A New Aid to Establishment of Vegetation in Waterways

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During the 1959 meeting of the Highway Research Board, a paper entitled "Recent Developments in Soil Erosion Control Practices and Materials" was presented by W.W. Steiner (3). The author reported, among other things, that "the results with the jute mat used in direct contact with the seedbed have been nothing short of remarkable."

Since that report the "jute mat" has become a proven product which has found wide application in roadside development.

When this jute mesh is pressed into the surface of a newly seeded area, it provides excellent erosion control until vegetation can become established. It is a unique combination of weight and weave that provides maximum erosion control and at the same time provides favorable growing conditions (Fig. 1). The material is woven from jute yarns which are approximately ¼ in. in diameter. The openings between yarns are about ¾ in. square. One square yard of cloth weighs approximately 1.4 lb. Once in contact with the soil, the jute decomposes in about a year.

The jute mesh grew out of the need of the Soil Conservation Service to find a material to stabilize newly seeded farm waterways. The material required had to be heavy enough so that flowing water, wind, and growing grass could not dislodge it. Yet, the material needed to be open enough to allow grass to grow unimpeded. The first heavy jute mesh was applied to a farm waterway in July 1958. By the first of September there was an excellent stand of grass in spite of frequent thunder showers.

During 1959 the material was made available to highway departments to a limited extent. Two years' experience demonstrated that jute mesh is hydrologically and agronomically sound. Since then many hundreds of thousands of square yards have been used.

Jute mesh has become an accepted erosion control measure and, as such, has been applied to many real problems in the highway field such as median strips, roadside ditches, critical backslopes and fill slopes. Median strips, for example, are constructed in such a way that there is a concentration of flowing water in the center. Stabilization of this center has always been a costly and troublesome problem. Figure 2 shows how the median strip problem was handled on a new highway near Schenectady, N.Y. The jute mesh was applied to that portion of the median where flowing water made grass establishment difficult. The remainder of the area was mulched with hay. The median was subjected to 6 in. of rain on September 12 as

Figure 1. A heavy jute mesh. Openings in the mesh are large enough to allow grass growth.

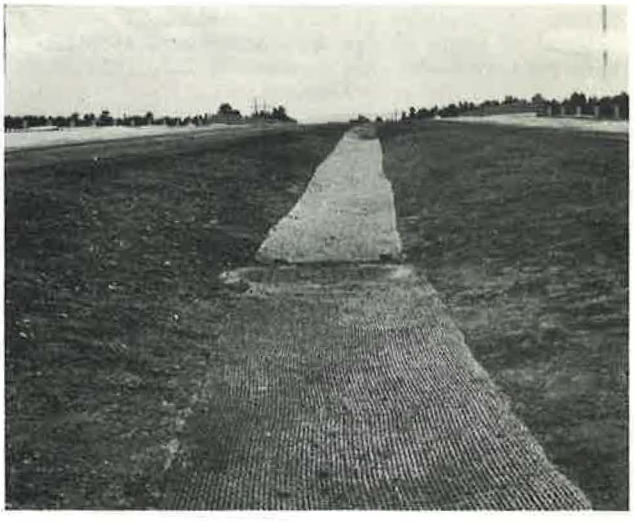

Figure 2. Jute mesh in a median strip of approximately 4 percent slope on a new highway near Schenectady, N.Y. (August 11, 1960).

Figure 3. Same area as Figure 2 nine days after a 6-in. rainfall from Hurricane Donna (September 26, 1960).

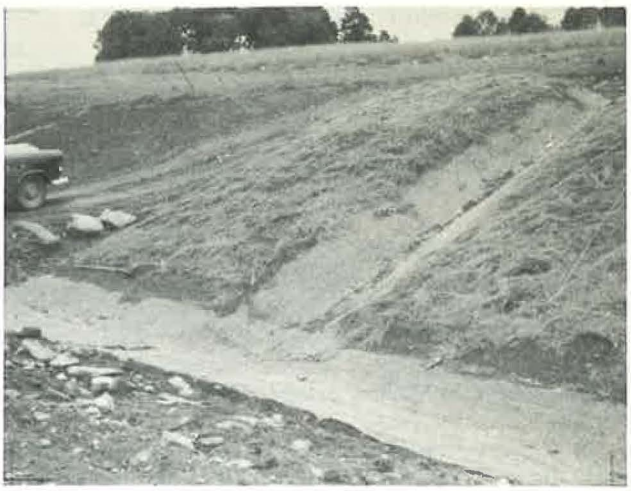

Figure 4. Roadside ditch (5 percent grade) and a down chute (3:1 slope) at Dover-Foxcroft, Maine, which have been stabilized with jute mesh (August, 1959).

