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Stabilization of Soil by Agricultural Waste

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***Abstract*: Large quantities of agricultural waste worldwide is facing serious problems like handling and disposal. Agricultural waste disposal creates a potential negative environmental impact that causes air pollution, water pollution ultimately affects local ecosystems. Therefore, safe disposal of agricultural waste becomes a challenging task. In many situations, expansive soil has swell when the water comes, and will shrink it can cause serious problem to the buildings because of swelling characteristics, we need to improve the characteristics of geotechnical properties. The purpose of this paper is therefore to investigate the use of certain agricultural waste such as corn cob ash, coconut shell to stabilize the expansive soil. The results of these tests can show improvement in UCC value and swell pressure with the increase in percentage of waste. Hence there is a value addition to these three agricultural wastes serving the benefits of safe disposal of wastes, using as a stabilizer and return of income on it.**

***Keywords*: Expansive soil, Corncob ash, Coconut shell ash, Rice husk.**

1. Introduction

In many parts of India, expansive soils shows a significant hazard to light building foundations. Swelling clays from residual soils may create pressure to elevate. As expansive soil get wet, the clay minerals absorb and expand water molecules on the other hand, as they dry, they shrink, leaving large vacuums in the soil in large quantity. Swelling clays can control the behavior of virtually any soil if the percentage by weight of clay exceeds 5 percent. The most deeply swelling properties are found in soils with smectite clay minerals, such as montmorillonite. In the field, the deep cracks on the ground surface can easily recognize expansive clay soils in the dry season. The zone of fluctuation of seasonal moisture content may extend from 3 to 40 feet deep. This creates swell behaviour in the upper portion of the soil column and cracks can extend to much greater depths than imagined by most engineers. In the upper part of the soil column, this creates swell behaviour and cracks can extend to far greater depths than most engineers imagine. The most obvious way to damage the foundations of expansive soils is by elevating as they swell with increasing moisture. Swelling soils lift and crack slightly loaded, continuous strip bases.

For any land-based structure, the foundation is very important and has to be strong to support the entire structure or foundation. In order for the foundation to be strong, the soil around it plays a very important role. So, to work with soils, we need to have proper knowledge about their properties and factors which affect their behaviors. This process of soil stabilization helps to achieve the required properties in a soil needed for the construction work. From the beginning of construction work, necessity of enhancing soil properties has come to the light. Ancient civilizations of the Chinese, Romans and Incas utilized various methods to improve the soil strength etc., some of these methods were so effective that their buildings and roads are still exist.

In India, the modern era of the soil stabilization began in early 1970's, with general shortage of the aggregates, it became necessary for the engineers to look at means to improve the soil other than replacing the poor soil at the building site. Soil stabilization was used but due to use of obsolete methods and also due to the absence of proper technique, soil stabilization lost favor. In the recent times, with the increase in the demand for infrastructure, raw materials and fuel, the soil stabilization has started to take a new shape. With availability of the better research, materials and equipment, it is emerging as a popular and cost-effective method for the soil improvement.

2. Literature review

- Improvement of clayey soil characteristics using rice husk ash, Mohammed Y. Fattah et.al., Journal of Civil Engineering and Urbanism, 2013.
- Analysis of swelling & shrinkage properties of expansive soil using brick dust as a stabilizer, Sachin N. Bhavsar, Ankit J. Patel, International Journal of Emerging Technology and Advanced Engineering, 2014.
- Laboratory study on soil stabilization using fly ash and rice husk ash, Anil Kumar Singhai et. al., International Journal of Research in Engineering and Technology, 2014.
- Black cotton soil stabilization using Bagasse ash and lime, Amruta P. Kulkarni, Mithun. K. Sawant, Vaishnavi V. Battul, Mahesh S. Shindepatil, Aavani P, International Journal of Civil Engineering and Technology, 2016.

3. Methodology

In this study following materials are taken in to consideration:

- *Expansive soil:* Expansive soils, also known as shrink soil, tend to shrink and swell with moisture content variation. Because of this variation in the soil, there is

considerable distress in soil, followed by damage to the surrounding structures. During the periods of higher humidity like monsoons, these soils absorb water and swell; subsequently they become soft and their capacity to hold the water decreases.

- *Corncob ash:* Corncob consists of the three natural parts: the chaff and pith that forms the light part and the woody ring that forms the cob's hard part. Ash is residue of the burnt parts of the plants such as bark, wood, sawdust, leaves, woody debris, pulp, husk, hulls, fronds and the other plant debris. Ash has been used for soil liming and for traditional pest controlled to some crawling pests. Corncob ash is obtained from the residue of combusted corncobs.
- *Coconut Shell Powder:* Coconut shell used to increase the strength of the soil. Coconut shell ash was produced by burning of coconut shell to ashes in an open metal drum. The ash formed were allowed to cool down before sieving. The ashes are therefore kept or stored in air-tight containers to prevent from moisture loss and from any other form of contamination.
- *Rice Husk Ash:* Rice is the primary source of food for the billions of the people around the world. Rice husk is the shell produced during husking of paddy. Rice husk is the amenable for value addition so that national economy may accrue. Most of the husk from the milling is either burnt or dumped as the waste in open fields and a small amount is used as fuel for the boilers, electricity generation, bulking agents for composting of the animal manure, etc.

4. Conclusion

This paper presented an overview on stabilization of soil by agricultural waste.

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