Advisory Circular No. 2013/06

Soil Conservation

Rubber Research Institute
of Sri Lanka

SOIL CONSERVATION

Soil erosion in rubber plantations can be greater, which are situated on undulating to steep terrain with high intensity of rainfall, especially during the early years after planting. But at the same time soil erosion can be minimized to a great extent by proper soil conservation and must be ensured in order to preserve the productivity and fertility of the soils of rubber growing areas.

METHODS OF SOIL CONSERVATION

Whatever the method that may be employed, the following 4 aspects are involved in minimizing soil erosion.

- Improve the structure of soil, to make it resistant to detachment and transportation and more absorptive for surface water.
- Protect the surface from rainfall impact.
- Slowing down run off.
- Providing safe-ways for the disposal of excess run off.

1. Agricultural methods

(i) Land preparation:

Land preparation should be completed before the monsoon.

(ii) Contour planting:

Planting should be done on the contour on steep or undulating land.

(iii) Embankment and fences:

Weeds on embankment and on areas close to the fences should not be completely removed. It should be kept under control by slashing or chemical weeding, because clean weeding not only exposes the soil surface, but also leaves behind a layer of loose soil that can be easily washed away by run-off water.

2. Biological methods

(i) Ground covers:

It is essential to establish a suitable ground cover (*Mucuna, Pueraria* and *Desmodium*) after clearing the land. In the wet zone regular showers are experienced in March, which permit the establishment of ground covers. These help to conserve the soil in several ways.

- Direct protection of the soil surface by the leaves and stems from wash by rain or blowing by wind.
- Binding the soil together by the root system of the cover crop.
- Formation of miniature bunds, which help to prevent surface wash.
- Breaks up the movement of water over the soil.
- The soil is opened and kept porous by the roots.

(ii) Vetiver grass:

This is one of the well known plants that can be used to help prevent erosion and increase moisture conservation. This system must form a continuous hedge along the contour to be effective, and take 2-3 growing seasons to establish as a dense hedge. Vetiver grass helps to conserve the soil by

- binding the soil along the contour by its deep, strong, dense root system.
- slowing down the runoff water, filtering out the soil it is carrying and spreading it out down the slope.
- forming natural terraces.
- forming a good mulch by death and decay of leaves.

In addition, this conservation system,

- is extremely cheap and fits well into smallholder planting systems.
- does not require maintenance for many years.
- hardly disturbs the soil during establishment.

(iii) Mulching:

Mulching had been found to be very effective in not only avoiding evapotranspiration losses but also in providing more nutrients and preventing run off and soil erosion losses. Lopping of tree legume such as *Crotolaria, Flemingia* and *Gliricidia* or paddy straw can be used as mulching materials. 6

Soil losses likely to occur due to erosion from bare lands which are in the region of 60-65/tons/ha/yr could be eliminated by mulching. Any cover treatment other than mulching normally takes 6 - 12 months before providing sufficient protection to the soil. Therefore it may be a good practice to mulch the soil at least around the base of the rubber tree, immediately after planting and at least until the legume covers are fully established.

3. Mechanical methods

(i) Drains

Main drains :

Normally natural drain lines already indicated in the land should be used except in cases where the distance between two natural drains becomes excessive for example more than 60 m. On sloping land, the correct siting of these main drains is more important than the distance between them. The natural main drains can be improved by the construction of reverse slope pits, "spill platforms" and "splash cushions", with stone slabs. These will tend to reduce bank erosion while checking the rate of flow of water down the drain lines (Fig.1).

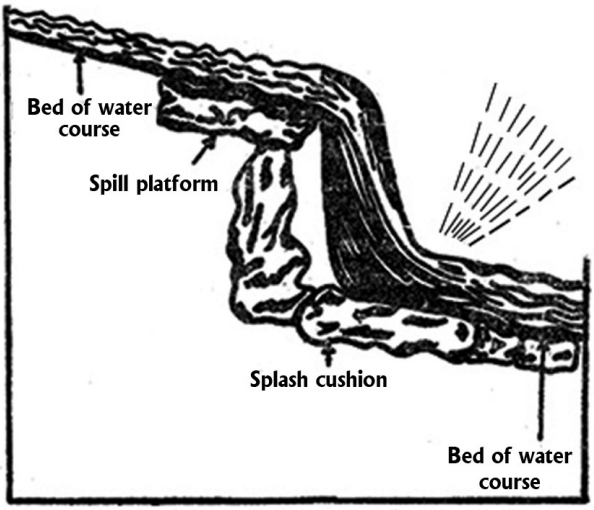

Fig. 1.

Lateral drains:

All lateral drains should be on the contour with a slope of approximately 1 in 120. Construction of these drains should be completed before the heavy rains, especially if a ground cover has not been established satisfactorily.

This type of drains generally consist of a series of silt pits, 3 m long 60 cm wide and 45 cm deep, spaced at intervals of 90 cm and connected by shallow drains on a depressed bund of the same width. What is aimed at in these drains is that excess water is carried away from each deep section to the other deep section through the shallow section which prevents the carrying away of silt which gets deposited in the deeper drain (Fig. 2).

