ENHANCING SOIL RECLAMATION THROUGH ORGANIC SOIL AMENDMENTS: A REVIEW OF THEIR IMPACT ON SOIL PHYSICAL PROPERTIES

[1]Aditya Shekhawat, [2]Dr. Pankaj Rawal

Department of Social Sciences
Manikya Lal Verma Shramjeevi College
J.R.N. Rajasthan Vidyapeeth
Udaipur 313001, Rajasthan, India

Abstract- **This review article examines the extensive body of research concerning the influence of organic soil amendments on soil physical properties and their pivotal role in soil reclamation. Organic treatments, including agricultural residues, manure, compost and biochar, are scrutinized for their potential to enhance soil structure, porosity, water-holding capacity and nutrient availability. The review encompasses international studies that highlight the positive effects of organic soil amendments on soil health, crop yields and environmental sustainability. The objective is to consolidate and synthesize the existing literature to provide valuable insights for policymakers, farmers and stakeholders involved in sustainable agriculture and soil restoration practices in the Udaipur District and similar agroecological regions. Ultimately, this review underscores the significance of organic treatments as a means of addressing soil degradation, fostering environmental conservation and promoting local food security.**

Keywords: **Organic soil amendments, Soil reclamation, Soil physical properties, Sustainable agriculture, Soil health restoration etc.**

INTRODUCTION

The physical characteristics of soil and soil productivity may be considerably improved by using organic treatments during soil reclamation. In the Udaipur District, soil deterioration is a serious problem, however using organic soil additions like agricultural wastes, manure, compost and biochar can help restore the health and fertility of the soil.

The texture, porosity, structure and water-holding capacity of soil can all be improved by using organic treatments made from leftover plant and animal material. These organic additions are essential for enhancing the soil's biological activity by enhancing nutrient cycling and microbial diversity.

By promoting soil aggregation and stability, the introduction of organic supplements can result in improvements in soil structure. As a result, there is less soil erosion, more water infiltration and better water storage capacity. The development of pore spaces made possible by organic soil additives can significantly affect soil porosity, a crucial component for plant growth and root development.

Furthermore, by releasing vital minerals like potassium, phosphorus and nitrogen, organic supplements can increase nutrient availability. Organic matter is an essential component of soil restoration since it significantly improves soil health and fertility.

The use of organic supplements can significantly improve attempts to restore degraded soil in the Udaipur District, where this problem is a serious one due to intense agricultural practises, overgrazing and deforestation. Organic soil additives can considerably improve the physical qualities of degraded soil, increase soil fertility and productivity and decrease runoff.

Organic treatment has the ability to improve soil physical properties and increase soil production throughout the soil reclamation process. Soil degradation is a major problem in the Udaipur District. However, restoring soil health and fertility through the use of organic soil additives has the potential to effectively address these challenges.

Through the incorporation of organic amendments, soil texture, porosity, structure and water-holding capacity can be improved. Organic substances from wastes of plants and animals, such as crop scraps, manure, compost and biochar, are the building blocks of these amendments. Soil biological activity may be positively affected by these additives because of their ability to improve nutrient cycling and increase microbial diversity.

Soil aggregation and stability can be improved with the use of organic additives, which could increase the soil's structural integrity. This has the potential to lessen soil erosion while also increasing the soil's capacity to absorb and hold water. Soil porosity is essential for supporting plant expansion and root formation. Organic soil additives can be used to great effect to create pore spaces in order to increase soil porosity.

Nutrients like nitrogen, phosphorus and potassium are essential for good plant growth and overall production and the addition of organic soil amendments has the potential to increase nutrient accessibility by accelerating the release of these elements. Soil health and fertility can be improved through the addition of organic substances, which can be achieved through the integration of organic matter.

Soil deterioration is a major problem in the Udaipur District due to intensive farming, overgrazing and tree cutting. The use of organic additives in this setting has the potential to greatly aid in soil reclamation initiatives. Improved soil fertility and production, restoration of physical properties in degraded soil and runoff mitigation are just some of the ways that organic soil additives can contribute to agricultural sustainability.

Soil reclamation through the use of organic soil additives is an environmentally sound and long-term solution that could help Udaipur District farmers improve their financial standing while also reducing their impact on the environment.

