ESTATE PRODUCTS.

MARCH 11TH MORNING SESSION.

HIS EXCELLENCY THE GOVERNOR PRESIDED.

THE DIRECTOR OF AGRICULTURE in introducing His Excellency said:—In asking you, Sir, to open this session of the Agricultural Conference I would like to say that to-day the papers deal with estate agriculture, and we have endeavoured to put forward a number of important questions. I wish to thank MAJOR OLDFIELD, Chairman of the Planters' Association, for kindly allowing us to have the whole day to-day in order that we may get through these various papers. He has made certain changes in the programme of Planters Meetings to suit our convenience.

HIS EXCELLENCY THE GOVERNOR.—I do not propose to detain you for a moment as we have a very full agenda to get through, and I would therefore ask Mr. T. H. Holland to read his paper on Soil Erosion and Cover Crops.

SOIL EROSION AND COVER CROPS.

T. H. HOLLAND, M.S.E.A.C.,

Manager, Experiment Station, Peradeniya.

It is not necessary to enlarge upon the evils attending on soil erosion, or the extent to which erosion is taking place on many tea estates.

Briefly the problem is how to keep the top soil in place without detrimentally affecting the tea.

The measures that had been suggested may be divided into:—

A.—Methods of opening up new clearings with the object of minimising erosion.

B.—Palliative measures to be taken in old tea.

A. The standard methods of opening new clearings in tea have as a general rule included no special measures designed to check soil erosion, except the provision of contour drains. More recently silt pits have sometimes been added. Lining has usually been done without regard to soil retention and, on steep land, severe erosion has been the rule rather than the exception.

The following special measures suggest themselves for consideration:—

1. Contour planting of tea.
2. The use of erect leguminous (or other) plants in conjunction with contour, or ordinary planting of tea.
3. The use of creeping cover plants.
4. Earth terracing.
5. Stone terracing.
6. The use of silt pits, either in or apart from drains.
7. Modifications of the ordinary weeding practice.

Contour planting of tea.

The main objections raised to this method of planting are: (1) The increased cost due to the extra labour and supervision required for lining and

holing, and the extra number of plants required. The experience of an estate in the Dolosbage district indicates that the cost of labour and supervision is in time not likely to greatly exceed that of opening a clearing in the ordinary way. It is also indicated that for practical purposes all the lines need not be true contour lines. It is sufficient to have true contour lines at intervals and to measure the other lines from these. The extra number of plants required depends of course upon the planting distance, and this is the all-important point. If the tea line is to effectively hold up all soil it is probable that planting at 4 to 6 inches would be required. This means a hedge of tea instead of a series of individual bushes: such hedges exist on estates but I do not know of a complete field or estate planted in this fashion and the yield per acre—which would largely depend on the distance between the hedges—is problematical. A compromise is possible and this brings us to

The use of erect leguminous or other plants.

It would appear probable that a line of tea bushes planted 18 in. to 2 feet apart would *when the roots are fully developed* be effective in holding up the soil. During the growth of the tea however the spaces must be filled with some other plant—preferably a leguminous plant—to complete the hedge. The choice of the plant must depend on the district but it should be a hardy plant that will last till the tea hedge can do its work unassisted and must stand pruning well. By far the most suitable plant tried at Peradeniya is *Clitoria cajanifolia*, and this plant is also giving admirable results on Kellie Group, Dolosbage.

In either the complete tea hedge or the tea-cum-leguminous-plant hedge all traffic must be along the lines. At every " neti-kan " therefore, tracks or steps must be provided to enable coolies to get up and down the hill and enter the rows from the end.

Hedges of leguminous (or other) plants can be used—though not quite so satisfactorily—with tea planted in the ordinary way. In this case there must be traffic up and down the lines and therefore the hedges must allow a cooly to pass over or through them.

