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Increasing Productivity of Farmland by Controlling Soil Erosion

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ABSTRACT: Soil erosion is one of the most critical environmental issues facing agriculture, causing significant losses in farmland productivity. Various soil conservation measures have been proposed and implemented to manage the problem of soil erosion. This review paper discusses different techniques to control soil erosion and their impact on increasing farmland productivity. The study identified that implementing soil conservation measures can increase farm productivity by reducing soil erosion, improving soil health and enhancing crop yields.

I. INTRODUCTION

Soil erosion is a natural phenomenon in which soil is moved from one location to another due to various geographical, physical, and environmental factors. Human activities have also been identified as one of the significant reasons for soil erosion [1]. So, it can be said that soil erosion has both natural and man-made causes that lead to the displacement of soil particles. Soil erosion has a significant impact on the environment by degrading soil quality, altering landscapes, and contributing to water pollution.

It is estimated that about 24 billion tons of fertile soil are lost worldwide each year, which is equivalent to the surface area of Portugal [1]. Soil erosion creates various challenges for farmers, which include reduced crop productivity, soil degradation, soil loss, and reduced soil fertility. However, controlling soil erosion can lead to increased agricultural productivity. This review of literature aims to provide a comprehensive overview of the causes, impacts, and prevention measures of soil erosion and how productivity of farmland increases by its control.

Soil erosion is a widespread problem affecting farmland productivity, soil fertility and water quality. The problem is exacerbated by factors such as climate change, deforestation, unsustainable farming practices and population pressure. According to Food and Agriculture Organization (FAO) estimates, about 33% of the world's agricultural land is affected by soil erosion, with an annual loss of 24 billion tonnes of fertile soil [2]. Soil erosion results in decreased soil productivity, lower crop yields, and reduced water quality [3].

II. METHODS

This paper reviews different techniques for controlling soil erosion, including agronomic, mechanical, and structural methods. Agronomic measures include crop rotation, cover cropping, mulching and tillage management. Mechanical measures involve terracing, contouring, and strip cropping. Structural measures, such as grassed water ways, sediment retention ponds, and filter strips, are commonly used to reduce erosion rates. The paper focuses on the impact of these measures on enhancing farmland productivity.

III. RESULTS AND DISCUSSION

Research has shown that implementing soil conservation measures can increase farmland productivity by improving soil health, enhancing water quality, and increasing crop yields [4]. Agronomic measures such as crop rotation, cover cropping, mulching, and no-t ill farming have been found to be effective in reducing erosion rates while enhancing soil fertility [5],[3]. For example, a long-term study in the United States found that no-till farming and crop rotation can improve soil health, reduce erosion rates, and increase crop yields [3]. Similarly, research conducted in Ethiopia demonstrated that conservation agriculture practices such as minimum till age, cover cropping, and inter cropping significantly improved soil quality, increased water infiltration rates, and enhanced crop yields [4].

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A. Causes of Soil Erosion

Natural causes of soil erosion include rainfall, wind, and waves that cause soil movement. Man-made causes of soil erosion are linked to human activities such as deforestation, agriculture, and construction. Deforestation increases soil erosion by removing vegetation that serves as a protective layer for soil, exposing it to the direct action of wind and rainfall. Agriculture and construction activities remove the natural layer of soil, contributing to soil compaction, decreasing soil quality, and increasing the susceptibility of soil to erosion.

Soil erosion is a natural process that occurs due to various factors. Some of the main causes of soil erosion are:

1. ***Water Erosion***: When rain water or surface water flows over the land, it picks up and carries away loose soil particles. This is known as water erosion.
2. ***Wind Erosion***: Strong winds can also carry away soil particles, particularly in areas with little vegetation cover and exposed soil.
3. ***Deforestation***: Deforestation reduces the root system of trees and other plants that help hold soil together, making the soil more vulnerable to erosion.
4. ***Overgrazing***: When too many animals graze on a piece of land, they can eat away the protective vegetation, which exposes the soil to erosion.
5. ***Unsustainable Agricultural Practices***: Certain farming practices such as monoculture, tilling, and leaving fields bare after harvest can lead to soil erosion.
6. ***Construction Activities***: Construction activities like building roads, buildings and land-fills can change the natural surface of land, leading to soil erosion.
7. ***Natural Disasters***: Natural disasters such as hurricanes, floods, and lands l ides can also cause severe soil erosion by washing away soil.
8. ***Climate Change***: Changes in rainfall patterns, increased temperature and extreme weather events caused by climate change can exacerbate soil erosion.

