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Abstract

The purpose of this study was to examine the influence of environmental protection interventions on human security in Muhanga District in Rwanda. Though the government puts much effort into enhancing the living standards of citizens in the region, they face a huge kind of disaster which harm the surrounding environment. The study employed mixed methods, using both qualitative and quantitative approaches with a descriptive research design which was used. Questionnaire and interview guide, observation and focus group discussion were involved during data collection as the instruments of data collection. A target population of 14,464 individuals were used, with a sample size of 402 respondents selected using Yamane's formula. Quantitative data was analyzed using SPSS version 21 while qualitative data was thematically analyzed. The findings revealed that Training on soil management control was notably lacking, with 52.2% strongly disagreeing on receiving adequate training. The use of terraces for soil erosion prevention was also not widely adopted, with 63.8% strongly disagreeing. Conservation practices such as rainwater harvesting and tree planting showed mixed responses. While there was strong support for preventing deforestation (91.8% strongly agree), practices like rainwater conservation and dam construction faced significant opposition. Satisfaction with water tank availability was low, with 74.2% strongly disagreeing, and 67.9% of respondents faced challenges in accessing or maintaining water tanks.

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This paper indicates that there is a significant gap in environmental education, with 52.2% of respondents strongly disagreeing that they had received adequate training on soil management. Not only this it was noted that there is need for increased awareness and support for sustainable land management practices. This paper recommends that there should be development and implement comprehensive training programs focused on soil management, terrace construction, and sustainable agricultural practices.

Keywords: *Environment, Environmental Protection, Influence, Intervention, Human Security*

1 Introduction

Globally like in Canada, the Canadian Institute of Governance (2003) posits that governance is the process whereby societies make decisions and determine whom they involve for the purpose of strengthening security in the community. The Human Settlement were logically in practices identified with view to ensure that human security concern is covered which existed with evolution of man, research had indicated that the governments continued to acknowledge that individuals and communities in general requires a protective agenda that is deliberate (Alkire,2003). Research recognized that people live in vulnerability of all events that are beyond control their control because of financial constraints, conflicts that are recurring, pandemic like aids, terrorism, water shortage, which requires a national policy to address the matter (Alkire, 2003).

Regionally, the determinants remain critical for the protection of public health and the integrity of ecosystems. African governments therefore recognized and committed to address the interlinked challenges of health and environment through the adoption of the Libreville Declaration. They created the Health and Environment Strategic Alliance (HESA) as the platform for strengthening linkages in countries. It is now 10 years since the endorsement of the landmark framework. In the Region, WHO estimated that over a quarter of premature deaths and sickness is attributable to unhealthy environments. This exacerbates the already costly and double burden of communicable and noncommunicable diseases saddling health care systems in the Region. This is further compounded by the increased frequency of reported public health events in the region, which in 2017 totaled 152 against an average of 100 per year (WHO, 2018).

In Rwanda, The Environmental Management Framework (EMF) aims to identify the range of required environmental management measures that need to be taken during the planning, design, implementation and operation phases of Urban Infrastructure for Roads, Drainage and Sanitation facilities, to ensure compliance with the national and WB requirements. EMF provides general policies, guidelines, codes of practice and procedures to be integrated into the implementation of the Project. It defines the steps, processes, and procedures for screening, alternative analysis, assessment, monitoring and management of environmentally related issues. In addition, EMF presents overview of environmental policies and legal regime of Rwanda and WB safeguard policies; includes institutional and capacity assessment related to environmental management; and describes the principles, objectives and approach to be followed while designing the site-specific environmental mitigation measures.

People have been using land with its natural resources without considering the environmental consequences. However, today there is increasing concern about the effect of rapidly growing population upon the environment. Finite resources such as copper, oil, tin are rapidly becoming depleted and there is no way in which they can be replaced. Even renewable resources such as

fish-stocks and timber are being overexploited at an alarming rate. The growth of human population and the environmental pressure imposed by economic development are posing great challenges for the environment.

1.1 Problem Statement

The current human settlement policy in Rwanda integrates human security in rural and urban areas (MININFRA, 2010). Human security, according to the United Nations (UN, 2018), should be free from fear, want, and uphold the dignity of citizens. It is seen as a strategy to help member states identify and address widespread and cross-cutting problems related to the survival, livelihood, and dignity of their people (UN, 2017). Ilcan and Rygiel (2015) revealed that the cost of disasters increased drastically in 2012, with an economic loss of 58,322,907,201 Rwf. This also led to the loss of land due to flooding in Rwanda, negatively affecting human security. Issues such as the absence of electricity, water, hunger, lack of access to basic health care, difficulties in land conservation, increased physical violence, and crime were observed, leading to violations of human rights (Ilcan & Rygiel, 2015). However, Alkire (2018) states that human security is people-centered, establishing prevention-oriented responses that strengthen the protection and empowerment of all people. Additionally, it is noted that in 2015, 2025 houses were destroyed, 131 deaths, 195 injuries, and 98 livestock died due to inadequate settlement policies in rural areas of Rwanda, which impacted people's health and food security, resulting in a lack of access to basic health care and hunger (MIDMAR, 2015). Despite the government of Rwanda stating that every citizen should be effectively secured, civil society and citizens in rural villages, who require daily human security, are complaining about the wide range of rural settlement policy implementations affecting their lives. The purpose of this paper therefore was to examine the influence of environmental protection interventions on human security in Muhanga District.

