SOIL EROSION: THE PRESENT POSITION.*

T. EDEN.

INTRODUCTION.

I have chosen to talk to you on the subject of Soil Erosion because I believe that the present is a critical time from the point of view of that important subject. You are all of you doubtless conversant with the findings of the Committee, and it is unfortunate that financial stringency, both in governmental and planting circles, has prevented a forward move in keeping with the major recommendation. Even the most whole-hearted supporter of the anti-soil erosion movement has at present to consider carefully plans for immediate extension of the work, whilst to the unbeliever the economic situation acts as a balm to any heart burnings he may have had.

I fully realise the difficulties, but at the same time I feel that it would be a thousand pities for the movement to hang fire and for enthusiasm to be damped entirely by present conditions. In soil erosion work there can be no standing still: we are either moving forward or backward, and the least we can do is to maintain what the sailor would call steering way.

I have come here today not only to give you my views, but also to hear yours. The Tea Research Institute has no desire to consider the subject *in vacuo*, and I welcome the chance of discussion that this meeting affords.

THE PRESENT POSITION.

As far as my own observations go I agree with the report that there is little fundamental opposition to the principle of combating soil erosion. To draw an illustration from the ills which are afflicting the world at large, and the home country in particular, few people deny the seriousness of the position, but all the argument rests on how to get over the difficulty.

The report advocates cover crops, and from a fundamental point of view there is no doubt that cover crops offer the completest solution of the problem. There is no harm in repeating what I have said elsewhere that the only way to prevent soil movement on steep slopes is to immobilise the soil, and, by encouraging humus, to increase the soil absorptive capacity for water. There is a limit for every surface soil to the amount of water it will retain in the pores, and when that limit is reached the resistance to the movement of one soil particle over the other is very much decreased. Cover crops fulfil the desired checking function better than any system

* This paper is the substance of a lecture delivered before the Sabaragamuwa Planters' Association on Oct. 16th, 1931.

of high or medium shade. The only thing I have seen which approaches them in efficiency is a very thorough mulch of Grevillea leaves.

DIFFICULTIES OF COVER CROPS.

There are, however, grave difficulties about the use of cover crops and it is with these I wish chiefly to deal today. I have no wish to minimise them, but I think that they are sometimes over-emphasized. My aim will be to point out what I believe is the best way of approaching the problem with a view to getting over the obstacles.

The first difficulty is to get a cover crop to grow at all well. A superficial examination of the problem might lead one to divide growers of cover crops into two classes: those who spend all their efforts in nursing the crop, and those who spend their time fighting it. I shall deal with the latter group later, but there is no doubt that large numbers of estates find it difficult to establish their would-be cover crops. The resolution of that difficulty, is I think, a matter for an institute such as the Tea Research Institute. It involves the testing of as many promising varieties as possible. We are already doing something in that line and we propose to do more. The type of cover which has hitherto found most favour is the leguminous crop, because of the contribution to soil nitrogen that the bacterial nodules on the root make. Now it is a well-established fact that those root nodules are as necessary to the plant as they are desirable to the planter, and the possibility has to be considered whether the soil naturally contains sufficient bacteria *of the right type* to produce a healthy young plant able to resist the severities of the climate at the most critical time in its life. It may be known to you that, in other countries, crops like lucerne have been grown successfully on what had hitherto proved unsuitable land, and the acreage manifoldly increased by the expedient of inoculating the seed before sowing. The process has been reduced to an extremely simple routine operation and put on a commercial basis. In England last year some 4,500 acres of new land were brought into lucerne cultivation in this way. I shall not elaborate this because the detailed problem, as it affects tea green manures, is in the hands of Dr. Gadd, but I wish to show you that our Institute is alive to the problem and desirous to implement the recommendations of the report.

CONTROL OF COVER CROPS.

