The objective of this Manual is to assist professionals concerned with the planning and implementation of watershed management activities by providing practical information supported by examples from a wide variety of situations. However, the watershed situation in each country is unique and it is impossible to provide step by step solutions which will apply in any specific case. The user of the Manual is therefore invited to add the local experience and information deemed necessary.

We wish to acknowledge the valuable work of Mr. A. N. Balci and Mr. T. C. Sheng on which Parts I and II of this volume were based respectively; it has been edited by Mr. S. Dembner, FAO consultant, and prepared for publication by Mr. T. Michaelsen of the Forest and Wild-lands Conservation Branch. It is hoped that the publication will be useful to all professionals involved in watershed management activities.

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ABSTRACT

The purpose of this document is to provide practical guidance on land preparation for afforestation and cultivation on sloping land affected by water erosion. Part I deals with practices and techniques for land clearing and preparation for afforestation in watersheds. Special consideration is given to environmental effects and means to minimize erosion. Part II on terraces and ditches describes conservation methods and land treatment for agricultural use of sloping land, ranging from annual to permanent crops. Layout, construction and maintenance of terraces and hillside ditches are described in detail, as well as the protection of terrace risers, outlets and waterways.

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INTRODUCTION

Watershed rehabilitation generally requires land use adjustment measures, which contribute to a reduction in soil erosion rates, and at the same time increase rural employment and income. The two main techniques considered in this volume are: afforestation or re-vegetation for catchment protection and the production of forest products; and terracing for conservation farming. The document provides technical guidance and specifications related to the preparation of sloping land for sustained agricultural and forestry production. As a technical guide, it describes the various measures and how to apply them, assuming that the decision to reforest, terrace, etc., is economically sound. Whether this is so or not depends on a series of factors and circumstances beyond the scope of this document. However, with population pressure on mountain areas showing no signs of diminishing, it is becoming increasingly clear that watershed protection and rehabilitation by removing people or by industrializing downstream areas and speeding up irrigation cannot any longer be considered a general solution. The alternative is to increase upland production while providing the necessary protection.

In order to reflect the most appropriate combination of techniques, due consideration should be given to: the scale of the operation; the availability of infrastructures, machinery and human resources; and the organization of the work. A project of afforestation of large areas of public land with savanna vegetation is completely different from bench terracing for vegetable gardening on steep volcanic soils. Reafforestation as a government undertaking requires large blocks of land. Otherwise, land preparation, road construction, fire control, logging and industrialization become uneconomic. On the other hand, farmers may plant small patches of steep, stony or otherwise unused land, effectively and economically producing fodder, fuelwood, shelter, fruit, etc. The scale of work may be down to a single tree.

Terracing, especially bench terracing, is generally not carried out as a large-scale operation on public lands. More often, the work is done by small farmers, assisted technically and financially by the government. The argument most often heard against bench terracing is its expense, a conclusion often reached by multiplying the amount of soil to be cut and filled and the resulting work required per hectare by the official daily wage. The result usually shows a cost per hectare, which no farmer can afford. However, the fact that farmers have constructed terraces for centuries shows clearly that when population density and intensity of cultivation reach certain thresholds, bench terraces are a workable solution. The government can speed up development by providing incentives. Furthermore, it is often found that cultivation on terraces is so intensive that a quarter of a hectare can generate full-time employment for one man. The construction of the terraces can be divided over several years. In order to “create” 0.25 ha of cultivable land, the upland farmer may work one month per year over four years, during periods of low agricultural activity.