Research Project

93-1GT

Capsule

Technology Transfer Program

LTRC

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Production and Evaluation of Sugar Cane Fiber Geotextiles

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LTRC

Louisiana Transportation Research Center

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Impact

The mats produced in the sugar cane project can significantly reduce erosion, thereby converting an agricultural waste into a useful product.

Objectives

- To develop a process for production of sugar cane fiber mats based upon appropriate fiber length and lignin removal.
- To compare the performance properties of these mats with other natural fiber geotextiles.

Description

LTRC is funding a study to investigate using fibers from sugar cane rind (using a process developed at LSU) as a biodegradable geotextile for erosion control. Principal investigators are Drs. John and Billie Collier, professors at LSU. They are a husband and wife team ideally suited to this research because of their experience in chemical engineering and textile industries, respectively.

Research is being conducted to develop a process for the production of sugar cane fiber mats and to compare the performance properties of these mats with other natural fiber geotextiles used to control erosion.

The use of natural fiber geotextiles is one of the few control measures to actually prevent or reduce erosion. Natural fiber geotextiles temporarily protect the soil surface until natural vegetation is established. These fibers must protect the seed, soil, and fertilizer from the impact of rain, provide a mulch, and allow the moisture needed to promote seed germination while draining off excess water.

Geotextiles produced from local materials would provide an economical product for the transportation industry in addition to an economic boost for the sugar cane industry.

In most current sugar cane processing, the cane stalks are crushed to extract the sugar, and the crushed stalks (or bagasse) are used for fuel or mulch or they are discarded. Unlike this traditional process, an extraction method is being developed to remove the fibers from the rind of the cane stalk without crushing.

Sugar cane fibers are being obtained through the patented Tilby separation process, which splits the cane longitudinally, routs out the inner pith, and leaves lengths of the outer rind. A process of controlled removal of lignin and hemicellulose ultimately results in a non-woven fiber mat. The mats can be used for soil erosion control.

Implementation Potential

This research may result in a geotextile produced from local materials, which would provide an economical product for the transportation industry in addition to an economic boost for the sugar cane industry. A side benefit is the conversion of an agricultural waste by-product to a useful product.

Results

A variety of laboratory tests were conducted to describe product properties. Appropriate geotextile requirements of physical compatibility, ease of installation, slope protection and stabilization, germination promotion, and cost-effectiveness were investigated. Specifically, weight, density, strength, water resistance, light penetration, permittivity, flammability, and properties of coconut, straw, and Excelsior wood fiber were determined by standard test methods.

Wood mats were denser than the other geotextiles. Sugar cane mats had a higher biodegradability rate and were intermediate in thickness with lower strength, light transmission, and water penetration and better flame resistance in comparison to the other products. In flammability tests, the sugar cane fiber mats burned more slowly than the commercial products, and 70 percent of the cane specimens self-extinguished prior to burning the entire specimen length (Figure 1).

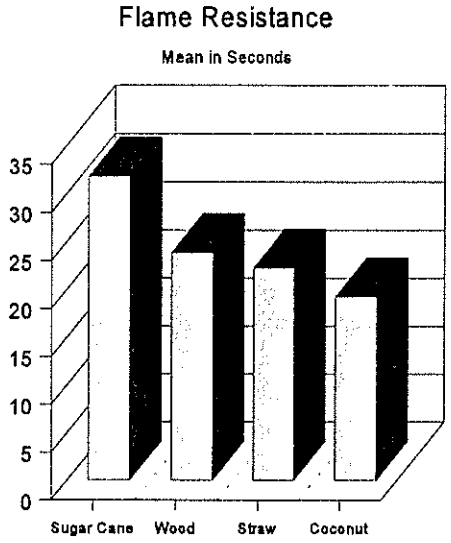

Figure 1- *Time for flame to travel up specimen a distance of 12.7 cm*

Preliminary field test results indicate that the sugar cane mats allow grass from planted seed to penetrate and that they maintain integrity during heavy rains. Although the sugar cane mats were visually similar to the other products, properties of weight, thickness, and light penetration can be altered by the amount of fiber used per square foot of mat.

Estimated processing costs for producing sugar cane erosion control mats are 10 cents per pound or 7 cents per square yard. The LA DOTD currently pays up to $1.50 per square yard, installed, for erosion control mats (Figure 2).

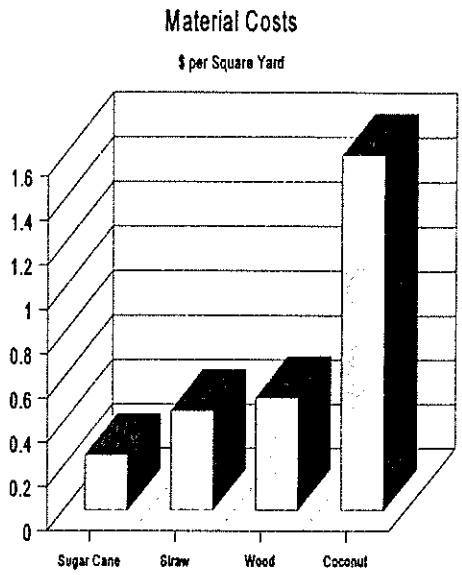

Figure 2

Economic Analysis

Areas of investigation include competitor analysis, market survey, and forecasted growth of supply and demand to identify organic erosion control geotextile market.

Field Evaluation

A field study is being conducted May through September 1995. The site currently has shallow erosion problems and is located ont Interstate 12 at Millerville Rd., Baton Rouge, LA. A total of approximately 400 square yards of sugar cane fiber, Excelsior wood, straw, and coconut geotextile will be tested. Evaluations will include: number of days until grass emergence, percent grass coverage, measured grass growth, density of grass coverage, evaluation of erosion, grass root growth, and biodegradability of products and nets.