

INTRODUCTION

This report is an attempt to gain a picture of soil erosion in the World at the present time and to use this in conjunction with instances observed in Trinidad in suggesting the development of a conservation agriculture in the Tropics. It is to be regretted that it was not possible to obtain experimental data in support of any suggestions made or conclusions drawn in this report.

In the Tropics and sub-tropics there can be found a great diversity of agricultural systems and practices; from the highly skilled market gardener to the nomadic cattle grazer. In the West Indies, for example, land is relatively scarce and there are large numbers of peasant farmers, often with no real agricultural tradition, subsisting on small plots of land, side by side with, and often having to compete against, large estates. In many cases these peasants have to farm marginal or sub-marginal land, often very steeply sloping, and have created a special erosion problem which unfortunately is not being faced up to. Any system of conservation for people such as these must interfere as little as possible with their present farming practices; it must be cheap, as no peasant is in a position to hire expensive equipment for large scale mechanical methods, neither will he be able to maintain such works. The benefits from the use of conservation methods must be represented in a tangible form, such as increases in food crops, more money from the sale of cash crops, or these methods will not be adopted. Many estates too do not realise the benefits accruing from a conservation agriculture or are persuaded that it is uneconomic to depart from the tried if not entirely trustworthy practices followed at present. It is up to the Extension Service of every Department of Agriculture to use all the means in its power to drive home the need for conservation methods.

Anyone who is reviewing the literature relating to soil erosion must be struck by the work and publicity accorded to it in the United States. It is unfortunate that their problems and the systems evolved to deal with these problems are not entirely relevant to tropical agriculture. One would have to be very careful indeed in applying any of their methods in the Tropics and it is intended in this report to consider the methods for conserving soil and water that have been worked out in the States and the probable adaptations necessitated by conditions in the Tropics. Conservation agriculture is really very little different from that practised at present. In appearance it is rather different in that the topography of the land controls the layout and not a survey office with its artificial boundaries. Careful planning is essential to achieve the necessary balance with Nature.

Soil erosion has been recognized within the last decade as a world problem of the utmost importance. Archaeologists have suggested that the downfall of many of the ancient civilisations was directly due to soil erosion and the consequent loss of fertility. Arid wastes now mark the sites of the departed empires of Babylon, Ur and Nineveh. The sites of ancient cities have been discovered in the deserts of Central Asia, indicating a once prosperous agriculture (REF. I). Although systems of soil conservation can be found in many parts of the world, for instance among certain African tribes in the Far East and in Central and South America they are more the result of trial and error than of any planned ideal. Soil Conservation in its present form is a very modern highly technical science and its swift spread to many parts of the world is tribute to its importance.

One may ask what is soil erosion. The geologist is very familiar with it as the process of denudation. The weathering of the earth's surface has proceeded for the whole span of geologic time,

something of the order of two thousand million years, though in any specific area the process has usually been an intermittent one. Weathering has many forms, mechanical by water, wind, and ice; chemical by solution, oxidation, and carbonation; biological by the effect of organisms and vegetation. Geologically it is a slow process, the final stage of weathering occupying thousands of years, is the building of a soil in which plant life and lower animal life can exist. As fast as the surface soil has been removed so has denudation kept pace by forming new soil from the parent material below. A natural balance of removal and renewal is maintained. Cultivation tends to upset this equilibrium by despoilation of the natural vegetal cover and has accelerated the denudation process to an enormous degree. Soil erosion as this process is now called is caused by water and to a somewhat lesser degree by wind.

A soil of about 4 ft. in depth can be removed in a matter of 40 years or less depending on the severity of erosion, and although cultivation can speed up the soil forming process too, it is negligible when compared with the rate of soil loss. An inch of topsoil may be lost in an hour of torrential rainfall. In temperate regions soil conservation also implies water conservation, but in the heavier rainfall areas of the Tropics the need is to conserve soil and moisture but at the same time to avoid excessive water-logging. Heavier rainfall implies leaching with loss of valuable nutrients, the higher temperatures of the Tropics imply a rapid oxidation of humic materials and a consequent loss of fertility and soil structure. Conditions however can be very different in the dry Tropics and present a quite distinct problem. The development of a conservation agriculture then will have to take into account many factors involving a certain amount of disruption of the traditional way of life of the peasant. Conservation has to be based on topographical features and Professor Shephard's recommendations are admirably suited to this purpose. Peasants grouped into settlements on land leased from the Government or a responsible

private owner, can be dealt with more easily than under the present freehold system. Estates occupying a large area are in a better position to adopt conservation methods.

Erosion is a serious problem and adequate steps must be taken to deal with it before it is too late. The present increase in world population coupled with decreasing soil fertility and the enormous rate of soil wastage and loss can, if not remedied, lead to a serious shortage of food in the near future. The remedy is in our own hands, let us then apply it.

It is the areas of pedalfer soils that are often the problem in the Tropics. They are capable of supporting only a poor subsistence agriculture, have a low fertility status, produce poor, often overgrazed vegetation, possess poor structure and are very liable to erosion. Fawcett is quoted as estimating that of the fifty-six million square miles of the earth's surface, 40% (twenty-two million square miles) are either too cold or too dry for cropping. Of the remaining 60%, one half consists of poor grazing, uncultivable forest, marsh waste or high mountain. The 30% useful land is being destroyed by mining of its fertility and by erosion. Soils of the pedal type when cleared and cultivated show low fertility reserves, even though in the natural state they supported heavy vegetation, this is typical of rain forest areas.

Pressure of population in many areas of the Tropics has necessitated the farming of poor land. For centuries it was possible for tribes in Africa to practice a shifting agriculture by which an area of land would be farmed for only one or two years in every twenty or thirty, or even more. As the population in many of these areas has increased the rotation has been shortened to one year in every, say five or ten. The numbers of cattle kept have increased greatly. The natives have been concentrated in some areas into reserves, often on poor soils and the resulting lowering of fertility and over-grazing has caused serious erosion.