2. Literature Review

2.1 Empirical Review

2.1.1 Environmental Protection Interventions and Human Security

Different studies on human settlement in Rwanda divided the development of human settlement in three main timeframes ranged from pre- to post-colonial period. The pre-colonial human settlement will be generally centered on agro-pastoral activities carried out in concentric cultivation plot of the family house. The Rwanda National Human Settlement Policy, (2009) showed that the social life of Rwandan family during this period will be generally organized inside the family enclosure consisting of inzu (the house), urugo (front yard), igikali (the backyard located rear of the house), the granaries for well-off families and a boundary made of an euphorbia hedge, or a fence designed out of reeds (Rwanda National Human Settlement Policy, 2009). The construction materials of that time included mainly the clay soil, soil from ant hills and straw. Inside the house, partitions came to be developed from plant fiber-woven mats. During the colonial period, the physical appearance of human settlement underwent considerable modifications. Within this period, urban centers emerged because of colonization and evangelization. The small population clusters were born in vicinity of colonial administration and staff residences.

This colonial period was characterized also by the introduction of the new layout of architecture separating the enclosure with the main buildings such as main house, toilette and kitchen. In terms of constructional materials, the colonialists and the missionaries announced new resources such as the adobe brick, the burnt brick, the tiles and the grooved iron sheet, among others. The post-colonial period was generally characterized by the development of urban areas and the rural village settlements first introduced in 1978. The main rural settlement villages established with this period included the rural villages of Gashora and Sake, the pilot village of Rango in for Butare District.

After 1994 Genocide against Tutsi, the policy of rural village settlements will be revived as a response to the pressing needs of inadequate shelters to homeless Rwandans, security challenges and land management in the same context, *Imidugudu* villages' policy will be adopted and implemented by the government as an adequate resettlement policy propelling the development of human settlement. Accordingly, this policy helped to construct the houses for the people in need and speed up the process of accessibility to the different social and economic services. As well, the *Imidugudu* villages' policy will be used also by the government as a useful mechanism to create a social integration platform for Rwandans with different backgrounds and re-shape the Rwandan society image torn by the 1994 war and Genocide against Tutsi.

In 2010, the government of Rwanda introduced an Integrated Development Project (IDP) to support the implementation of current human settlement policy by creating planned settlement villages. IDP village model were constructed in different parts of Rwanda to improve the existing rural human settlement system to achieve sustainable socioeconomic development, slow down population growth and accelerate progress towards achievement of MDGs and EDPRS goals.

2.2 Theoretical Review

Understanding how public policies emerge and are adopted has long been a central concern in political science and public administration. One of the most influential frameworks in this regard is the Multiple Streams Policy Theory (MSPT), developed by John W. Kingdon in his seminal work *Agendas, Alternatives, and Public Policies* (1984). The theory provides insight into why certain issues gain policy attention while others do not, emphasizing the role of timing, problem framing, and political dynamics. In recent years, MSPT has been applied beyond traditional policy arenas, including environmental governance and human security, where it helps explain how environmental protection interventions are prioritized and implemented to safeguard human well-being. Kingdon's (1984) Multiple Streams Policy Theory posits that the policymaking process can be understood as the convergence of three independent but interrelated "streams": the problem stream, the policy stream, and the politics stream.

This theory challenges linear models of policymaking, instead presenting policy formulation as a dynamic, fluid, and often unpredictable process influenced by timing, opportunity, and agency. MSPT's flexibility has made it one of the most widely applied frameworks in public policy analysis, including fields such as health policy, education, environmental management, and security studies (Rawat & Morris, 2016).

Human security encompasses protection from critical and pervasive threats to people's lives, including environmental degradation, food insecurity, and natural disasters (United Nations Development Programme (UNDP, 1994). Environmental protection interventions such as climate change mitigation, pollution control, and sustainable resource management are therefore central to

maintaining and enhancing human security (Barnett & Adger, 2007). MSPT provides a valuable framework for understanding how environmental protection policies emerge as governmental priorities that ultimately influence human security outcomes.

Multiple Streams Policy Theory offers a dynamic and context-sensitive lens for analyzing how environmental protection policies emerge and affect human security. It highlights the importance of aligning problem recognition, viable policy solutions, and favorable political conditions to open windows of opportunity for transformative action. By applying MSPT, scholars and policymakers can better understand how timing, advocacy, and political dynamics shape environmental interventions that safeguard human well-being and promote sustainable security for future generations.

2.3 Research Gap

The literature reviewed in this chapter illustrates empirical accounts on existing relationships and impact of rural village settlement policy and human security. Different previous studies conducted in this field and literature reviewed human settlement and human security, but they did not evaluate the influence of the rural village settlement policies on human security in context of Rwanda (NISR, 2016). Thus, this remains an area to venture in and ascertain the influence that rural village settlement policies have on security, empirical findings of this study will cover this research gap of the relationship of influence that the rural village settlement policies have on human security. Security as a concept and the connections between environmental policy gaps and human security from Kautiyla to Plato to Machiavelli and Hobbes, the concept of military security from external threats or the lack of harm to gained values has indeed been popular. The scope of security has grown due to political divides, cybercrime, and cultural threats. Security now includes political, financial, social, human, ecological, national, territorial, community, home, and personal challenges.

3. Methodology

The study utilized a descriptive survey research design to make a concurrent triangulation model with descriptive survey research design. This design was employed to establish some descriptive statistics related to access to utilities and human security in Muhanga District in Rwanda and help to establish the extent through access to utilities can influence human security. Questionnaire, interview guide, observation and focus group discussion were taken as data collection instruments. The obtained quantitative data were analyzed using SPSS version 21. This involved the computation of frequencies and percentages while qualitative data was thematically analyzed.

4. Presentation of Findings

The findings of this paper are presented focusing of the specific research objective which was to examine the influence of environmental protection interventions on human security in Muhanga District in Rwanda. Environmental protection interventions are crucial for safeguarding natural resources, ensuring ecological balance, and supporting sustainable development. In the Muhanga District, Rwanda, such interventions play a vital role in enhancing human security by protecting the environment from degradation and mitigating the impacts of climate change. These efforts are essential for preserving agricultural productivity, maintaining water quality, and preventing soil erosion, all of which are critical for the community's health, economic stability, and resilience. This study examines the influence of environmental protection interventions on human security in

the Muhanga District, assessing the effectiveness of current measures and identifying opportunities for improvement to ensure long-term sustainability and well-being for the district's residents.

