Reducing Irrigation Requirements

J. S. ROBINS
Washington State University
Irrigated Agriculture Research & Extension Center
Prosser, Washington

I. INTRODUCTION

The use of irrigation requirement in this chapter will refer to the quantity of irrigation water per unit area of land required at the farmer’s headgate or pump discharge, annually, to adequately irrigate the crops. It includes seepage, evaporation, and transpiration from the farm distribution system; deep percolation; leaching requirement; surface runoff from the farm; and requirements for evapotranspiration in excess of usable precipitation.

Irrigation requirement thus defined is greatly influenced by many factors elaborated in other sections of this monograph. Many of these are covered in sections II, IV, VII, VIII, XI, and XII, along with chapters 60 and 61. In essence, any climatic, soil, plant, irrigation system, or management factor that affects a water consumption mechanism alters irrigation requirement. Many of the factors will be merely mentioned in this chapter, and the reader will be referred to other chapters for more detail. Emphasis in this chapter will be placed on fundamentals of the new, the possible, and the unproven mechanisms generally not elaborated elsewhere.

Although not specifically embraced in irrigation requirement as defined, the concept of water use efficiency (crop production per unit of water used) has notable implications when considering irrigation requirement. This applies both from an on-farm and national or regional standpoint as related to total production possible with present and potential irrigation water supplies (Haise et al., 1960; Viets, 1962). Frequent reference to this concept will be made in this discussion relative to the efficiency of water utilization on a national, regional, and individual farm basis.

II. IRRIGATION SYSTEM DESIGN, WATER CONTROL, AND MANAGEMENT

Positive water control and management on the farm can greatly reduce irrigation requirement. Reducing seepage loss from farm ditches, preventing farm runoff, improving water distribution over the field, and reducing unnecessary deep percolation are probably the most significant areas for improvement (see chapters 41, 42, 43, 44, 45, 60 and 61).

Related to distribution system losses is the use of water by weeds growing in, on, or adjacent to farm ditches or canals. Such plants not only transpire water