to what extent they have been practicing the technology. Summary of the findings are indicated in figure 1

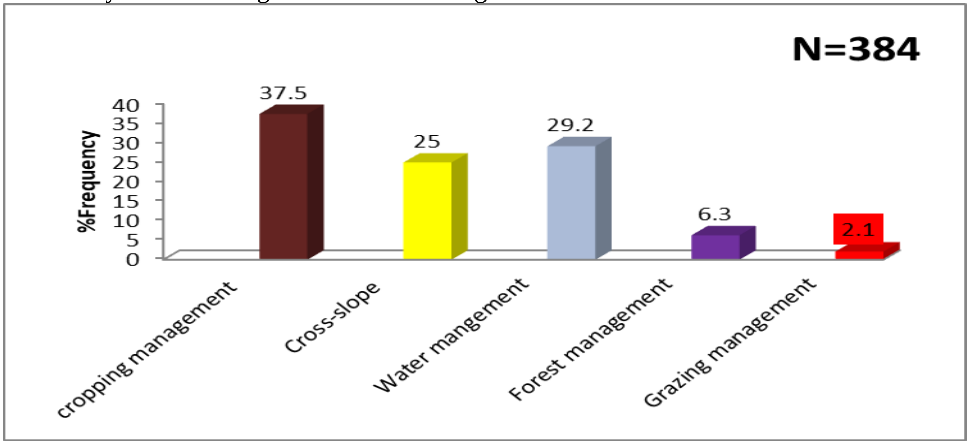

Figure 2. Household respondents on existing SLMT practiced in Western Region, Kenya

From the respondents 37.5% Nyando (25), Busia (121) acknowledged that they practiced cropping management and 2.1% Nyando (1), Busia (7) got involved in grazing management practices. The Chi-square test conducted on SLMT existence indicated (X4 0.00= 22.21) which showed that there was highly significant ($P < 0.01$) variation among existing SLMT employed by farmers. The results agree with those of GoK,(2015), which indicated this SLM technology was promoted because it enables efficient utilization of soil nutrients, serves to control pests and diseases and helps to diversify crop production as well us reduce impacts of floods. Cropping management involves; crop rotation a measure in which various crops are planted in a rotational way in the same pieces of land enhancing fertility utilization; Use of Early Maturing Varieties-it is a measure in which primary budding varieties of crops that take really very less time to mature are planted in the pieces of land. Thus putting lesser pressure on the soil (Takagi, 2020). In this way it can help in reducing the soil erosion. Rain storms generate runoff and associated soil erosion (Lucas-Borja et al.,2019); Checking Shifting Cultivation- Shifting cultivation method is a measure mainly used by tribal to switch over to settled agriculture by checking shifting cultivation. Arrangements for tribal resettlement can help to make them understand the best technology for farming in the area. Shifting cultivation, which is still prevalent in the flood prone areas, contributes significantly to forest loss and is the main cause of land degradation (Carley & Christie, 2017).

3.2 Effect of Land size on the existing Sustainable Land Management Technologies

The respondents were called upon to rate effect of Land size on existing SLMT. The findings summarized in figure 2. Majority (72.9%) Nyando (48), Busia (232) of the respondents acknowledged that land size affected highly moderate and slightly moderate at (4.2%) Nyando (3), Busia (12). The Chi-square test conducted on effect of land size on SLMT practiced indicated (X2 0.00= 36.37) which showed that there was highly significant ($P < 0.01$) variation on land size on existing SLMT.

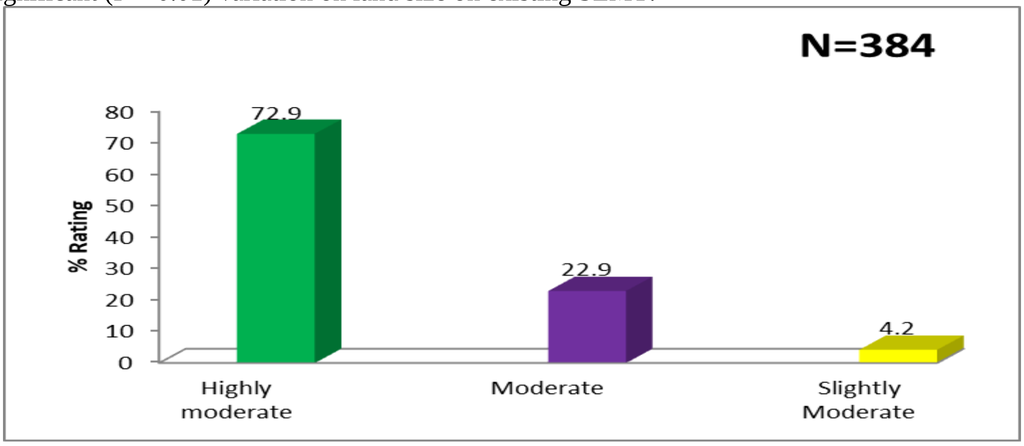

Figure 3: Household respondents on Land size on existing SLMT in Western Region, Kenya

