



Coconut Research Institute of Sri Lanka



Advisory Circular No A 11

SOIL CONSERVATION IN COCONUT LANDS

Soil conservation is an extremely important agricultural practice in coconut lands, and the growers should pay close attention to it in order to maintain productivity and profitability from coconut lands. The main objective of this practice is to prevent loss of soil by surface run-off during rainy periods.

Coconut lands are mostly flat or have a very gentle slope and therefore it is generally believed that these lands do not suffer from soil erosion. However, heavy rains remove large amounts of fertile topsoils in a relatively short time even in a land having gentle slope.

Therefore, soil conservation practices have to be essentially adopted in sloping lands. Soil conservation measures also have additional benefit of conserving soil moisture.

Agricultural practices for soil conservation in coconut lands



Picture 1: A cover crop grown as a ground cover

1. Ground cover by coconut and other crops/grasses

Soil erosion is generally high on bare soil surface. Coconut canopy with correct density and proper inter cultivation cut down the speed of raindrops fallen on the ground. Further, the roots of those crops enhance water percolation to the deep layers of soil. Grasses, other cover crops and controlled weeds also reduce surface runoff (Picture 1).

In this regard the following practices are important.

- Mulching the manure circle
- Maintenance of a soil surface over with dried mulch or crop residues
- Avoid burning of plant materials suitable for mulching
- Control over grazing by cattle and other animals. Cover crops such as *Puero* and *Calapo* also reduce surface run-off by providing a mulch and increasing water infiltration.

2. Contour drains

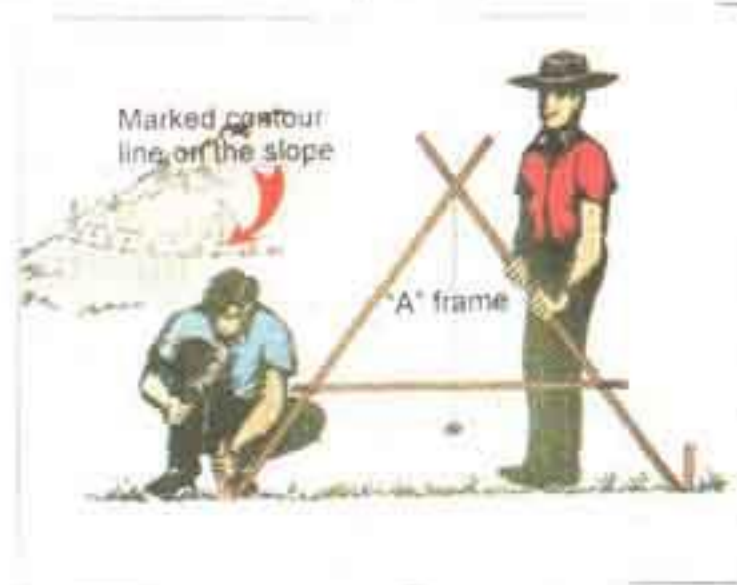
Contour drains are useful for reducing soil erosion and increasing moisture conservation in lands where the gradient is more than 1 in 10 (10%) (Picture 2). There is evidence that in a gentle slope of 10%, a good cover crop or a mulch could almost arrest erosion. Thus it would be seen that contour drains, which are costly, should be attempted only when required and not as a matter of routine. Contour drains should be laid carefully on the contour as otherwise the full benefit is lost.



