



**IDENTIFICATION OF THE ENVIRONMENTAL IMPACTS OF SOIL
DEGRADATION IN THE BOGAWANTHALAWA SOUTH GRAMA NILADHARI
DIVISION IN THE NUWARA ELIYA DISTRICT**

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Abstract

Soil degradation has become a crucial environmental problem in Sri Lanka, especially in the upcountry area, including the Nuwara Eliya district. Bogawantalawa South Grama Niladhari Division has been identified as a vulnerably area for soil degradation and environmental impacts. This division has shown a drastically increasing trend, due to unplanned human activities. The main objective of this study is to identify the environmental impacts of soil degradation in the Bogawantalawa South Grama Niladhari Division. This study followed quantitative and qualitative methods to collect data, applying purposive sampling techniques. 86 affected families as samples have been selected for questionnaire survey and field observations, while structured interviews and multiple discussions have been carried out to collect primary data. The data has been analyzed using MS-Excel and SPSS. According to the findings, there is a higher variability of environmental impacts, such as natural disasters (landslide and flood)-(31%), water pollution (24%), modified natural terrain (21%), decreased soil quality (19%) and soil organism (5%). The vulnerabilities have increased, due to gem mining (40%), vegetable cultivation (24%), tea cultivation (21%), and infrastructure development processes (15%). This study invites all stakeholders to participate in minimizing the environmental impacts of soil degradation, through an integrated approach. This study further suggests to promote environmental friendly gem mining activities by way of protecting the extracted soil, refilling the gem mining pits, prohibiting illegal and unregulated gem mining. Recycling polluted water, using organic fertilizers, finding hazardous areas through a hazardous map and conserving them are other suggested measures to minimize the soil degradations of the area. Similarly, it is important to practice sustainable soil-conservation and farming methods, while ensuring strict implementation of existing soil conservation laws against illegal activities and providing frequent public awareness and education on environmental friendly practices, among the public.

Keywords: Natural Disaster, Nuwara Eliya, Soil Degradation, Soil Conservation.



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1. Introduction

The loss of actual or potential productivity and utility of soils is basically known as soil degradation (Hegde et al, 2011). This is a recurring issue and its volume and risk levels may vary from place to place and period to period, based on the soil type and causes for degradation. This paper analyses the environmental impacts of soil degradation in the Bogawantalawa-South Grama Niladhari Division (GND) and suggests control strategies to minimize or manage such environmental issues.

2. Literature review

Mapa (2003), Controller of Agricultural Land Degradation in Sri Lanka, states that the main reasons for agricultural land degradation in Sri Lanka are soil erosion, fertility decline, salinization and compactions. 33% of the land area in Sri Lanka was degraded, due to the soil erosion, which should be controlled by introducing agroforestry systems and conservation of farming, building-up the organic matter of soil content and revising the existing Soil Conservation Act to accommodate the current needs.

Dharmasena, (2014) states that Nuwara Eliya district shows the highest amount of soil erosion, majorly due to the potato-cultivation, which was found to be prone to higher rate of erosion, amounting to 15 tones/ha/year.

According to Ajayi (2015), soil degradation is induced by human activities, which resulted in erosion, loss of organic matter, plant nutrients and soil compaction, generating food security. Furthermore, it needs a paradigm shift in agriculture development from a green revolution to an ecological intensification approach that will minimize land degradation.

3. Research Objectives

- To find the major causes of soil degradation in the Bogawantalawa-South GND.
- To identify the negative environmental impacts of soil degradation in the study area.
- To provide recommendations to mitigate and manage the negative impacts of soil degradation.

4. Research Methodology

The primary and secondary data collection methods have been deployed, following the qualitative and quantitative approaches. The primary data was collected mainly through questionnaire survey, interviews and field observations during 2019/2020 periods, following the purposive sampling techniques. 86 severely affected families from 1,427 families of the Bogawantalawa-south GND have been elected for this study. Further, 12 structured interviews and 02 small groups discussion were held as other data collection tools. The structured interviews have been completed with the experts (Manager of Bogawana tea factory, agriculture officers of the Ambagamuwa Divisional Secretariat and the Grama



Niladhari) of the area who possessed practical knowledge about the study area. Further, small groups discussion was held to identify participants’ practices related to issues in the study area. Secondary data have been collected from research articles, annual reports, related books and internet sources. Data has been analysed through MS-Excel and SPSS and presented in the form of charts, graphs and pictures.

5. Result and Discussion

5.1. Causes of soil degradation in the study area

According to the results, approximately 30% of the gem mining activities has led to 68% of the soil degradation in the study area. It has taken place close to the Kesalgamuwa river basin (Chapilton-Bridwell). Unsystematic digging and refilling process and lack of maintenance of the extracted soil provide pieces of evidence for validating this statement. Similarly, illegal gem mining activity has also been carried out in the study area and has lead to more deteriorations in terms of soil conservation. Approximately 32% of soil degradation has been attributed to illegal gem mining.