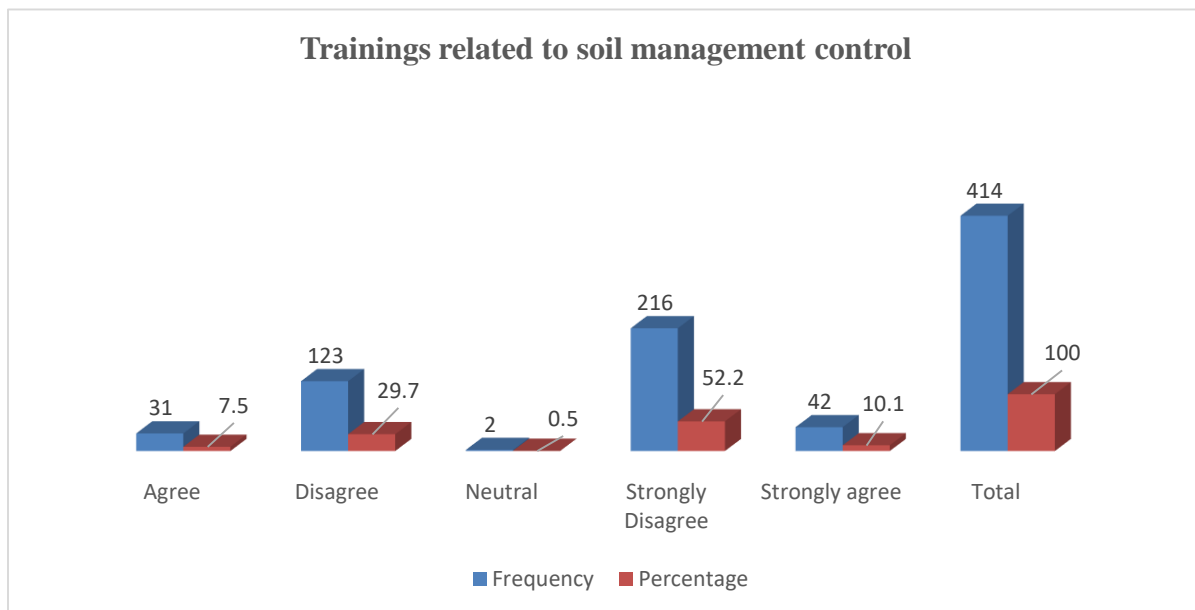
4.1 Environment Protection

The image below shows a rice plantation that was flooded, significantly impacting food security in Muhanga District.



1. Management control

Figure1: Trainings related to soil management control



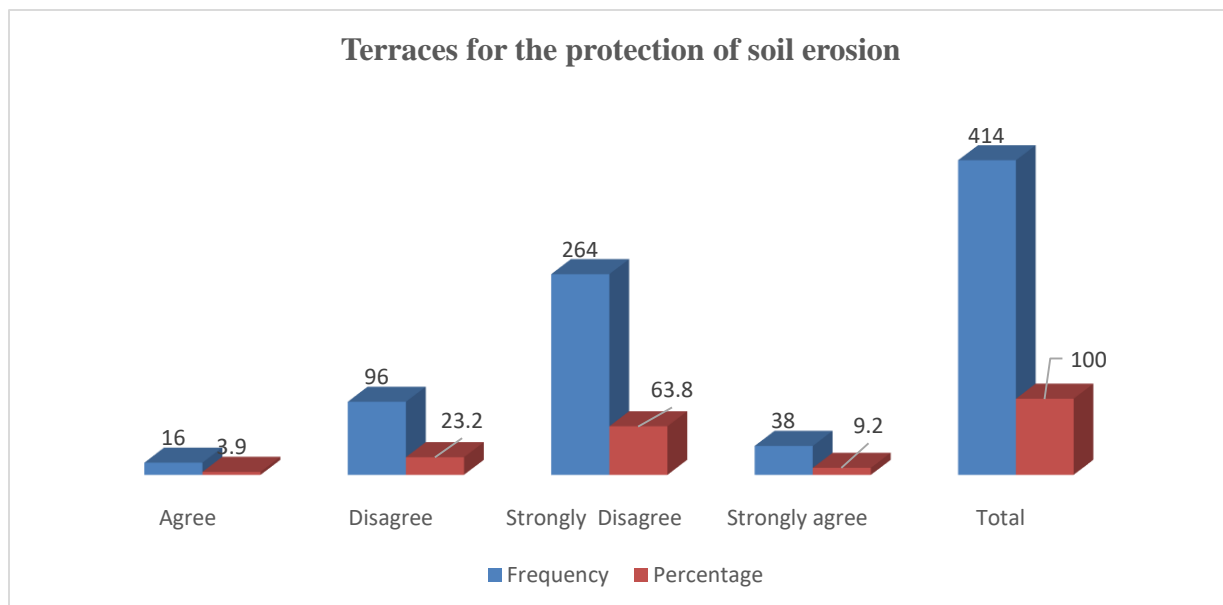
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This Figure shows the distribution of responses regarding whether individuals have received training on soil management control. A significant portion, approximately 52.2%, strongly disagree with this statement, indicating that many people may not have had the opportunity to access training on proper soil management. This suggests potential gaps in the availability or accessibility of training programs in our context. The lack of training can lead to improper practices, which can degrade soil quality and reduce crop yields. Ensuring widespread access to soil management education is critical for maintaining soil health and promoting sustainable agricultural practices.

