ANALYSING THE ROLE OF INTEGRATED FARM PLAN ENVIRONMENTAL APPROACHES AND CONSERVATION OF THE MANAFWA WATERSHED, EASTERN UGANDA

BY

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DECLARATION

I, **Doreen Chepkurong, declare** that this dissertation entitled **Analysing the Role of Integrated Farm Plan Environmental Approaches and Conservation of the Manafwa Watershed, Eastern Uganda** is my original piece of work and has never been presented to any University or higher institution of learning for any academic award.

Signed……... Date……

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APPROVAL

We certify that this dissertation titled, **Analysing the Role of Integrated Farm Plan Environmental Approaches and Conservation of the Manafwa Watershed, Eastern Uganda** has been compiled under our guidance and supervision and is now ready for submission with our approval.

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DEDICATION

This work is dedicated to my beloved children Asiya Cheruto, Ibrahim Ruto and Ismael Kiprop who stood with me during this study program and my parents Lwoley Wilfried and Kissa Naume, my sisters Maureen, Prossy and Miria for taking care of the home.

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ACRONYMS

CVI:	Content Validity Index
FAO:	Food and Agricultural Organisation
MWARES:	Manafwa Watershed Restoration and Stewardship
MWE:	Ministry of Water and Environment
NEMA:	National Environmental Management Authority
NFA:	National Forestry Authority
NUSAF:	Northern Uganda Social Action Fund
PEAP:	Poverty Eradication Action Plan
PIP:	Plan Inte´gre´ de Paysan in French
SPSS:	Statistical Packages for Social Scientist
UBOS:	Uganda National Bureau of Statistics
UWA:	Uganda Wildlife Authority

ABSTRACT

The government of Uganda is committed to watershed conservation practices in the Manafwa river valley. Interventions have been made through Northern Uganda Social Action Fund, National Forestry Authority, National Environmental Management Authority and Manafwa Watershed Restoration and Stewardship in order to reduce watershed degradation. The implementation of MWARES has been in place for the last two years. This study was therefore intended to analyse the role of Integrated Farm Plan environmental approaches and conservation of the Manafwa watershed, Eastern Uganda. This was operationalized by specifically studying the locational characteristics of the area where the schools are found, the forms and process of activity integration within the watershed, the networking and collaboration strategies and the influence of pupils' environmental awareness on watershed management. In further execution, the study adopted both a correlational research design to establish associations among variables and mixed methods to avail comprehensive conclusions. A sample of 214 respondents was selected using both purposive, and simple random sampling techniques, where 209 were from pupil environmental club participants and five of them from club patrons. The study availed descriptive, inferential, and qualitative findings after using a questionnaire, an interview guide, and observation checklist for data collection. By using Binary regression analysis, the study found that the forms and process of activity integration within Manafwa watershed from Bukalasi, Bushika, and Bushiyi had significant Beta values of 0.95, 0.96 and 0.96 respectively. Pupils' strategies of networking and collaboration in Manafwa watershed had a low positive effect with Beta values 0.38, 0.17 and 0.22 from Bushiyi, Bukalasi and Bushika Sub- Counties respectively. Pupils' environmental awareness in all the three Sub-counties of Bukalasi, Bushika and Bushiyi had significant Beta values of 0.78, 0.86 and 0.85 respectively for watershed management. The study thus recommends that strategies like training pupils on how to put value to PIP products like fruits and bananas so as to generate funds to run their activities, training them on tree nursery bed establishment so as to ensure availability of trees to be planted in schools and for sale in the community and banana management, head teachers and classroom teachers to adequately timetable environmental club activities and constantly pass on conservation messages during classroom sessions, assemblies and budgeting for such activities. Further, district officials and partners like MWARES should train

and retrain teachers to orient them towards environmental conservation responsibilities and occasionally organise environmental club competitions to boost competitiveness among schools.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

"PIP approach'', originally, Plan Inte´gre´ de Paysan (PIP) was designed for farming communities. It has been widely applied in North America and Burundi. It starts at farmer family level with the creation of an integrated farm plan (Kessler et al., 2020). In this approach farm households and other local stakeholders create a long-term vision, make a plan, and become intrinsically motivated to transform their reality: their farm, their village and eventually the whole watershed. The PIP program involves creation of PIP activities like creating awareness among the communities (farmers and children in schools). This approach is being applied at a school level as part of its mandate to build competences of primary school pupils beginning with those in the upper Manafwa watershed. Through PIP activities pupils are shown pre-PIP and post-PIP interventions, providing marketing information, building structures of communities through generations and mobilisation for fund creation towards watershed conservation. PIP is based on three principles: empowerment, integration, and collaboration

In primary schools, MWARES is working through the environmental education clubs to bring about mindset change in pupils through knowledge and encouraging hands-on approaches. These are aimed at building environmentally sustainable visions, plans, and actions in the schools. Therefore, there was a need to assess the extent to and the process by which children in school environmental education clubs had attained conservation competences to enable them contribute to the conservation of the Manafwa Watershed through the PIP approach. The study aims at analysing the contribution of the PIP Environmental Approaches in watershed Conservation.

Carla (2011) has advocated for an approach that focuses on empowering young people through developing knowledge and understanding for decision making, planning, acting and participation on environmental issues (Carla, 2011). This is through skill building to solve real environmental problems collectively that directly affect learners either at home, school or in their community.

Also, arousing pupils' awareness on environmental issues is crucial as future citizens (Melinda et al., 2014). This requires change at the level of thinking and everyday behavior among children (Despina & Vasilla, 2013). Despina (2013) & Vasilla (2013) further noted that children need to develop their knowledge, values and ways of reasoning in their early years in relation to the environment they live in. The study aims at analysing the contribution of the PIP Environmental Approaches in watershed Conservation.

Conservation is the act of identifying, understanding, preserving, and protecting nature's energy flow by humans (Graham, 2020). Conservation activities may be both direct or indirect physical action. Graham (2020) further noted that hope for mankind's future comes from instilling a deep connectivity consciousness in our youth. Therefore, children need to be involved in the processes of environmental conservation since they are the next generation that will experience either the success or failure of current environmental sustainability effort by engaging in programs that integrate sustainability and early childhood policies at school and communities (Šorytė & Pakalniškienė, 2019). The study aims at analysing the contribution of the PIP Environmental Approaches in watershed Conservation.

Watershed is the landscape that contributes surface water to a single location, such as a point on a stream or river, or a single wetland, lake or other water body (Bamutaze et al., 2014).
Watersheds are hierarchically organised systems, and their delineation depends on the context of the scale of focus (Thomas *et al*., 2007). For example, a watershed may represent the landscape upstream. On a human scale, what happens within a watershed, whether natural or caused by humans, affects the water quality and health of that watershed that will impact on neighbouring watersheds (Yetiş, 2008). As a result, the quality and quantity of services generated by watersheds are rapidly declining (Farber et al., 2002) because of accelerating rates of land-use change, water consumption and climate change. The study aims at analysing the contribution of the PIP Environmental Approaches in watershed Conservation.

1.2 Statement of the Problem

Manafwa watershed in Eastern Uganda is facing a lot of degradation as a result of both physical and human activities. Heavy rains, steep nature of the land and deep weathered soils with high clay content of low shear resistance have brought about severe soil erosion, floods, and landslides (Nakileza & Nedala, 2020, Khaitsa, 2020). In the Manafwa watershed, there has been pressure on land due to an increasing population of about 4.5% (UBOS, 2020). This has been worsened by cultivation of steep slopes, deforestation, and insufficient use of soil conservation measures (Mugagga et al., 2012), uphill cultivation, limited terracing causing more degradation (Kagoya, Paudel & Daniel, 2018), widespread poverty and unsatisfactory knowledge on disaster preparedness (Osuret et al., 2016). These have led to decreased generation of income (Laura et al., 2021), floods, landslides, destruction of crops and loss of lives.

Interventions like promoting tree planting and afforestation (Buyinza et al., 2020), adoption of good farming practices and support from government and private partners (Osuret et al, 2016), forest cover restoration and restriction of communities from opening critical slopes (Mugagga et al., 2012), digging of run-off channels (Lunyolo et al., 2021) are done but not involving children in schools. PIP has therefore been put in place to empower the local farmers and the pupils in primary schools so that there is reduction in the challenges of watershed management. However, whether the interventions by PIP in the Manafwa watershed is contributing to watershed conservation is not yet known.

This study was therefore designed to analyse the role of pupils in watershed management using the Integrated Farm Plan Environmental and Conservation approaches in the Manafwa Watershed.

1.3 Study Objectives and Research Questions

1.3.1 General Objective

The general objective of the study is to find out whether the involvement of pupils using the PIP environmental approaches towards Manafwa conservation in Bududa District results in improved watershed environmental management.

1.3.2 Specific Objectives

This research was guided by the following objectives.

i. To study the locational characteristics of the area where schools are located
ii. To examine the forms and process of activity integration within Manafwa watershed in Bududa District.
iii. To find out how the strategies of networking and collaboration are integrated in Manafwa watershed conservation in Bududa District.
iv. To analyse the influence of pupil's environmental awareness on Manafwa watershed conservation in Bududa District.

1.3.3 Research Questions

This research was guided by the following questions.

i. What are the locational characteristics of the schools in the study area?
ii. What are the forms and activities of PIP integration within Manafwa watershed conservation in Bududa District?
iii. How are networking and collaboration strategies integrated in schools found in Manafwa watershed?
iv. Has environmental awareness among pupils influenced Manafwa watershed conservation in Bududa District?

1.4 Significance of the Study

The study will generate important information to the readers on the level of watershed degradation and the physical conservation potentials suggested by pupils such that they can apply to other watersheds.

The study may enable policy makers to formulate concrete actions that will involve pupils or children towards watershed conservation and restoration. This will work for not only Manafwa watershed but for other watersheds with similar degradation.

The findings generated from this study may be relevant to the policy makers like NEMA, Ministry of Water and environment, NFA, Ministry of Agriculture and disasters in reviewing their policies and laws and international agencies like MWARES other stakeholders to shape ongoing policy workable strategies in the conservation of the Manafwa region.

The findings from this study may generate information to resource managers both national and international to support long term watershed restoration and conservation programmes like training children in different watersheds towards watershed conservation.

1.5 The Conceptual Framework

Although children's involvement in environmental sustainability efforts has been widely acknowledged, there is still inadequate concrete evidence on what they think about the environment and how it should be protected (Šorytė and Pakalniškienė, 2019). This study is conceptualised on the opinions that humanity lacks adequate evidence on what makes pupils to think, feel and behave in a given pro-environmental manner (Collado, Evans, & Sorrel, 2017). This study was operationalized on a framework in reference to the efforts of the PIP approach in the Manafwa Watershed Restoration and Stewardship programme for watershed conservation.