This indicates that land size is directly proportional to the existence of the SLMT applied. The smaller the land sizes the minimal existence of the technology. The results agree with that of (Wachira, 2006), an evaluation of potential sustainability on SLM Practices. Most places in Africa, there are a noticeable variation in holding size, but there are very few large farms. For example, in the western Kenya sites, the range in farm sizes within a village is generally small and these affect the existence of SLM. Farm size has been found to be positively associated with technology use (Rogers, 1983). Small farms have been said to have a greater likelihood of adopting improved varieties as they are more intensively managed. The adoption of reduced tillage in Nigeria was found to be positively related to farm size at 45%. In West Africa, however, farm size was not found to be a significant factor influencing adoption of soil fertility improvement technologies (Adesina and Baidu-Forson, 1995) at 60% all this contradicts the study

3.3 Effect of slope of the farm land on the extent of Sustainable Land Management Technologies

According to the survey established from the research, the results in Figure 3 respondents were asked to rate the effect of land slope on extent of SLMT. Majority (48.3%) Nyando (32), Busia (154) of the respondents acknowledged that land slope affected highly moderate the extent of and (4.2%) Nyando (3), Busia (13) affected slightly. The Chi-square test conducted on effect of land slope on SLMT practiced indicated ($X^3{}_{0.000}$= 22.17) which showed that there was highly significant (P < 0.01) variation on land slope on existing SLMT.

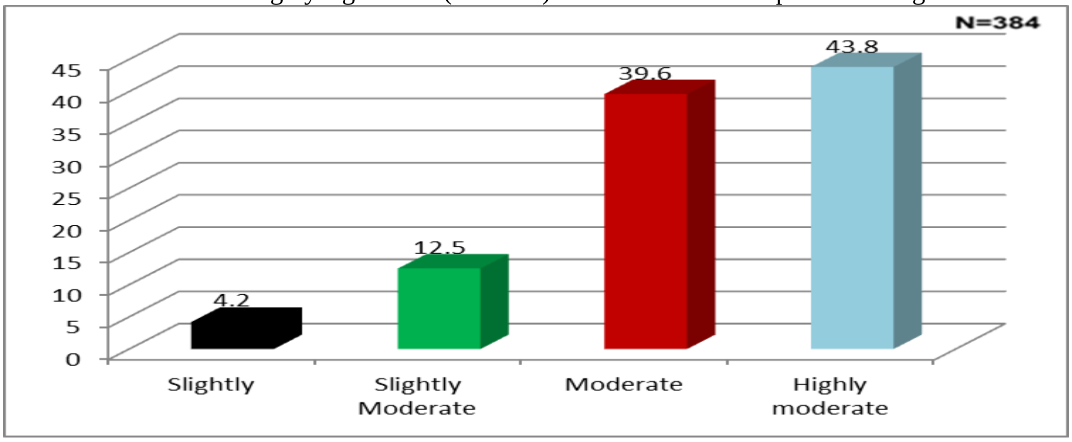

Figure 4: Household respondents on effect of Land slope on SLMT in Western Region,

The slope mainly determined ways of improving water harvesting; this was mostly achieved by reducing water loss through reduced surface runoff mainly cropping management and cross-slope barriers. Water harvesting was achieved by water management technologies specifically aimed at this, of which they were also successfully maximizing water storage and managing excess water.

3.4 Effect of degree of erosion on the extent of Sustainable Land Management Technologies

The respondents were tasked to rate degree of erosion on extent of SLMT. The results summarized in figure 4. Majority (39.6%) Nyando (26), Busia (126) of the respondents acknowledged that degree of soil erosion slope affected moderately the extent of SLMT, and highly moderate at (27.1%) Nyando (18), Busia (86). The Chi-square test conducted on effect of erosion on SLMT practiced indicated (X^3 0.002= 15.00) which showed that there was highly significant (P < 0.01) variation on degree of erosion on extent of SLMT.

