

**Soil Erosion And It's Effect On Agricultural Productivity In Uganda. A case Study Bwanswa Sub County,
Kabale District.**

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Abstract

The study aimed at soil erosion and it's effect on agricultural productivity in Uganda with a case study bwanswa sub county, kabale district and it was guided by the following objectives; To find out the effects of soil erosion in Kabale district Kihumuro hills, to find out the forms of soil erosion in Kabale district, kihumuro hills and to find out the main causes of soil erosion kabale district, kihumuro hills. A correlation research design was used in this study to enable the researcher to find out the relationship between the studies effects of soil erosion on agricultural production (Sekaran, 2003). In addition, the study used a triangulation approach that includes both qualitative and quantitative approaches. Some causes of soil erosion in Bwanswa Sub County are, like deforestation, bush burning land fragmentation, though content may be viewed on websites. For purposes of this study, the study population consisted of all 80 residents of Bwanswa Sub County these people were selected using interview guide and questionnaire. This was evidenced by 56.7% of the respondents agreed that there was topography, 53.5 % of the respondents agreed that there was climatic conditions that led to soil erosion, 44.5% of the respondents agreed that there was thick vegetation, 57.7% of the respondents revealed that excessive cutting of trees was also a causative of soil erosion 76.9 of the respondents disagreed with the statement of monoculture , 88.4 %of the respondents agreed that bulumbali district experience soil erosion through mining

To Prevent Further Soil Erosion As a way to prevent further soil erosion from occurring, the researcher recommends that good and appropriate crop farming practices should be put in place. Farming practices such as terracing and contour plough along slops should be emphasized by those in authority. This will help to stop soil particles from moving down and remain fertile to support agriculture. Furthermore, local people should adapt and be encouraged to practice

crop rotation and mulching.

Keywords: Soil Erosion And Agricultural Productivity

Background of the Study

According to (Kazaara et al., 2023) Soil erosion simply refers to the removal or wearing away of the soil surface by agents such as wind, running water and glaciers (Allan et al., 2023). Soil erosion was considered a form of soil degradation along with soil compaction, low organic matter content and loss of soil structure, poor internal drainage, salinization and soil acidity problems. However, Lopez (1995) stated in his study that these other forms of soil degradation are serious and contribute to accelerated soil erosion. (Collins et al., 2023) defined the term soil erosion as the removal of topsoil by the combined action of human activities and natural processes at a rate greater than would occur as a result of the natural process alone. In this case, it can therefore be said that any natural process or human activity that wears down the soil surface can be described as a factor of soil erosion. (Niyonzima, 2023) formulated in his research that soil erosion can be a slow process that goes on relatively unnoticed, or it can occur at an alarming rate and cause serious loss of topsoil. Loss of agricultural land can result in reduced crop production potential, lower surface water quality, and impaired drainage

As soil erosion has detrimental effects on agricultural production, a worrisome interest in finding tough solutions or curbing aspects of soil erosion has rapidly spread across the African continent, and as such many African countries have taken these challenges seriously and started looking for ways to fight against soil erosion. phenomenon (Ronet et al., 2023). Currently, many authorities are coordinating and have initiated the development of a database of research activities on soil erosion and have produced a set of guidelines for surveying, assessing and monitoring soil erosion, including early warning indicators (F.A.O 2001). Deacon (2015), Bwanswa County, Kabale District, the phenomenon of soil erosion is at its peak. This led to poor agricultural production and related problems. Thus, within this framework, the objective of this research is to analyze the effects of soil erosion on agricultural productivity in Uganda. The researcher chooses the study because he will have all the necessary information and the area is favorable for the study.

However, the impact of grazing on vegetation development and soil erosion processes is rarely quantified in the literature on this topic (Ries, 2010). The specific objectives of the current research will be to determine the effects of soil erosion on land use in Kabale district. The six investigated land uses and vegetation types (cereals, fallow land or short-term abandonment, shrub land or long-term abandonment, regenerating autochthonous vegetation or very long-term abandonment, arable land forested with *Pinus pinaster* and arable land converted to pasture) are representative of situations, which are often found in central and northern Portugal as well as in other Mediterranean systems (Paul & Kazaara, 2023). The main objective was to obtain consistent conclusions for ecosystem management in marginal areas of Portugal. This information on hydrogeomorphic response could be useful as a guide for regional soil conservation planning in the future.