B. Impacts of Soil Erosion

Soil erosion has significant impacts on the environment, including water pollution, loss of soil nutrients, and reduced soil quality, among others. Eroded soil particles carried by water can clog river channels, leading to flooding and water pollution. Soil erosion also leads to the loss of topsoil, which contains essential nutrients for plant growth, negatively affecting crop productivity in agricultural systems. Additionally, soil erosion can alter landscapes, contributing to the loss of biodiversity and natural habitats.

Soil erosion can have a severe impact on agriculture. When soil erosion occurs, the top soil is removed, which is where most of the essential nutrients that plants need to grow are located. This can lead to a reduction in soil fertility, which makes it more difficult for plants to grow and produce healthy crops. In addition, soil erosion can lead to soil comp action, which makes it hard for water to penetrate the soil. This can cause water runoff, leading to soil moisture loss and making it challenging for crops to absorb nutrients and grow. Moreover, soil erosion can also impact the overall health of the ecosystem, affecting the soil's ability to support plant growth and other organisms that depend on it. Therefore, preventing soil erosion is essential for maintaining the productivity and sustainability of farming practices.

C. Prevention Measures of Soil Erosion

Different methods are applied to prevent soil erosion, aimed at reducing the rate of soil displacement. Agricultural methods such as conservation tillage, crop rotation, and contour ploughing reduce soil erosion in agricultural systems. Conservation tillage involves leaving crop residues on the soil surface, which acts as a protective layer for soil, reducing wind and water erosion. Crop rotation involves alternating crops on a field to reduce soil erosion, with some crops reducing soil compaction while others improve soil fertility. Contour ploughing involves cultivating crops at the contour of a slope, reducing the rate of soil movement.

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Controlling soil erosion involves preventing soil from leaving its original position by reducing the effects of agents responsible for erosion, such as wind and water. There are several methods of controlling soil erosion, such as:

1. ***Planting of Vegetation:***

Planting vegetation is an effective method of controlling soil erosion. The roots of plants help to hold the soil in place and protect it from being washed away. Additionally, vegetation also helps to reduce surface runoff and strengthens soil structure. Therefore, planting vegetation helps to reduce soil erosion, which translates to increased productivity.

2. ***Terracing:***

Terracing involves the creation of leveled steps on a slope. Terraces help to slow down surface runoff and reduce the risk of soil erosion. This method is particularly useful where the landscape is steep and prone to erosion. Thus, terracing can lead to increased productivity by reducing soil erosion.

3. ***Contour farming:***

This involves planting crops along the contour lines of the land. By doing this, water is prevented from flowing downhill and carrying soil with it. The crops help to hold the soil in place, reducing erosion.

4. Cover crops:

These are planted in between cash crops to protect the soil from wind and water erosion. Cover crops help to improve soil fertility by adding nutrients and organic matter to the soil.

5. ***Conservation Tillage:***

Conservation tillage is a method that involves reducing soil tillage to the minimum level required for planting. This method helps to reduce soil disturbance, improve soil structure, and increase soil organic matter, which reduces soil erosion [1]. Therefore, adopting conservation tillage practices increases productivity by maintaining stable soil conditions.

6. ***Application of Mulch:***

Mulching involves the addition of organic or inorganic matter on the soil surface to protect it from the effects of wind and water. Mulch helps to reduce surface runoff, reduce soil compaction, and improve soil temperature regulation [1]. Therefore, applying mulch helps to control soil erosion, which translates to increased productivity.