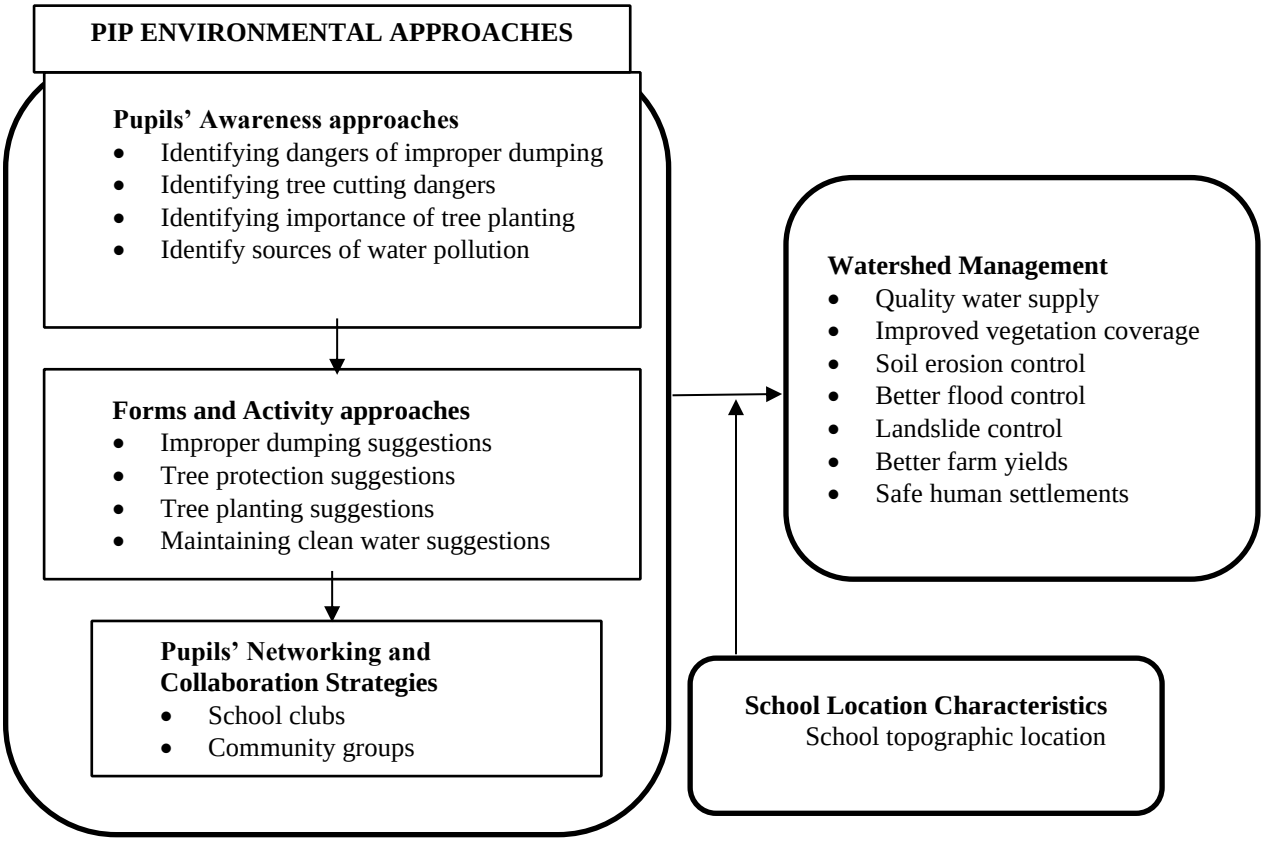

Figure 1: Conceptual framework of the study (*Adapted from:* Graham, 2020; Šorytė & Pakalniškienė, 2019; Collado et al., 2017.)

The conceptual framework above shows that watershed conservation is the dependent variable while the PIP environmental approaches are the independent variable. The dependent variable was discussed in relation to improved vegetation cover, landslide control and soil erosion control. The independent variable looked at the PIP environmental approaches of awareness, integration, networking and collaboration. School location factors like slope, rainfall, drainage proximity is the intervening variable. It is assumed that PIP environmental conservation approaches like awareness, integrating activities and networking leads to improved water quality, soil erosion and landslide control. However, this can be influenced by the location factors.

1.6 Scope of the Study

The study focused on the Sub- Counties located on the upper Manafwa watershed. It covered the three Sub- Counties of Bukalasi, Bushiyi and Bushaki. The study selected 8 primary schools from the three Sub- Counties. The Sub- Counties were selected because they are prone to disasters like landslides, floods, soil erosion and they were implementing the PIP approach.

The study focused on finding out whether the involvement of pupils using the PIP environmental approaches towards Manafwa conservation in Bududa District results in improved watershed environmental management as propagated by the MWARES (Manafwa Watershed Restoration and Stewardship) Project.

The research study covered a period of three years from 2019 to 2021 because this was the period the PIP approach was implemented. Field activities lasted for a period of three (3) months between March to June. It was assumed that this period was sufficient to collect the data for analysis.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

In this chapter, literature related to the study is reviewed and examined to identify any available research gaps, gain thorough insight into the research variables, and further illustrate the significance of this current study.

As an intervention, the Manafwa Watershed Restoration and Stewardship (MWARES) project is applying the integrated farm planning approach (PIP) to build competences of farmers and pupils in both primary and secondary schools in Bududa District. The PIP approach is applied in schools through environmental education clubs to bring about a mindset change of pupils in knowledge, care and agency to attain stewardship. This is done through participatory approaches like adaptive co-management among pupils to build a vision, plan, learn and act.

2.1 Locational characteristics

Watershed management aims in caring for natural resources in order to support human needs like food, energy and fibre (Tomer, 2014). However, such management practices can be customised according to the location characteristics like climate, land use, rainfall received, topography, surface-water and type of soils as described below.

It was noted that the climate of the Brewery Creek watershed is continental. where the winters are cold and snowy, and summers are warm and humid (Rappold, Wierl & Amerson, 1997). The nearness of Lake Michigan keeps the winters warm and summers cooler. Madan & Mimi also reported that climatic conditions depend on temperature, wind velocity and humidity. Therefore, the more the intensity of the rainfall in the watershed, the more is the peak flow (Madan & Mimi, 2016). There was a need to establish how the climate of Bududa influences the Manafwa watershed management.

Krishi noted that agricultural watersheds experience significant land-use change due to the tillage (Krish, 2014). This leads to increased erosion and formation of rills due to the falling rain drops. Krishi also noted that where forest watershed dominates, the ground is littered with leaves, stems and branches which resist erosion. There was a need to establish the locational characteristics of Manafwa watershed.

Slope controls the rainfall distribution (Madan & Mimi, 2016). If the slope is more, the velocity is more and there is increased soil transportation. In the Tinalah watershed, the landslide occurrence coincides with an elevation of higher than 400 m.a.s.l and steep slope inclination than in lower elevations (Henky et al., 2015). Therefore, watershed management practices vary according to slope elevation. There was a need to establish the location characteristics of the slope on Manafwa watershed management.

It was reported that topography significantly influences low flows in snow-dominated watersheds in British Columbia and Canada (Li et al., 2018). In relation, it was discovered that topography directly impacts on the spatial distribution of soil attributes since it affects the surface composition (Li et al., 2017). It was also found that both climate and topography affect rills of watersheds in the Welmel watershed of the Genale Dawa Basin, Ethiopia (Tessema et al., 2020). This study aimed to also examine the role of locational characteristics towards building competences for the management of the Manafwa watershed.

Digital Elevation Models are important for watershed management (Alrajhi et al., 2016) noted that the inundation map obtained from DEM provides change of elevations and approximation for flooding during high precipitation. The study will generate a map of the area using DEM to enable Manafwa watershed management.

2.2 Forms and activities in watershed management

Watershed management activities aim at conserving the land resources by identifying the problems and solutions to them. The measures to solve the problems are particular to a specific watershed.

These activities include waste management, tree planting, tree protection, tree nursery bed raising, planting grass and digging trenches.

2.2.1 Waste management

There is growing global evidence of plastic pollution of watersheds over the years, especially of small plastic and microplastics (Birch et al., 2020). Urban runoff is the most common source of heavy metals in adjacent water bodies in Bacanga and Cachorros Watersheds in São Luís, Brazil (Cabral et al., 2020). Additionally, dumping of household waste was the main challenge in watersheds in Brazzaville City of Congo (de Dieu Nzila et al., 2020). Also, direct dumping of sewage and waste adversely impacted on watersheds in Addis Ababa River Basin in Ethiopia, Citarum River Basin in Indonesia; and Nairobi River Basin in Kenya (Laituri, 2020). Although all the above recommend modification in human behavior towards sustaining watersheds, they never laid emphasis on the use of children as stewards that would suggest long term binding solutions as assumed by Palmer and Suggate (2004) opined children mature between 4-10 years and are thus therefore able to have a longer-term view towards environmental issues and subsequently make meaningful associations between the causes and resultant effects of such issues. This gap will be bridged by this current study

2.2.2 Tree protection

The Brazilian Amazon was found to be one of the areas with the wildest changes in forest cover because of deforestation as man aims at agricultural expansion and infrastructure development (Souza et al., 2019). In relation, increasing watershed deforestation from urbanisation and land cultivation has resulted in the loss of 19% of primary forest (approximately 24,000 km^2) in Cambodia (Lohani et al., 2020). Furthermore, there are increasing fears of nitrogen loss around watersheds in Panama due to increasing levels of deforestation (Valiela et al., 2018), as well as in North America's Great Lakes (Guiry et al., 2020). Further still, it was seen that deforestation leads to decrease in groundwater recharge and results in drought periods in the Mediterranean region in the watersheds (Reis & Dutal, 2019). Such significant loss of trees through increasing global deforestation needs a sustainable formula, that was why this current study hypothesised integrating pupils from infant stage might be the answer by instilling in them conservation attitudes.

2.2.3 Tree planting

It was established that every river in India is in trouble, hit by multiple impacts including climate change, pollution, overexploitation, river-interlinking, mining, and damming (Nanditha, 2020). It was suggested that the solution to the declining health of India's rivers centres on tree planting and encouraging farmers to plant trees on their own private agricultural lands. To do this for the case of the Manafwa watershed, there is a need to establish whether tree planting is an activity carried out by pupils towards watershed conservation.

2.2.4 Planting grass

It was noted in the Maharashtra State of India, grasses which form effectives hedges check the speed of runoff (Prakash, 2017). planting of grasses was adopted such that the soil particles are trapped by the live bunds for soil and water conservation. There was a need to examine if planting grass as an integration activity is being carried out for the conservation of the Manafwa watershed.

2.3 Networking and collaboration strategies

Networking activities range from individuals, groups, or networks of actors (Bodin, 2017); it was opined by Bodin that children's environmental education plays an essential role in sustainability debates and noted that there is an urgent need to adopt alternative pedagogical education and related training to help children along with young adults to better relate with nature (King et al., 2020; Taylor, 2017). Pesanayi and Weaver noted that interactions through networks build collaboration and partnership within the different sectors (Pesanayi &Weaver.,2016). Pesanayi & Weaver also noted that more gain and benefits from the collaborations in knowledge sharing amongst each other is improved. There was a need to establish the networking and collaboration strategies and watershed conservation in Manafwa. This was because children are regarded as future guardians of mother Earth (Shaari et al., 2018).