4.2 Trainings Related to Soil Management Control and human security

The data shows that 52.2% of respondents strongly disagree with having received training on soil management control, suggesting a significant gap in training opportunities. This lack of training can affect economic security as proper soil management is essential for maintaining agricultural productivity. Without adequate training, soil degradation may threaten food security and reduce agricultural output, impacting the economic stability of farming-dependent households.

Figure 2: Terraces for the protection of soil erosion



Moving on this Figure 2, which illustrates attitudes towards the use of terraces for soil erosion protection, we observe that the majority, about 63.8%, strongly disagree with this practice. This suggests that many people may not support the idea of using terraces to prevent soil erosion. It could be due to a lack of understanding of the benefits or other concerns surrounding the use of terraces.

4.3 Terraces for the Protection of Soil Erosion and human security

Most respondents (63.8%) strongly disagree with using terraces for soil erosion protection. This indicates a lack of support or understanding of the benefits of terraces. Effective use of terraces is crucial for preventing soil erosion and maintaining soil fertility. The absence of such practices

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could lead to soil degradation, negatively impacting land quality and agricultural productivity, thus affecting both environmental and economic security.

Figure 3: Conserve rainwater for further use

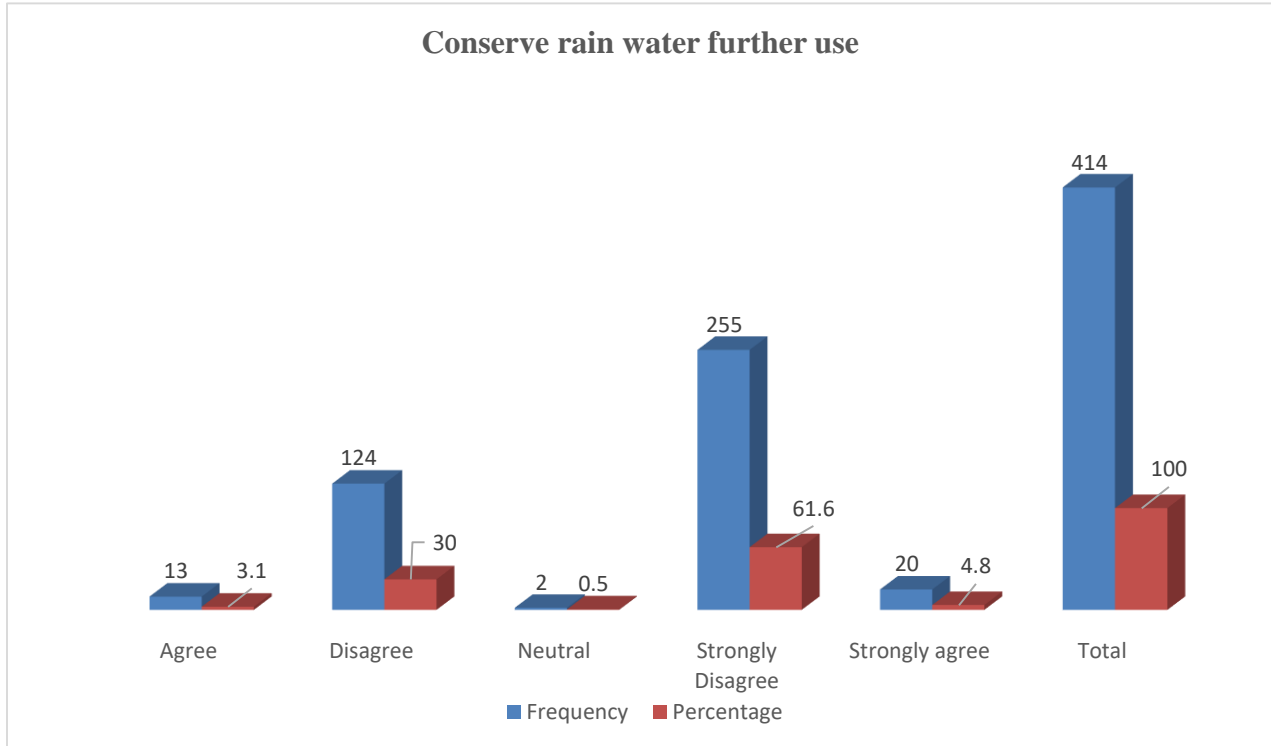
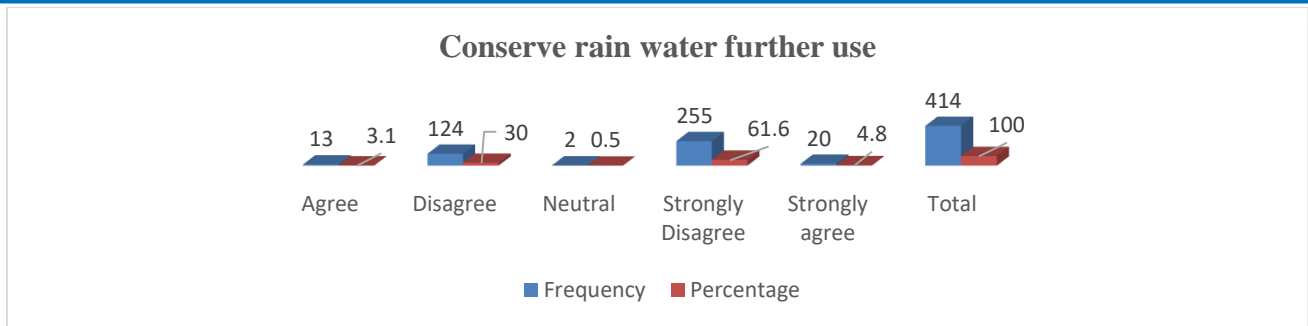


Figure3 addresses rainwater conservation for future use, we see a similar trend. A considerable number of people, around 61.6%, strongly disagree with this statement. This implies that there may be limited support for the idea of collecting rainwater for future use. It's crucial to investigate the reasons behind this strong disagreement, whether it's due to awareness gaps or other concerns preventing people from adopting such practices. This increases water volumes, disrupting the movement of people and goods and causing infrastructure damage, which hinders economic development.

