

## **Coconut Coir Fibre as an Eco-Friendly Renewable Resource for Soil and Water Conservation**

*Gordon Francis De Silva*

138/4 Minuwangoda Road, Ekala, Ja-Ela, Sri Lanka

Tel: 94 1 232475/6 Fax: 94 1 232477

E-mail: hayexpo@slt.lk

Modern living compels man to avoid the indiscriminate use of plastics and such ecologically damaging materials. Industries that manufacture these products generate countless tonnes of chemical wastes that pollute the air, land and water. Large-scale abuse of fertile forestland has led to heavy loss of precious topsoil. The undigested plastics prevent recharge of ground water and chokes drainage. The consequent environmental degradation is threatening every existing form of life on the planet.

Erosion control is the process of restraining the initial movement of soil particles by wind and water. The selection and installation of an effective erosion control material will reduce the impact of raindrops so that fewer soil particles become dislodged during rainfall.

Historically, concrete and steel was used as erosion control material. Use of concrete and steel in the form of concrete structures and steel piling etc. is called hard engineering. However there is an increase in awareness the world over on the urgency to maintain the much needed ecological balance. It is imperative that any development effort should go hand in hand with ecological equilibrium so as to sustain it and a return to natural living has been accepted as a safe way to solve many environmental problems. This method is called soft engineering.

The ultimate objective of natural erosion control measures is to establish a dense network of root system and vegetative cover to the desired degree of growth in the shortest possible time. Slowing the flow of water down the slope accomplishes two things. The transport capacity of the thin sheet flow is reduced, thereby minimising the displacement of dislodged soil particles, and more rainfall infiltrates to the soil, providing desirable moisture to newly planted seedlings.

The material used in soft engineering are woven and non-woven geotextiles, geogrids, geomembranes and geocomposites. The majority of geosynthetics, covering a wide range of woven and non-woven geotextiles, geogrids, geomembranes and geocomposites used in civil engineering applications are polymeric. These products generally have a long life and do not undergo biological degradation, but are liable to create environmental problems in the long run. Throughout the world growing awareness of the sustainable development to preserve the environment has led to the rehabilitation of areas damaged either by natural or industrial causes. In effecting this, the use of biodegradable natural materials are gaining popularity.

In recent years coconut coir fibre due to its characteristics of degradability, moisture retention, tensile strength and adaptability has been found to be eminently suitable internationally for manufacturing products used in soft engineering for soil and water erosion control, stream bank stabilisation, wet land regeneration, river bank stabilisation, wasteland restoration, hill side slopes, road embankments, re-vegetation applications etc.

Coir fibre is obtained from the Outer layer of the fruit of the Coconut tree (*Cocos Nucifera* L). This outer layer "mesocarp" is called the coconut husk. Chemically coir fibre is composed of a highly lignified form of cellulose (cellulose lignin complex), which accounts for its colour, harshness and relative brittleness in comparison with pure cellulose fibre. The bulk of the ground tissue of the husk, on the other hand, is made up of pectin and hemicelluloses (Nathaniel, 1960). i.e. pectin and hemi cellulose act as a spongy binding material that that bind the large fibre cells together to make up the husk. Coconut coir is in great demand on account of its natural resilience, durability, water absorption upto 5 times its weight and other properties.

Coir fibres can be converted to fabric both by woven and non woven (air laid, needle punched, adhesive bonded) processes. From these a variety of composites (like rolled erosion control products,

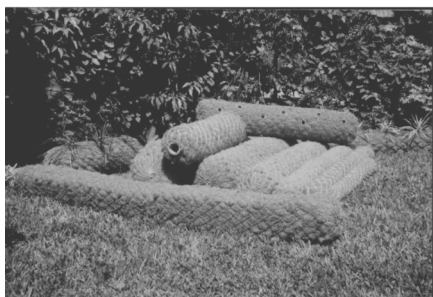
vertical drains, vegetation fascines) can be manufactured to suit particular applications. Coir Geotextiles is a generic member of the geosynthetic family also one such product. Like other polymeric counterparts Coir Geotextiles are developed for specific application in civil engineering like soil and water erosion control.

The woven or non-woven coir Geotextiles gives the grass plenty of room to grow and at the same time provides larger number of “check dams” per square metre of the soil media. Coir geotextiles give maximum protection to the soil until the grass takes root and provides permanent coverage. After the soil is stabilised the netting decomposes to form a mulch and provide nourishment to grass growing on the soil media.

Its low cost makes it attractive for geotechnical applications. Though compared to synthetics it degrades faster, coir has begun to be accepted as material suitable for specific applications in civil engineering. Installations in various parts of the world have proved coir Geotextiles as excellent for riverbank protection and embankment stabilisation.

The effectiveness of vegetation for soil erosion control has been well proven for agriculture, landscaping, forestation and civil engineering applications. It is often more economical and aesthetically pleasing compared to hard armour applications.

#### **Vegetation fascines / coir logs**



Coir logs - lake bank stabilisation in Switzerland



Coir logs installed in Korea