2.3.1 School groups

It was revealed that although effective environmental education through environmental clubs in schools in Morocco play a significant role in environmental protection, such clubs were found to be ineffective since a few clubs were able to execute their planned activities, along with poorly designed programs and insufficient funding (El-Batri et al., 2019). Although half of school environmental groups/clubs aimed at school beautification, better waste collection, environmental research activities, and enhancing environmental awareness, over 66.7% of such clubs failed to make any environmental school trips in two subsequent years (El-Batri et al., 2019). In Australia, environmental clubs were found to be appealing to young although they lacked capacity to implement sustainable environmental education (Tanu & Parker, 2018). Furthermore, it was found that Nigerian youth had low participation in environmental conservation programs despite having environmental knowledge (Abiolu, 2019). This called for the need to go beyond environmental knowledge through changing learners' mindset towards the same as a whole as suggested by the PIP approach under study.

Community groups

It was revealed that community networks were gaining popularity in dealing with environmental challenges like pollution controls which calls for collaborative and innovative actions that involve multiple institutions or entities (Wang et al., 2019). Indeed, it was additionally observed that environmental financing networks in China had strategies that mobilised resources and maintained network long-term stability to execute their activities (Wang et al., 2019). Similarly, in Tunisia, environmental network leaders brought together social and political actors from differing backgrounds and ideological orientations to develop collective ideologies for network sustainability (Loschi, 2019). Likewise, environmental summer camps were considered to increase participants' consciousness towards promoting environmental conservation and sustainability skills in northern Greece (Skanavis et al., 2020). Therefore, there was a need to establish whether pupils around Manafwa watershed belong to any community environment conservation and the extent such initiatives affect watershed effectiveness.

2.3.2 Participating in environmental club activities.

The world is currently facing serious environmental challenges (UNEP., 2019). UNEP observed that an environmental club is an ideal place for students to gain these understandings on how to solve environmental problems both locally and globally. Also, the Environmental Governance Institute observed that environmental Clubs promote dialogue and cooperation among students and other levels of the community (EGI., 2013). There was a need to establish whether pupils around Manafwa watershed belong to any environmental club and its effectiveness on watershed conservation.

It was observed that by promoting the actions on issues that really interest students, the environmental club increases their participation on environmental issues (UNEP.,2019) towards improving the environment. Environmental Governance Institute observed that the club can carry out research on local environmental issues, draw informational posters and flyers and hang them up, Instal an environmental club notice board in the school and update it regularly with information, announcements and progress reports, develop a catalogue of trees in the local community and establish a tree nursery in the school, where club members can learn to nurture• trees (EGI., 2013). Therefore, there was a need to establish whether pupils around Manafwa watershed participate together in environment conservation activities.

2.3.3 Participating in community environmental activities.

The United Nations Environment Program noted that participating in community environmental activities promotes a sense of place and connection through community involvement (UNEP.,2019). This enables them to share their voice and make a difference at their school and in their communities towards environmental conservation. The future of conservation is collaboration (Joni., 2019). It was also noted that in North Texas, collaborations with the Wildlife Department, North Texas Municipal Water District, and the John Bunker Sands Wetland Centre has created over 4,000 acres of wetland habitat, provided a reliable water supply for more than 3.8 million people and offered countless education and recreation opportunities. demonstrate their knowledge through collective action in their communities. It was noted by the Environmental Governance Institute that an individual student might find it difficult to be heard at home, but if they work together.

2.4 Pupils awareness and watershed management

Environmental conservation awareness refers to being aware of the natural environment and making choices that benefit it. It's important that the pupils are aware about their environment through identifying some of the challenges within their environments. Some of the environmental issues that the pupils need to be aware of are identifying the forms of improper dumping, tree cutting dangers, importance of tree planting, forms of poor farming methods and sources of water pollution as reviewed below.

2.4.1 Identifying the forms improper dumping

Benchmarking on Faggi et al., 2021) who sampled 118 children studied how pupils aged 9-13 years related with nearby riverscapes in Buenos Aires city. They witnessed that the children perceived their current landscapes as contaminated especially with elements like garbage. They also found that participant pupils were able to identify present images showing degraded environments and suggested future visions. Faggi et al. (2021) further established that participants had a strong attachment towards nature, and they highly valued the riverscape for recreation purposes and not for conservation. There is evidence that empowering children to identify dangers of improper dumping equips them with environmental sustainability attachment. These findings were established in urban areas of Buenos Aires in Argentina. There was a need to analyse the influence of pupil's environmental awareness on watershed conservation in Manafwa so as to generate empirical recommendations.

2.4.2 Identifying tree cutting dangers

Osiimwe (2019) in a study from Kiha River Watershed in Hoima District of Western Uganda concluded that the prevailing land cover changes and pollution is a result of increased human activity such as sugarcane growing and other agricultural activities, along with settlement all leading to increased deforestation and pollution levels (Osiimwe, 2019). Osiimwe recommended urgent interventions, which included but not limited to reforestation and integrated land use methods with a new approach. However, since suggestions included all ages, this particular study intended to concentrate on analysing the influence of pupil's environmental awareness on watershed conservation in Manafwa

2.4.3 Identifying the importance of tree planting

In Indonesia, it was established that the importance of forest existing in a particular watershed can also be understood by analysing the intrinsic value of forest ecosystem services, covering provisioning, regulatory, cultural, and supporting services (Angel & Luis, 2021). Forest ecosystem services represent the conversion of a wide array of forest vegetation properties, such as woody perennial trees, animals, microorganisms, carbon storage, and soil-water conservation, into services that support human well-being. Wylie et al. (1998) recommended that children between the ages of 8-11 years can think systematically in respect to environmental problem-solving issues and can ably understand any underlying relationships. That was why several studies have called for empowering the young generation to safeguard our future environment although the exact effect of such suggestions was still unclear thus there was need to analyse the influence of pupils' environmental awareness on watershed conservation in Manafwa in Eastern Uganda.

This chapter involved reviewing the literature in line with the research objectives of study stated. In each objective, the sub themes were identified and reviewed such that new knowledge is generated, research gaps are identified through looking at what other authors have written on watershed management while comparing it with what is happening in Manafwa watershed.

In order to answer the gaps identified, the research methodology was systematically selected to be followed during the process of data collection and analysis as described in the chapter below.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

It was opined that successful research lies in the adequate selection of a suitable research methodology to achieve research objectives using the accessible resources (Ragab & Arisha, 2018). This chapter presents the procedure followed while carrying out the study. It covers description of the study area, research design, study population, sample size, sampling techniques, data collection methods and instruments, data quality controls, processing and analysis.

3.1 Study Area Description

3.1.1 Location

The study is conducted in the Manafwa watershed in Bududa district. Bududa district lies in the lat. 0° 56′30”- 1°7′0" N, long. 34°19′0"- 34°22′30" E (Figure 2). The study was conducted in the three sub-counties of Bukalasi, Bushiyi and Bushika. In each Sub- County, the 8 schools that were selected were Footo Primary school, Bubungi Primary school, Bukalasi Primary school, Bukibumbi Primary school, Bushika Primary school, Bumwalye Primary school, Bushibuya Primary and Bukiga Primary school all found in the watershed area (Figure 2).

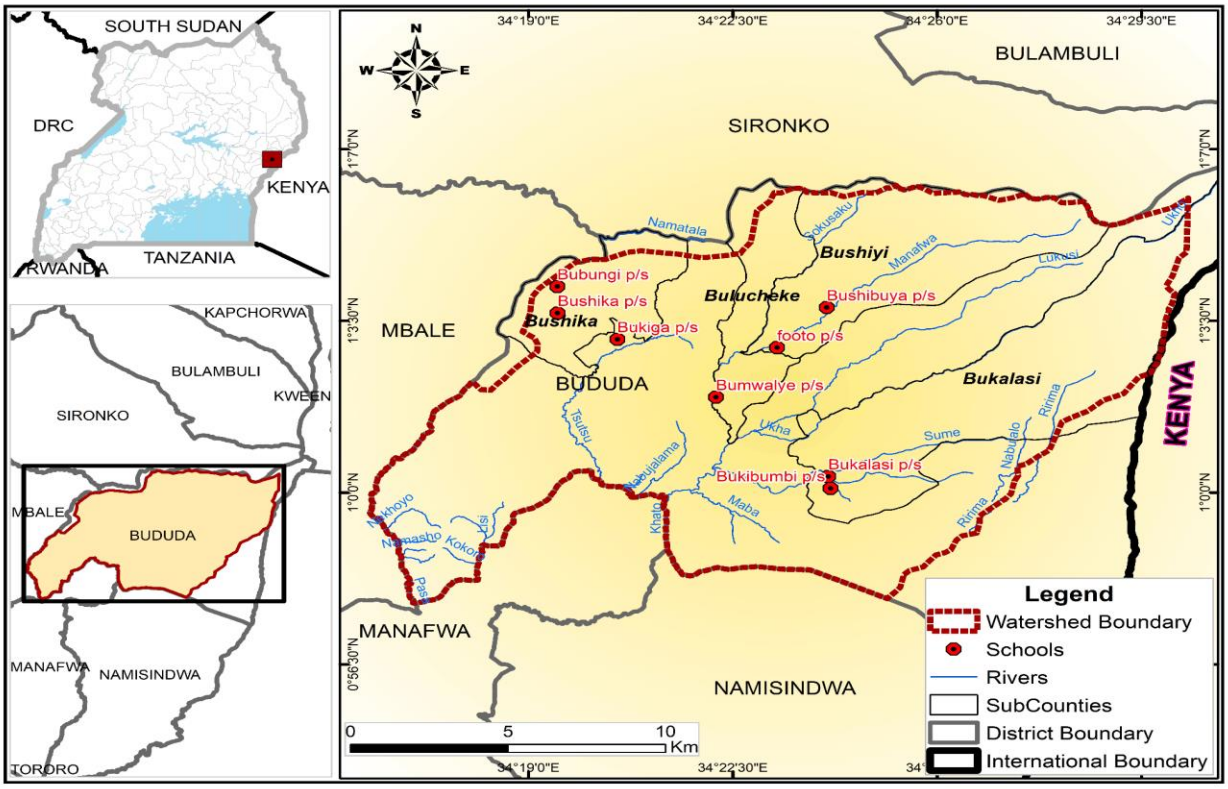

Figure 2: Location of the study area

Source: Field data (2021)

3.1.2 Topography

Bududa District lies at an altitude of about 1800m above sea level on the slopes of Mt. Elgon with the highest catchment elevation at 3,616 m a.s.l. and the lowest at 1,083 m a.s.l. It is characterised by stand-alone volcanic cones, steep and gently undulating slopes, interlocking spurs, V-shaped valleys and ridges as indicated in Fig 3 (MoLG, 2011).