3. Conserve Rainwater for Future Use and human security

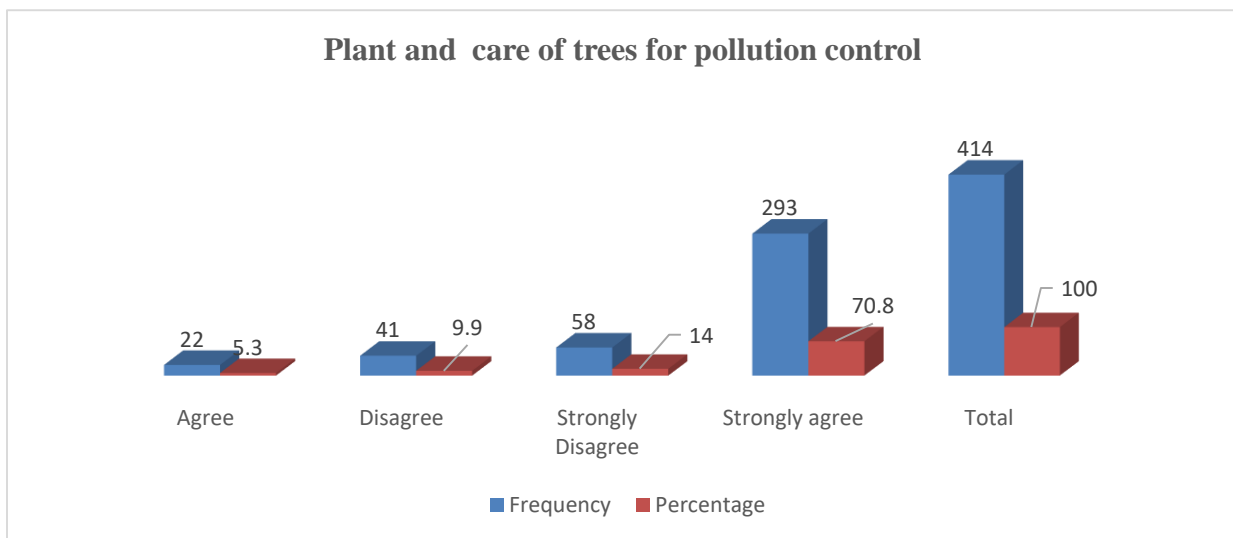


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A significant portion of respondents (61.6%) strongly disagree with the practice of conserving rainwater for future use. This suggests limited support for our awareness of rainwater conservation. Rainwater conservation is vital for managing water resources and mitigating water shortages. Limited adoption of this practice can strain water availability and impact health security by affecting sanitation and overall health, particularly during dry periods. Rainwater harvesting plays a crucial role in health security by providing clean water for drinking, cooking, and sanitation, which is essential in preventing waterborne diseases.

Figure 4: Plant and care of trees for pollution control



The data reveals the distribution of responses to a statement, with a total of 414 respondents participating in the survey. Among these respondents, the majority strongly agree with the statement, with 293 individuals accounting for 70.8% of the total responses. Conversely, there are notable proportions of respondents who express disagreement, with 41 respondents (9.9%) disagreeing and 58 respondents (14%) strongly disagreeing. Additionally, 22 respondents (5.3%) express agreement with the statement.

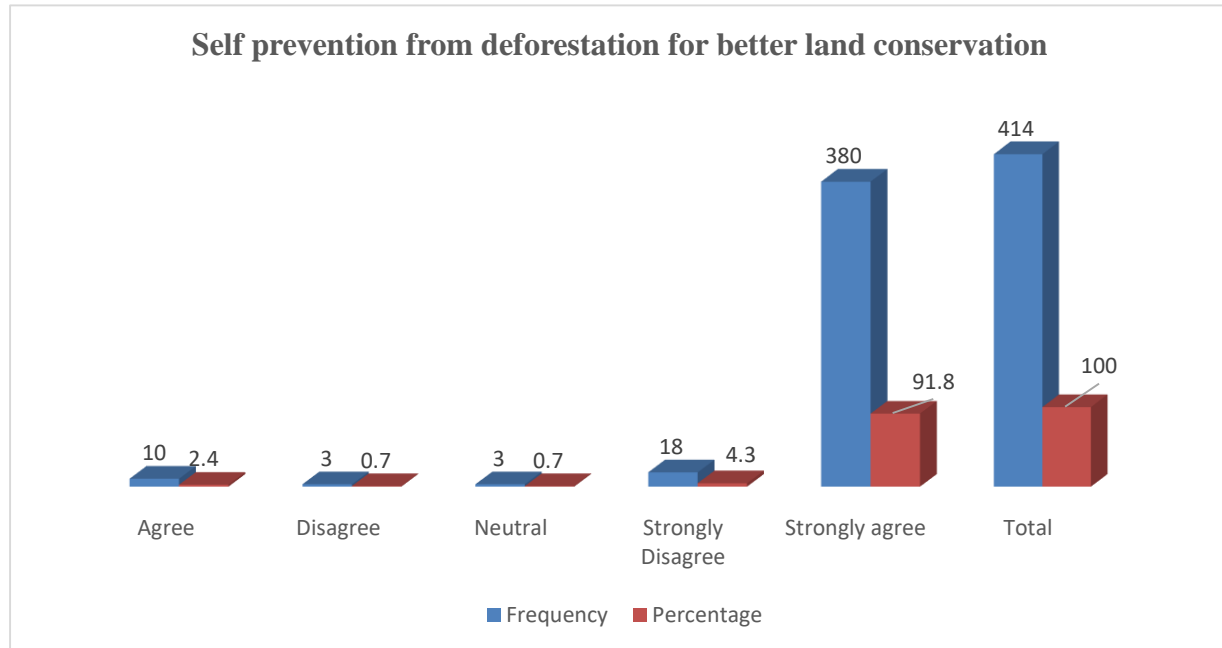
4.4 Plant and Care for Trees for Pollution Control and human security

Most respondents (70.8%) strongly agree with planting and caring for trees to control pollution. This strong support for tree planting enhances air quality and contributes to environmental health. Improved air quality reduces respiratory issues and promotes overall public health, thereby

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positively impacting health security. Trees are vital for air purification, as they absorb pollutants like carbon dioxide, sulfur dioxide, and nitrogen oxides while producing oxygen.

