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RESEARCH NOTES

USE OF SOIL STABILIZATION FOR EROSION CONTROL

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Erosion is essentlly a smoothing or levelling process, with soil and rock particles being carried, rolled and washed down by the force of gravity. The main agents which loosen and break down the particles are water and wind.

The farmer is the first to be concerned with soil loss. The higher the erodibility of a farm soil, the greater is the potential loss of productivity.

Soil erosion is a serious environmental problem in many parts of the world, especially in tropical and semi-tropical areas. The present methods of erosion control are either expensive or not uniformly effective.

Erodibility and durability of cement stabilized loam soil was tested by Shen and Akky (1974). The results showed that resistance to weathering and erosion increased as cement content in the samples increased. The factors that affected the performance of cement-stabilized soil were mixing procedure, compaction control, construction scheduling and curing method.

To investigate the effectiveness of cement and lime as stabilizers to control erosion, a laboratary study was made at Purdue University (Machan and Squire, 1975).

It was concluded that soil ranging in texture from sand to heavy clay could be rendred effectively resistant to soil erosion by treatment with as little as 1.0 per cent Partland Cement or hydrated lime. Incorporation 1 per cent lime decreased the erosion loss from 78 tones/acre to 5 tons/acre. The partland cement treatments were effective after only 3 days of fog room curing at 21°C while hydrate lime seemed to require a week or more of curingfor the development of full effectiveness.

The cement and lime provide effective erosion resistance, but they are relatively expensive and there is a need to find a cheaper alternative for erosion control.

When properly integrated with the correct proportions of soil and aggregate, and compacted to the unit weight required in standard practice, sodium chloride helped the soil mass to harden and continue to compact under traffic.

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primarily because of its moisture-retention property over a long period of time. The degree of dust palliativeness imparted by sodium chloride is also a function of the soil type used in soil stabilization. It acts as an effective dust proofer when the soil practicles adhere to each other. To determine the erodibility of the natural and stablized soil treated with 0.5, 1.0, 1.5 and 2.0 per cent salt content, the rainfall simulator of drop former (hypodermic needle) type was used at Leeds University, U. K. (Chaudhry, 1982). The soil specimens were cylinderical (100 mm X 100 mm) and were cured at 30°C (54% relative humidity) for 28 days. The specimens, after weighting, were subjected to a rainstorm of 62 mm per hour intensity for two hours. The surfaces of the specimens were maintained at 2 percent slope to the horizontal which is the general value of the cross-slope in rural roads.

It is obvious from the results (Table 1) that the salt treated soil is less erodible than the untreated one. The addition of salt at higher salt contents (1.5 and 2.0 per cent) is not very effective in reducing erosion as compared to lower salt contents. It was found that no cementing occurred between the sodium chloride and soil. The decrease in erodibility of salt treated soil was due to an increse in dry density and the crystallization of sodium chloride caused by curing at the surfaces of the specimens.

CONCLUSION

The soils, depending upon their type, can be effectively & economically stabilized by different soil stabilizers resulting in considerable decraase in their erodibility.

Table 1. *The amount of erosion ($kg/m^2/hr$) at different salt contents.*

Natural soil	0.5%	1.0%	1.5%	2.0%
3.1	2.0	1.8	1.9	2.1

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USE OF SOIL-STABLIZERS FOR FARM STRUCTURES

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The alteration of soil properties to meet specific engineering requirements is known as soil stabil zation. The most common stabilizers in use are bituminous material, Portland Cement and lime. The type & degree of stabilization required in any given case is largely a function of the availability and cost of the required material as well as the use which is to be made of the stablized soil mix. Cement is one of the most common and successful stabilizers for soil (Sharma, 1964).

In this stdy, the compressive strengths of different sandy soil-cement mixes were determined. These soil-cement mixes can be used for low-cost rural roads, farm buildings and lining of water courses in the rural areas. Sandy soil was treated with cement. The dry density/moisture content relationships were developed for natural and cement-stablized soil mixes (Table 1). The cylinderical specimens (4 inches dia. and 4½ inches long) were prepared at different cement contents and were moulded at their respective optimum moisture contents (B.S. 1924 & Chaudhry, 1984). The compressive strengths of these specimens were determined after 7 and 14 days of curing (Table 2). It was concluded that compressive strength of soil increased as the cement content increased. The compressive strength of the syecimen treated with 4 per cent cement content was double that of the natural soil while the ratio of the compressive strengths was 3 with an 8 per cent cement content. The curing period was limited to 14 days in both the cases.

Table 1. *Optimum moisture content and maximum dry density relationships at different cement contents*

Cement Content (%)	Optimum moisture content (%)	Maximum Dry Density (Lbs/cubic foot)
0	12.0	124.2
2	12.4	126.0
4	12.0	126.5
6	11.8	127.0
8	12.0	127.5
10	14.5	128.0

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Table 2. *Compressive strengths of different soil-cement mixes at different curing periods*

Curing Period (days)	Compresaive Strength (kg/cm²)					
	Natural soil	2% Cement	4% Cement	6% Cement	8% Cement	10% Cement
7	2.03	3.02	4.01	5.03	6.02	7.01
4	2.05	3.03	4.03	5.03	6.03	7.03

These results encourage the use of sandy soil-cement mix for the construction of low-cost roads and lining of water courses in rural areas. It can also be used for the preparation of bricks for the construction of farm houses.

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