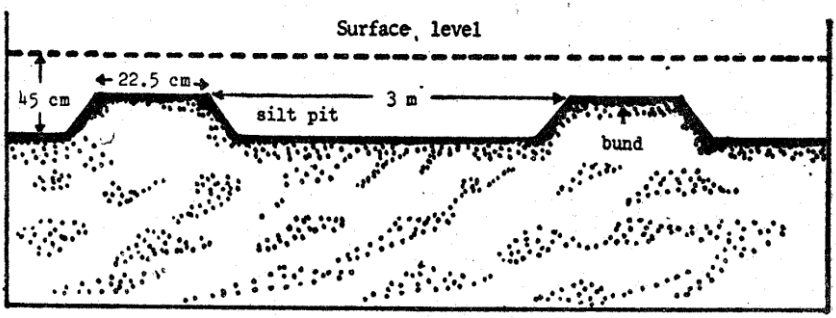

Fig. 2.

The tracing of the lateral drains can be done independently of the planting rows, commencing from the middle of the two planting rows, which are approximately level contours, the spacing of lateral drains can bring the drain lines within 1.5-1.8 m (5-6 ft.) of the planting rows.

The following spacing for lateral drains would be suitable for the satisfactory control of run-off water;

1. Spaced 21.5 m (72') for gradients of 1 in 20 and under including flat land
2. Spaced 14.5 m (48') for gradient between 1 in 20 and 1 in 4
3. Spaced 7 m (24') for gradients over 1 in 4.

The earth cut from the drain should be heaped up on the upper side of the drain, in a continuous ridge. The cutting of drains should be started at the top of the slope. Soil deposited in the lateral drains should be cleared regularly. The soil can be deposited uniformly in areas above the drain.

(ii) Stone terraces:

On very rocky land, where it is impossible to cut continuous lateral drains, the soil conservation needs are partially satisfied by the construction of level contour stone terraces. These terraces can check the rate and distance of movement of surface run-off water. The eroded soil will be deposited on the upper sides of the terraces and water will filter through the terraces. As in the case of lateral drains the distances between terraces should be adjusted according to the slope of the land.

In the construction of stone terraces, the following particulars need special attention.

- The upper side of the terrace should be on a perfect contour.
- For greater stability, the base of the terrace should be wider than the top.
- The lower side of the terrace should have a slope towards the hill side
- The base of the terrace should be built with large even stones. The stones should be laid with a reverse slope to that of the land. To achieve this beds should be cut into the hill side . Stone terraces can be built with 90 cm base converging to 30 cm at top level and 45 cm above ground level on the upper side.
- Terraces can be built with 90 cm base converging to 30 cm at top level and 45 cm above ground level on the upper side (Fig. 3).

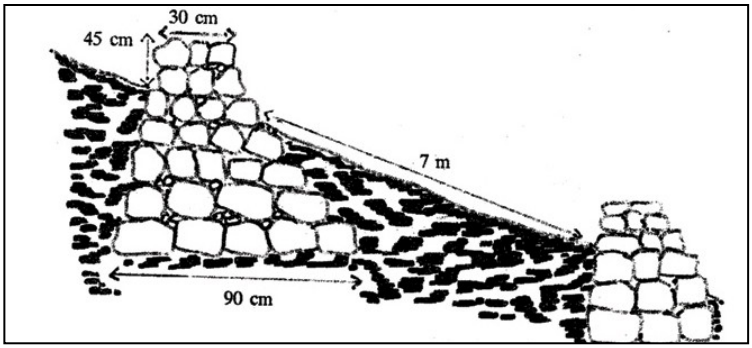

Fig. 3.

SUMMARY

- Land preparation should be completed before the monsoon.
- Planting should be done on the contour on steep or undulating land.
- Weeds on embankment and on areas close to the fences should not be completely removed. It should be kept under control by slashing or chemical weeding.
- Establish leguminous covers at planting.
- Vetiver grass must form a continuous hedge along the contour to be effective.
- Soil losses likely to occur due to erosion from bare lands which are in the regions of 60-65 tons/ha/yr could be eliminated by mulching.
- It may be a good practice to mulch the soil at least around the base of the rubber tree, immediately after planting and at least until the legume covers are fully established.
- Construction of drains and terraces should be completed before the monsoon.

- Natural drain lines already on the land should be used as main drains. Distance between two main drains should be 60 m.

- All lateral drains should be on the contour, with a slope of 1 in 120.

- Lateral drains should be 1.5-1.8 m (5-6 ft.) away from planting row.

- Spacings for lateral drains should be as follows:

    - 21.5 m (72 ft.) for gradients of 1 in 20 and flat land

    - 14.5 m (48 ft.) for gradients between 1 in 20 and 1 in 4

    - 7 m (24 ft.) for gradients over 1 in 4

- Upper side of the stone terraces should be on a perfect contour.

- For greater stability, the base of the terrace should be wider than the top.

Rubber Research Institute of Sri Lanka
Dartonfield
Agalawatta.

February 2014