Problem statement

Soil erosion can affect agricultural productivity. The main problem is the off-site influence, the movement of sediments and agricultural pollutants into watercourses, leading to sedimentation in rivers and disruption of ecosystems (Emmanuel et al., 2023). The on-site effect is directly produced by the loss of soil nutrients. This effect is

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particularly critical on agricultural land as there is a loss of soil stability, soil quality and structure. Although the issue of soil erosion in relation to agricultural productivity has been explored several times, an inquiry from some residents of Kabale district revealed that knowledge on soil erosion regarding its causes, effects and possible solutions has not been well propagated at the grass roots level. Niklitschek (2015). Many people in the area have little knowledge of this phenomenon using existing parameters. Moreover, many residents of the district have continued to practice activities that lead to soil erosion. It is because of this background that this research has attempted to reveal aspects of soil erosion in the area, especially in relation to land use activities in Bwanswa Sub-District, Kabale District.

General objectives

To find out the effects of soil erosion on agricultural productivity in kabale district, Bwanswa sub county.

Objectives of the study

The objectives of this study were:

- To find out the effects of soil erosion in Kabale district Kihumuro hills.
- To find out the forms of soil erosion in Kabale district, kihumuro hills.
- To find out the main causes of soil erosion kabale district, kihumuro hills.

Methodology

Kabale District is a district in the Western Region of Uganda. Kabale hosts the district headquarters. It was originally part of Kigezi District, before the districts of Rukungiri, Kanungu, Kisoro, Rubanda and Rukiga and were excised to form separate districts. Kabale is sometimes nicknamed "Kastone" as in the local language Rukiga, a "kabale" is a small stone.

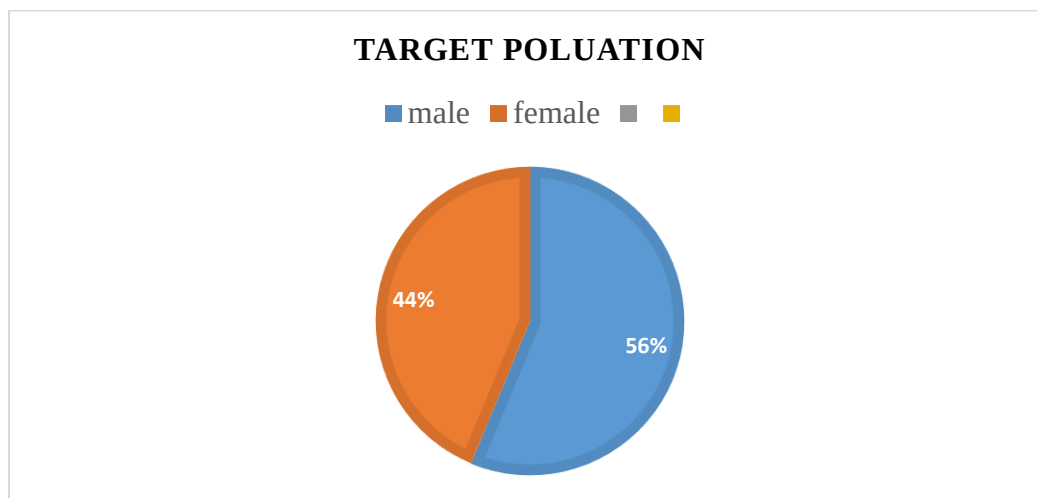
The Kabale District is bordered by Rukungiri District to the north, Rukiga District to the north-east, Rwanda to the east and south, Rubanda District to the west, and Kanungu District to the north-west. Kabale is approximately 143 kilometres (89 mi), by road, southwest of the city of Mbarara, the largest urban centre in Uganda's Western Region.^[1] Kabale is located approximately 410 kilometres (255 mi), by road, south-west of Kampala, the capital of Uganda.^[2] Kabale sits approximately 25 kilometres (16 mi), north of the town of Katuna at the international border with Rwanda. Bwanswa Subcounty is composed of Gayaza, Kasingo, Kihumuro, Kihurumba, Lubaya and Nkondo parishes. This will suggest that all the information needed will be got from the people in the sub-county as they are well versed with the area. This study adopted a correlation research design (Saris and Revilla, 2015). A correlation research design refers to a quantitative research design involves two or more quantitative variables from a similar group of subjects and it tries to establish the relationship between the two variables as to whether they had anything in common (Sekaran, 2003). Theoretically, any 2 quantitative variables can be correlated (Amin, 2005). A correlation research design was used in this study to enable the researcher to find out the relationship between the studies effects of soil erosion on agricultural production (Sekaran, 2003). In addition, the study used a triangulation approach that includes both qualitative and quantitative approaches. Some causes of soil erosion in Bwanswa Sub County are, like deforestation, bush burning land fragmentation, though content may be viewed on websites. For purposes of this study, the study

