Soil conservation for small farmers in the humid tropics

by

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FOREWORD

Our existence depends largely upon the thin layer of soil from which we produce most of our food, fibres and timber. If used for the right purpose, and managed well, soils can continue to produce and to provide for our needs indefinitely. But if put to the wrong use, and badly managed, soils can quickly degrade, decline in fertility and lose their potential to provide us with the things we need.

Nowhere is this more so than in the humid tropics. In this region soils tend to contain most of their fertility in the top few centimetres of their profile. If these soils are exposed, and left unprotected from the frequent, high-intensity rainstorms which are common in the humid tropics, they can quickly erode, losing their fertile topsoil and leaving behind poor, infertile land.

The humid tropics are important particularly as they are the home for many millions of small farmers. Most of these farmers are poor and many of them are forced to farm small plots of land on steep hillsides where the risk of erosion is at its greatest. For these people, the control of soil erosion is of the utmost importance — if their land is allowed to erode its fertility quickly falls, crop yields decline and the farmer may well be faced with the prospect of starvation or of migration to the slums of a city in search of work.

In spite of the need, surprisingly few textbooks or manuals have been written specifically for the humid tropics, to help those involved in practical problems of arresting soil erosion in this part of the world. FAO has therefore produced this Soils Bulletin as a reference for the planners and technicians working with small farmers in the humid tropics and who are searching for ideas and guidance in their efforts to overcome soil erosion and to introduce sustainable systems of productive agriculture.

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1. INTRODUCTION

1.1 OBJECTIVE

This bulletin describes problems, approaches and techniques of soil conservation in the humid tropics and in particular is intended to assist farmers on small holdings in these regions ('small farmers') to overcome their soil erosion problems. The terms which frame this objective are defined briefly as follows:

- **Soil Conservation**: The scientific use and protection of land; including wise choice of land use and the pursuit of necessary measures of soil management and of erosion control (especially against erosion by water).
- **Small Farmer**: Any farmer who farms less than 5 hectares. An average would be around 2 hectares.
- **Humid Tropics**: Land between the Tropics of Cancer and of Capricorn having a tropical climate and annual rainfall of at least 1 000 mm.

1.2 SOIL CONSERVATION NEEDS

1.2.1 Soil Vulnerability

Soils are the very basis of our existence. Through the past, in the present, and through the foreseeable future, they remain the foundation of our food supply chain--a vital recurrent and capital resource of each nation. People should be keenly aware that the soil mantle which supports human life is very thin and that soil formation is a slow process. Once the thin top layer is eroded away it is difficult to restore. Damage invisible to the naked eye may seriously affect productivity. Soils are much more vulnerable than is generally thought. Only under proper management can they be regarded as renewable resources.

In the humid tropics, where many of the developing countries are situated and where individual holdings are usually small, the risk of soil erosion is likely to be high due to frequent and intense rains. When exposed by improper farming and cultivation the soils in these areas can be badly eroded in a short time. The need for careful soil conservation in these areas is apparent.

1.2.2 Historical Lessons

History shows us that neglect and abuse of soil resources has led, in many instances, to human suffering and even to the downfall of countries and civilisations. Human tragedy repeated periodically on the banks of the Yellow River – 'China's sorrow' – provides a well-known example of suffering caused by mis-use of a
watershed. In many countries, from Asia to the Near East and North Africa, once green and productive lands have become barren deserts through the abuse of soil resources. Lands described in the Bible as 'flowing with milk and honey' three thousand years ago are now badly eroded, leaving bare hills and bedrock. Countries which were the granaries of the Roman Empire present the same picture. Dr. Walter Lowdermilk, one of the pioneers of soil conservation in the USA, has described these changes in detail in his book 'Conquest of the Land through 7,000 Years'. He suggested a need for an Eleventh Commandment to safeguard the land 'that thy descendents may have abundance forever'.

