Chapter 2

Carbon Utilization and Losses by Plant Root Systems

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Plant root systems have been reported to achieve lengths of up to 71,000 m/plant when growth was uninhibited by environmental stresses or plant competition (Pavlychenko, 1937). Recent reports, however, have indicated that there may be an inverse relationship between total root length and specific root water uptake (Taylor and Klepper, 1978). There are also conflicting reports which relate root length density, axial resistance, and radial resistance to the absorption of ions and water by different cultivars. Traditionally, crop production has been thought to be proportional to the size of the root system. This premise, however, essentially ignores the tremendous investment of photoassimilate energy by plants for the production and maintenance of extensive root systems. Perhaps one reason for accepting this premise is that our knowledge of the morphology and physiology of root systems is inadequate.

When the primary objective of multidisciplinary plant research is to modify plants so that they maximize the utilization of solar energy, soil fertility, and water, then the root systems of both current and future cultivars must be evaluated for their efficient utilization of the limited...