

SOIL MANAGEMENT ON COCONUT ESTATES

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SOIL management aims at maintaining the soil in such a condition that maximum use will be made of inherent and added fertility and of soil moisture for the benefit of the crop. Correct management of the soil is as important as correct manuring for crop production. Its primary objective is to maintain the soil in an optimum physical condition as a medium for plant growth and for the conservation of the soil and its fertility.

Besides soil moisture in which the nutrients enter into solution and are absorbed by the plant, the soil needs an adequate supply of air round the roots in order to maintain an optimum content of oxygen. The soil should therefore be kept permeable so that water can drain through at a reasonable rate. To some extent these factors are controlled by proper cultivations which are discussed in the course of this paper.

Some cultivation practices on coconut estates are based on sound scientific principles, others on tradition, and yet others on misconceptions and fallacies. Unfortunately we have little experimental data that have critically examined some of the traditional practices and as such there is bound to be some controversy.

Every item of cultivation costs money and adds to the cost of production of coconuts and it is therefore essential that redundant and superfluous cultivation process should be discarded and essential cultivation restricted to the minimum.

Ploughing

In the case of annual crops such as cereals, ploughing is the first tillage operation in the preparation of a seed bed. In the case of a widely spaced perennial crop such as coconuts, ploughing is done for quite a different purpose and the benefits that could be expected to result from ploughing may be briefly considered.

An unploughed soil is compact and rainfall tends to run off the surface instead of percolating into the soil. Ploughing makes the soil porous and absorptive. Similarly the aeration of the soil is improved. Organic matter in the form of grass and weeds is turned into the soil and these on decomposition release nutrients which are absorbed by the palm.

The following points should be noted when ploughing coconut lands :—

Time of Ploughing.—Ploughing should be done during the rainy seasons, preferably at the beginning of the monsoon.

Slope.—Ploughing should always be done along the contour and never down the slope. Plough-furrows down the slope cause erosion and can result in gullying. Cross-ploughing as done in the old days in two directions can be definitely harmful.

Depth.—Deep ploughing should be avoided and depth of ploughing should not exceed six inches. This should be particularly kept in mind where tractor ploughing is done. There is an extensive body of experience that has shown that deep ploughing can cause a set-back to the palms.

Frequency.—It is usual to plough coconut lands once in two years. In the case of lands that have not been cultivated for long periods, annual ploughing of alternate rows, rather than ploughing the entire area once in two years is to be recommended. In any case, in areas subject to drought conditions, annual ploughing of alternate rows is to be preferred. Should a drought follow ploughing there would be less risk of the palms suffering a set back if the root system of only half the area is disturbed by ploughing.

Under tropical conditions too frequent ploughing can be harmful as high temperatures would favour the oxidation of organic matter. Ploughing the same row once in two years can be considered a satisfactory compromise.

Soil Turning

When labour was plentiful and cheap the traditional method of cultivation on coconut estates was soil turning with the mamoty or hand-hoe. It is an ideal method of turning the soil and burying organic matter. The clods are aligned in such a way that rain water effectively percolates into the sub-soil.

A SERRATED DISC-HARROW.



Mechanised farming makes it possible to keep cover crops and illuk under control.

Even today it is the only method of cultivating water-logged lands, provided with deep drains in proximity where ploughs cannot be used. This method is very effective in breaking the mat of roots, *bissa* on such soils.

Harrowing

Disc-harrowing is an established routine practice on coconut estates and is carried out during the dry season in the expectation that a surface dust mulch conserves soil moisture. Experiments have, however, shown that a dust mulch cannot appreciably reduce the rate of evaporation of water from the soil.

It is an obsolete idea that disc-harrowing conserves soil moisture because it breaks the capillary tubes that bring moisture up from the sub-soil. There is no such upward movement of water unless there is a water table within a few feet of the surface.

The benefit of disc-harrowing

is probably due to the killing of weeds which by transpiration can cause a loss of soil moisture during dry weather and also compete for plant food with the palms. It is an effective and economical method of controlling weeds. The dead weeds are left *in situ* on the surface as a dry vegetable mulch which further helps to shade the soil and thereby conserve moisture. Where manure is applied by broadcasting and ploughing, disc-harrowing is a useful operation to break the clods and effectively cover the manure. Otherwise if heavy rain follows there is the possibility of mechanical loss of manure removed by run off with the fine soil particles.

Mulching

There is a considerable amount of experimental data on orchard crops in other countries (including tropical countries) which show that the practice of applying a layer of dead vegetable waste material on to the surface of the soil surrounding the tree is effective in conserving soil moisture. The surface layers of the soil are kept cooler and at a more even temperature and damper and more permeable to water than an unmulched soil. Thus working with coffee in Tanganyika it has been shown that the temperature of the soil at two inches depth might vary by 12° C during the day, whilst under a mulch it varied by 2° or 3° C. The mulch slows down the rate of evaporation from a bare wet soil very considerably and would therefore be particularly useful in areas subject to drought.

On a coconut estate the materials that can be used for mulching are husks and fronds and where estates are in proximity to fibre mills, coir dust.

Husk Mulch.—Husks can be used as a mulch round palms by closely packing one layer, one against the other, with the convex side facing upwards.

In the case of young palms it may extend up to a distance of 4 to 6 ft. from the base of the palms depending upon the age of the palms. It is particularly effective in preventing weed growth round the palms, and especially in the early stages of planting helps to mitigate the adverse effects of droughts by conserving soil moisture round the palms.