population consisted of all 80 residents of Bwanswa Sub County these people were selected using interview guide and questionnaire. These were chosen because they are expected to have sufficient knowledge about the study problem

Categories of the target population.

Particulars	Target population	Percentage (%)
Male	45	56%
Female	35	44%
Total	80	100%

The pie-chart showing the categories of the target population and target response population



The researcher employed purposive sampling on effects of soil erosion on agricultural productivity. Bwanswa sub county people who were equipped with knowledge about the study. This suggested that all the information needed was got from the people in the sub-county as they are well versed with the area. The researcher employed descriptive design involves both qualitative and quantitative methods. Through these, research design was both the detailed and specific information obtained from key respondents. The researcher selected a total of 80 respondents in the sub-county using questionnaires. This sampled respondent was composed of both men and women of different positions, age and education background. The target groups included the local councils, sub-county administrators, NGO staff, students and farmers in the sub-county. In this research, the researcher employed both simple random sampling and purposive sampling methods. The category of respondents to be sampled by random sampling included the local councilors, students and farmers while those that were sampled purposively include the sub-county administration and NGO staff. The selection of the respondents was done from the surnames that started with the letters A, G, O, D and S. Since the people with their surnames starting with letters A, G, O, D and S are many, the researcher employed purposive sampling method to select the number that fits the sample size. In using purposive sampling, the researcher

employed the cases of some age range and educational level. This is because the researcher believe that some age range and education level was incapable of revealing the required information for the study.

Both open ended and closed ended questionnaires were formulated to provide adequate information on the study. In this, issues of age, sex and education background were all considered for realistic information about the topic for the study. Data obtained was recorded manually, this helped to make adjustments on the information gathered, add supplementary information basing on the respondent's personal attitudes, emotions, characteristics and environment which help in interpreting the results. Data was analyzed qualitatively using the following methods; In analyzing quantitative data, the data was sorted as per its allocated codes and will be entered into a statistical package known as Statistical Package for Social Scientists (SPSS) to generate both descriptive and inferential statistics that created the mean, mode and median; the variance, standard deviation, frequencies and percentages (Nelson et al., 2022).

Results

Level of Knowledge about effects of soil erosion by respondents in Bwanswa subcounty Kabale district.

Figure 1: Shows level of knowledge when asked about the effects of soil erosion.

