

Weed control and slope protection

R.A. FOUAN, FIBRIMPEX, France

ABSTRACT: Hitherto contemporary methods of slope protection or erosion control in general have centered around laying a blanket or similar covering and fastening it to the surface with pegs or nails. Natural fibres and products in use include straw, sisal and coconut or coir fibre. Of these, the most successful has been the use of coir fibre in the manufacture of these blankets. These geo-textiles or geo-blankets as they are sometimes called are stitched together often with either natural cotton thread or synthetic materials such as nylon or plastic thread.

1 INTRODUCTION

At present, Synthetic material such as plastic, polypropylene, etc . . . are the most commonly used in weed control.

This entails the use of cutting and fixing with pegs or nails, which is both time consuming, labour intensive and also costly.

Furthermore, these products are not permeable to water and hence rain or irrigation water does not percolate into the soil, valuable moisture is lost to the plants.

These blankets or sheets come in rolls and it is impossible to make them adhere closely to the contours of the land.

Also these cannot be impregnated with seed for purposes of erosion control and slope protection to ensure stability of the slopes.

Another important factor is the environment side, where synthetic material leads to pollution and contamination of the soil, contrary to material of vegetable origin which is biodegradable and adds nutrients to the soils.

2 USE OF COIR FIBRE

Coir fibre is an excellent choice for use in the weed control and slope stabilization leading to good erosion control.

- It is a natural product
- It biodegrades but very slowly thus giving a long useful life time.
- Comes in a form that can be transported and handled conveniently and quickly.

Availability : The current growing areas in Asia, Africa and South America provide plenty of raw material which is the husk of the coconut.

More over, each well managed tree can produce 60 to 100 nuts/year harvested bi-monthly.

Usually, a hectare of coconut plantation contains 120 to 150 trees.

Coir fibre is a most versatile material.

The fibres are extremely strong perhaps one of the strongest among natural fibres.

Its high cellulose content and thickness makes it resistant to degradation and as such can survive on a soil surface upto 4 years.

Furthermore, it comes in various grades such as Bristol fibre, Omat and Mattress fibre, thus giving the geo-textile producer a wide range of material to work with.

These fibres in various mixes are used interwoven with each other to form a layer which is held together by stitching.

Sometimes a bonding agent or some adhesive material is sprayed on in the absence of stitching.

Most often rubber latex is sprayed on with subsequent vulcanization to hold the fibre together and form a mat. Alternately, the fibres are spun together to form yarns of various thickness and strengths.

Often, combination of the different fibre grades are used to make different types of yarn.

The yarn is woven together in a loom to produce a woven mat or blanket which is basically a mesh type of textile.

These are extremely strong and are used in steep slopes for erosion control with suitable pegging to attach it to the surface.

It is the purpose of this work to introduce another material, 100% organic, biodegradable, which also derived from the coconut husk. The entire husk is utilized in the production of this material, for convenience and as a fairly accurate description of this material, the name "Husk Mix" will be used to denote this product.

3 "HUSK MIX"

This consists of particles of a certain uniform patterns with the allowed maximum and minimised size controlled. The two main physical items are:

- a) The fibre fraction
- b) The solid or "chip" fraction

The third fraction or "dust" particles which is very fine are totally eliminated.

The selected whole husk of the coconut are processed through a series of cutting, grinding and finally sieving operations.

The final product is then compressed into blocks or bales for purpose of easy handling and cost effective transportation.

It is re-expanded into the original state prior to the final stages of field application.

The main advantage of forming a mat of these material is that when "sprayed on" its fibres and the solid particles mesh with each other to form a uniform and esthetic cover which cuts off light penetration, thus preventing both dicot and mono cot weeds from sprouting through.

It has been estimated that this ability to limit light penetration will be retained for a least 3 years.

To keep the surface without weeds, it needs to use weed-killer every 6 to 8 months depending on the climate. The blanket will remain firmly attached to the surface throughout this period.

The degree of light penetration can be varied by controlling the thickness of the blanket from almost 95% cut off to 50% light penetration can be easily obtained in case of sowing grass or plants.

If the usage is only for erosion control, it can be further enhanced by incorporation of seeds during the application which will germinate and give further strengthening to the geo-blanket.