3.1.3 Geology and soils

Bududa comprises three main lithologies that can be distinguished. These are the Butiriku carbonatite covering the central part which corresponds with the Sub- County of Bukigai, a zone of finitized basement rocks of Precambrian age surrounding this central carbonatite outcrop and the zone with Mount Elgon agglomerates and tuffs situated in the northeast of Bududa District and falling within the borders of Mount Elgon National Park (MoLG, 2011). These rocks are

composed of extremely fine pyroclasts of potash feldspar and are referred to as potash ultra-fenites which makes Mt. Elgon is vulnerable to landslides during wet seasons. During wet seasons, this soils with high clay content over hard impermeable rocks swell and cause landslides in the area.

3.1.4 Drainage

The Manafwa watershed originates from the upper slopes of Mount Elgon and traverses the districts of Bududa, Manafwa, Mbale and Butaleja and joins River Mpologoma which pours the water into Lake Kyoga. The upper sub-catchment is drained by river Manafwa and has the main tributaries of Rivers Tsume and Lukuse, occupying about 166.02km^2 (Nakileza & Nedala, 2020). The sites were selected for study because it's facing serious degradation challenges like landslides, soil erosion, flooding which has led to decline of water quality, vegetation cover and loss of soil fertility yet the area is a source of water, energy and biological diversity.

3.1.5 Climate

Bududa District experiences a bi-modal type of rainfall with the highest starting from March to June and light rains from September to November (MoLG, 2011). With a short dry spell between June and July and a long dry spell from the month of December to March. The annual rainfall is above 1500mm with its highest peaks experienced in May and October, which supports intensive agriculture (Muggaga et al., 2012)

3.2 Research design

The researcher and her assistant visited the sampled schools during school hours and got help from environmental education club patrons in administering the questionnaires to the pupils. Questionnaires were issued and collected on the same day per school visited. This helped increase the response rate and save time. Further still, the researcher personally interviewed the school environmental club patrons as the key informants and also reviewed necessary documents that were related to the study. With the help of the observation checklist, the researcher also observed the school environment and recorded the emerging watershed management activities.

The study used correlational design. This design was adopted to enable the researcher to analyse whether the involvement of pupils using the PIP environmental approaches towards Manafwa watershed conservation results in improved watershed management. Correlation research design would also help to provide more accurate estimates of the relationships among research variables i.e., between the independent variables of (pupils' environmental awareness, pupils integration approaches and networking and collaboration approaches on watershed conservation) and the dependent variables of (soil erosion control, better flood control and improved vegetation coverage) as watershed conservation elements.

Data on PIP environmental conservation approaches was collected using Self-administered questionnaires. The data was analysed by use of SPSS in order to get the degree of variations in the pupil's responses about environmental conservation. A binary regression model was used in order to test the relationship between the independent variables of PIP environmental conservation approaches and dependent variables of Manafwa watershed conservation.

Descriptive approach was used to explain the binary regression value.

3.3 Study population

Moffatt (2015) defined a study population as the sum of elements with similar characteristics as explained in the research interest. Therefore, since earlier related studies considered children's involvement in environmental sustainability (Halliwell et al., 2020; Ying, 2020; Wang et al., 2021), this current study considered environmental club members and club patrons because they are implementers of the PIP approach. All the environmental clubs in the eight PIP implementing primary schools were involved. These schools were distributed in the three Sub-counties of Bukalasi, Bushiyi and Bushika These schools were purposively selected given the fact that they are implementing the PIP program. The study targeted a total of 435 pupils who are members of the environmental clubs and patrons.

3.4 Sample size selection

A satisfactory sample size is an important aspect of an empirical study as it aims at generalising about an entire population (Taherdoost, 2017). To avoid sampling errors and ensure adequacy (Taherdoost, 2017), the study applied the table and formula given by Krejcie and Morgan (1970) (See Appendix I)

$S = X^2NP(1-P) + d^2(N-1) + X^2P(1-P)$

S = required sample size

X^2 = the table value of chi-square for 1 degree of freedom at the desired confidence level (3.841)

N = the population size

P = the population proportion (assumed to be .05 since this would provide the maximum sample size)

d = the degree of accuracy expressed as a proportion (.05)

A sample of 8 primary schools out of 18 was purposively selected from the three Sub- Counties of Bukalasi, Bushiyi and Bushika as indicated in the Table 1 below. The selected schools were implementing a PIP program, located in disaster prone areas, near the watershed and had environmental clubs. The sampling of the pupils was done using convenience sampling technique because the time of data collection was the period of Covid 19 where movement of pupils was restricted. The available environmental club members were therefore used because they were expected to be having the same characteristics of being members of environmental clubs, learning about how the environment can be protected through using conservation methods. A Sample of 209 out of 435 pupils were selected from the three Sub- counties because during the data collection process, only the pupils in primary six and seven were at school due to Covid 19 (Krejcie and Morgans 1970). The selected respondents available were given a questionnaire (Appendix II) to obtain the primary data. There were 5 patrons who were purposively interviewed so as to cross check information given by pupils and they were few in number to make the interaction with them easy.

Table 1: Sampling framework

No	Sub- counties	Name of school	Population of club members in each school	Sample per school (Due to Covid19)
1.	Bukalasi	Bukalasi Primary	60	30
		Bukibumbi Primary	60	25
2.	Bushika	Bushaki Primary	50	24
		Bubungi Primary	50	32
		Bukiga Primary	51	24
3.	Bushiyi	Footo Primary	60	24
		Bumwalye Primary	56	28
		Bushibuya Primary	40	22
	Total number of environmental club members		**427**	**209**
	Total number of School environmental club patrons		08	05
	Total Study Population		**435**	**214**

Source: Field data 2021

3.5 Data collection methods

Both primary and secondary data was collected to answer the research questions and address the research objectives using Questionnaire, Key informant interviews, Observation and Documentary review.

3.6 Data collection instruments

Data collection in this study involved the use of questionnaire, interview guides, observation checklist and documentary review guide.

3.6.1 Questionnaire

Likert questionnaire

A Likert scale is a rating scale used to assess opinions, attitudes, and behaviours (Bhandari, 2020). In correlational research, you investigate relationships between your study variables. Her studies indicated that the modified Likert methodology is valid to use with children. David & Kathleen, 2013 in their report quoted Wright and Asmundson (2003) who changed the original 5-point Likert scale response format for the illness attitudes Scale to a 3-point format to make it more easily understood by children. This current study also modified the Likert scale Questionnaire to three items that are Agree, Neutral and Disagree.

A 3-Point Likert Scale questionnaire (Appendix 2) that has alternatives from Disagree, Neutral and Agree, was administered to pupils to ascertain how they have been involved in watershed management stewardship. Data on school location factors with respect to watershed management practices was collected. Hartley & Betts (2010) observed that response formats for children should be selected carefully to avoid cognitive overload. In addition, Bell (2003) noted that children could not fully interpret the six-rating scale while three- rating scale items were answered well.The study conducted a questionnaire validation process of a 5-point Likert scale response format with 20 pupils from one of the schools in Bududa district and concluded that pupils were not able to distinguish between strongly agree and agree, strongly disagree, and disagree. When the researcher

changed to 3-point Likert scale response format, the pupils were able to answer the questions. Therefore, the researcher changed the 5-point Likert scale response to 3 because the pupils' reasoning growth is not yet complete and found it difficult to differentiate between strongly agree and agree, strongly disagree, and disagree.

3.6.2 Interview guide

Key Informant Interviews were conducted among patrons of environmental clubs who often interact with the pupils by use of an interview guide (Appendix 3) that had pre-determined questions on awareness, involvement and networking of the pupils towards watershed stewardship, as well as how they are supporting the pupils towards watershed stewardship. The patrons were interviewed to acquire in-depth qualitative responses. From these key informants' data on watershed management was also collected.

A semi-structured interview guide with open ended questions was prepared to determine how the patrons have raised awareness among pupils for watershed conservation.

3.6.3 Observation checklist

During the study an observation guide and checklist (Appendix 4) was used to check aspects like the types of trees planted, forms of waste management and their effectiveness on watershed management. The researcher also attended and observed the methods used during PIP training.

3.6.4 Global Positioning System (GPS)

The researcher collected the elevations of the schools from the three Sub-Counties using a Global Positioning System (GPS). At various Sub- Counties, the GPS was used to obtain the altitude of each school. This was done such that the researcher gets information on how schools topographical location influences PIP conservation practices.

3.7 Quality control

The quality was controlled through undertaking Validity and Reliability tests.

Validity

Instrument validity testing or pre-testing was defined as a test to assess the suitability and avail the extent to which questions are understandable (Sekaran & Bougie, 2016). It was emphasized that validation improves data quality (Memon, 2017). The study will seek validity ratings on research items from 2 (two) experienced and skilled individuals in the field of geography and academic research as to ascertain whether the questions on the tools were in line with the main themes of the study and whether they were indeed representative of the research problem to be studied. After their ratings on the scale of relevant (R) or irrelevant (IR), content validity indices (CVI) were computed using the following formula (Sekaran & Bougie ,2016)

$$CVI = \frac{Number\ of\ Questions\ rated\ as\ relevant\ (R)}{Total\ Number\ of\ Questions\ in\ the\ instrument\ (R+IR)}$$

As recommended by Sekaran and Bougie (2016) and Amin (2005), if the Content Validity Indices of instruments are above 0.7, then an instrument was deemed valid.

3.7.1 Reliability of the study instruments

Instruments' reliability is the extent to which the measurements of a test remain consistent over repeated tests of the same subject under identical conditions (LoBiondo-Wood & Haber, 2014). Reliability is also the consistency of any measurement to which an instrument measures the same way each time it is used for data collection with the same subject. Reliability of the study on the instruments was maintained using Cronbach coefficients. This data collected from 20 respondents was entered in SPSS (Statistical Package for Social Scientists) and tested for Cronbach's Alpha at a threshold of above 0.7 (Amin, 2005). The results (see Table 2) indicated that all the questions on pupil's awareness, forms of integration, networking and collaboration were having a significance value of greater than 70% which was high and relevant.