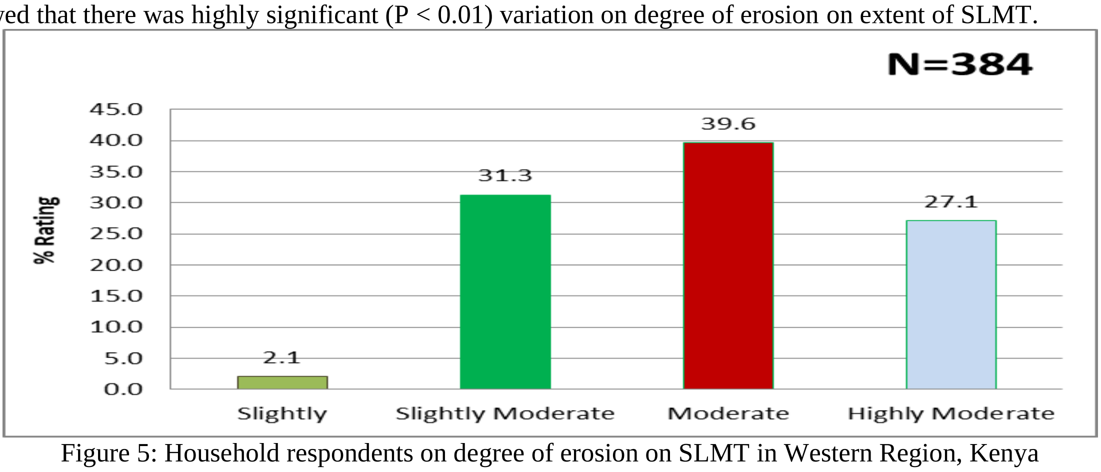

Figure 5: Household respondents on degree of erosion on SLMT in Western Region, Kenya

Reduced soil loss, reduced crusting and sealing, reduced damage on neighbors' fields and public/private infrastructure had very high impact, mainly through cropping management and cross-slope barriers, but also through forest and grazing management this information was backed up by FGDs and Key informants from the interviews conducted to them and this showed that soil erosion was indeed a factor that affected the extent of SLMT as suggested by SLM technology (WOCAT, 2010).

3.5 Fertility status of the farm land on the extent of Sustainable Land Management Technologies

Majority of the respondents (62.5%) Nyando (41), Busia (199) rated moderately the fertility status of land on SLMT and slightly rated at (2.1%) Nyando (2), Busia (6). The summary findings indicated in figure 5. The Chi-square test conducted on fertility status of land on SLMT practiced indicated ($X^3_{0.00}$= 40.17) which showed that there was highly significant ($P < 0.01$) variation on fertility status of land on extent of SLMT.

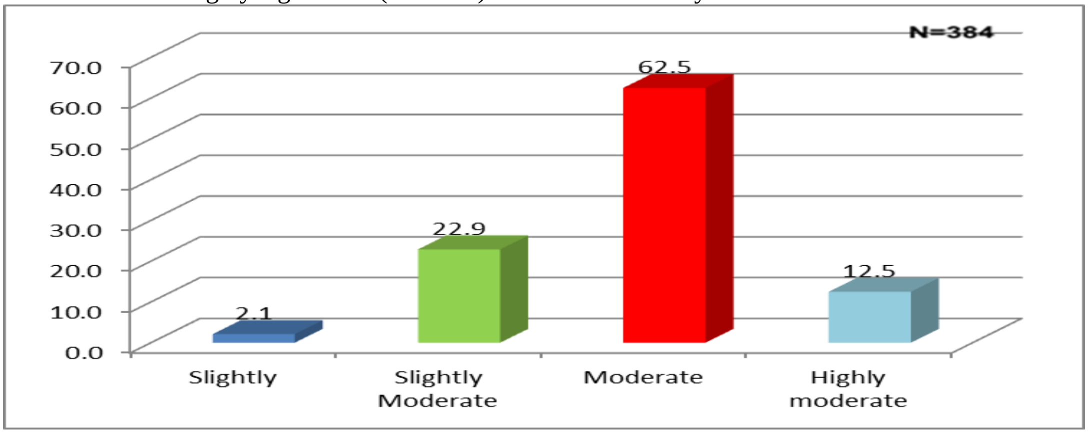

Figure 6: Household respondents on Fertility status of Land on SLMT in Western Region, Kenya