Figure 5. Because of very erodible soil the 2:1 slopes of these bridge approaches were stabilized with jute mesh—US 66, Braidwood, Ill. (August 9, 1960).

Figure 6. High velocity waterway on a 20 percent slope carries water from bridge and roadway—US 41, Dayton, Ohio (April 28, 1960).

a result of Hurricane Donna. Figure 3 shows the appearance of the same area on September 26. Erosion was prevented and an even stand of vegetation developed. The seeding mixture was red fescue, birdsfoot, trefoil, red clover and cereal rye.

Roadside ditches are another area where jute mesh has been used. A number of states are using the jute mesh in place of solid sodding. Figure 4 shows how the Maine State Roads Commission substituted jute for sod. The interceptor ditch, down chute and shoulder ditch were all stabilized with jute mesh. Once the water was controlled in this manner, it was an easy task to hold the remainder of the area with hay mulch. The contractor proposed jute mesh installed at $0.60 per square yard, as compared to sod at $1.25 per square yard. The material was stored on the site and as a ditch was prepared the jute was applied.

Critical backslopes and fill slopes occasionally require extensive erosion control measures. The interchange of US 66 and Reed Road, Braidwood, Ill., illustrates this point. The ramps and bridge approaches were built of very erodible sand. Because of this soil condition, it was felt that stabilization of the 2:1 slopes would be difficult; therefore, jute mesh was used. Figure 5 shows a portion of the completed job. The installation required 24,000 sq yd of jute mesh. The average cost of installation, which included seed, material, and labor was $0.31 per square yard.

Many maintenance problems can be solved with jute mesh. Figure 6 shows a high velocity waterway in Ohio which had washed out. The waterway was reshaped, seeded and stabilized with jute. No mulch was necessary as the heavy jute yarns provide an effective mulch. Once the mesh was fastened in place, it protected the seed and soil against flowing water until the grass became established.

Experience has indicated that the labor requirement for a jute installation is approximately 1 man-hour per 100 sq yd. Contractor bids have ranged from $0.30 to $0.60 per square yard depending on local labor costs and type of installation.

In determining the application of jute mesh in specific instances some facts on velocity of water and slope ratios may be helpful. Factors such as soil type and water velocity are more important than degree of slope in determining the requirements of the site in question. One state which uses hydraulic standards for ditch design has tentatively placed a permissible velocity for jute mesh at 6 ft per second. Another state is specifying it in ditches and median strips from 1½ percent to 5 percent slope.

Jute mesh has been used successfully in waterways in excess of 20 percent slope and on banks as steep as 1:1.

In addition to the Corps of Engineers, the following states have written either a supplemental specification or a special provision covering installation of heavy jute mesh: Illinois, Iowa, Kentucky, Maine, Maryland, Missouri, Nebraska, New Jersey, New York, Ohio and Washington. Fifteen other states have at least one successful installation.

REFERENCES

1. Broach, R. V. D., Slater, C. S., Augustine, M. T., and Evaul, E. E., "Jute for Waterways." Journal of Soil and Water Conservation, 14: 117-119 (May 1959).
2. Fox, L., "Jute Matting Saves Slopes." Highway, pp. 15-17 (Jan. 1960).
3. Steiner, W. W., "Recent Developments in Soil Erosion Control Practices and Materials." HRB, Roadside Development 1959, pp. 19-24 (1959).

Discussion

Iurka:—W. O. Ree, Hydraulic Engineer of the Agricultural Research Service, U. S. D. A. at Stillwater, Oklahoma, has tested jute liner performance in a drainageway and in Research Report No. 331, "Report of Preliminary Tests of a Fine Mesh Jute Channel Liner," reports on the performance of this material at various velocities of flow. This report is of real value to highway designers.