The second difficulty is the problem of control of cover crops, and that is a subject upon which I feel the estates themselves can do the most useful work. The cultural cycle of tea varies so much

from district to district, and even from estate to estate, that set and formal experiments at a place like St. Coombs are not calculated to give anything except a fraction of the information desired. The control of green covers would probably involve the alteration of estate routine to a greater or less extent. It is for you to decide whether weeders can be trained successfully to do the work, or whether the estate itself will have to organise a new branch of workers. In the long run it comes down to a question of cost. As the report says, the control of shade is a recognised procedure and is regarded as a legitimate expenditure, and ultimately cover crops will have to be put onto a similar footing. I personally feel that there is no greater or more important contribution that the planting community can make than to try out with an open mind the question of control of cover crops. It is a job that nobody else can do. All the departments of agriculture and tea research institutes in existence cannot on this particular problem provide half such important data as you yourselves can. If you could see your way to trying covers out on one division with a thorough costing of the control, and if some of you can show us the most economic and least disturbing way of doing it, that would be a tremendous contribution to the spread of anti-erosion methods. It calls for some persistence and imagination, but I am convinced that it is worth giving a thorough trial.

COMPETITION BY COVER CROPS.

The third difficulty, or rather objection, lies in the competitive activities of cover crops. That this takes place to some extent must be allowed, but against this must be placed the ultimate benefits conferred by the cover crop and the fact that the two crops, cover and tea, are exploiting different soil zones. As far as nutrients are concerned there does not appear to me to be any justification for drawing any distinction between ground cover and shade, in fact the advantage seems to be with the cover crop. Leaving out of consideration for the moment the nitrogen fixed by the root nodules, cover and shade are both drawing appreciably on the soil for nutrients. Now in burying loppings of dadap for instance, there is a great bulk of woody tissue rejected in addition to the tree trunk. All this woody tissue contains nitrogen, but because the *concentration* of nitrogen in this tissue is small it is inadvisable to bury it. Tissues containing less than about 2% of nitrogen provide, when buried, no readily available nitrogen for use in the soil and tend to lock up temporarily existing soil supplies. This is a sufficient reason for not burying woody matter, but it does not lessen the loss of nitrogen caused by this removal of wood, containing, in the aggregate, large

quantities of this valuable nutrient. The argument for using loppings is that despite the loss in wood the system of returning green stuff to the soil and growing more green stuff is still more economical than cutting out green stuff altogether. The point I wish to make is that shade trees compete just as much as cover crops and that the losses of nitrogen in woody tissue is greater proportionally in shade trees than in cover crops. If you compare a clean weeded soil with one on which a cover has recently been established, you may find a drop in crop in the latter, but if you proceed with your cover and fork it in, thus conserving soil and humus, you put a period to that loss in crop, whilst the unprotected soil proceeds literally and metaphorically down the incline of capital loss.

There is one other point that I should like to mention, namely the efforts that should be made to put on an experimental footing the observations on types of drain referred to at some length in the report. One looks forward to the time when new openings of tea will be a practical proposition again, and the first question that arises is what type of drain to use. It is to be hoped that the old open drain is a relic of the past, and moreover that, where possible, existing drains will be converted into types designed to resist soil movement rather than encourage it. In order to clarify the position we have on St. Coombs laid down a number of drains, some plain and some open, some bunded, and some with a reverse slope. Half of these receive drainage from areas that have been burned before forking the patna, and half from plots where the patna was forked without burning. In the heavy rain storms of the N. E. monsoon measurements of water delivered into these drains will be made at intervals of say half an hour. For the time intervals we shall naturally have to be guided by circumstances. At the same time an automatic rain gauge will give us accurate measurements of the rainfall in the interval, and samples of the turbid drainage water will provide a measure of the amount and type of soil removed. Not only shall we be able to get detailed data on how these drains do their work, but on how the type of opening affects the water absorption and water delivery. Especially interesting will be the behaviour of the soil after very dry periods, compared with its behaviour when the soil is already moist, and also the effect of recent cultivation. Hand in hand with these measurements will go analyses of the soil for loss of nitrogen and humus, so that eventually we shall hope to have a comprehensive picture of a good many of the factors which contribute to, or prevent, soil erosion. Only by some such means can the value of soil erosion schemes be rapidly and accurately assessed.