Table 2: Results from instrument reliability testing

Research Variable	Number of items	Cronbach Alpha
Awareness	06	0.859
Integration	06	0.848
Collaboration/networking	06	0.705
School Location	04	0.770
Watershed Management	08	0.845

Source: Reliability test results (2020)

3.8 Data analysis

3.8.1 Quantitative data analysis

Data collected using questionnaires was coded, entered into Statistical Packages for Social Scientists (SPSS) version 23.0, The study firstly used descriptive frequencies to avail extents to which respondents agreed or disagreed to a given research opinion. After presentation of descriptive frequency, quantitative data was analysed using a Binary regression model. This model was used by (Zewdu & Ashine, 2016) to predict whether a number of student variables like time, peer influence, father's education level can influence the student academic performance. Where the dependent variable academic achievement has two binary outcomes of yes or no and independent variables are age, sex, study habit etc. This model was also adopted to predict whether the involvement of pupils using the independent variables of different PIP environmental approaches can result in improved watershed environmental management as a dependent variable (Appendix 5). If the data value is run, it will give a value which is between 1 to -1. If the Beta value is greater than 0.5, then it is a strong positive effect, if the value is between 0.3 to 0.5, then it is a moderate positive effect, if the Beta value is between 0.1 and 0.3, then it is a weak positive effect, if the value is less than -0.5, then it is a strong negative effect, if the value is between -0.3

to -0.5, then it's a moderate negative effect and if the value obtained is between 0 to -0.3, then it is a weak negative effect.

3.8.2 Qualitative data analysis

Qualitative data from interviews, observation and document review was analysed using thematic content analysis in respect to different themes of the study and in relation to different research objectives. The verbal responses from interview sessions were transcribed, organised and categorised under themes related to the objectives of the study. Presentation of qualitative data involved use of descriptions as either quoting verbatim or as narratives of the responses.

3.9 Ethical considerations

This study was conducted following ethical procedures governing social sciences research studies. An introductory letter was obtained from Kyambogo University, introducing the researcher to the respondents as seeking assistance in conducting the study. Consent was sought from respondents to participate in the study.

CHAPTER FOUR

RESULTS

4.0 Introduction

In this chapter, the data collected is presented as results based on the research objectives of study. Here presentation of descriptive statistics such as totals, percentages, and inferential statistics from Pearson's correlation coefficient on each research question. The study constituted four research objectives: To study the locational characteristics of the area where schools are located, To examine the forms and process of activity integration within Manafwa watershed in Bududa District, To find out how the strategies of networking and collaboration are integrated in Manafwa watershed conservation in Bududa District and To analyse the influence of pupil's awareness on Manafwa watershed management in Bududa District.

4.1 Location characteristics on watershed management.

Location characteristics are the physical and human properties of a place. They are important because they affect the functioning, manipulation and management of watersheds. In this particular watershed, the study took into consideration the shape slope (elevation), Drainage (drainage pattern and stream order), Geology (Rock type), soil (Texture and moisture), Land Use (present land use and surface water) all these are relevant in Run-off and sedimentation and determining the management factors (Diwakar, 2014).

To bring out these characteristics, a Digital Elevation Model (DEM) was developed as shown in fig3. The figure reveals that elevation of the study area is classified into four i.e. areas below 1400m above sea level, elevation between 1500-1800 m asl, elevation between 1900-2200m asl and elevation greater than 2300m asl as shown in (Fig 3).

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The schools' elevations were found using the Digital Elevation Model and

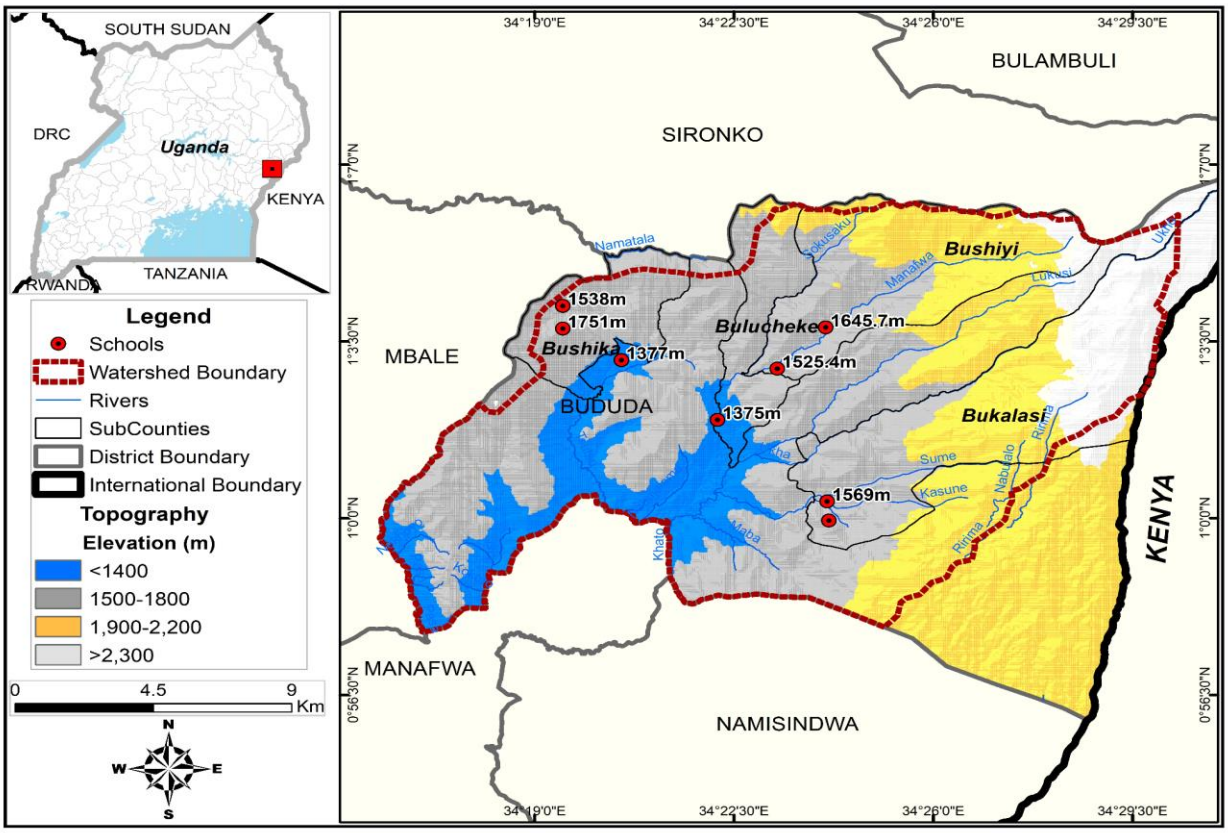

Figure 3: Map showing the Primary Schools and their elevations

Source: Field Data (2021)

Fig 3 indicates Bukiga Primary School in Bushika Sub- County and Bumwalye Primary School in Bushiyi Sub- County are located at an elevation below 1400m above sea level. These schools are located at the minimum elevations and during heavy rains soil erosion is less and flood water drains slowly.

Buchikumbi and Bukalasi Primary Schools in Bukalasi Sub- County, Bushibuya and Footo Primary Schools in Bushiyi Sub- County, Bubungi and Bushaki Primary Schools in Bushaki Sub-County are located in elevations between 1500-1800m high above sea level. These schools are located at maximum elevations and during heavy rains, the velocity is more, flood water drains quickly, less infiltration and increased soil erosion.

Drainage

Fig 3 shows that the watershed has a drainage order of streams running from the steep slopes and radial pattern where the tributaries radiate away from the central point which can result in rapid water runoff during the heavy rainfall. This implies that much of the runoff ends in the streams and is drained off.

Proximity to the river

Fig 3 indicates that some schools like Bukalasi Primary School located close to River Summe in Bukalasi Sub- County, Bumwalye and Footo Primary Schools in Bushiyi Sub- County are near River Manafwa which is facing serious degradation due to unsustainable human activities like deforestation and Bukiga Primary School in Bushika Sub- County near River Tsutu. The schools have planted Bamboo trees to retard the flow of water during heavy rains and to protect soil erosion since much of the run-off ends up in the rivers and causes soil degradation, as shown in Fig 4 below.

Figure 4: Bamboo trees planted along riverbanks by environmental club members of Bukalasi primary school

Source: Field Data (2021)

4.2 Forms and activities in watershed management.

In order to examine the forms and activities in watershed management. The pupils were asked questions on the activities that they carried out in order to manage the watershed. Their responses are summarised in the table 3 below.

Table 3: Pupils' responses indicating the forms and activities of waste management in watershed management.

Activity	Responses	Bukalasi Sub-County	Bushiyi Sub-County	Bushika Sub-County
Waste management	**Disagreed**	21 (38.2%)	24 (32.4%)	11 (13.8%)
	Neutral	16 (29.1%)	10 (13.5%)	26 (32.5%)
	Agree	18 (32.7%)	40 (54.1%)	43 (53.8%)
Tree planting	**Disagreed**	16 (29.1%)	12 (16.2%)	14 (17.5%)
	Neutral	12(21.8%)	20 (27%)	13 (16.3%)
	Agree	27 (49.1%)	42 (56.8%)	53 (66.3%)
Maintaining clean water in the nearby water sources	**Disagreed**	47 (85.5%)	62 (83.8%)	65 (81.3%)
	Neutral	3(5.4%)	6 (8.1%)	9 (11.3%)
	Agree	5 (9.1%)	6 (8.1%)	6 (7.5%)
Total responses		**55 (100%)**	**74 (100%)**	**80 (100%)**

Source: Field Data (2021)

Table 3 indicates that 32.7%, 54.1% and 53.8% respectively of the respondents from Bukalasi,

Bushiyi and Bushaki sub-counties agreed on engaging in waste management. While 38.2%, 32.4% and 13.8% respectively of them disagreed and 29.1%, 13.5% and 32.5% of the respondents from Bukalasi, Bushiyi and Bushika respectively were neutral. This implies that the majority of the pupils in Bukalasi Sub- County need to engage in waste management.

A key informant interview with the environmental club patrons reported that, "out of 5 patrons, majority (4) from the three Sub-counties said that the pupils have dug rubbish pits as an integration activity of managing wastes towards Manafwa watershed conservation" as shown in Fig 5.

Figure 5: A rubbish pit dug by environmental club members of Bukalasi primary school

Source: Field Data (2021)

Table 3 shows that, most of the respondents from the three Sub-counties Bukalasi, Bushiyi and Bushika 49.1%, 56.8% and 66.3% respectively reported that they have been engaged in establishing tree nursery beds and tree planting to increase on the number of trees and practised agro-forestry as a form of an integration approach to protect trees. However, 29.1%, 16.2% and 17.5% respectively of them disagreed and 21.8%, 27% and 16.3% were neutral. These imply that the majority of the pupils have been engaged in tree protection as a way of conserving the Manafwa watershed.

In an interview with the environmental club patrons, 5 of them said that "they have engaged pupils in planting and taking care of trees as an activity to increase the number of trees in their school compounds (Fig 6), pupils are encouraged to bring tree seedlings from their homes.

Figure 6: A pupil of Bukalasi Primary School planting a tree as a PIP activity

Source: Field Data (2021)

Results from table 3 revealed that pupils from the three Sub-counties have limited forms of maintaining clean water in the nearby water sources. This was indicated by 9.1%, 8.1% and 7.5% respectively of the respondents who agreed from Bukalasi, Bushiyi and Bushika. 85.5%, 83.8% and 81.3% respectively disagreed while 5.4%, 8.1% and 11.3% respectively were neutral. Therefore, there is a need for more activities on how to keep water clean in the nearby water sources from the three Sub-counties.