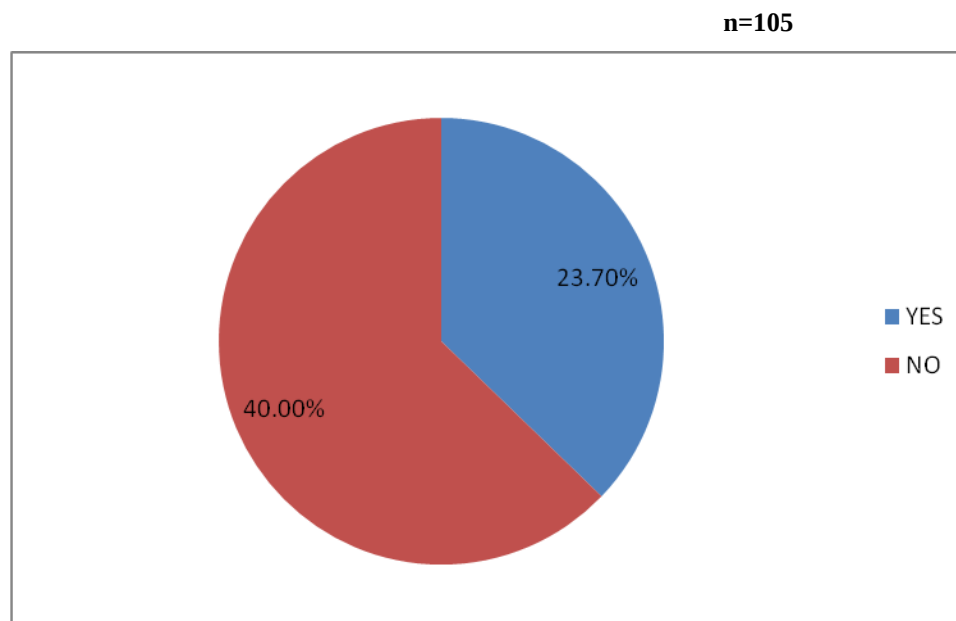


Figure 2: Awareness about soil erosion was insufficient with 74.3% (60/80) respondents

Forms of soil

erosion in Bwanswa sub county Kabale district

The research findings revealed that Splash and Surface flow forms of soil erosion in Bwanswa sub county Kabale district. This one is caused by the impact of rain drops. Rain drops divide soils particles and these joins running water to move in any direction. According to the finding shows Surface Flow is one the forms of soil erosion in Bwanswa sub county Kabale district is subdivided into rill, sheet and quickly processes surface flow to takes place when the rate of precipitation exceeds that of water and sinks into the ground. The research finding found out Sheet Erosion as one

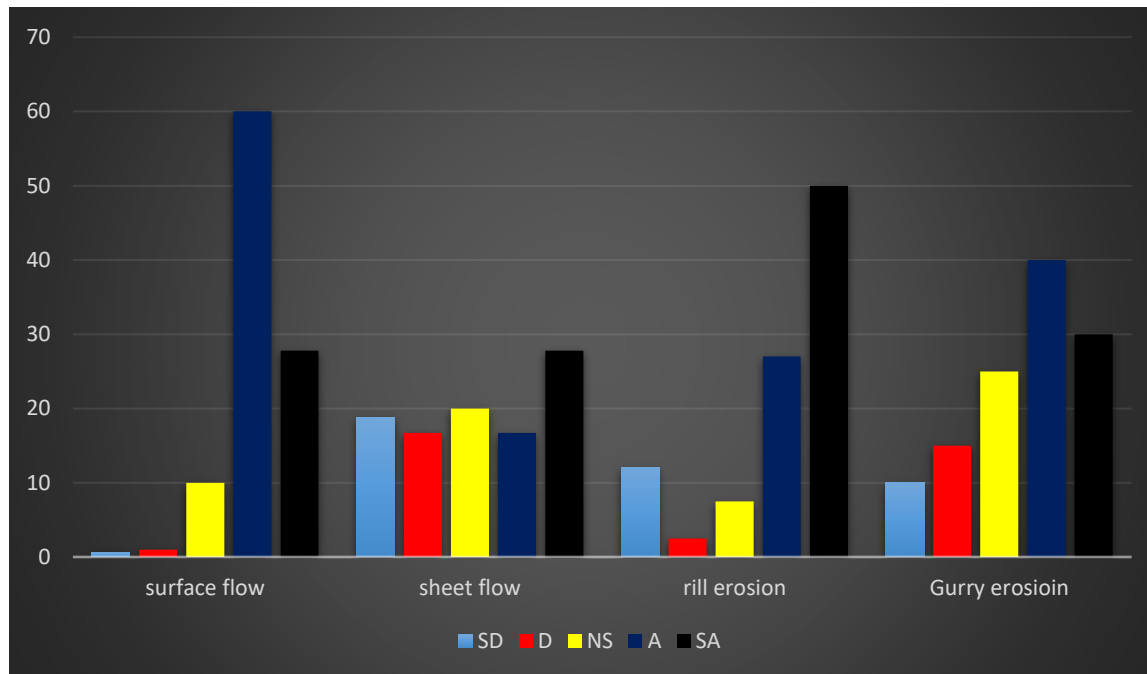
of the forms of soil erosion in Bwanswa sub county Kabale district. This is a uniform wash away/removal of a thin layer of the top soil by running water or wind. It involves slow movement of a thin layer of soils at a wider extensive area. It was seen in northern part of Bwanswa Sub County. The findings also found out that Rill Erosion was one of the forms seen in Bwanswa sub county Kabale district it Is a process of soil erosion which occurs when small channels guide soil movement of surface of the earth for instance in common vary verandas of Bwanswa sub county Kabale district where water from roof stamp out water from clear channels Research findings revealed that there was Curry Erosion in Bwanswa sub county Kabale district where there were deep wide channels through which soil is washed away down slope by running water in Bwanswa sub county Kabale district. Deep channels were cut in the slope by running water thus creating bad or waste lands (Nicholas et al., 2023).