Further, the second prime cause for this recurring issue is vegetable cultivation (24%), with the usage of chemicals, pesticides and fertilizers, irregular irrigation methods (supply of water by a garden hose and watering cans) and mono-cropping (carrot, potato and beetroot) *etc.* Accumulation of all these activities are attributed to 47% soil degradation of the study area. Similarly, 21% of tea cultivation in the study area has also contributed to soil degradation in the long-term. This study observed that the many previously tea planted land plots have been abandoned, due to the illegal gem mining activity.

Besides, the increasing trend of infrastructure developments function (14 %) has become a reason for soil degradation. The research findings indicate that 11% of physical factors have contributed to soil degradation in the study area. The annual average rainfalls in the Nuwara Eliya District and excessive rainfall damages the topsoil layer and causes soil erosions subsequently. Especially, deep valley and steep slope spread in the Nuwara Eliya district accelerate the high volume of soil degradation.

5.2. Environmental impacts of soil degradation

Soil degradation has created multifarious negative environmental impacts. Those can be categorized as natural disasters (31%), water pollution (24%), modified natural terrain (21%), decreased the soil quality (10%) and soil organism (9%) and loss of land value (8%).

A natural disaster is an important negative impact of soil degradation in the study area. Landslide and flood affect the vegetation canopy and day-to-day lifestyle of dwellers. The Table 1 shows the affected families, due to the landslides and floods in the Ambagamuwa Divisional Secretariat. The highest numbers of people were affected in 2013 and 2014, due to the landslides. The removed soil from gem mining has washed into the river basin. This has decreased the river level and water catchment area and caused floods.

Table-1: Number of affected persons by landslides and floods in the Ambagamuwa Divisional Secretariat (2013-2018)

Types of disaster	2013	2014	2015	2016	2017	2018
Landslides	432	233	128	50	22	53
Floods	17	05	06	06	02	27

Source: Ambagamuwa Divisional Secretariat,2018



Gem mining activities in the area pollute the pure water. Similarly, the adverse impacts on the environment create many social crises, primarily the drinking water problem. Moreover, the soil degradation (soil erosion, soil structural decline and mass movement) has modified the natural terrain. More usage of pesticides and weedicides have decreased soil organisms. Particularly earthworms, ants, soil beetles and soil insects support to create fertile soil. The number of soil organisms decreased in the vegetable garden and tea estates. Sri Lanka's tea plantation sector used the glyphosate weedicide until 2015 (Central Bank of Sri Lanka, 2017).

Further, soil degradation harms the land value in Bogawantalawa-south. Approximately, 95% of gem mining pits were not refilled properly in the Chaplton-Bridwell mining area. The grasslands have severely been plagued by the gem mining and also impact the animal husbandry (cow and goat) activities of the area.

6. Conclusions and Recommendations

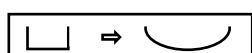
6.1. Conclusions

This research found the environmental impacts of soil degradation in the Bogawantalawa-south GND. Soil degradation has been creating multifarious negative environmental impacts. Such as natural disasters (31%), water pollution (24%), modified natural terrain (21%), decreased the soil quality (10%) and soil organism (9%), loss of land value (8%). To mitigate the environmental impacts, the productive strategies together with viable solutions should be implemented to reduce the environmental impacts of soil degradation

6.2 Recommendations

a. Gem mining area

1. It is recommended that the government take measures to control the illegal gem mining activities.
2. Approved gem mining activities should be properly monitored with the respective Government Authority and abandoned pits should be refilled immediately.
3. Protect the extracted soil from the water erosion, by covering such soil with waterproof bags and waterproof sheets.
4. Create eco-friendly gem mining pits as depicted below. The diagram number-2 is suitable than the diagram number-1 since this could minimize the landslides.



b. Vegetable and tea gardens

1. Use more efficient irrigation methods, such as sprinkler irrigation and drip irrigation in the vegetable garden.
2. Stop the irregular land preparation and use the contour ploughing in the slope lands.
3. Improve the existing drainage system in the area.
4. Use natural fertilizers instead of chemical fertilizer and stop the usage of harmful chemical pesticides and weedicides.

c. Other recommendations

1. Strictly implement the existing Soil Conservation Law (Soil Conservation Act 1951 (No.25.of 1951) and Soil Conservation Amendment (Act.No.24.1996)
2. Recycle the polluted water.
3. Sustainable soil conservation activities should be created by the government and it should begin from the rural level.



4. Create a productive soil conservation policy.

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