Irrigation Options to Avoid Critical Stress: An Overview

EDWARD A. HILER
Texas A&M University
College Station, Texas

TERRY A. HOWELL
Water Management Research Laboratory, USDA-ARS
Fresno, California

I. INTRODUCTION

In many areas of the United States and other parts of the world, available irrigation water supplies are either very low already or being depleted rapidly. As water supplies diminish, population increases, and municipal and industrial water needs increase, optimization of efficiency of irrigation water use in food and fiber production becomes increasingly imperative.

A recent United Nations Food and Agricultural Organization publication (Doorenbos & Kassam, 1979) on yield response to water contains in its preface the following statement in bold-faced lettering:

The upper limit of crop production is set by the climatic conditions and the genetic potential of the crop. The extent to which this limit can be reached will always depend on how finely the engineering aspects of water supply are in tune with the biological needs for water in crop production. Therefore, efficient use of water in crop production can only be attained when the planning, design and operation of the water supply and distribution system is geared toward meeting in quantity and time, including the periods of water shortages, the crop water needs required for optimum growth and high yields.

This suggests three areas that offer considerable promise for increasing efficiency of water use in irrigated agriculture as related to the subject of this chapter: (i) improved irrigation scheduling techniques, (ii) improved irrigation water application and distribution systems, and (iii) application of system optimization methods to improve the on-farm water allocation to crops. These three areas will be the principal topics considered in this chapter. Off-farm allocation, though important, is beyond the scope of this chapter, but some aspects are discussed in Chapter 12 by van Schilfgaarde and Rawlins.