1.2.3 Pressing World Problems

i. Land degradation

A study by FAO and UNEP concludes that between 5 and 7 million hectares of land worldwide are lost to production annually through soil degradation (FAO/UNEP 1983). If current rates of land degradation continue, close to one third of the world's arable land will be destroyed by the year 2000 (UN 1978). Of all the forms of land degradation, soil erosion is the major problem. FAO further pointed out that between 1980 and 2000 the area of arable land available per capita in developing countries is set to fall from 0.37 to 0.25 ha with a 19 percent loss of overall land productivity (FAO 1981, 1984a).

ii. Population increase

Regardless of major efforts to encourage birth control, world population is predicted to increase from about 5 billion at present to 6 billion by the year 2000. Most of the increase will be in developing countries and even more pressure is likely to be placed on land which is already degrading.

iii. Food supplies

FAO has estimated that the number of severely undernourished people in the developing world increased from about 360 million in 1969-71 to about 435 million in 1974-76, an increase of 20 percent in only 5 years. The 1985 famine in Ethiopia and other African countries has vividly illustrated the seriousness of the problem. Food and other agricultural production levels need to be doubled in developing countries within the next 15 years merely to keep pace with population growth (FAO 1981). Some developed countries have capacity for increased production but in supplying the needs of developing countries there are attendant problems of transportation and distribution. Accordingly, 'self-sufficiency' is probably a wise agricultural policy for many developing countries to pursue but, as more land is brought under food production, greater efforts will be needed to preserve the soil.

1.3 BENEFITS OF SOIL CONSERVATION

A better appreciation of the value of soil conservation is obtained by recognizing two categories of benefit: on-site benefits and off-site benefits. Many people equate soil conservation with erosion control. Certainly, measures that minimize erosion and reduce sedimentation and flood damage are very important but, in developing countries especially, soil conservation programmes can generate other major benefits which are often overlooked. These other benefits are outlined in the following paragraphs.

i. Inducing permanent farming

Given proper soil conservation and management, many areas could be farmed permanently and much more intensively without risking undue erosion. For instance, the construction of bench terraces would permit settled, continuous farming (Plate 2) in many areas where shifting cultivation (Plate 1) is presently being practised. Shifting cultivation currently occupies 300 million ha of land, mostly in developing countries (FAO 1978).

ii. Increasing the population supporting capacity of the land

Well-planned soil conservation introduces a better choice of land use, improved farming practices, conservation of soil moisture and other measures designed to increase agricultural
production and thus raise the population supporting capacity of the land. In some developing countries, cultivated land can support only 2.5 to 5 people per hectare (1 to 2 people per acre). In contrast, some Asian countries support up to 15 people on each hectare of their terraced paddy lands. Increase of population supporting capacity to this level will rarely be feasible but any increase can be important in densely populated countries with limited land resources.

iii. Developing new land safely

FAO has estimated that to feed the world in the year 2000 an additional 150 to 200 million ha of new land should be brought into production (FAO 1981). This expansion will inevitably embrace land inherently less favourable for farming, such as more steeply sloping land in the humid tropics. Sound soil conservation measures will be essential to the safe development of these kinds of land on a sustained basis.

iv. Modernizing upland farming

More intensive use of hilly uplands in many countries seems inevitable. It may also be desirable. In the tropics where the lowlands are hot, the uplands and hill regions often offer climatically ideal places to produce many high value crops for domestic use and export. Upland farming in many countries remains primitive because the hilly terrain is rough and remote. Properly designed conservation structures in these areas will not only protect the hillslopes but will also provide better access (e.g. using terraces for road alignment), better drainage (e.g. waterways) and increased potential for mechanization and irrigation.

v. Providing employment opportunities

Soil conservation and land use intensification activities could create much-needed employment opportunities in the rural areas of many developing countries. Most traditional soil conservation practices are highly labour-intensive. Four to five hundred person-days of work may be employed in constructing one hectare of bench terraces on a moderate slope. Even simple soil conservation structures may require 60 to 80 person-days per hectare under similar conditions. These estimates exclude work on waterways, gully control, etc. Thus a substantial national soil conservation programme with government financial support could effectively alleviate rural unemployment problems prevalent in many developing countries.