Sugarcane (Saccharum officinarum) is a tropical crop which is grown predominantly between 30°N and 30°S latitude. The climatic boundary for sugarcane in the Northern and Southern Hemispheres is further defined by the coldest mean monthly temperature isotherm of 18.3°C (65°F). In many of these areas, crop production is often restricted by limited seasonal rainfall. This situation emphasizes the need for irrigation, water development, and effective water management practices.

I. ROOTING HABITS AND MOISTURE EXTRACTION

Sugarcane is a fibrous-rooted crop whose roots are most active in the first 2 or 3 ft of surface soil. Active rootlets have been noted to extend to depths of 8 ft or more. Rooting patterns vary with the physical condition of soils—particularly machine-compacted soil layers, moisture distribution, aeration, and their genetic profile characteristics (Baver et al., 1962; Humbert, 1954; Lee and Weller, 1927; Trouse and Humbert, 1959, 1961; Yamasaki, 1956).

As with most crops after irrigation, the soil water suction increases most rapidly in the surface soil, followed by a gradual rise in successively lower soil layers. The area from which the greatest quantity of water will be withdrawn at any specific time from a uniform soil profile does not depend entirely on the quantitative root distribution or the soil matric potential but rather on a combination of these factors.

This is illustrated in Table 33II–1 where, between two critical stages of cane stalk elongation rate, the greatest water extraction occurred at the 3-ft depth. Under field practice, it is often desirable to irrigate before the cane elongation rate decreases. Robinson (1963a) has shown that the elongation rate of cane stalks declines as the matric potential approaches -200 centibars at the 12-inch depth.

II. EVAPOTRANSPIRATION

Evapotranspiration (ET) represents the quantity of water which must be applied at suitable intervals to maintain a soil water balance favorable to plant growth. The importance of this concept in sugarcane production is evidenced by its application in irrigation and water management strategies.