Crop production is reduced when excessive accumulations of soluble salts exist in soils. Reductions in crop yields result from osmotically produced water stresses that plants encounter when grown under saline conditions and from specific nutritional imbalances and toxicities that are created when certain salt constituents, such as chloride, sodium, and boron, are individually in excess. In addition, excessive sodium may indirectly decrease plant growth by its deleterious effect on soil structure. Additional information on the interactions of crop growth and salinity is presented in Chapter 3 of this monograph and elsewhere (U.S. Salinity Laboratory Staff, 1954; Bernstein, 1961, 1964a).

The primary sources of soluble salts in agricultural soils are: (i) irrigation waters, (ii) salt deposits present in soil parent materials when the soils were brought into production, (iii) agricultural drainage waters (both surface and subsurface) draining from upper-lying to lower-lying lands, and (iv) shallow water tables. Additional, but generally secondary, sources of salts include: (v) fertilizers, agricultural amendments, or livestock and poultry manures applied to soils; (vi) weathering soil minerals; and (vii) rain and snow. In the previous drainage monograph (Luthin, 1957) and elsewhere in this monograph, methods and practices used to remedy the drainage problems associated with seepage and agricultural drainage waters are adequately presented. Therefore, this chapter will be limited to a discussion of the drainage requirements for salinity control.

Irrigation waters may contain from 0.1 to 4 metric tons of salts/1,000 m³ and are generally applied to soils at annual application rates of 10,000 to 15,000 m³/ha. Thus, from 0.1 to 60 metric tons of salt per hectare may be added to irrigated soils annually. These salts are added to those already present in soils. While it may be possible to eliminate the salts from the other major salt sources, it is not yet economically possible to eliminate salt from irrigation water. For this reason the use of saline irrigation waters sets a unique drainage requirement for irrigated soils. It is this requirement that shall be emphasized here.