Figure 5: Self-prevention from deforestation for better land conservation

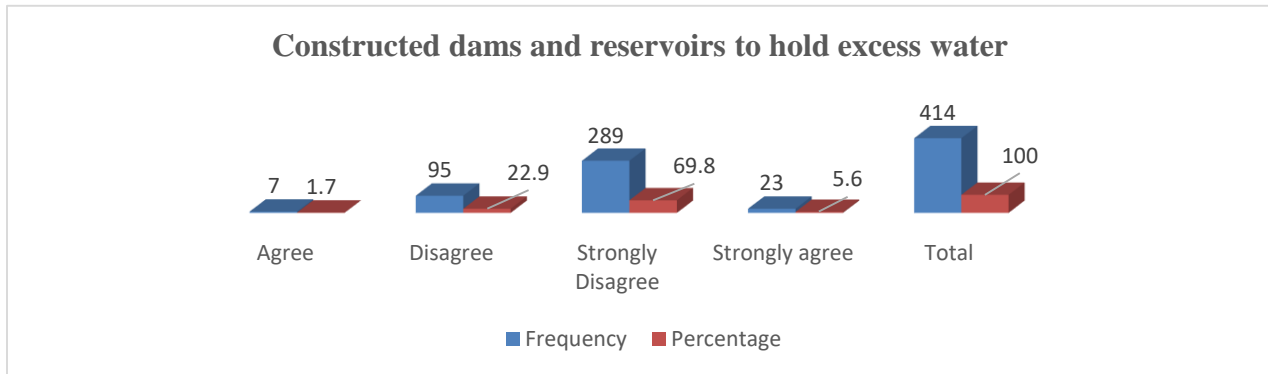


The data shows that out of 414 respondents, a significant majority of 389 individuals (94.9%) strongly agree with the statement about preventing deforestation for better conservation of land. Additionally, 10 respondents (2.4%) agree, while 3 respondents (0.7%) each are either neutral or disagree. Finally, 18 respondents (4.3%) strongly disagree. This indicates a strong commitment among respondents to avoiding deforestation for land conservation purposes.

4.5. Self-Prevention from Deforestation for Better Land Conservation and human security

An overwhelming majority (91.8%) strongly agrees with preventing deforestation for better land conservation. This high level of commitment supports maintaining biodiversity, soil quality, and ecosystem stability. Preventing deforestation helps ensure sustainable land use, which supports both environmental health and economic resilience. Deforestation has significant consequences for ecosystem stability, affecting biodiversity, water cycles, and soil integrity.

Figure 6: Constructed dams and reservoirs to hold excess water

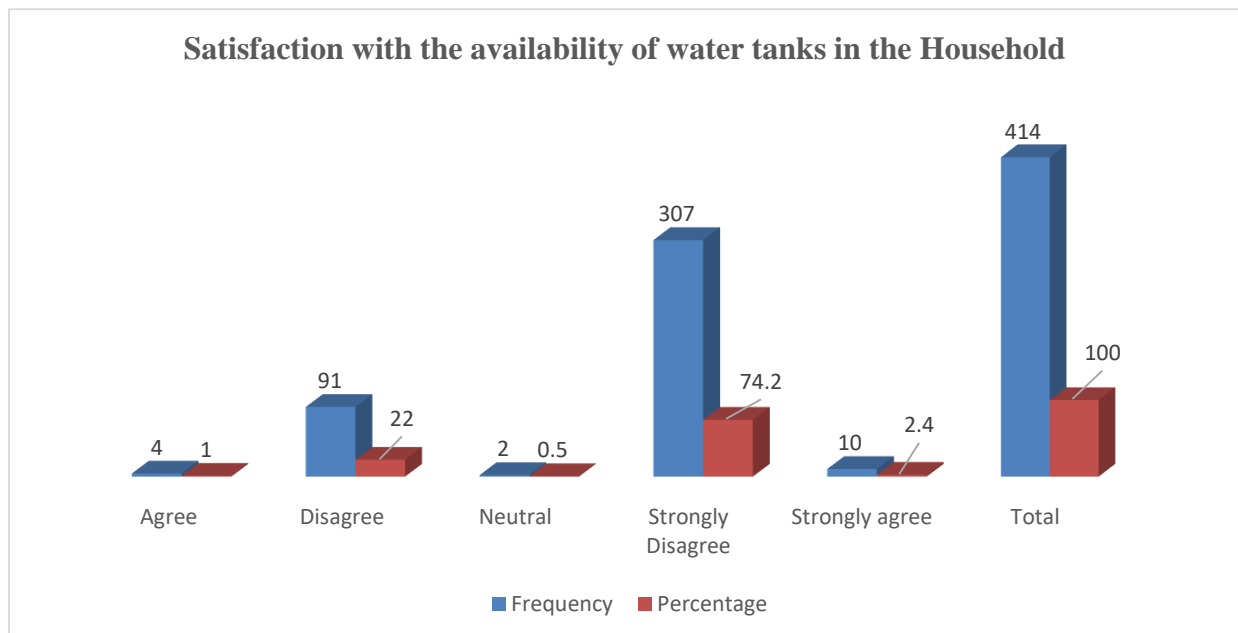


The survey results reveal that among the 414 respondents, only 23 respondents (5.6%) strongly agree with constructing dams and reservoirs to hold excess water, and 7 respondents (1.7%) agree. However, a large portion of respondents, 289 individuals (69.8%), strongly disagree with the practice, and 95 respondents (22.9%) disagree. This indicates a significant opposition or lack of engagement in constructing dams and reservoirs for water management among the respondents.