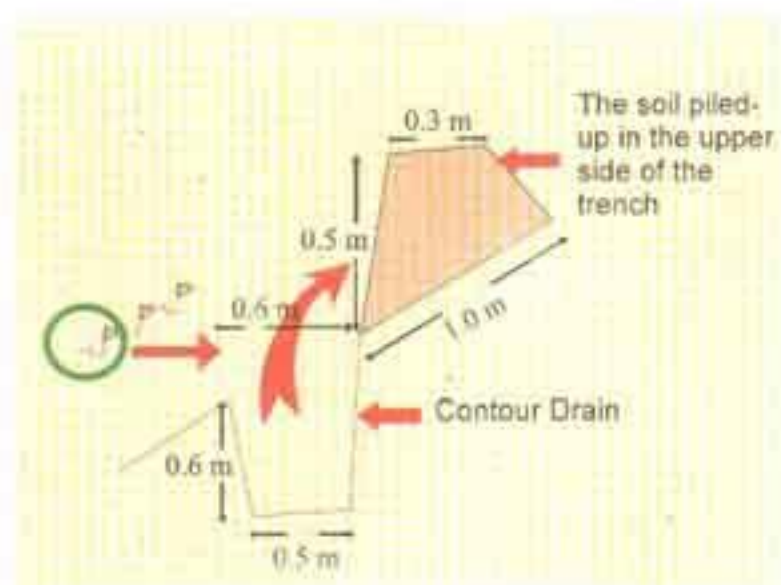
Picture 2: A contour drain

Opening of contour drains

The contour could be traced with a simple A-frame or rod tracer (Picture 3). Once the path of the contour drain is traced, the drain can be cut. The contour drains should start at the crown of the hill. The drain should be 0.6 m (2 ft) deep and 0.5 m (1.5 ft) wide at the bottom. At the top, it should be 0.6 m (2 ft) wide. Such a trapezoidal trench will have slanting sides rather than vertical sides. The earth removed from the trench is piled up on the upper side of the trench, to a height of about 0.5 m (1.5 ft) and spread over a distance of about 1 m (3 ft) (Picture 4).



Picture 3: Marking a contour line with an 'A' frame



Picture 4: A cross section of a contour drain

Contour drains should be perfectly flat in order to avoid lateral flow of water in the drain which will minimize soil movement. Creeping covers could be established on the bunds to preserve them.

Spacing of contour drains

Spacing of contour drains depends on the slope of the land, soil type and rainfall intensity. As a general rule, the guidelines given in the table could be used.

Slope	Intensity of Slope	Spacing
5%	1:20	40.0 m (130 ft)
10%	1:10	20.0 m (66 ft)
15%	1:7	15.0 m (89 ft)
20%	1:5	10.0 m (33 ft)

3. Contour bunds

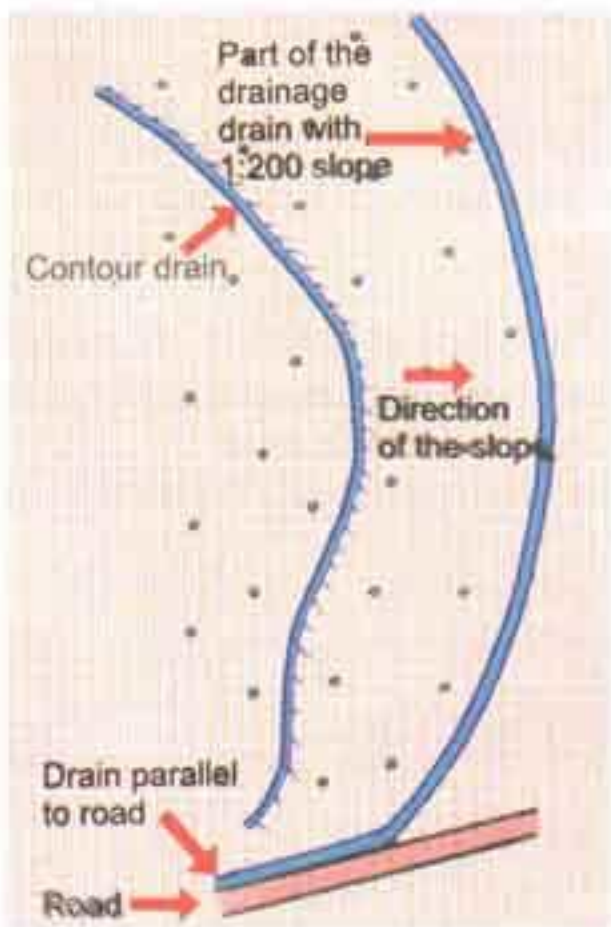
Contour bunds are also useful for controlling soil erosion in sloping lands as an alternative to contour drains. Contour bunds are also built along contours with materials such as stones, husks etc. Spacing of contour bunds will be decided on the basis as for contour drains (Picture 5).



