I. INTRODUCTION

Humid region agriculture embraces farming in areas where rainfall is generally sufficient to permit sustained production of crops and pasture. The level of production may be quite low in years of deficient rainfall but irrigation or arid region practices, such as alternate years of crops and fallow, are not essential. The rainfall seldom coincides completely with crop needs, however, so water excesses and drouths are common occurrences.

Most of the incoming solar energy that is received in the humid region of the Northern Hemisphere comes between March 21 and September 21. During the first 3 months of that period, nearly all of the energy is used to evaporate the excess water that has accumulated during the winter months. This usually amounts to 5 to 6 mm/day. Unless rains replenish the diminished soil water, late summer energy cannot be expended in evaporating water so most of it is used to heat the soil and the air. Late summer is always hot for this reason and not because solar radiation has increased. We may never be able to markedly reduce the amount of water required to produce an acre of crop but we most certainly can increase the yield and quality of the crop. This will require, in addition to good germ plasm and protection from insects and disease, a major increase in efficiency of management of soil and water resources (Quackenbush et al., 1957; Quackenbush and Thorne, 1957).

II. DROUGHT CRITERIA

Procedures have been developed for evaluation of recurrence probabilities of drouths and water excesses (Van Bavel, 1953). The amount of water that the soil can store in a form available to plants is treated as a bank account, rainfall as input, and evapotranspiration as withdrawal. When more rain falls than the soil can store, it is treated as excess, and when evapotranspiration exceeds rainfall for sufficient time to exhaust soil water, it is treated as a deficit or drouth. Such studies in Eastern USA have shown that water excesses occur with sufficient frequency to make drainage absolutely essential and that drouths of sufficient duration to reduce crop yields are likely to occur every year (Van Bavel, 1959; Blake et al., 1960; Palmer, 1958). Crop yields are reduced by these drouths; yet, a prominent role for irrigation is not assured. In some cases, limitations on use of irrigation result from inadequate water supplies; in other cases, costs of irrigation exceed economic benefits.