The most fertile land could not encourage SLMT practices. The response from the key informant and FGDs from both study sites agreed to the fact that fertility status of land determined the extent of SLMT practiced and chosen. The achievement of the information was through expansion of farmers' options for resource and crop management and enhancing their capacity to make relevant management decisions. The balance between organic and inorganic production technologies to select crops on the basis of their performance in terms of soil fertility indicator Similarly, the extension officer as the key informant had the same sentiments to support production of crops that are well suited to conditions of the western Kenya highlands and ensuring adequate provision of high quality seed of priority crops and varieties according to Kenya SLM baseline information.

3.6 Marital status response on existing and extent of SLMT

When respondents were asked to state the marital status the findings were summarized in figure 6. Over half of the respondents were married 75% Nyando, (50) Busia (238) of the household respondents, widows at 15% Nyando (10), Busia (48) and divorced at 4% Nyando (2) Busia (13). Chi-square test conducted on household head marital status gave ($X^3_{0.00}$=65.16) which showed that there was highly significant ($P < 0.01$) variation among the household head marital status distribution.

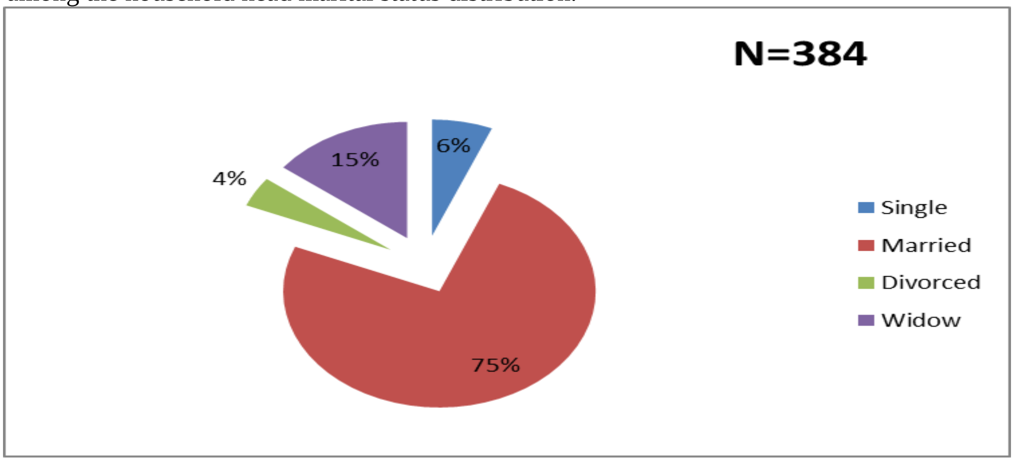

Figure 7: Household respondents on marital status in Western Region, Kenya

This study is in tandem with Palm and Carroll (1998) who asserted that the psychosocial aspects of marriage manifest as a strength among married couples during disaster and even after disasters while the widows, divorced and single families are hard hit by disaster shocks and losses. In terms of making decision regarding disasters, the married make jointly owned decisions in responding to disaster threats by pulling resources and earnings together lessening the burden. The widows and divorced are affected negatively because the burden of raising children and solely in making decision alone considering meager income and emotional needs. Flood risk occurrence adds to their suffering and may not easily recover from the shocks

4. Conclusion and Recommendations

Conclusion

From the study it was clear that residents of Western region were aware of SMLT influence on flood risk control and that the communities which practiced the technologies acknowledged the practice that it had highly reduced the impact of flood hence reducing flood risk

Recommendations

Based on the findings, on type and extent of existing SLMT faces many challenges in lower western region. However, it is possible to achieve sustainability if deliberate and pragmatic efforts from project implementers, farmers and trainers take in to consideration available time, not just for new activities, but also emphasize on the need to practice SLMT with seriousness

Acknowledgements

We wish to express our sincere thanks to National Commission for Science, Technology and Innovation (NACOSTI) for permitting us to carry out this research work and Masinde Muliro university, Directorate of Postgraduate studies for providing the required facilities and working environment through school of Disaster management, Department of Sustainable Management and Sustainable development making the research successful.

Reference

[1]. Adesina, A.A. and J. Baidu-Forson (1995). "Farmers' Perceptions and adoption of new agricultural technology: Evidence from analysis in Burkina Faso and Guinea, West Africa." *Journal of Agricultural Economics* 13(1995): pp 1-9.