Consequently, the investigation will examine the impact of organic soil amendments on the soil within the vicinity of the Udaipur district. Conducting an investigation on the soil's reaction to organic amendments within the vicinity of Udaipur has the potential to produce numerous benefits. Firstly, it can offer valuable insights into the efficacy of various organic treatments in enhancing soil physical characteristics and revitalising soil health within a specific agroecological region. Insights of this nature possess the potential to provide valuable guidance to farmers and decision-makers in determining the optimal organic soil and crop amendments. The investigation of the impacts of organic inputs might facilitate the comprehension of the mechanisms that drive alterations in soil properties, including variations in microbial communities and nitrogen cycling. This study aims to enhance our comprehension of the long-term impact of organic soil amendments on soil health and productivity. The Udaipur region can benefit from conducting research on the impact of organic treatment in order to build sustainable farming practises that foster soil conservation, environmental protection and local food security.

OBJECTIVE OF THE STUDY

The objective of this review article is to comprehensively evaluate and summarize the existing research on the impact of organic soil amendments on soil physical properties and their role in soil reclamation, with a focus on the Udaipur District.

REVIEW OF LITERATURE

INTERNATIONAL

The Influence of Organic Farming Practices on Paddy Field Soil Physical Properties and Crop Yields: A Systematic Review **(Peng et al., 2021):** In order to maximize soil physical attributes and crop productivity in paddy fields, this meta-analysis examines the efficacy of several organic soil treatments. To determine the best organic treatments for improving soil structure, porosity, water-holding capacity and crop yield in rice farming, the researchers evaluated data from 51 trials. The results show that soil structure, porosity and water-holding capacity are greatly enhanced after organic treatment in rice fields. Increased agricultural yields and decreased soil emissions of greenhouse gases are the results. Sustainable rice production with organic soil additions has the potential to increase crop yields and reduce environmental impacts in paddy fields.

Soil Physical Properties and Crop Productivity after Organic Treatment in High-Intensity Farming Systems: A Systematic Review and Meta-Analysis **(M. Xu et al., 2020)**The effects of organic treatment on soil physical parameters and crop productivity in high-yield agricultural systems are the subject of this meta-analysis. To learn how organic soil additives affect soil structure, porosity, water-holding capacity, nutrient retention and crop yields, the researchers compiled data from 61 trials. Soil structure, porosity and water-holding capacity are all greatly enhanced after organic treatment, as shown by the results. Increased yields are a direct result of these enhancements' good effect on crop productivity in high-intensity agricultural contexts. To add to its promise for sustainable and productive agriculture in intense systems, the application of organic soil additives reduces nutrient losses.

A Meta-Analysis of the Effects of Organic Farming on Soil Quality and Crop Production in the North China Plain **(Cui, L., et al., 2019):** The effect of organic treatment on North China Plain soil properties and agricultural production is the subject of this meta-analysis. After reviewing the results of 69 investigations, the scientists concluded that organic soil additions enhance the soil's physical qualities by making it more porous, stable and able to retain water. These alterations are particularly important for the North China Plain because they increase soil stability and lessen erosion. The improved growing conditions brought about by organic methods also contribute to higher harvest yields. The application of organic remedies is an encouraging step toward environmentally responsible farming and higher yields in this area.

A Meta-Analysis and Review of the Long-Term Effects of Organic Treatment on Soil Nutrient Fertility **(Chen et al., 2018)**: The long-term effects of organic treatment (OA) and OA Plus inorganic fertilizer (IF) on soil nutrient fertility are studied in this meta-analysis. Researchers analyzed 132 global trials with extensive follow-up periods and concluded that OA boosts crop output when used in conjunction with IF compared to IF application alone, under certain soil conditions. Soil Olsen P can be raised gradually with continuous manure treatment, however equal yields might be

attained with IF and straw instead. The success of organic treatment, which increases the resilience of agronomic systems, depends on the nature of the soil and the methods of management in place. In order to enhance fertilizer utilization efficiency and prevent any detrimental environmental effects, the type and application rate of OA must be carefully considered.
According to the article "GIS Based Study of Reclamation of Degraded Semi-Arid Soil: A Case Study from Rajasthan, India" by **Rathore et al. (2013**): This research looked at the potential for soil reclamation in semiarid regions of damaged Rajasthan, India, using GIS technology. Geographic information systems (GIS) are effective tools for analyzing and visualizing data about land use, soil quality and other environmental issues by combining different types of spatial data. Soil degradation, land use and accessibility to water were some of the factors used to identify and rank possible areas for soil reclamation. This study's results showed that GIS could be useful in semi-arid areas like Rajasthan for locating promising sites and formulating comprehensive plans for soil reclamation. Land managers and policymakers can improve efforts to restore damaged soils and boost agricultural output in these areas by using GIS to make educated decisions about soil reclamation schemes.