7. ***Wind breaks:***

Planting trees or shrubs along the edges of fields or around homes can help to reduce wind erosion.

8. ***Soil testing and nutrient management:***

Proper nutrient management can improve soil health and reduce erosion by improving plant growth and root development.

9. ***Soil stabilization:***

This refers to the use of structures such as retaining walls, rip rap, and gab ions to anchor the soil in place and prevent it from eroding. These structures can be used in areas where natural soil stabilization methods are not effective.

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D. Limitations of controlling soil erosion

Controlling soil erosion in farmlands can be challenging due to several limitations, including:

1. ***Topography***: Steep slopes are more prone to soil erosion, making it difficult to control erosion in such areas.
2. ***Soil structure***: Soil with a low organic matter content and weak structure is more susceptible to erosion. These soils are harder to control erosion within than those with higher organic matter content.
3. ***Climate***: The intensity and distribution of rainfall and wind patterns play a major role in soil erosion. In areas with high-intensity rainfall or strong winds, controlling soil erosion can be difficult.
4. ***Land use***: Farming practices such as tilling, over grazing, and improper use of chemical fertilizers and pesticides can exacerbate soil erosion, making it harder to control.
5. ***Economic constraints***: Implementing erosion control measures can be costly for farmers, especially small-scale farmers who lack the necessary resources.
6. ***Lack of awareness and knowledge***: Farmers may not be aware of the importance of controlling soil erosion or may not have the necessary knowledge and skills to implement erosion control measures effectively.

IV. CONCLUSION

In conclusion, soil erosion is one of the most significant environmental challenges that affect productive farmland. The loss of top soil reduces the fertility of the soil and eventually leads to decreased crop yields. Therefore, controlling soil erosion is critical in ensuring the productivity of farmland. The review paper has highlighted various effective strategies that farmers can use to control soil erosion and increase their productivity. These strategies include soil conservation practices such as strip-till, no-till, cover crops, and grassed water ways. The adoption of these practices undoubtedly requires an effort from both farmers and policymakers. Nonetheless, the benefits that come with controlling soil erosion are immense, including increased yields, reduced soil degradation, and better water quality. Hence, it is crucial for stakeholders to establish policies and provide incentives that encourage farmers to adopt these best management practices. Overall, the review paper establishes that controlling soil erosion is vital in maintaining the productivity of agricultural land and the overall sustainability of the farming system.

REFERENCES

[1] Lal, R. “Soil Erosion and Soil Quality in Central Africa: A Review”. Sustainability, 6, 631-655, 2014.
[2] Keesstra, Saskia D., et al. "The significance of soils and soil science towards realization of the United Nations Sustainable Development Goals." Soil , 2016.
[3] Lal, Rattan. "Accelerated soil erosion as a source of atmospheric CO2." Soil and Tillage Research 188 ,35-40, 2019.
[4] Takele, Chalsissa, and Birhanu Iticha. "Use of infrared spectroscopy and geospatial techniques for measurement and spatial prediction of soil properties." Heliyon 6.10 : e05269, 2020.
[5] Ali, U., et al. "Soil erosion risk and flood behavior assessment of Sukhang catchment, Kashmir basin: Using GIS and remote sensing." J. Remote Sens. GIS 7.1 : 1-8, 2018.
[6] Boerboom, C., Sklenar, J., & Pepin, D. “An evaluation of soil erosion assessment methods for sustainable agriculture”. Journal of Environmental Management, 297, 113400, 2021.
[7] Lal, R. “Soil erosion and land degradation: role in land degradation, conservation measures, and socio-economic problems”. Advances in Agronomy, 125, 1-38, 2014.
[8] Morgan, R. P., Nearing, M. A., Jorda-Sales, J. P., Vente, J. d., & Aptroot, A. “The impact of soil erosion on ecosystem services and natural capital”. Land Degradation & Development, 28(3), 246-261, 2017.
[9] Renard, K. G., & Foster, G. R. “Predicting soil erosion by water: a guide to conservation planning with the revised universal soil loss equation (RUSLE)”. USDA, 2020.

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