Forms of soil erosion in Bulambula district Bwanswa Sub County.**Table 1:** Distribution of the respondents on Forms of soil erosion in Bulambula district Bwanswa Sub County

NO	STATEMENT	SD %	D %	NS %	A %	SA %	TOTAL %
1	Surface flow	0.6	1.0	10.0	60.6	27.8	100
2	Sheet erosion	18.8	16.7	20.0	16.7	27.8	100
3	Rill erosion	12	2.5	7.5	27	50	100
4	gurry erosion	10	15	25	40	30	100

Source primary data 2023

Bar graph 3 shows Distribution of the respondents on the Forms of soil erosion in Bulambula district Bwanswa Sub County



Source primary data 2023

SA-strongly agree, A- agree, NS- not sure, D- disagree, SD- strongly disagree

This is from the fact that: 0.6% of the respondents agreed that there was surface erosion, 1% disagreed, 10% were not sure, 60% agreed, 27.8 % strongly agree. 18.8% strongly disagree with sheet erosion, 16.7 disagreed, 20% not sure, 16.7% agreed, 27.8 % strongly agreed. 18.8 % strongly disagreed that there was sheet erosion, 16.7% disagreed, 20% not sure, 16.7% agreed, and 27.8% strongly disagreed. 12% disagreed that there was rill erosion, 2.5% disagreed, 7.5 not sure, 27% agreed, 50 % strongly agreed. 10% strongly disagreed there was gurry erosion, 15% disagreed, 25% not sure, 40% agreed, 30% strongly agreed

Causes of soil erosion in Bwanswa sub county Kabale district

According to the 80 respondents that the researcher interacted with, their response was revealing that the causes of soil erosion in their area are both physical and human in nature. In a separate form for purposes of easy analysis and comprehension, they were as follows

Physical factors causing soil erosion in Bwanswa subcounty Kabale district included the following;

According to the findings, it is found out that Topography in form of steep slopes in highland areas of Kabale facilitate a high rate of soil erosion. The surface run off is stronger and the steep slopes increase their erosive power according to respondents especially the farmers who have experienced a great decline in their agricultural productivity.

According to the findings, it is found out that Climate is another factor that causes soil erosion in Bwanswa sub county Kabale district. Heavy torrential rainfall in the hilly areas of the area has led to loss of soil through sheet, rill, and gully erosion according to the information from the respondents. The research findings also revealed that the nature

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of soil or soil structure, also influences soil erosion, the young volcanic soils in Kabale are not in compact. They easily get saturated and are easily washed away. Similarly, the sand soils in some dry areas of Bulabuli are easily blown by wind and removed by torrential rains (Willies et al., 2022). The research findings also revealed that some parts of Kabale areas are covered by thick vegetation in form of forests and have limited soil erosion while areas which lack vegetation experience erosion caused by both wind and running water simply because of soils are directly exposed to the agents of erosion.

The research findings also revealed that crustal instabilities like Earthquakes, disorganized soil particles preparing the massive flows respondents in Kabale confirmed that the area experience soil erosion partly due to the effect of earthquakes which affects landslides, more wasting and erosion (Christopher, 2022).

Human factors causing soil erosion in Bwanswa sub county Kabale district

Among the human factors that cause soil erosion is overgrazing according to the respondents of Kabale district Bwanswa Sub County. This is a result of overstocking with large herds of cattle graze all pasture thus exposing soils to agents of erosion.