An interview with the environmental club patrons revealed that," there was limited time to engage pupils in activities like planting grass, bamboo trees along the riverbanks as a way of maintaining clean water in the nearby water sources

A Binary regression model was run to ascertain whether the different forms of activities within Manafwa watershed are effective in watershed management. The analysis is shown in table 4.

Table 4: Binary regression analysis showing the effectiveness of integration activities on watershed management.

	Effect (Beta)	**P-Value**
Model 1: Bukalasi Sub- County	0.946	0.000
Model 2: Bushika Sub- County	0.962	0.000
Model 3: Bushiyi Sub- County	0.961	0.000

Source: Field Data (2021)

From the Table 4, the forms of integration activities within Manafwa watershed in all the three Sub-counties of Bukalasi, Bushika and Bushiyi had a positive effect of (0.95, 0.96, 0.96) respectively which implies that the PIP integration activities can result into watershed management.

4.3 Networking and collaboration strategies

In order to establish the networking and collaboration strategies the respondents were interrogated on how they collaborate and what strategies they use in order to promote watershed management. for which it was established that they engage in an environmental club in their school and participate in community environmental group activities, which promotes environmental activities as a group which creates opportunities for networking and strengthens collaboration among the pupils. Their responses are further presented in tables 5 below.

Table 5: Pupil's responses indicating creation of environmental clubs as a form of a strategy of networking and collaboration in Manafwa watershed conservation

Networking & collaboration strategies of	**Responses**	**Bukalasi Sub-County**	**Bushiyi Sub-County**	**Bushika Sub-County**
Creating an environmental club	**Disagreed**	18 (32.7%)	39 (53%)	32 (40%)
	Neutral	7(12.7%)	15(20%)	14 (17.5%)
	Agree	30 (54.6%)	20 (27%)	34 (42.5%)
Participating in community environmental group activities	**Disagreed**	27 (49.0%)	23 (31.1%)	27 (33.8%)
	Neutral	8(14.6%)	19(25.7%)	16 (20.1%)
	Agree	20 (36.4%)	32 (43.2%)	37 (46.1%)
Total responses		**55 (100%)**	**74 (100%)**	**80 (100%)**

Source: Field Data (2021)

Table 5 indicates that 54.6%, 27% and 42.5% respectively of the respondents from Bukalasi, Bushiyi and Bushika sub-counties agreed that they have created an environmental club to form a network for collaboration. However, 32.7%, 53% and 40% respectively disagreed and 12.7%, 20% and 17.5% respectively of them were neutral. Majority of 73% and 57.3% respectively of the respondents from Bushiyi and Bushika sub-counties disagreed on having active environmental clubs. This could be that PIP had just been introduced in some schools but was in its initial stages since the approach was 2 years from the time of implementation

With an interview with the club patrons, the majority of 5 patrons indicated that, regarding the strategies being used by the pupils in watershed conservation, pupils have been encouraged to join

an environmental club, collaborate together in managing PIP activities and share environmental information with their relatives at home.

The researcher further asked the environmental club patrons about the constraints encountered during networking of pupils for watershed conservation pupils. The patrons said that pupils' absenteeism and dropping out from environmental clubs has made networking not to achieve its implication and negative learners' attitude towards the laborious nature of conservation activities. This could be the reason why Bushiyi and Bushika had a small percentage of 27% and 42.5% respectively of the respondents who agreed on having an environmental club in their schools.

Participating in community environmental group activities enables pupils to share their voice and make a difference at their school and in their communities towards environmental conservation. Table 5 indicates that 36.4%, 43.2% and 46.1% respectively of the respondents from Bukalasi, Bushiyi and Bushaki Sub-counties agreed on participating in community environmental group activities like tree planting and digging trenches. 49.0%, 31.1% and 33.8% respectively disagreed while 14.6%, 25.7% and 20.1% respectively of them from Bukalasi, Bushiyi and Bushaki sub-counties remained neutral. However, from all the three Sub-counties of Bukalasi, Bushiyi and Bushaki, the majority of 63.6%, 56.8% and 53.9% respectively of the pupils do not participate in community environmental activities due to limited time.

The Binary regression model was run to test whether the networking and collaboration strategies used by pupils has a significant effect on watershed conservation as presented in table 6.

Table 6: Binary regression analysis showing the effectiveness of the networking and collaboration strategies in Manafwa watershed conservation.

	Effect (Beta)	P-Value
Model 1: Bukalasi Sub- County	0.178	.193
Model 2: Bushika Sub- County	0.220	.059
Model 3: Bushiyi Sub- County	0.382	.000

Source: Field Data (2021)

Table 6 shows that pupils' networking and collaboration strategies from all the three Sub- Counties of Bukalasi, Bushika and Bushiyi had a weak positive effect of (0.178, 0.220 and 0.382) respectively. Implying that the networking and collaboration strategies can help to improve Manafwa watershed management.

4.4 Pupil's environmental awareness on Manafwa watershed management

In order to analyse the influence of pupils' environmental awareness on watershed management in Bududa District, the pupils from Bukalasi, Bushiyi and Bushika Sub-counties were asked several questions to establish whether they were environmentally aware. Their responses revealed that they could identify the dangers of improper dumping, tree cutting dangers, importance of tree planting, poor farming methods and sources of water pollution. See their responses as presented in tables 7 below.

Table 7: Pupils' responses indicating pupil's environmental awareness on identifying the dangers of improper dumping at school.

Pupils' environmental conservation awareness on identifying;	**Responses**	**Bukalasi Sub-County**	**Bushiyi Sub-County**	**Bushika Sub-County**
Dangers of improper dumping at school	**Disagreed**	18 (32.7%)	16 (21.6%)	27 (33.8%)
	Neutral	9 (16.4%)	18 (24.3%)	19 (23.8%)
	Agree	28 (50.9%)	40 (54.1%)	34 (42.5%)
Tree cutting dangers	**Disagreed**	22 (40%)	19 (25.7%)	23 (28.7%)
	Neutral	16 (29.1%)	8 (10.8%)	15 (54.6%)
	Agree	17 (30.9%)	47 (63.5%)	42 (42.5%)
Importance of tree planting	**Disagreed**	25 (45.5%)	20 (27%)	19 (23.8%)
	Neutral	14 (25.4%)	26 (35.1%)	21 (26.3%)
	Agree	16 (29.1%)	28 (37.9%)	40 (50%)
Sources of water pollution	**Disagreed**	18 (32.7%)	22 (29.7%)	25 (31.3%)
	Neutral	16 (31.1%)	8 (10.8%)	17 (21.3%)
	Agree	21 (38.2%)	44 (59.5%)	38 (47.5%)
Total responses		**55 (100%)**	**74 (100%)**	**80 (100%)**

Source: Field Data (2021)

Table 7 shows that 50.9 %, 54.1% and 42.5% of the pupils from Bukalasi, Bushiyi, and Bushika Sub-counties respectively agreed that they are aware about the dangers of improper dumping in and around their school compound. However, 32.7%, 21.6% and 33.8% of the respondents from Bukalasi, Bushiyi and Bushika respectively disagreed, coupled by 16.4%, 24.3% and 23.5%

respectively of them who remained neutral. This indicates that most respondents from Bukalasi and Bushiyi Sub-counties are aware of the dangers of improper dumping as compared to 46 out of 80 respondents from Bushika Sub- County who disagreed and remained neutral. This finding implies that there is a need of raising awareness on the dangers of improper dumping in Bushika Sub- County.

Additional information on pupils' awareness on waste management was done by use of an interview conducted with the club patrons, 4 out of 5 of them said that, "the pupils are aware about the dangers of improper dumping.

Table 7 revealed that 30.9% of the pupils from Bukalasi, 63.5% from Bushiyi and 54.6% from Bushika Sub- counties agreed that they are aware about the dangers of cutting trees. However, 40%, 25.7% and 28.7% respectively of the respondents from Bukalasi, Bushiyi and Bushika disagreed and 29.1%, 10.8% and 18.8% respectively were neutral. This implies that the majority of 63.5 % and 54.6% of the pupils from Bushiyi and Bushika Sub-counties are aware of the tree cutting dangers that lead to soil erosion, loss of vegetation cover and flooding. This finding indicates that 38 out of 55 pupils from Bukalasi Sub- County are not aware about the tree cutting dangers.

In an interview conducted with the environmental club patrons from Bukalasi, 2 of them revealed that, "the awareness on tree cutting dangers is low due to learners' limited time for such activities as per school timetabling, pupils' absenteeism and lack of reading and writing materials has affected awareness progress in schools"

Table 7 shows that, most of 50% of the pupils from Bushika Sub- County agreed that they are aware about the importance of planting trees as compared to 29.1% and 37.9% of the respondents from Bukalasi, Bushiyi Sub-counties respectively. However, 45.5%, 27% and 23.8% of the pupils from Bukalasi, Bushiyi and Bushika Sub-counties disagreed and 25.4%, 35.1% and 26.3% respectively remained neutral. These percentages indicate that most of the pupils are not aware about the importance of planting trees. Therefore, there is a need to raise awareness among pupils on the relevance of tree planting.

According to an interview with the environmental club patrons, the majority of 4 out of 5 said that, "sensitization about the importance of planting trees during morning times before classes, during assemblies, lessons".

Table 7 shows that, from Bukalasi, Bushiyi and Bushaki sub-counties, 38.2%, 59.5% and 47.5% respectively of the respondents agreed that they are aware about the sources of water pollution in and around their schools. 32.7%, 29.7% and 31.3% respectively of the respondents from Bukalasi, Bushiyi and Bushika sub-counties disagreed while 31.1%, 10.8% and 21.3% respectively remained neutral on the sources of water pollution. This indicated that pupils' knowledge on the sources of water pollution is still limited from the two Sub- Counties of Bukalasi and Bushika hence the need for more sensitization on sources of water pollution.

During interviews with the club patrons from Bukalasi and Bushika, "they said that this low awareness about the sources of water pollution could be as a result of limited time as per the school time table which has not incorporated time for environmental activities.

The researcher also observed pupils during PIP environmental conservation awareness training in Buchibumbi Primary School where pupils have been empowered to lead others in raising awareness through asking pupils to identify some of the problems within their school environment and suggesting solutions as illustrated in (Fig 7).

Figure 7: A Pupil of Buchibumbi Primary School leading others in identifying environmental problems and suggesting solutions
Source: Field Data (2021)

A Binary regression model was run to test whether PIP approach has played a significant role in raising awareness among pupils on watershed conservation as indicated in table 8.

Table 8: Binary regression analysis showing the influence of pupil's environmental awareness on Manafwa watershed conservation

	Effect (Beta)	**P-Value**
Model 1: Bukalasi sub-county	0.781	0.000
Model 2: Bushika sub-county	0.864	0.000
Model 3: Bushiyi sub-county	0.856	0.000

Source: Field Data (2021)

Table 8 reveals that Pupil's environmental awareness in all the three Sub-counties of Bukalasi, Bushika and Bushiyi had a positive effect of (0.781, 0.864, 0.856) respectively on Manafwa watershed conservation. Thus, the PIP environmental conservation approach of raising awareness among pupils can result in the conservation of the Manafwa watershed.