4.6. Constructed Dams and Reservoirs to Hold Excess Water and human security

A large proportion of respondents (69.8%) strongly disagree with constructing dams and reservoirs to manage excess water. This indicates a lack of support for or engagement with water management infrastructure. Dams and reservoirs are crucial for managing water resources, mitigating flood risks, and supporting irrigation. The absence of such infrastructure could lead to inefficient water management and increased flood risks, affecting environmental and food security.

Figure 7: Satisfaction with the availability of water tanks in the Household



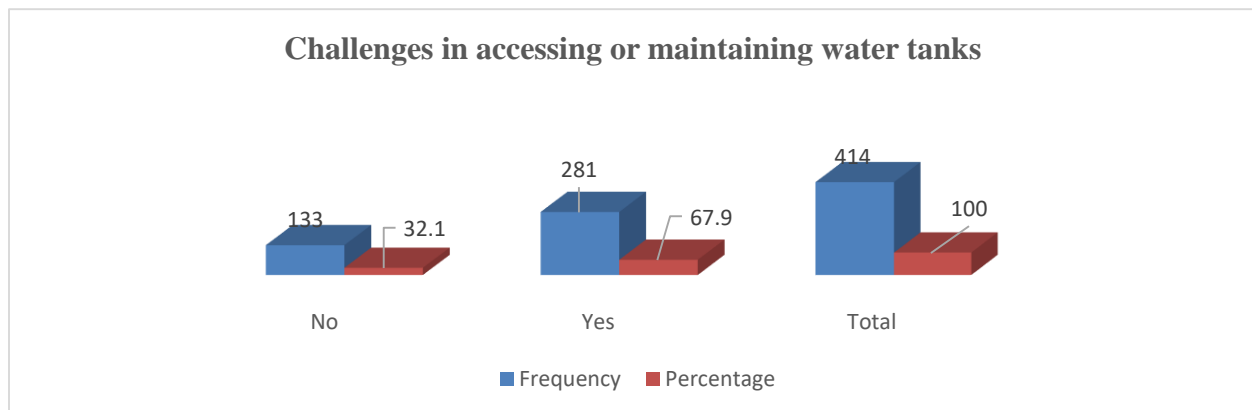
In this survey, 414 respondents were asked about their satisfaction with the availability of water tanks in their households. The majority, 307 respondents (74.2%), strongly disagree with being satisfied, and 91 respondents (22%) disagree. Only a small fraction of respondents, 10 individuals (2.4%), strongly agree with being satisfied, and 4 respondents (1%) agree. Additionally, 2 respondents (0.5%) remain neutral. This highlights a general dissatisfaction with the availability of water tanks among the respondents.

4.7. Satisfaction with the Availability of Water Tanks in the Household and human security

Most respondents (74.2%) strongly disagree with being satisfied with the availability of water tanks. This dissatisfaction highlights issues with water storage infrastructure. Adequate water storage is essential for ensuring reliable access to clean water. Poor availability and dissatisfaction with water tanks can impact health security by affecting sanitation and overall public health.

Water storage infrastructure, such as household water tanks, plays a crucial role in maintaining health security by providing a buffer against water supply disruptions.

Figure 8: Challenges in accessing or maintaining water tanks



The data indicates that out of 414 respondents, 281 individuals (67.9%) have faced challenges in accessing or maintaining water tanks, while 133 respondents (32.1%) have not faced such challenges. This suggests that most of the respondents' experience difficulties related to water tank access or maintenance.

4.8. Challenges in Accessing or Maintaining Water Tanks and human security

A significant portion of respondents (67.9%) have faced challenges in accessing or maintaining water tanks. These difficulties can lead to water scarcity, which affects sanitation and health. Addressing these challenges is crucial for ensuring reliable access to clean water and supporting overall health security. District leadership emphasizes proactive management control by informing residents about disaster prevention and sustainable land use, such as planting trees and maintaining level terraces. They also stress the importance of justifying actions with natural resources, protecting against pollution, and guiding land conservation. This approach helps ensure responsible resource use, promotes environmental health, and supports community well-being. By integrating these practices into local governance, the district aims to enhance economic stability, food security, environmental health, and public health.

5. Discussion of Findings

This section discusses the findings of the study by comparing and contrasting them with previous empirical studies on environmental protection interventions and human security. The discussion is organized according to the key thematic areas derived from the study objectives.

5.1 Soil Management Training and Human Security

The study revealed that a majority of respondents (52.2%) strongly disagreed with having received training on soil management control, indicating a significant gap in knowledge dissemination. This finding is consistent with Hajdu et al. (2020), who found that limited access to agricultural training contributes to soil degradation, reduced productivity, and increased food insecurity in rural communities. Similarly, Lal (2001) emphasized that lack of soil management knowledge leads to unsustainable farming practices and declining soil fertility. However, the current study contrasts with findings from FAO (2021), which indicate increasing global efforts in farmer education and extension services aimed at promoting sustainable land management. The persistence of low training levels in Muhanga District suggests that such global and national initiatives may not be effectively reaching local communities. This gap undermines economic and food security, as farmers lack the technical capacity to sustain agricultural productivity.