The research findings also revealed that the stamping effect on the grounds by animals like cattle as they move detaches soils particles making them loose on the ground. This is later washed away by running water. The respondents also confirmed the fact that excessive cutting down of trees that is greater than regeneration of new ones (deforestation) also leads to soil erosion in Kabale by the migrants has led to massive soil erosion in the area. It was also realized that Mining or marrum on lateritic soils in hilly areas had led to soil erosion this is because the soils were left bare and exposed to erosion Bwanswa sub county Kabale district. The research findings also revealed that monoculture practices where one crop is grown on the same piece of land from year to year leads to deposition of more soil nutrients leading to soil deuteriation and later erosion in Kabale areas where bananas and coffee are grown in Bwanswa sub county. According to the findings still revealed that poor farming practices such as up and down ploughing on hill slopes in Kabale accelerate erosion, Rills and gullies are created leading to erosion (Musaibah et al., 2023). The research findings also revealed that Bush burning by pastoralists as some people in Kabale carry out bush burning in dry season with an anticipation of fresh grass for their animals at the time rainy season thus exposing soil to agents of soil erosion like wind, running water among others.

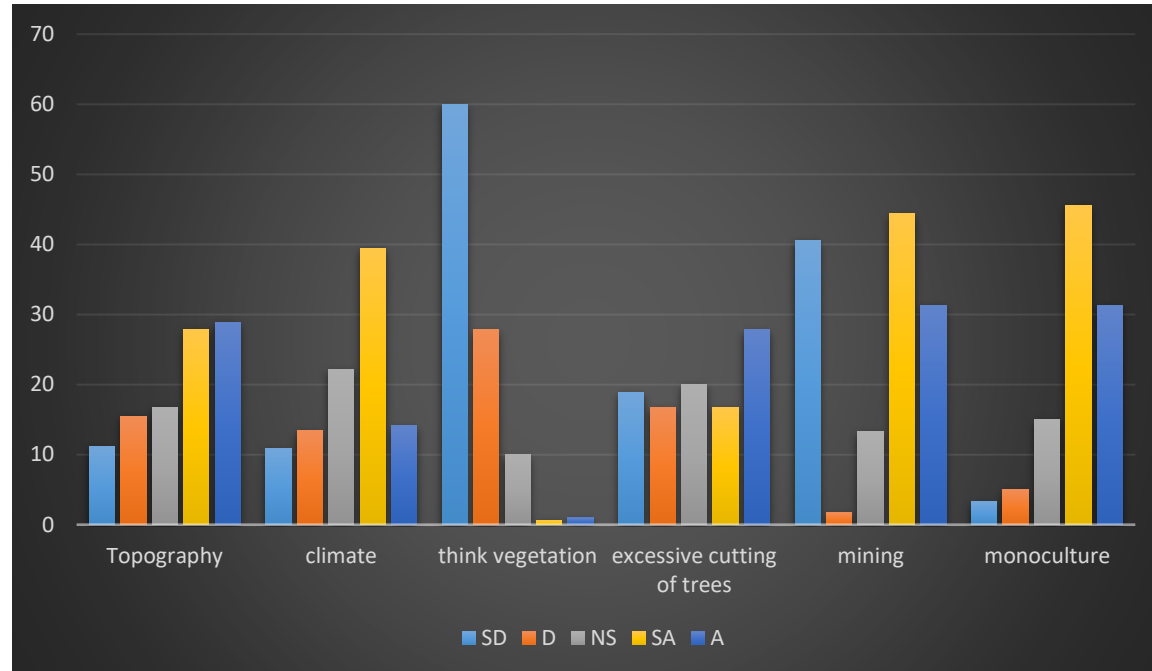
Table 2: Distribution of the respondents on the causes of soil erosion in Bwanswa sub county Kabale district

No.	Statement	SD %	D %	NS %	SA %	A %	TOTAL %
1	Topography	11.1	15.5	16.7	27.8	28.9	100
2	Climate	10.9	13.4	22.2	39.4	14.1	100
3	Thick vegetation	60.6	27.8	10.0	0.6	1.0	100
4	Excessive cutting of trees	18.8	16.7	20.0	16.7	27.8	100

5	Mining	40.6		1.7	13.3	44.4	100
6	Monoculture	3.3	5.0	15.0	45.6	31.3	100

Source; primary data, 2023

Distribution of the respondents on the causes of soil erosion in Bwanswa sub county Kabale district.