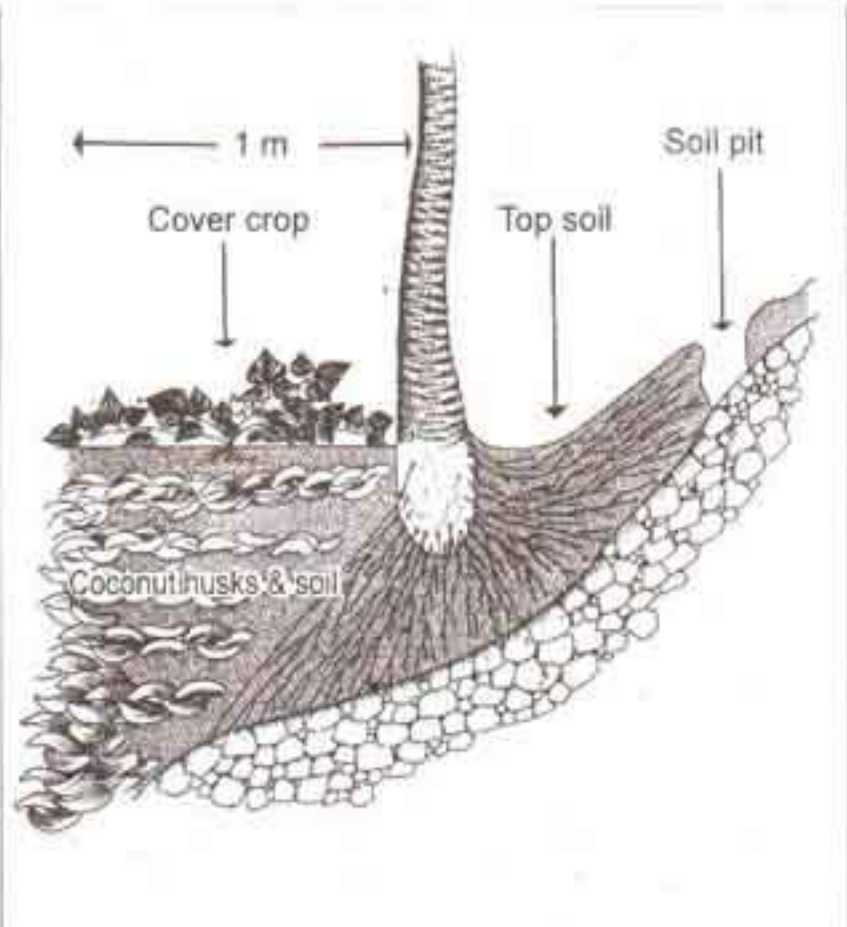
Picture 5: A contour bund

4. Drainage drains

In areas of high rainfall such as 5 cm (2 inches) a day during the monsoon, it is not possible to stop and store all the rainwater. However, every effort should be made to conserve as much water as possible. Drainage drains (diversion ditches) should be provided for this purpose. They should be laid out with a very slight down-grade because, it is intended deliberately to avoid accumulation of fine particles due to surface drainage. When short lengths of road are involved, the diversion ditch can be made about as long (Picture 6). The water flow in these drains should be controlled by having frequent cross-ties or earth or stone across the bottom of the drain, similar to lock and spill. Another way to ensure complete absorption of water is to flatten out the last few hundred meters of the drain into a true contour.



Picture 6: A drainage drain



Picture 7: A terrace constructed for a palm

5. Terracing

In steep lands, infiltration of water into the soil can be increased by terracing. This will reduce surface run-off and loss of fertilizer from the manure circle. Where terracing of the entire land cannot be done, each palm should be given a terrace with a crescent bund or husk platform. The slopes of terraces should be stone-walled or paved with a suitable cover crop or carpet grass (Picture 7).

