Crop Yields as Affected by Salinity

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I. INTRODUCTION

Drainage of irrigated lands is one of the requisites for sustaining agricultural productivity in a given region over the long term. Adequate drainage not only allows for better aeration in the crop root zone but provides a means by which salinity and toxic elements can be managed and controlled. The previous chapter in this publication addressed the influence of inadequate drainage on crop yields in terms of excess water and timeliness. The emphasis of this chapter is on: (i) how plants respond to salinity and toxic elements (i.e., Na⁺, Cl⁻, and B), (ii) the various factors that influence plant response to salinity, (iii) the extent to which salinity affects crop yields, and (iv) management strategies to maximize yields by controlling soil salinity. In each of these subsections, we have specified areas which require additional research. It is not our intent to provide a comprehensive review of the physiological effects of salinity on crop plants. This subject has been covered by others (Cheeseman, 1988; Gorham et al., 1985; Greenway & Munns, 1980; Läuchli & Epstein, 1990; Maas & Nieman, 1978; Munns, 1993; Poljakoff-Mayber & Lerner, 1994; Yeo, 1983).

II. SOURCE AND CAUSES OF SOIL SALINITY

All salts found in soils and waters originated from parent rock material that has undergone geochemical weathering. Over geologic time, primary minerals have reacted with water, O₂, and CO₂ to form secondary minerals and salts that were transported by water to oceans or depressions in the landscape. Inundation of large land masses by saline seas deposited sedimentary materials that have become the major source of salt in arid regions. The processes of weathering and the chemistry of salt-affected soils have been addressed by Jurinak and Suarez (1990).