Source; primary data, 2023

SA-strongly agree, A- agree, NS- not sure, D- disagree, SD- strongly disagree

Table 2 the causes of soil erosion. This is evidenced by 56.7% of the respondents agreed that there was topography, 53.5 % of the respondents agreed that there was climatic conditions that led to soil erosion, 44.5% of the respondents agreed that there was thick vegetation, 57.7% of the respondents revealed that excessive cutting of trees was also a causative of soil erosion 76.9 of the respondents disagreed with the statement of monoculture , 88.4 %of the respondents agreed that bulumbali district experience soil erosion through mining

The effects of soil erosion in Bwanswa subcounty Kabale district.

According to the finding shows, in elaborating, the effects of soil erosion on agricultural activities are more of adverse as elaborated bellow

It was outlined and explained that wind erosion, for example, creates adverse operating conditions in the field. This therefore suggests that crops can be totally ruined. This condition caused by soil erosion by wind therefore makes plants to be sandblasted and set back with a resulting decrease in yield, loss of quality and market value. Soil drifting is a fertility depleting process that can lead to poor crop growth and yield reductions in areas of fields where wind

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erosion is a recurring. Continual drifting of an area gradually causes a textural change in the soil. Loss of fine sand, silt, clay and organic particles from sandy soils serves to lower the moisture holding capacity of the soil, hence low agricultural, productivity. Water erosion's main off-site effect is the movement of sediment and agricultural pollutants, hence affecting the productivity of agricultural activities. Additionally, flooding through the process of water erosion also leads to damage of crops planted, hence affecting agricultural production since it removes plants and crops. It's illustrated that areas with higher levels of soil erosion tend to have high levels of crop and animal diseases hence affecting both crop production and meat and milk production in such areas. This therefore puts soil erosion affected areas at a disadvantageous position as far as agricultural production is concerned especially in terms of pests and diseases affecting both crops and animals.

It was also illustrated that soil erosion affects fish farming through the process of flooding and sedimentation this means that through leaving huge amounts of soil in ponds, fish hide in the soil hence reducing fishing in such ponds. Additionally, they illustrated that soil erosion leads to removal of agricultural chemicals that often move with eroded sediment. These chemicals move into, and pollute downstream water courses and water bodies and sometimes fish ponds, hence affecting the lives of fish in such ponds.

Soil erosion is also said to not only have effect on agricultural production but also animal production in terms of meat and milk production.

Areas affected by soil erosion tend to have little vegetation and pasture to feed animals. This means that poor feeding as a result of poor pasture definitely affects the production of meat and milk.

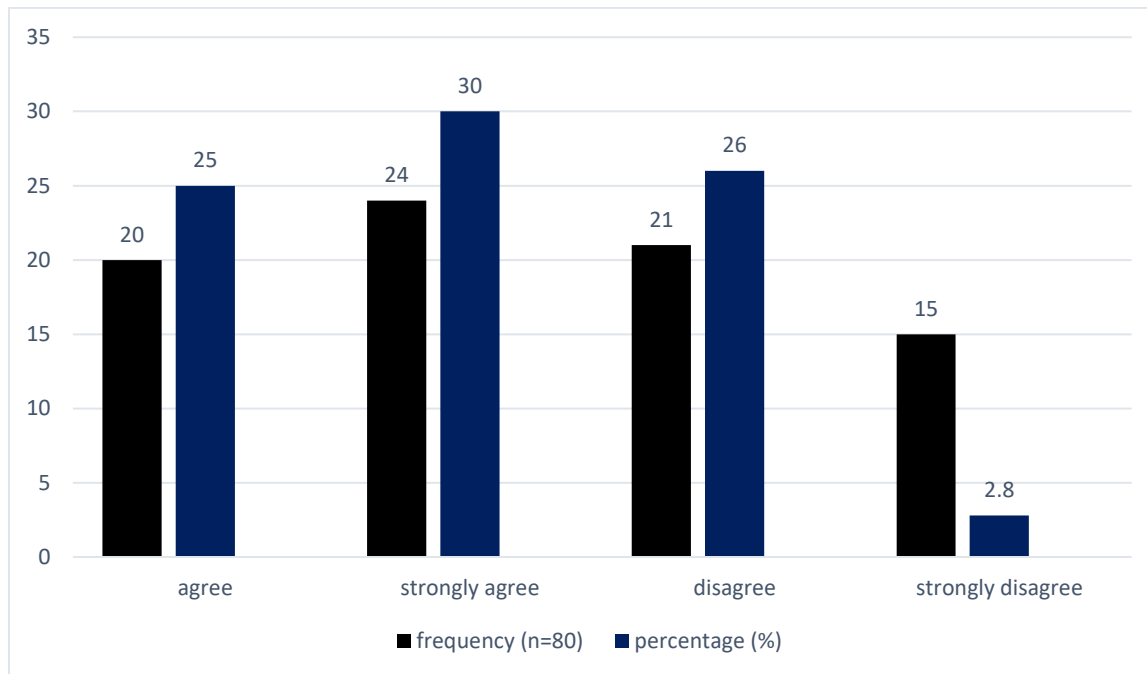
Perception of individual about soil erosion in Bwanswa subcounty Kabale district.