Again *Clitoria cajanifolia* proves eminently suitable. It can be cut down without damage to two or three inches above the level to which the soil has risen on the upper side, thus forming a living step and very little obstruction to the passage of coolies. Tephrosias and Crotalarias can also be used but they do not supply the desired conditions so well.

It may be remarked that there is no scientific evidence in Ceylon of a pile of earth on the top side of a tea bush inducing disease or exerting any detrimental influence.

The use of creeping cover plants.

Viewed solely from the point of view of soil erosion, this is certainly a most promising solution of the problem. How much competition the young tea plants will stand, however, is a point on which further information is urgently required. The experience of some estates with Desmodium appears to have been unfavourable, but the effect of other cover crops may not be the same. The questions that arise in this connection are—

(1) What to plant
(2) How to plant it.

(1) The choice of a plant depends again on the locality. The success and popularity of *Vigna oligosperma* in certain rubber growing districts has created an impression that it must be the best plant for any crop, in any district. A plant, however, which will not creep up and interfere with the tea bush seems far more desirable. *Indigofera endecaphylla* would seem in many districts to be the plant for the purpose and has already attained considerable popularity. It thrives from sea level to elevations of 4,000 ft.—and possibly higher. It is easily established from cuttings, is deep rooting, stands cutting well, and nodules are found in abundance on its roots.

(2) Only two methods appear to need consideration; planting all over the ground, or in contour belts. This question is bound up with the probable effect on the young tea. If no ill effect is to be anticipated it would seem simpler and more efficacious to plant the cover crop all over the ground. If the contour belt system is adopted, half the ground or less would be occupied by the cover crop and, while fairly effective wash prevention might be hoped for, any possible ill effects would be reduced. On the other hand if the crop becomes well established constant labour will be required to keep it in such belts and weeding costs will not be reduced as they would if a complete cover was formed. The necessity for careful weeding till the cover crop is fully established must be emphasised.

Earth terracing.

This may be divided into (1) Terracing without drains, (2) Terracing in conjunction with drains. Mr. Denham Till has apparently demonstrated the possibility of the former method for rubber, using a separate terrace complete with bunds for each rubber tree. Possibly some scheme of providing a terrace for every two or three bushes might be feasible in some soils but the difficulties and expenses would be greater than for rubber. The main question is what is to happen to all the water during heavy rain. If the system is a success it must all be absorbed into the soil. Any overflow will rapidly create a river most certainly involving the destruction of all the bunds in its track. It seems unlikely that soils sufficiently porous to absorb all the heaviest precipitations of rain exist in many districts.

Earth terracing in conjunction with drains is perhaps a somewhat more practical proposition but here again difficulties are met with. The *Tropical Agriculturist* of September, 1923, illustrates a number of methods used in Java. Lack of experience of such methods under Ceylon conditions makes it difficult to offer a definite opinion, but it appears unlikely that such terraces would stand up to heavy rain on steep land before the earth had had time to become consolidated. The slopes between terraces would be partly composed of subsoil and it would undoubtedly be a slow and difficult matter to establish a creeping cover crop to bind the terraces. Rocky land provides serious obstacles to such terracing. Earth terracing with drains postulates contour planting, and would not contour planting at suitable distances by itself meet the case at considerably less expense?

Stone terracing.

Given a plentiful supply of stone, this work would appear most effective in conjunction with contour planting—rows of tea alternating with stone terraces.

In this case the tea could be spaced wider in the rows. With ordinary planting a less number of bushes would be directly benefited and this again would of course depend on the distance between the terraces.

Silt pits.

These may be dug in the drains or placed in echelon apart from drains. Their value—now generally realised—depends of course upon their being promptly cleaned out when full.

Modifications of the ordinary weeding practice.

This might be divided into

(1) No weeding at all.
(2) Keeping the weeds cut short.
(3) The use of forks or similar implements instead of scrapers.
(4) Selective weeding.