This article is a review of Organic Treatment's Function in Soil Revitalization **(Larney and Angers, 2012)**. This review of the literature examines the mechanisms through which organic soil amendments enhance physical, chemical and biological soil qualities and their role in soil reclamation. Soil organic matter improvement and biomass production during reclamation are the main topics of this review. The results show that organic treatment can hasten the beginning of soil reclamation and help maintain net primary output. Longer-lasting advantages from organic amendments can be expected from those with slower rates of degradation. By contributing to land reclamation efforts and also efficiently sequestering and lowering metal(loid) bioavailability in contaminated soils and sediments, organic soil additives, such as waste products from diverse industries, offer a win-win option.

Organic Treatment Improves Bioremediation of Heavily Polluted Heavy Metal(loid) Soils **(Park et al., 2011):** This literature review focuses on the role that organic treatment can play in facilitating the bioremediation of heavy metal(loid)-contaminated soils. This study demonstrates the efficacy of organic soil additives in lowering metal(loid) bioavailability and facilitating sequestration in contaminated groundwater, soil and sediment. Through adsorption, complexation, reduction and volatilization, among other mechanisms, the review demonstrates that organic soil additives can enhance the bioremediation process by decreasing metal(loid) bioavailability. Manure compost and municipal solid waste are two examples of the metal(loid)-free organic treatments that can be used to successfully reduce metal(loid) bioavailability and improve soil fertility and physical health. Heavy metal(loid) contaminated soils can be cleaned up and their effects on the environment mitigated by the use of an organic treatment method.

Tripathi et al. (2021). "Role of Organic Treatment in Soil Health Management: A Review" The value of organic treatments for maintaining healthy soil is emphasized in this review. The effects of organic amendments on soil structure, chemistry and biology are investigated. To improve soil water and nutrient retention, the article recommends using organic soil additives like vermicompost and farmyard manure. The organic treatments are emphasized for their positive effects on soil health and crop productivity. It's helpful for learning about the ways in which organic additions can improve soil health.

Jatav, et al. (2021). "A Review of the Effects of Organic Amendments on Soil Physical Properties": The effects of organic additions on the structure, texture and water-holding capacity of soil are the primary emphasis of this review study. Various organic treatments, such as crop residues, manure, compost and biochar, are discussed in terms of their impact on improving these soil characteristics. Sustainable farming techniques and better soil health can be attained with the use of organic treatments, as is emphasized in this review. It sheds light on how organic amendments improve soil physical qualities and overall production, which is of great use.

"Role of Organic treatment in Soil Health and Soil Quality: A Review" by **Lal and Kumar (2021):** The importance of organic treatments for improving soil health and quality is the topic of this paper. Physical, chemical and biological changes to soil are just some of the topics covered in this article. It highlights the need of organic treatments for improving nitrogen cycling in eroded soils and preserving soil quality. Organic treatments have been shown to improve soil fertility and sustainability, which is highlighted in this review. Incorporating organic methods into soil management has been shown to increase soil health and sustain soil production over the long run.

"Impact of Organic treatment on Soil Physical Properties: A Review" by **Jyoti et al. (2021**): This article reviews the literature on the impact of organic treatments on soil physical parameters and gives a complete analysis. It examines a wide range of characteristics, including the soil's structure, porosity and water-holding ability. The potential of organic treatments to improve soil physical characteristics and soil fertility and productivity in degraded soils is summarized in

this article. This article describes the beneficial effects of organic treatments on soil structure, including enhanced soil aggregation and less soil compaction. It also explains how organic additions improve soil water retention by increasing water infiltration and retention. Sustainable soil management approaches are highlighted, with an emphasis on the use of organic treatments.

"Impact of Organic and Inorganic treatment on Soil Physical Properties: A Review" by **Iqbal et al. (2021):** The physical features of soil are discussed in this review article, along with a comparison of the impacts of organic and inorganic treatments. Organic soil amendments are discussed, along with their ability to increase the soil's water-holding capacity and porosity. The review also notes that, compared to inorganic treatments, organic ones can have a more significant effect on soil fertility and sustainability. In order to improve soil structure, water retention and soil health as a whole, the article highlights the importance of incorporating organic treatments into soil management techniques. It's a great resource for learning about the positive effects organic additions can have on soil health and productivity.