Table 3: perception of individual during the research soil erosion in Bwanswa subcounty Kabale district.

Option	Frequency (n=80)	Percentages (%)
Agree	20	25%
Strongly Agree	24	30%
Disagree	21	26%
Strongly disagree	15	18%
Total	80	100

Table. 3: Source: Field survey data August 2023

The bar graph shows the effects of soil erosion in Bwanswa subcounty Kabale district.



Source primary data 2023

As shown in **Table 3** above, individuals had varying perception on soil erosion in Bwansa sub county Kabale district according to the research, 25% of 20 respondents agreed, 30% of 24 respondents strongly agreed representing, 26% of 21 respondents disagreed, and 15 respondents of 18% representing poor perception when they strongly disagreed

Conclusion

A keen observation of analysis of this work draws a conclusion that the phenomenon of soil erosion in Nyadri Sub-County is rampant. Soil erosion in the sub-county manifests itself in different forms. However, the commonest and rampant forms of soil erosion in the sub-county are nil erosion and gully erosion constituting 28 % and 25 % respectively out of the total percentage of soil erosion occurrence in the area. Regarding the major causes of soil erosion in Nyadri Sub-county, it was noted that both natural and human induced activities are responsible for the cause of soil erosion in the Sub-county. However, human induced activities constitute more to the cause of soil erosion (55 %) than natural factors (45 %). The commonest cause of soil erosion in the area was deforestation, being 30 percent of the total percentage. The findings affirm that soil erosion is detrimental to agricultural activities in sense that it depletes the most top and fertile land leaving the soil particles that do not support agriculture, discouraging pasture growth to feed animals hence affecting milk and meat production, encouraging pests and diseases, enabling flooding through its channels that damage crop production, leading to harsh climatic conditions like drought, making crops stunt especially in ditches created by erosion from mining and construction activities. Since the danger of soil erosion to agricultural activities is real, more care to combat the phenomenon should be taken. This suggests that massive sanitization and campaign regarding the phenomenon should be put in place. Additionally, involvement of different

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stakeholders in the protection of environment would be important.

Recommendations

To Prevent Further Soil Erosion As a way to prevent further soil erosion from occurring, the researcher recommends that good and appropriate crop farming practices should be put in place. Farming practices such as terracing and contour plough along slopes should be emphasized by those in authority. This will help to stop soil particles from moving down and remain fertile to support agriculture. Furthermore, local people should adapt and be encouraged to practice

crop rotation and mulching. Through these practices, soil texture and nutrients will be kept intact and damages that would occur from rainfall and wind are avoided hence good agricultural production. People should all be encouraged to plant trees like eucalyptus that tend to grow up in a period of short time. This will enable the local people to stop abusing forests around especially as fuel for their bricks and tobacco cure. Local government should set some bye-laws that can enable people both in town and rural to plant some trees before they start construction work. This will help to boost tree population in the area hence enhancing climatic condition. Farmers should also be discouraged from participating in some of the activities that are likely to cause disastrous effect on environment. This means that instead of people participating in tobacco growing and brick laying activities, they should be encouraged to grow coffee to earn money they are seeking for. To avoid further loss of soil particles occurring from over grazing, zero grazing should be encouraged among farmers. As ignorance among people regarding causes and effects of soil erosion has led many of people to get involved in destruction of environment, sensitizing the masses about the phenomenon would enable them to act and perform different activities with responsibility and this could help to reduce chances that are likely to endanger environment.

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