Bearing palms can be similarly mulched up to a distance of 6 feet from the base. Here too it is very effective in preventing the luxurious weed growth that appears round the palms after manuring and competes with the palms for plant food and moisture.

HUSK BROADCASTING.



The husks are laid in strips.

Besides moisture conserved, the potash in the husks leached down by rain into the soil benefit the palms.

Where husks are available in plenty and cannot be otherwise utilised due to exigencies of labour, rather than accumulating in heaps, it may be broadcast in the squares as a very useful mulch. On gravelly soils this method of mulching gives good results. Husks broadcasted in this manner decay soon and could be ploughed into the soil after two years.

Fronds.—Fronds, without the butt ends, cut into short lengths can be useful for mulching round palms as with husks. It is not advisable to use these for mulching seedlings in the early stages, as these tend to attract white ants, which can do considerable damage.

Burning of Debris

FIRE !



Destruction of valuable organic matter on a coconut estate.

An undesirable traditional practice, which appears to die hard, and is typical of bad soil management is the burning of debris, particularly heaps of fronds, on coconut estates in the form of systematic night fires.

Such materials should be used as mulches or if mulching makes a demand on labour, allowed to decay *in situ*.

The only materials that need be burnt are butt-ends and stumps, particularly the latter which breeds coconut black beetle.

Drains and Draining

The proper control of the water required in the soil is one of the most important aspects of soil management. Excess ground water can do as much harm as slack of water.

Drains and Water Conservation.—

The subject of soil and water conservation will not be considered here except to state that a system of contour drains, forms the first line of defence for this purpose.

Draining Water-logged Lands.—By drainage we understand the removal of the superfluous or free water from the upper layers of the soil and thus a lowering of the water table.

Coconut lands which come under this category are of two types :

Under the first category we have to consider those lands that remain water-logged through a greater part of the year because of the impermeable nature of the heavy clay soils and lack of outlets to drain off excess water owing to the low-lying situation of the land.

In this case, deep drains at least 3 ft. wide and 3 to 4 ft. deep should be cut to lower the water table. Husks can be used with advantage on such lands to raise the ground level round the palms and thereby lower the water-table and increase the effective range for root development. This can be done by placing a layer of husks, with the convex side facing upwards and covering with the soil removed from the drains.

Normally drains are cut between alternate rows of palms and in extreme cases of permanent water-logging drains are cut between every row.

It is unfortunately a common sight to find such drains filled with husks, coir dust or fronds. As the object of the drains is to remove excess water and lower the water-table, refilling with husks or coir dust will only defeat the purpose of draining.

In the other category of lands, the soil conditions are different and consists of a top soil which is sandy, usually cinnamon sand of varying depth, overlying an impermeable clay sub-soil. During dry weather there is no apparent water-logging, but during the rainy season the water table rises close to the surface. On such soils, therefore, the problem is lack of soil moisture during the dry season and excess water causing water logging during the rainy season.

Here too deep drains are necessary and wherever possible should lead into roadside drains, water courses or other outlets to lead off the excess ground waters.

At the same time the texture of the top soil should be improved by burying husks to conserve moisture during droughts.

On such sandy soils manuring is essential to produce good crops, but the palms will fail to respond unless drained.

Claying

On light sands, such as the marine sands, which have in their immediate neighbourhood beds of clay, such as lagoon clay (particularly near the Madampe and Chilaw lagoons) attempts have been made to improve the texture and fertility by incorporating the clay on the sands.

Claying was an old English practice, according to which 50 to 150 cartloads used to be applied per acre and subsequently ploughed in. Under the conditions of coconut estates referred to, even with a moderate rate of application the economics of claying is highly doubtful.

The reverse process of applying river sand to heavy clay soils has been suggested and even here the economics of attempting to improve such unfavourable soils is questionable.

One has to face the fact that soils of this nature should never have been planted with coconuts.

Weeding

Clean weeding of coconut estates was advocated in the old days and even as late as 1923, the statement was made in Ferguson's Coconut Planter's Manual that "it will not be long before an estate with grass growing amongst the palms will be a rare sight."

Since then the danger of clean weeding has been appreciated, and except for weeding round seedlings and young palms, most estates have a cover of grass grazed by cattle.

Selective weeding of certain woody and herbaceous plants which can seriously compete with the palms should be carried out, in the earliest stages. This should be done wherever possible before the weeds flower and set seed.

Of these *Hyptis suaveolens* has rapidly spread in coconut estates. This is a quick growing weed which if not controlled in the early stages may grow to a height of two feet. In the early stages of growth it can be controlled by harrowing, but if allowed to become woody hand weeding is inevitable.

A herbaceous weed which is rapidly spreading on coconut estates is *Euphorbia geniculata*.

Cenchrus echinatus, with its spiny seeds, is an undesirable grass which once established is difficult to eradicate. Similarly the Giant mimosa, *Mimosa invisa* with its large spines and even the common sensitive plant, *Mimosa pudica*, though as legumes are beneficial plants to the soil, should not be allowed to spread under coconuts as they interfere with labourers who have to work bare-footed.

Tephrosia purpurea (Sinh. Pila) and *Crotalaria* species (Sinh. Andanahiriya) are useful legumes which should be encouraged and should not be hand weeded, but allowed to go to seed and then harrowed or ploughed so that a second crop could regenerate from shed seeds.

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