Ghosh et al. (2020). Title: "Effect of Organic Treatment on Soil Physical Properties: A Review" The physical features of soil, such as its structure, texture and water-holding capacity, are affected in diverse ways by the various organic soil amendments. It explains how adding organic matter to soil can improve soil quality and crop yields. This article explains how increasing soil fertility and structure using organic treatments can boost plant growth and productivity. To what extent organic amendments improve soil physical attributes and agricultural output is revealed.
Economics of soil and water conservation in Rajasthan, India (**Singh et al., 2018**; Journal of Sustainable Development). This research set out to determine how much soil and water conservation in Rajasthan is actually worth. The results showed that soil and water conservation in Rajasthan could have monetary benefits.
Restoring Salt-Affected Soils in Rajasthan, India, **Sharma et al.,** Journal of Environmental Science and Technology, **2015**. This study investigated the efficacy of gypsum and organic amendments in reviving salt-affected soils in Rajasthan. Physical and chemical improvements in salt-affected soils in Rajasthan were observed when gypsum and organic amendments were introduced.
Impact of Soil and Water Conservation Efforts on Soil Quality and Productivity in Rajasthan, India. Reference: **Meena et al., "Journal of Soil and Water Conservation," 2014**. Several approaches to water and soil conservation in Rajasthan were evaluated for this study. These results gave credence to the theory that water and soil conservation efforts in Rajasthan would improve soil quality and crop productivity.
Opportunities and threats to soil reclamation in India are discussed by **Mishra et al. (2013),** with a focus on organic supplements and irrigation management. Soil physical qualities, such as bulk density, can benefit greatly from the addition of organic amendments, which can also boost soil fertility and structure.
Bioremediation and phytoremediation, which employ living organisms and plants to treat contaminated soils, are two of the restoration options summarized by **Gupta et al. (2012).** Sustainable land management and mitigation strategies, including land use planning, are also highlighted.
Singh et al. (2010) provide a comprehensive analysis of soil reclamation in India, discussing the successes and failures that have been encountered thus far. Bioremediation, phytoremediation and land use planning are only few of the methods discussed for rehabilitating damaged soils in India.

Naveed Iqbal Khan et al., (2010): In order to meet the necessary NPK (nitrogen, phosphorus and potassium) values, this research investigated the impact of applying farmyard manure (FYM) at two different rates (40 and 20 Mg ha-1). Researchers observed that FYM increased hydraulic conductivity by between 62.2% and 35.5%. These findings corroborate those of Shirani et al. (2002), who found that the addition of organic dung increased hydraulic conductivity. Soil amendment with pig manure compost (PMC) and fertilizer-yielding microorganisms (FYM), as proposed by **Dhamak et al. (2010),** has been shown to considerably and positively affect soil hydraulic conductivity. The research found that organic soil additives like FYM and compost were optimal for preparing seedbeds because they increased aggregation and porosity, which improved hydraulic conductivity and changed soil water dynamics.

Coir pith particle size and bulk density were investigated in a study by Vijayaraghavan, & Joshi, (2009). Researchers found that the bulk density of coir pith decreased with increasing particle size, indicating that particle size and bulk density are negatively related. This study elucidates the role that particle properties play in determining bulk density.
The addition of tank silt at varied rates enhanced the soil's available water content by as much as 0.032% gm-1, according to research by **Mohammed Osman (2008).** Soil moisture content and moisture depletion behavior were both enhanced when tank sediment was added to Alfisols (Anonymous, 1993), with the modified soil holding 60 percent more usable water than the original soil.

Tank silt has been shown to reduce soil bulk density (**Mohammed Osman, 2008**) from 1.5 to 1.25 g cm-3 when applied to land. Tank silt had a clay concentration of between 60% and 80%. In the TS+(F+CP) combination, **Jeyamangalam**

et al. (2012 b) found an inverse relationship between organic manure and bulk density and varied bulk density values were achieved by applying tank silt at varying rates.

CONCLUSION

Insights into the effect of organic treatment on soil physical qualities during soil reclamation are provided by the aforementioned studies. Organic supplements, such as green manure, farmyard manure (FYM), compost and other organic sources, have been shown in these studies to significantly enhance a number of key soil physical properties. Improvements in water infiltration and root growth have been linked to the organic treatment's effects on soil structure, stability and aggregation.

In conclusion, the incorporation of organic soil amendments represents an environmentally sound and promising long-term solution to address soil degradation challenges. By enhancing soil physical properties and overall fertility, organic treatments offer a pathway toward improved agricultural sustainability and economic well-being for local farmers while reducing their environmental footprint.

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