Application on orchards, vineyards, etc . . . where mature trees are already in place.

The apparatus used in spraying or laying this "husk mix" can be easily maneuvered inside orchards or other plantations containing perennial trees.

The applying arm is as long as 100-200 metres, thus making very steep or inaccessible places or areas around the foot of trees quite accessible.

Another very desirable property of "husk mix" is that during periods very high temperature such as in summer, the surface roots are protected and kept cool and humid, thus preventing withering and similar setbacks to the trees, whether irrigated or rain fed the water easily percolates through this blanket and reduce the soil surface.

Conversely evaporation from the soil surface is minimized, due to the cooler temperatures just under the blanket.

4 CHARACTERISTIC OF THE PROPOSED MULCH MAT

The thickness of the spray mat will vary according to the terrain, mainly the slope and also the general texture of the surface.

The thickness of the layer to be sprayed on will be decided taking into consideration both above factors. Even on steep slopes, if the general adhesive characteristics of the surface are good a thinner layer would suffice, whereas even on a slight slope, if the surface is not very absorptive a slightly heavier layer would be necessary.

This process can be used to prevent river bed erosion by spraying a thicker layer with more compound.

It can reach the bottom of rocks and other solid bodies that are prone to erosion and give protection.

It has been estimated that the thickness of the layer generally measured in gm/m² can vary from 0,5 Kg to 1,0 Kg/m². However in all cases the effectiveness or the duration or "life span" of the mat is estimated to be around three years. Normally the colour of the mat is brown which is the natural colour of the fibre, but if necessary it is possible to have it green or any other desired colour.

These results were obtained in a test carried out by the CNEP/France in October 2001. Other tests have been carried out in the INRA (National Institute of Agronomic Research) where the types of weeds that can be controlled and the duration of its effectiveness have been evaluated.

Results of those tests have estimated the growth of weeds was four times less than a non treated soil.

5 METHOD OF APPLICATION

The process consists to expand the bales compressed (ratio 4:1) with a deballing system, first of all, bales are put on a roller (with variable speeds which determine the volume of fibre for the projection), after that, the expanded material arrives to a regulation system for size and quantity of fibres who push the dry "husk mix" in a tube and just before and during the material touch the ground a compound bonding agent (latex) is spraying at the same time then the product becomes a mat who take the exact shape of the surface.

This basically consists of 3 steps or operations.

The compact material is re-expanded to its original composition in the dry state.

This is done by an arrangement which ensures uniform break up without any structural change of the material.

Next, this dry material is pushed into a tube under high pressure at the point where the material is just about to leave the tube, the bonding agent consisting of a basic latex-mix is "sprayed on". When this semi-wet mixture hits the ground, it sticks to the surface and immediately starts 'setting' or solidifying to form a uniform mat. The setting or solidifying time is an half to one hour after leaving this machine outlet.

For special areas, such as ski slopes and waterways, which are subjected to repeated erosion, a special mix with much higher mechanical stability and resistance can be used, which will be more resistant to running water and extremely slow biodegrading.

6 THE SPRAYING MACHINE AND ITS BASIC WORKING PRINCIPLE

The machine itself is installed or mounted on a "Tow truck" with a four wheel drive. This gives it easy accessibility even on steep, uneven and rough terrain, which is not possible with normal truck or tractor.

The machine basically consists of a conveyor for the transport of the compact fibre bales which are decompressed and mixed into a homogeneous blend.

The pump provides sufficient power to mix the solid particles with the compound and a spray capacity of one to four m² per minute which depends on the surface to be covered.

Capacity of the two tanks of compound are 500 liters each which give an application time around 5 hours.

Finally the mixture is taken in an outlet pipe or "Boom" extending up to a length of 200 meters. This is achieved by a powerful turbine worked off a diesel engine.

7 CONCLUSION

This new system suggested, apart from being completely biodegradable and environment friendly, opens many varied avenues of application which were not available with techniques and systems used so far.

This allows treatment of all kinds of terrain and can reach most areas usually inaccessible to other systems.

This is a blanket, organic, biodegradable which takes the form of the contour it is applied on.

Minimum use of staff, much faster and reliable than all present systems and above all protects the environment.