IRRIGATION WATER MANAGEMENT

Training manual no. 8

STRUCTURES FOR WATER CONTROL AND DISTRIBUTION

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

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Preface

This is one in a series of training manuals on subjects related to irrigation, issued in the period from 1985 to 1993.

The papers are intended for use by field assistants in agricultural extension services and irrigation technicians at the village and district levels who want to increase their ability to deal with farm-level irrigation issues.

The papers contain material that is intended to provide support for irrigation training courses and to facilitate their conduct. Thus, taken together, they do not present a complete course in themselves, but instructors may find it helpful to use those papers or sections that are relevant to the specific irrigation conditions under discussion. The material may also be useful to individual students who want to review a particular subject without a teacher.

Following an introductory discussion of various aspects of irrigation in the first paper, subsequent subjects discussed are:

- topographic surveying
- crop water needs
- irrigation scheduling
- irrigation methods
- scheme irrigation water needs and supply
- canals
- structures for water control and distribution.

A further two subjects to be covered are:

- drainage
- scheme irrigation management.

At this stage, all the papers are provisional because experience with the preparation of irrigation material for use at the village level is limited. After a trial period of a few years, once enough time has elapsed to evaluate the information and the methods outlined in the draft papers, a definitive version of the series can be issued.

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ABOUT THIS PAPER

STRUCTURES is the eighth in a series of training manuals on irrigation. The manual presents some of the common open channel structures that can be found in small irrigation schemes and in small units of larger schemes. It explains the system of water distribution and related structures which are needed to control the flow of water and water delivery from the water intake to the fields.

Furthermore, the manual presents different types of structures for flow measurement and for the protection of the canals. Common technical problems that are often encountered in the operation of structures as well as the necessity of maintenance and repair works are discussed.

The consequence of minor scheme extension for the existing structures is also discussed.

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Chapter 1

Introduction

Operating an irrigation scheme without hydraulic structures is like trying to drive a car downhill without a brake or steering wheel + you cannot control your speed and you cannot control where you are going. With the help of hydraulic structures water reaches the fields at the proper time and in the quantities needed.

Reference is made to Training Manual 7, *Canals*, where the structure of a canal network is compared to that of a tree: fields, the smallest units of a scheme, are like the leaves of the tree; tertiary canals the twigs; secondary canals the branches; and the main canal is equivalent to the stem of the tree. In the canal, the volume and the level of flow are controlled by hydraulic structures + very often referred to simply as _structures_ + and without them there will be too little water available, or too much water and so wasted.

In an irrigation scheme, many structures with different functions exist. It is not the aim of this Training Manual to give a complete overview of all the many types of structures in use, with a precise description of each. That would take up too much space and confuse the reader with too much detail. If details are needed, then a good source of information is *FAO Irrigation and Drainage Paper*, Nº 26. This present Training Manual concentrates on presenting some typical structures that are commonly used for small irrigation schemes, or for small units of large schemes. To give the reader an idea of the different types of structures used in an irrigation scheme and where they would be found, an overview of a typical scheme is presented in 0.

This manual should help extension officers and farmers to understand the functioning and use of the most common structures. It must be emphasized here that for the design of new structures and for the construction of complex ones, experts should be consulted.

Chapter 2 describes the water intake structures which divert water from the canal to the fields. Then in Chapter 3 the problem of controlling the water level in field channels is discussed, followed in the next chapter by a description of water distribution structures in the canal network. Chapter 5 is devoted to discharge measurement structures so that farmers or operators of a canal can know how much water is flowing in the canal, in order to obtain precise water control.

Because the canal structures change the direction or speed of water flowing in the canal, the canal and the structures themselves are often damaged by erosion and scouring. Chapter 6 discusses this problem and presents some protective structures. Chapter 7 describes some of the most common problems in structures, while Chapter 8 deals with maintenance and repair works.

Finally, in Chapter 9, there is an explanation of how to construct small diversion and check structures when a scheme is extended.

Annexes describe a method of flow measurement through a field intake, and presents discharge-head tables for flow measuring devices sited in canals.