(1) *No weeding at all.*—It is practically certain that young tea will not stand these conditions. The problem is in some respects similar to that of a creeping cover crop but a crop of mixed weeds would largely consist of grasses, and grasses have been proved in some countries to be injurious to other plants. In addition, the land would very soon revert to " cheddy " rendering progress difficult and operations such as manuring impossible.

(2) *Keeping the weeds cut short.*—This would prevent seeding and keep the land clear for the passage of coolies. Grasses however would still flourish.

(3) *The use of hand forks or similar instruments in place of scrapers.* This seems a sound move which has been adopted by a large number of estates.

(4) *Selective weeding.*—This depends on having a suitable weed widely established which can be left. A low creeping plant which affords a fairly thick cover but which can be fairly easily got rid of if required is desirable.

Again, the question of the effect on the tea is similar to that of the planted cover crop. The selected weed cover is also apt to become infested with grasses. *Oxalis corniculata* was left unweeded in the Experiment Station tea plots for two years and formed a fair cover in parts. At the end of 1925 it had become very much mixed with grasses and was rooted out to make way for *Indigofera endecaphylla.*

B. Palliative measures to be taken in old tea.

Of the measures enumerated for clearings the following are capable of use in old tea.

1. The use of erect leguminous (or other) plants.
2. The use of creeping cover plants.
3. Stone terracing.
4. The use of silt pits.
5. Modification of the ordinary weeding practice.

1. *The use of erect leguminous (or other) plants.*—Contour hedges are again indicated as the best means of utilising such plants. The remarks made with reference to clearings when ordinary planting is adopted apply equally in this case.

2. *The use of creeping cover plants.*—In this case the establishment of a cover will probably not be so easy as in a young clearing. After pruning and the application of a pruning mixture would appear to be the most favourable time for planting. Not much information is available as to the effect on tea. A leading planter, with reference to *Indigofera endecaphylla* planted in tea on a low-country estate, writes: " There has so far been no noticeable effect on the yield or appearance of the tea in which the Indigofera is growing. Planting was done by cuttings about 6 ft. apart and a fair cover was obtained in 6 months and a very thick cover in about 15 to 18 months." Ten acres of tea were planted with *Indigofera endecaphylla* on an estate in Dimbulla in the North-East monsoon of 1925, and 10 acres on the Experiment Station, Peradeniya.

Vigna oligosperma has also been tried on low-country tea: the chief difficulty in this case is the smothering of the bushes.

3. *Stone terracing.*—This presents considerable difficulty in old tea since the roots of the tea occupy most of the ground. Useful work has been done on many estates on road and drain edges.

4. *Silt pits.*—Silt pits in the drains are used with good effect on many estates. Digging pits apart from the drains in old tea involves a good deal of cutting of roots.

5. *Modifications of the ordinary weeding practice.*—The remarks made on this subject with regard to young clearings apply also to old tea except that in this case the tea will be better able to withstand competition from weeds.

At the conclusion of the paper, His Excellency proposed that as the next few papers dealt also with soil erosion they should be read and the discussion postponed until they had all been read.

MR. F. DENHAM TILL read a paper on some practical notes on prevention of soil erosion upon estates.

MR. R. SENANAYAKE read a paper on the same subject.

SOME PRACTICAL NOTES ON THE PREVENTION OF SOIL EROSION UPON ESTATES.

F. DENHAM TILL,

Superintendent, Lowmont Estate, Ceylon.

The Director of Agriculture has asked me to describe to you the methods I have adopted in an attempt to provide some practical antidote to the erosion menace on new lands. Erosion itself has been dealt with at such lengths, and is so familiar to all, that I need not refer to its cause or effects. Suffice to remark that our heavy tropical rainfall, although presenting a problem of some magnitude, is not an Abstract Force about which we know nothing, but a Natural Force, following all natural laws, especially the Law of Gravity.

We know that a stated number of inches of rain will represent a given volume of water, falling over a given area, within a given period. It is