CHAPTER FIVE

DISCUSSION

4.0 Discussion

In this section the researcher came up with discussions of the results that were presented in the previous sections as shown below.

4.1 Location characteristics.

According to Shipra (2018), the montane ecosystem is a remarkably diverse ecosystem, mainly characterised by hillslope asymmetry i.e., hill slope variation as a function of elevation creates difference in vegetation growth and distribution.

According to Titshall et al. (2000), slope elevation rules over the patterns and trends of vegetation in mountainous regions. It was also noted by Guangyu, Shari & John (2016), that a watershed is a topographically delineated area that is drained by a stream system. Improper management of the ecosystem within a watershed will result in impaired functioning of the watersheds. It was further demonstrated by Jeon et al., 2018) that watershed conservation plans ought to be adjusted according to climate/weather changes for effective implementation.

The researcher observed and noted that at different elevations, schools have adopted different PIP activities for example schools like Bushika, Bubungi, Bushibuya, Footo, Bukalasi and Buchikumbi at an elevation between 1500-1800m asl have planted grass, cover crops and dug trenches in their school compounds to reduce on the velocity of run-off water. This finding was in line with Henky et al., (2015) who noted that watershed management practices vary according to slope elevation. The study further documented that schools at an elevation below 1400m asl for example schools like Bumwalye and Bukiga have incorporated a variety of PIP activities such as planting trees, grass, and cover crops like beans for watershed conservation.

On nearness to the river, the researcher noted that schools near Rivers like Manafwa, Summe and Tsutu have planted Bamboo trees, Napier grass along the river banks so as to reduce the speed of running water and floods. This was in line with Madan & Mimi, (2016) who said that the more the intensity of the rainfall in the watershed, the more is the peak flow.

4.2 Forms and activities in watershed management.

The forms and activities in watershed conservation were considered significant in all the three Sub-counties. This finding was in line with Singh et al., 2021 who said that supportable watershed practices induce support from the different stakeholders. Through involvement in what makes children to think, feel and behave in a pro-environmental way (Collado et al, 2017). This is because the future lies in their hands.

Pupils from the two Sub- Counties of Bushiyi and Bushaki were able to integrate waste management practices like digging rubbish pits (Fig 4) and burning non-bio degradable materials. Therefore, this research has been able to document the importance of engaging pupils in integrating various ways of waste management. This finding was in line with Palmer and Suggate (2004) who opined those children mature between 4-10 years and are thus therefore able to have a longer-term view towards environmental issues and subsequently make meaningful associations. However, a few children from Bukalasi did not participate in waste management. This implies that PIP has to actively involve these pupils.

On the activity of tree planting, most respondents from Bukalasi Sub- County reported that pupils have been engaged in agroforestry through planting fruit trees like Guavas, Avocado, mangoes, jackfruit and apples such that the trees help to bind the soil particles together to reduce soil erosion as shown in (Fig 8) below. These findings imply that PIP has changed pupils' attitude towards Manafwa watershed restoration. This finding was also in line with recommendations from Nanditha, (2020) who suggested that the solution to the declining health of India's rivers centres on tree planting and encouraging farmers to plant trees on their own private agricultural lands. However, pupils from Bushiyi and Bushika sub-counties still need to be involved.

Figure 8: Jackfruit, Avocado and Bamboo trees planted to protect the soils from degradation.

Source: Field Data (2021)

Equally, on integrating tree planting, respondents from Bushiyi and Bukalasi Sub-counties reported that they have been actively participating in establishment of tree nursery beds and bringing of tree seedlings from home. This research documents that through the PIP environmental approach, pupils have participated in establishing tree nursery beds as a response to environmental conservation as shown in Fig 9.

Figure 9: Tree nursery bed established by environmental club members of Bukalasi Primary School.
Source: Field Data (2021)

This finding was in line with suggestions that villagers along watersheds ought to be involved in conservationism like agroforestry. (Swagatika et al., 2020; Hobo & Suryatmojo, 2020). Respondents also had not integrated ways of maintaining clean water sources around their schools. These findings agreed with Nakileza and Nedala (2020) who confirmed that water quality in the Manafwa watershed was undermined by unsustainable human activities and this current study additionally suggested that engaging pupils on integrating various environmental conservation activities could be a remedy for Manafwa watershed.

4.3 Networking and collaboration strategies

According to Lena, Adam & Gary (2021), collaboration has gained prominence as a strategy to share practical experiences and accelerate the spread of sustainable practices.

Networking and collaboration strategies were having a weak positive effect in all the three Sub-Counties of Bukalasi, Bushika and Bushiyi respectively on Manafwa watershed conservation. These findings disagreed with Pesanayi and Weaver opinions who noted that interactions through networks build collaboration and partnership within the different sectors (Pesanayi &Weaver.,2016). This implies that the adoption of the strategies was low due to the dodging of environmental group activities by the pupils. It was also against claims that community networks were gaining popularity in dealing with environmental challenges like pollution controls which calls for collaborative and innovative actions that involve multiple institutions (Wang et al., 2019). Therefore, PIP needs to motivate pupils who participate in club activities so as to encourage others.

4.4 Pupils' awareness and watershed management.

The Binary regression model showed that the PIP effect on pupil's awareness towards watershed conservation was significant in all the three Sub-counties. For example, in Bukalasi and Bushiyi Sub-counties, it was observed that PIP has created awareness among pupils on identifying the dangers of improper dumping, tree cutting, importance of planting trees and identifying the sources of water pollution around their schools. This finding is in agreement with previous studies that environmental awareness is a measure to better conservation of watersheds (Moges & Bhat, 2020; Mathevet et al., 2018a; Wylie et al., 1998).

The majority of the respondents from all the three Sub- Counties of Bukalasi, Bushiyi and Bushika were aware of the tree cutting dangers. This implies that PIP has helped in raising awareness for Manafwa watershed conservation. This was related to the previous studies that have been calling for equipping children with environmental conservation competences like tree planting and consciousness for future sustainability and their involvement in addressing watershed challenges in Eastern Uganda (Aben et al., 2019; Akello et al., 2017), and other parts of the world (Spiteri, 2020; Graham, 2020; Hamel et al., 2020; Mengistu & Assefa, 2021; Naburi et al., 2020). Knowledge on poor farming methods among the pupils was low from the two sub-counties of Bukalasi and Bushika and high in Bushiyi Sub- County. Implying that PIP has to re-train the pupils from the two Sub-counties on the different farming methods like intercropping, mulching and agroforestry. However, the high rate of lack of awareness on the forms of farming could be due to pupils' absenteeism and limited time for PIP activities in the school time table. This view was also reflected in the interviews with most of the club patrons.

Most of the respondents from Bushiyi Sub- County were aware of the sources of water pollution. This was however different from findings that water pollution in the Shiwuli River basin watershed of Hefei City, China was because of irresponsible dumping (Zeng et al., 2020). However, the majority of the respondents from Bukalasi and Bushika Sub-counties were not aware of the sources of water pollution around their school. This is due to the short time PIP is being implemented, compared to the general 4-year program of PIP.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter avails summary, conclusions and recommendations of the study. The general objective of the study was analysing the contribution of the PIP environmental conservation approaches on Manafwa watershed conservation in Bududa District

5.2 Summary of major findings

Location characteristics

It was observed that schools at different elevations had adopted different PIP activities. For example, schools located at elevations between 1500-1800m asl have planted Napier grass and dug trenches while schools at elevation below 1400m asl have planted trees, practised mulching and planted grass towards watershed conservation.

It was also observed that schools near the river valley have planted bamboo trees and Napier grass so as to reduce the speed of running water.

Forms and activities in watershed management.

The study noted that from all the three Sub- Counties of Bukalasi, Bushiyi and Bushaki, the most common forms of integration approaches included digging rubbish pits, planting grass, planting trees and setting up of tree nursery beds to ensure the conservation of the Manafwa watershed. It was further noted that these activities were hindered by lack of equipment like hoes, tree seedlings and limited time on the school time table. Therefore, if more integration activities are carried out in the watershed, it would result in Manafwa watershed conservation.

Networking strategies and Manafwa watershed conservation

It was established that the networking and collaboration strategies had a weak positive effect from all the three Sub- Counties of Bushiyi, Bukalasi and Bushika. This would be due to the limited time the PIP activities. Therefore, networking and collaboration strategies would be used as a way

of bringing children and community together for Manafwa watershed conservation but needs to be given attention such that it becomes significant.

Pupils' awareness and watershed management

The findings of this objective noted that in all the three Sub- Counties, pupils' environmental awareness on watershed conservation was significant. The pupils were able to identify the environmental challenges like improper dumping, forms of poor farming, dangers of cutting trees and sources of water pollution within their environment. Therefore, pupils' environmental awareness would result into Manafwa watershed conservation

5.3 Conclusion

The conclusions were drawn following the research questions.

Forms of integration approaches within Manafwa watershed.

The study concluded that the forms of integration approaches had a positive effect of 0.946, 0.962 and 0.961 respectively from Bukalasi, Bushika and Bushiyi Sub- Counties on watershed conservation. The study qualitatively concluded that the forms integration activities included digging rubbish pits, burning rubbish, proper disposal, nursery bed planting, tree planting, terracing, mulching, pruning, cleaning springs, and elephant grass planting. It was noted that these activities hindered by insufficient funding, lack of needed equipment (hoes), unavailability of tree seedlings, and limited time.

Networking strategies and Manafwa watershed conservation

The study concluded that PIP environmental conservation approaches of collaboration and networking had 0.178, 0.22 and 0.382 weak positive effects for Manafwa watershed conservation. If schools form environmental clubs and the members actively and frequently participate in club activities it would build networks for collaboration. In addition, the study qualitatively concluded that although some school environmental club patrons encourage pupils to work in groups while planting trees, cleaning their school compound, and encouraging them to share environmental information with their relatives at home, such efforts were constrained by dodging of group

assignments, learner absenteeism and drop out from environmental clubs, and negative learners' attitude towards the laborious nature of conservation activities. Also, it was concluded that school environmental club patrons created club registration books but most members were not frequently attending clubs' meetings and activities coupled with inadequate funding for supplies like tree seedlings.

Pupils' environmental awareness and Manafwa watershed conservation

The study concluded that pupil environmental awareness from Bukalasi, Bushika and Bushiyi were having 0.781, 0.864 and 0.856 positive effects towards watershed conservation. In-depth conclusions from qualitative findings revealed that although school environmental club patrons were trying sensitize learners by encouraging them to join environmental clubs, holding club meetings, through announcements during general school assemblies, and teaching them about environment methods for instance tree planting, agroforestry, constructing bunds, contour ploughing, crop rotation, reafforestation, such measures were facing countless challenges. Such challenges like limited time for such activities as per school timetabling, poor learners' attitude, and limited number of skilled personnel in environmental conservation were so vibrant to be eliminated.