5.2 Adoption of Terracing Practices and Environmental Security

The findings showed that 63.8% of respondents strongly disagreed with the use of terraces for soil erosion control, reflecting low adoption levels. This aligns with Lal (2019), who noted that despite the effectiveness of terracing in reducing soil erosion, its adoption remains limited due to lack of awareness, labor intensity, and cultural resistance. Conversely, the findings differ from studies conducted in other parts of Rwanda and East Africa, where terracing has been widely adopted due to government-led land husbandry programs (World Bank, 2019). The discrepancy may be attributed to differences in local implementation strategies and community engagement. The low uptake of terracing in Muhanga District poses a risk to environmental security, as it accelerates soil erosion and reduces land productivity.

5.3 Rainwater Conservation and Health Security

The study established that 61.6% of respondents strongly disagreed with conserving rainwater for future use, indicating limited adoption of water harvesting practices. This finding supports Worm and Hattum (2006), who argued that inadequate rainwater harvesting systems contribute to water scarcity and poor sanitation outcomes. However, the results contradict WHO (2021), which highlights increasing global awareness and adoption of water conservation practices as essential for improving public health. The low level of adoption in Muhanga suggests persistent barriers such as lack of awareness, infrastructure, or financial resources. This situation negatively affects health security, as unreliable water access increases vulnerability to waterborne diseases and sanitation challenges.

5.4 Tree Planting and Air Quality Improvement

The study found strong support (70.8%) for planting and caring for trees to control pollution. This aligns with Nowak et al. (2006), who demonstrated that trees significantly reduce air pollution and improve public health outcomes. The findings also correspond with FAO (2021), which promotes afforestation as a key strategy for environmental sustainability and climate change mitigation. Unlike other environmental practices examined in this study, tree planting shows high community acceptance. This could be attributed to increased awareness campaigns and visible benefits such as improved air quality and climate regulation. The positive perception of tree planting enhances health security by reducing respiratory diseases and improving overall environmental conditions.

5.5 Prevention of Deforestation and Ecosystem Stability

The overwhelming majority (over 90%) of respondents supported preventing deforestation, indicating strong environmental awareness. This finding is consistent with Myers (1988), who highlighted the critical role of forest conservation in maintaining biodiversity and ecosystem stability. It also aligns with recent global environmental policies emphasizing forest protection as a means of enhancing climate resilience. However, while attitudes are positive, previous studies (FAO, 2021) suggest that behavioral change does not always translate into practical action due to economic pressures such as reliance on firewood and agricultural expansion. Therefore, although the study demonstrates strong commitment to forest conservation, actual implementation may still face challenges. Nonetheless, this positive attitude contributes significantly to environmental and economic security.

5.6 Water Infrastructure (Dams and Reservoirs) and Food Security

The study revealed that 69.8% of respondents strongly disagreed with constructing dams and reservoirs, indicating low support for water infrastructure development. This finding is in line with McCully (2001), who noted that communities often resist dam construction due to concerns about environmental degradation and displacement. On the other hand, the findings contrast with World Bank (2019), which emphasizes the importance of water infrastructure in enhancing irrigation, controlling floods, and ensuring food security. The reluctance observed in Muhanga District suggests a need for community sensitization and inclusive planning processes. Without adequate water infrastructure, the region remains vulnerable to floods and droughts, thereby undermining food and environmental security.

5.7 Water Storage Facilities and Health Security

The study found high levels of dissatisfaction (74.2%) with the availability of water tanks, alongside significant challenges in accessing and maintaining them (67.9%). These findings are consistent with Gleick (1996) and Graham and Polizzotto (2013), who emphasized that inadequate water storage systems contribute to water scarcity and increase the risk of waterborne diseases. However, the findings differ from WHO (2021), which reports improvements in water access infrastructure in many developing regions. The continued challenges in Muhanga District indicate

disparities in infrastructure development and service delivery. Poor water storage capacity directly affects health security by limiting access to safe water for drinking, hygiene, and sanitation.

5.8 Community Awareness and Governance in Environmental Protection

The study also highlighted the role of district leadership in promoting environmental protection through community sensitization and disaster risk reduction strategies. This finding aligns with UNDRR (2020), which emphasizes that effective disaster risk management depends on community participation and awareness. Similarly, World Bank (2019) and FAO (2021) underscore the importance of integrating local governance and community engagement in environmental sustainability initiatives. While the study shows that awareness campaigns exist, the low adoption of several practices (e.g., terracing, rainwater harvesting) suggests that awareness alone is insufficient without practical support, resources, and enforcement mechanisms.

5.9 Implications for Human Security

The findings indicate a mixed level of adoption of environmental protection interventions in Muhanga District. While practices such as tree planting and deforestation prevention show strong support, others like soil management training, terracing, rainwater harvesting, and water infrastructure remain poorly adopted. These findings both align with and diverge from previous studies, highlighting that while global evidence supports the effectiveness of environmental interventions in enhancing human security, local implementation gaps persist. The study therefore underscores the need for strengthened capacity building, infrastructure investment, and community engagement to ensure that environmental protection interventions effectively contribute to sustainable human security in Muhanga District.

6. Conclusions and Recommendations

The lack of sufficient training and the low adoption of key environmental practices such as terrace construction and rainwater harvesting reveal a critical gap in environmental management. Enhancing training programs and promoting sustainable land use practices are vital for protecting natural resources and ensuring long-term agricultural productivity. It was also concluded that efforts to restore degraded ecosystems, such as reforestation and soil conservation, can enhance the natural resilience of the environment to disasters. Healthy ecosystems, including forests and wetlands, can act as natural buffers against floods and landslides, reducing the impact of these disasters on communities. It was recommended that there should be a develop and implement comprehensive training programs focused on soil management, terrace construction, and sustainable agricultural practices. These programs should be accessible to all community members and tailored to local conditions.

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