6. Application of SALT (Sloping Agricultural Land Technology)

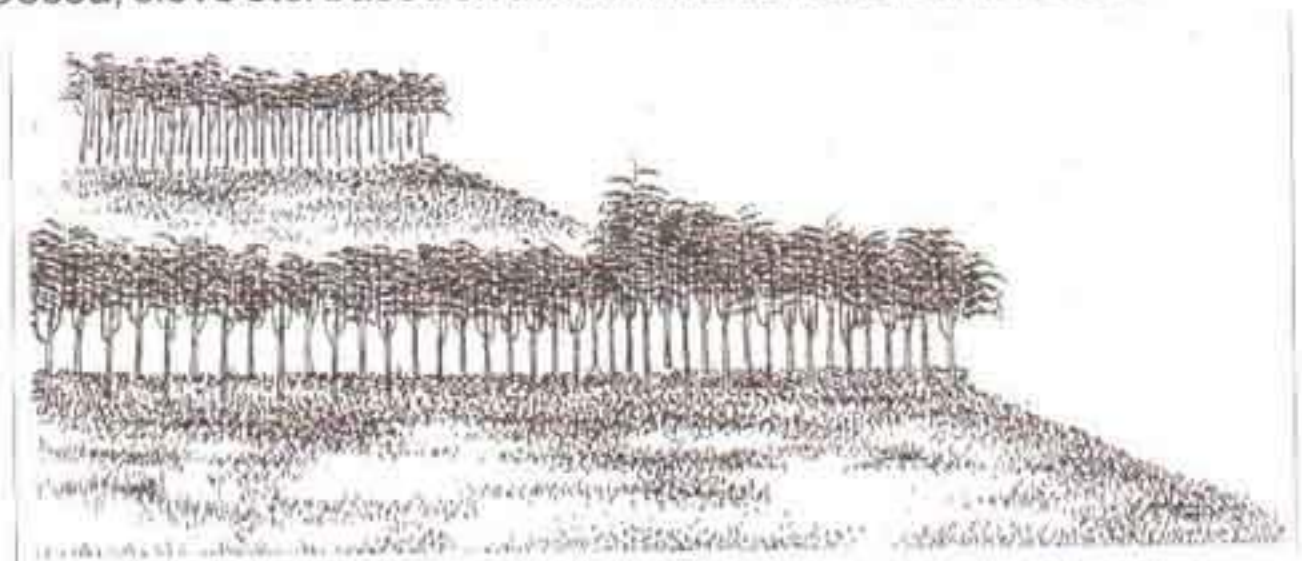
In this system, nitrogen-fixing trees such as Gliricidia are closely planted in double rows following contour lines. In between those live fences coconut and other trees should be planted (Picture 8 and 9).



Picture 8: A sloping land with SALT system

General principles involve in this system are:

- Coconut should be planted in contour lines. Minimum spacing between two planting lines should be not less than 7.0 m and maximum should be not more than 10.0 m.
- A double row of Gliricidia (60 cm x 20 cm) should be planted at 30 m distance from each coconut row. In between the two Gliricidia rows, soil bund will be built naturally. Gliricidia trees have to be lopped at 4-6 months interval regularly and lopping should be used as a mulch for coconut and the other crops.
- Complete weeding or soil disturbance in then should be avoided or minimized.
- Perennial intercrops should be planted in the avenue of coconut. Suitable intercrops are papaya, rambuton, cinnamon, pepper, coffee, Cocoa, clove etc. based on the climatic condition of the area.



Picture 9: A line drawing of a sloping land with SALT system

7. Other practices

Avoid ploughing and harrowing in sloping lands

When ploughing and harrowing are required (eg. intercropping with pineapple, ginger etc) it should only be done along the avenues of coconut, leaving 2.0 m margin from each raw of coconut. During heavy monsoon periods, ploughing and harrowing should not be practiced.

Rain water harvesting

A small bund up to 15 cm height with a width of 20 cm at 2.0 m distance from the bole to conserve rainwater. This small bund should be prominent in the lower part of the slope. This will serve as a basin to collect rainwater in the manure circle and enhance water infiltration (Picture 10).



Picture 10: A basin constructed around the base of the palm to harvest rain water



Picture 11: A tank constructed for collecting rain water

Rain water collection in tanks

In some lands bunds can be built to block water flowing down the slopes, by selecting a suitable location at the bottom of slopes across two ridges (Picture 11). Drainage drains should be directed to the tank. water collected in tanks could be used for irrigating coconut

Application of organic manure for coconut palms

This encourages root development of palms and improve soil physical conditions thereby enhance infiltration of rainwater.



Picture 12: A slopping land with cashew as a inter crop



Picture 13: Leaf mulch provided by intercrop

Perennial intercropping

Particularly in sloping lands, cultivation of seasonal cash crops with coconut is not encouraged. However, perennial crops such as cocoa, pepper, coffee, cinnamon, Rambutan and cashew are recommended as ideal crops for sloping lands(Picture 12). These crops serves as a ground cover and soil conditioners. They also provide leaf mulch conserving both soil and moisture(Picture 13).