The study concentrated on primary schools that are attached to MWARES project in Manafwa watershed because there was project evidence that they are being trained in the implementation of the PIP approach for Manafwa watershed conservation. This implied that other schools located within the watershed were not sampled. Therefore, a wider related study may additionally be carried out to further the conclusions for this current study.

5.4 Recommendations

Collaborating partners should pay more attention to training and retooling teachers on watershed conservation practices which will have trickle down effects to the learners and the community at large.

Since pupils' awareness boosts watershed conservation, the PIP approach should be scaled up to other schools within the watershed. This way, all pupils will adopt environmentally cautious

behaviour which would forever affect their relationship with environmental demands.

Government should prioritise education curriculum modification to pay more emphasis on environmental conservation skills of learners instead of doing it as a voluntary, tertiary or leisure activity at school. This way, learners will adopt environmentally cautious behaviour which would forever affect their relationship with environmental demands. This would be implemented by the ministry of education.

Head teachers should ensure that environmental clubs are allocated adequate space on their school timetables such that teachers, patrons, and pupils can freely participate in the clubs' activities instead of having to dodge normal classes so as to participate in club duties. This often affects learners' academic performance, and they often choose to be absent from environmental clubs to pay attention to examinable school assignments. Therefore, sufficient timetabling will create harmonised learning goals and targets which will deepen sharing of environmental awareness skills.

Pupils should be trained on tree nursery bed establishment such that they are able to train other pupils and also community members from where they come from so as to increase on tree planting. This can be done by PIP.

Pupils and patrons should be taught how to market their PIP activities products such that they can generate money to facilitate the PIP activities being implemented. This can be done by the schools and PIP.

Pupils' need to be trained on better banana management practices such as mulching, use of compost manure and pruning by the MWARES project team since most school gardens were poorly managed.

Environmental club patrons should listen to learners more so as to allow them make suggestions on how they would rectify prevailing challenges. This will make pupils own environmental conservation targets since they suggested them.

Teachers should encourage pupils during classroom sessions to join environmental clubs by exploring the attached advantages and inherent responsibility that learners are dodging. This will

increase enrolment into environmental clubs, curb absenteeism, and boost completion of associated tasks.

Head teachers and school inspectors should pay extra attention to budgeting, supervising and inspecting the environmental club activities. This will not only gazette watershed conservation and restoration activities as core performance targets but will thus be taken seriously.

Respective district education officials should organise routine school environmental club competitions which will encourage schools to showcase how far they have contributed to watershed restoration goals. Also, collaborating partners for example MWARES to additionally consider such social gatherings that will create competitiveness among participating schools.

Schools and MWARES projects should reward and motivate best performing patrons and pupils so as to build intrinsic motivation among them towards environmental restoration and conservation. In fact, if significant rewards are attached to such conservation goals, participation will increase.

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Appendix I: Krejcie & Morgan (1970) Sample Size Determination Table

Population (n)	Sample (s)	Population (n)	Sample (s)	Population (n)	Sample (n)
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354

95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Source: Krejcie and Morgan (2005)

Appendix II: Questionnaire for Environmental Clubs

Dear Sir/Madam

I am Doreen**,** a student of Master's in Geography from Kyambogo University studying the pupils' environmental stewardship approaches and Manafwa Watershed management effectiveness in Eastern Uganda. Your objective opinion will be highly appreciated.

SECTION A: DEMOGRAPHIC BACKGROUND

The following questions provide demographic information about yourself. Please answer all questions and responses by ticking (√) in the appropriate box as requested.

1. **Gender**

    a) Male

    b) Female

2. **Level of Education**

    a) Primary Seven

    b) Primary Six

    c) Primary Five

3. **Age (Years)**

    a) 11 Years old

    b) 12 Years old

    c) 13 Years old & Above

1	**2**	**3**
Disagree	Not Sure	Agree

Please use the following alternatives that better represents your honest opinion on a given research item

	PIP created awareness on:	**1**	**2**	**3**
Emp.1	The dangers of improper dumping at school			
Emp.2	Tree cutting dangers			
Emp.3	Importance of tree planting			
Emp.4	Poor farming methods used in our school garden			
Emp.5	Sources of water pollution			

Source: Adapted from Graham (2020); Šorytė & Pakalniškienė (2019); Collado et al., (2017).

	Pupils' suggested restoration practices on:	**1**	**2**	**3**
Inv.7	Improper dumping			
Inv.8	Tree protection			
Inv.9	Tree planting to protect the environment			
Inv.10	Better farming suggestions that be used at the school farm			
Inv.11	Better ideas to maintain clean water in the nearby water sources			

	Pupils' Networking and collaboration strategies for watershed conservation	**1**	**2**	**3**
Net. 12	Presence of an environmental club			
Net.13	Participation in environmental club activities			
Net. 14	Implementation of the activities by the environmental group			
Net.25	Participate in community environmental group activities			

Appendix III: Interview Guide for Environmental Club Patrons

Dear Sir/Madam

I am Doreen**,** a student of Master's in Geography from Kyambogo University studying the pupils' environmental stewardship approaches and Manafwa Watershed management effectiveness in Eastern Uganda. Your objective opinion will be highly appreciated.

Section A: Demographic Background

The following questions provide demographic information about the respondent.

1. **Gender**

    a) Male

    b) Female

2. **Level of Education**

    a) Certificate Level

    b) Diploma Level

    c) Bachelors Level

    d) Masters' Degree & Above

3. **Age (Years)**

    a) Below 20 Years old

    b) Between 21-30 Years old

    c) Between 31-40 Years old

    d) Between 41-50 Years old

e) Between 51-60 Years old

f) Between 61 Years & Above

Section B: Questions on Research Variables

You are kindly requested to give your honest opinion to the questions below as all information provided shall be treated with strict confidence and shall be used for academic purposes only.

1) **Pupils' Awareness towards effective watershed management**

a) How have you raised awareness among pupils on environmentally stewardship?
b) How challenging is it to raise awareness of pupils towards effective Watershed management?
c) Which measures have you put in place to address the above challenges?

2) **Pupils' Activities in watershed management**

d) How have you ensured that pupils are involved in effective Watershed management?
e) What could be the challenges faced in involving pupils in Watershed management?
f) Which measures have you applied to address the above challenges?

3) **Pupils' Networking on watershed management**

g) How does pupils' networking influence effective Watershed management?
h) What challenges are you facing in networking pupils in Watershed management?
i) Which measures have you applied to address the above challenges?

4) Effective Watershed Management;

j) What is the status of the Watershed around the school in terms of; water quality, green coverage, soil erosion, flood control, landslide, wetland use, agricultural yields, and human settlement?

Thank you, patrons, for your response

Appendix IV: Observation Guide and Checklist

1) Methods used in PIP Approach

a) Observe and note the methods used in training pupils in PIP approach *b) Observe and note how pupils participate in PIP trainings*

***2)* Pupils' Awareness towards effective watershed**

a) Observe and note how pupils are being made aware of the environment
*b) Observe and note the challenges in **a** raising awareness of pupils towards Watershed management*

***3)* Pupils' activities in watershed management**

c) Observe and note how pupils are involved in Watershed management
d) Observe and note the challenges faced in involving pupils in Watershed management

***4)* Pupils' Networking on watershed management**

e) Observe and note how pupils networking influence effective Watershed management
f) Observe and note the constraints faced in networking pupils in Watershed management

5) School location factors

g) Observe and note how weather conditions affect effective Watershed management
h) Observe and note how school topography affects effective Watershed management

Appendix V: Observation Checklist

SCHOOL……..

ITEM	***Research Question***	***YES***	***NO***
Presence of membership of the Environmental clubs	***3***		
During meetings, I will observe how pupils are involved	***2***		
Presences of PIP action plan	***2***		
What PIP activities have taken place	***2***		
To observe school nursery beds	***2***		
To observe the trees planted as a result of PIP	***2***		
To observe good farming practices like mulching, crop spacing, intercropping	***2***		
To observe proper solid waste management	***2***		
To observe how river banks are being protected	***2***		
To observe how soils have been protected	***2***		
To observe how the school topography have been managed	***1***		
To observe what PIP activities pupils have carried out in their communities	***3***		
To observe grouping list of pupils	***3***		

Appendix VI: Observation Checklist

Binary Regression for Integration activities on Watershed Management

a. Bukalasi Sub-County Results

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound
1	(Constant)	8.137	1.671		4.869	.000	4.785	11.489
	Integration activities	.905	.099	.946	9.110	.000	.706	1.105

a. Dependent Variable: Watershed

b. Bushika Sub-County Results

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound
1	(Constant)	2.226	.785		2.836	.006	.661	3.791
	Integration activities	1.199	.040	.962	29.802	.000	1.119	1.279

a. Dependent Variable: Watershed

c. Bushiyi Sub-County Results

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound
1	(Constant)	2.190	.792		2.766	.007	.614	3.767
	Integration activities	1.202	.040	.961	30.355	.000	1.123	1.281

a. Dependent Variable: Watershed

Binary Regression for Networking and collaboration strategies on Watershed Management

a. Bukalasi Sub-County Results

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound
1	(Constant)	18.756	3.070		6.110	.000	12.600	24.913
	Networking and collaboration strategies	.289	.219	.178	1.320	.193	-.150	.728

a. Dependent Variable: Watershed

b. Bukalasi Sub-County Results

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound
1	(Constant)	15.149	3.035		4.992	.000	9.100	21.199
	Networking and collaboration strategies	.587	.180	.220	3.250	.059	.227	.946

a. Dependent Variable: Watershed

c. Bushiyi Sub-County Results

Coefficients[a]

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	t	Sig.	95.0% Confidence Interval for B Lower Bound	95.0% Confidence Interval for B Upper Bound
1	(Constant)	18.657	3.066		6.086	.000	12.554	24.761
	Networking and collaboration strategies	.404	.178	.382	2.274	.000	.050	.758

a. Dependent Variable: Watershed

Binary Regression for pupil's environmental awareness on Watershed Management

a. Bukalasi Sub-County Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	4.793	.884		5.422	.000	3.020	6.565
	Pupil's environmental Awareness	1.077	.051	.781	21.156	.000	.975	1.179

a. Dependent Variable: Watershed

b. Bushika Sub-County Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	6.894	1.328		5.191	.000	4.247	9.542
	Pupil's environmental Awareness	.978	.069	.864	14.095	.000	.840	1.117

a. Dependent Variable: Watershed

c. Bushiyi Sub-County Results

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound
1	(Constant)	7.146	1.270		5.628	.000	4.618	9.673
	Pupil's environmental Awareness	.916	.061	.856	15.039	.000	.795	1.037

a. Dependent Variable: Watershed