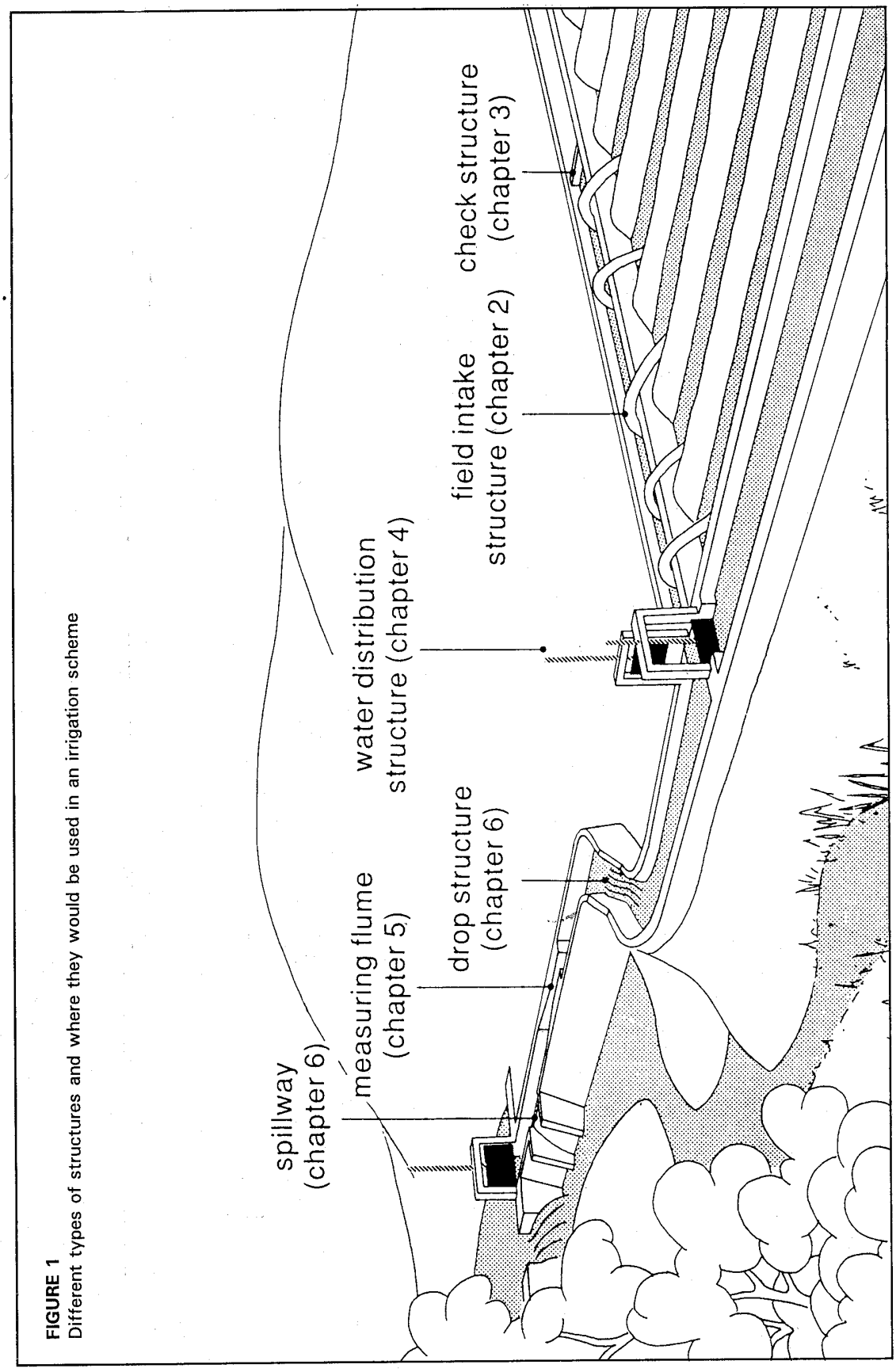

FIGURE 1
Different types of structures and where they would be used in an irrigation scheme