SOIL EROSION.

NOTES ON CONTOUR PLANTING OF RUBBER.

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In these notes, which summarise a lecture delivered before the Kalutara Planters' Association, it is my intention briefly to describe the salient features of clearings for planting rubber in a hillside district of Ceylon, and to recapitulate the general facts about soil erosion which are familiar to us.

SOIL EROSION.

The chief cause of soil erosion on hillsides is clean weeding. A few rough figures as given below will be of interest. A foot depth of soil per acre is estimated to be equivalent to 43,500 cubic feet approximately, and a cubic foot weighs about 80 lbs. An acre-foot of soil will therefore be equal to 1,555 tons. I am not exaggerating, I think, when I say that most of this 1 foot of top soil containing the best plant-food is washed away within three years of felling a hillside clearing. These figures are, of course, disputable, as it is difficult to arrive at any accurate loss of the constituents of the eroded soil.

The existing methods of planting waste the top soil almost immediately and seldom allow the subsoil a chance of becoming a useful factor.

An attempt is usually made to replace this loss by putting in a quarter ton of manure per acre once in 2 or 3 years at a cost of not less than Rs. 100—150 per ton, and it must strike anybody that a quarter ton manure is a poor compensation for 1,200 tons or more of top soil lost by erosion.

It will be interesting to note that summits of uncleared hills are crowned with a luxuriant growth of healthy trees, but rubber which is a forest tree, on a cleared hill is often of a stunted and wretched growth.

Proof of soil loss is further evinced by the paddy-field silt claim during the first year of opening, and the large quantity of silt deposits at the mouths of Ceylon's rivers.

It appears that the limit of maximum productivity has been reached in many rubber estates and passed on many tea estates. Evidence of this is found in the perpetual manuring which is required to keep up yields. The larger the tree the more plant-food it requires. At present, in Ceylon, the opposite is taking place owing to fine top soil being washed away.

Level trenches and silt-pits without drains are of course excellent methods of arresting wash, but they result in the soil being taken off the top of a hill, and after some years gravitating to the bottom. Either one has repeatedly to throw out the soil from level trenches resulting in the

downward trend of the soil, or fresh trenches have to be re-cut with consequent damage to root systems. Level trenches with graded drains are wasteful of plant-food.

ROOTS.

Roots always try to feed on silt at the bottom of the drain and to push into terraces, proving that in these places, and in the overlay of fallen leaf, which is periodically washed away, lies the only available plant-food. After fallen leaf has washed off, feeding roots are exposed to sun and wind and die off. Repeated re-cutting of drains cuts off the roots feeding therein, with a consequent set-back and starvation of the tree. Drains are usually re-cut at the worst possible time, just after the wintering of the rubber. Upkeep of terracing is fairly expensive, and pressure from the roots and from water on the base of the terrace tend to produce its collapse. There is no insurance against this collapsing, and when it does occur the result of years of trouble trying to save the soil from erosion is gone in a few minutes. The root systems are left exposed. In Ceylon large quantities of sub-soil have been eroded as well as the top soil, and much land has assumed a dangerously steep angle.

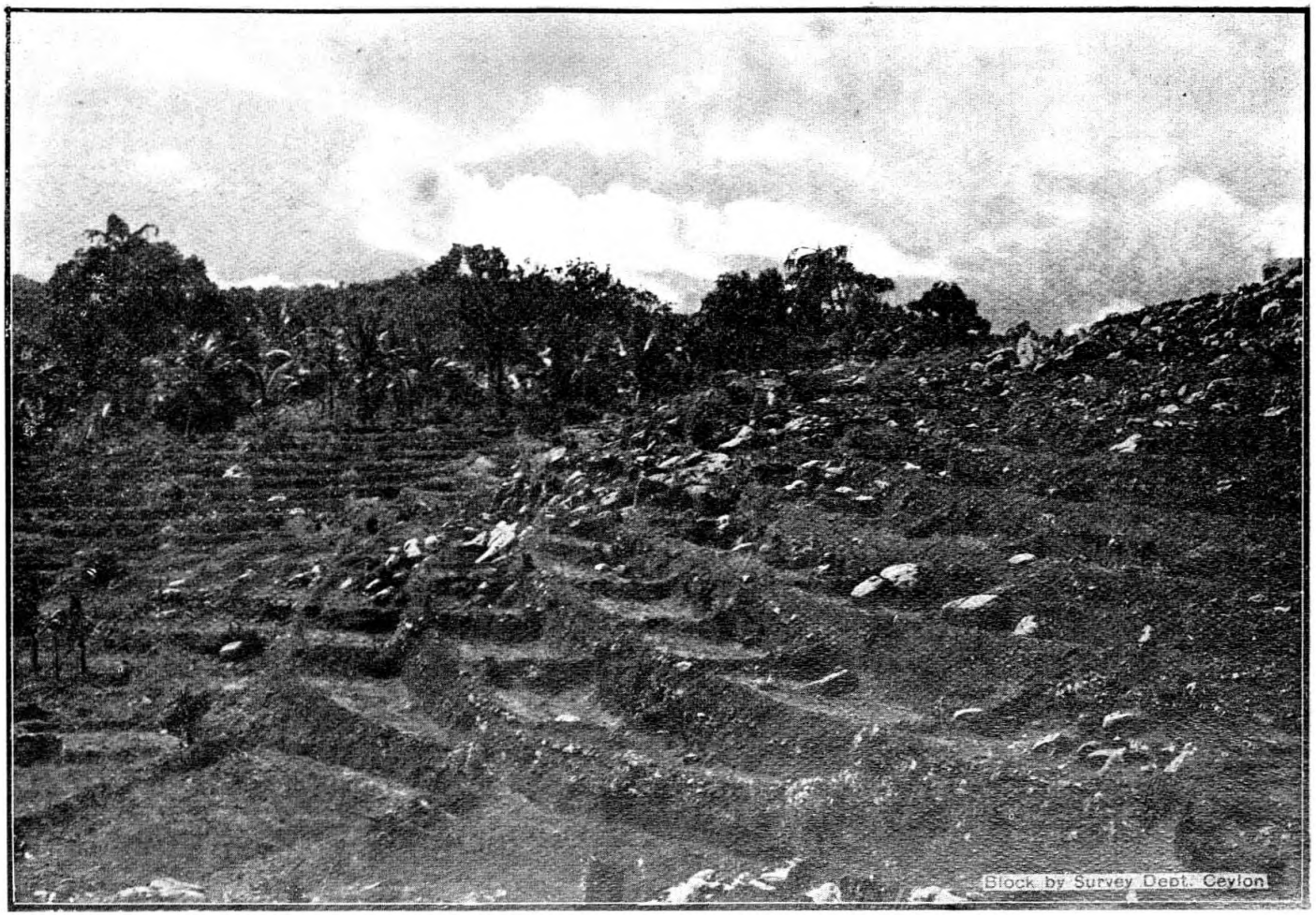
TERRACES.