[2]. Aitsi-Selmi, A., Egawa, S., Sasaki, H., Wannous, C., & Murray, V. (2015). The Sendai framework for disaster risk reduction: Renewing the global commitment to people's resilience, health, and well-being. *International Journal of Disaster Risk Science*, *6*(2), 164–176.

[3]. Berndtsson, R., Becker, P., Persson, A., Aspegren, H., Haghighatafshar, S., Jönsson, K., Larsson, R., Mobini, S., Mottaghi, M., & Nilsson, J. (2019). Drivers of changing urban flood risk: A framework for action. *Journal of Environmental Management*, *240*, 47–56.

[4]. Bhattarai, K. (2019). *Contested Water Resources: Social and Environmental Justice in Rural-Urban Water Transfer for Municipal Use in Nepal*.

[5]. Carley, M., & Christie, I. (2017). *Managing sustainable development*. Routledge.

[6]. Changnon, S. A., Pielke Jr, R. A., Changnon, D., Sylves, R. T., & Pulwarty, R. (2000). Human factors explain the increased losses from weather and climate extremes. *Bulletin of the American Meteorological Society*, *81*(3), 437–442.

[7]. Cornia, A., Dressel, K., & Pfeil, P. (2016). Risk cultures and dominant approaches towards disasters in seven European countries. *Journal of Risk Research*, *19*(3), 288–304.

[8]. Kull, D., Mechler, R., Hochrainer-Stigler, S., 2013. Probabilistic cost–benefit analysis of disaster risk management in a development context Disasters 37 (3), 374–400

[9]. Li, X., Zhang, F., Hui, E. C., & Lang, W. (2020). Collaborative workshop and community participation: A new approach to urban regeneration in China. *Cities*, *102*, 102743

[10]. Lucas-Borja, M. E., Plaza-Álvarez, P. A., Gonzalez-Romero, J., Sagra, J., Alfaro-Sánchez, R., Zema, D. A., Moya, D., & de Las Heras, J. (2019). Short-term effects of prescribed burning in Mediterranean pine plantations on surface runoff, soil erosion and water quality of runoff. *Science of the Total Environment*, *674*, 615–622.

[11]. Ogie, R. I., Adam, C., & Perez, P. (2020). A review of structural approach to flood management in coastal megacities of developing nations: Current research and future directions. *Journal of Environmental Planning and Management*, *63*(2), 127–147.

[12]. Otieno, S. A. (2016). *A comparative study of resilience to flood disasters: A case of Kano in Kisumu County and Budalangi in Busia County*. University of Nairobi.

[13]. Peters, K., Peters, L. E., Twigg, J., & Walch, C. (2019). *Disaster risk reduction strategies: Navigating conflict contexts*.

[14]. Richmond, A., Myers, I., & Namuli, H. (2018). Urban informality and vulnerability: A case study in Kampala, Uganda. *Urban Science*, *2*(1), 22.

[15]. Rogers, E.M. (1983). Difussion of innovations. Free press, New York, U.S.A Sarmiento, J. P., Hoberman, G., Ilcheva, M., Asgary, A., Majano, A. M., Poggione, S., & Duran, L. R. (2015). Private sector and disaster risk reduction: The cases of Bogota, Miami, Kingston, San Jose, Santiago, and Vancouver. *International Journal of Disaster Risk Reduction*, *14*, 225–237.

[16]. Takagi, H. (2020). Garlic Allium sativum L. In *Onions and allied crops* (pp. 109–146).

[17]. CRC Press. Tiepolo, M., & Braccio, S. (2020). Mainstreaming disaster risk reduction into local development plans for rural tropical Africa: A systematic assessment. *Sustainability*, *12*(6), 2196.

[18]. Wachira, S. W, (2006), An Evaluation of Potential Sustainable Land Management Practices to enhance Watershed Ecosystem Services in Upper Tana Catchment: A Case study of Kirurumwe River, Ena Basin in Embu County, Kenya

[19]. WOCAT (2008a) Questionnaire on SLM Technologies (Basic). A Framework for the Evaluation of sustainable land management (revised). Liniger HP, Schwilch G, Gurtner M, Mekdaschi Studer R, Hauert C, van Lynden G, Critchley W (eds*) Centre for Development and Environment*, Institute of Geography, University of Berne, Berne