There is an alternative system on which I am now experimenting, which will prevent soil erosion, with a more even labour distribution, and which can be financed over a period of years instead of all at the beginning. I wish however to satisfy myself on one or two minor points before giving any account of it, and will confine my remarks to what may be termed the *Full Terraced Contour System.*

Before any earth shifting is commenced, careful judgment must be exercised to determine the best width for the terraces, and a gradient graph plotted, so that earth-shifting be as small as possible. Line for holes at the predetermined distances, and then for width and position of terraces. Good supervision is esseutial. Holes for rubber should be as near the centre of terrace as possible—for tea the position is immaterial. It is vital that all terraces should be sloped backwards into the hillside. The bunds to hold in water should be rammed fairly tight. Instead of stone terracing, draining and silt-pitting, energy has been expended in altering the face of the hill. Where the fall of the contour occurs in the horizontal plane, it is cheaper to make small terraces instead of a single long one right round the hill face. Bunds, however, must be left in with every change of level, otherwise erosion will take place. It is sometimes necessary to alter level every 10 feet.

The terrace is sloped backwards and all humus, leaf mould, weed growth, green manure, prunings, etc. are washed backwards and make a heavy deposit of plant-food there and tend to equalise the top soil which was originally thrown out. Rain-water has not followed a course towards the edge of the terrace so that the maximum water-pressure has been exercised against the hillside. The action of this has been to aerate the original sub-soil strata on this side, rendering it capable of nourishing the tree. The only plant-food actually moved by water is always being taken backwards into the hillside instead of forward and downwards.

A NEW CLEARING TERRACED FOR CONTOUR PLANTING OF RUBBER.



THE TERRACED CONTOUR SYSTEM OF CLEARING—LOWMONT ESTATE.

COSTS.

I have these in detail. The Lowmont type clearing costs Rs. 20 approximately less per acre and uses approximately 6 more coolies per acre to bring into bearing. These may be summarised as follows :—

Cost of Lowmont Terraced Clearing.

1st year	...	366 coolies	costing	...	Rs. 295'00
2nd ,,	...	10 ,,	,,	...	,, 10'50
3rd ,,	...	23 ,,	,,	...	,, 16'60
4th ,,	...	27 ,,	,,	...	,, 18'20
5th ,,	...	21 ,,	,,	...	,, 10'50
Total	...	447 ,,	,,	...	Rs. 350'80

Cost of Ordinary Clearing.

1st year	...	220 coolies	costing	...	Rs. 243'00
2nd ,,	...	56 ,,	,,	...	,, 34'00
3rd ,,	...	70 ,,	,,	...	,, 41'00
4th ,,	...	52 ,,	,,	...	,, 32'00
5th ,,	...	43 ,,	,,	...	,, 22 80
Total	...	441 ,,	,,	...	Rs. 372'80

These costs should hold good for land with a slope up to 45 degrees, after that the additional cost should work out approximately 20 per cent. extra for 60 degrees, 40 per cent. extra for 70 degrees.

The one drawback to this type of clearing is of course the large labour force required during the first year—and the resultant difficulty in opening a large acreage at once.

The alternative scheme I mentioned is designed to do away with this difficulty and allow of a large area being opened with an average labour force. I am not in a position to give details of this system at the present time.

Nevertheless, I would personally rather have one good acre than three bad ones, and working to this policy the above single disadvantage ought not to count too much against this form of opening.

GENERAL.

I must leave you to form your own opinion as to which type of clearing you would rather have your own money in, as this is the best test of their comparative merits.

Remember that the capital value of the one is increasing all the time through the medium of nature's aids, that of the other is decreasing at a rate which I fear we shall be in a position to correctly estimate in a very few years.