682.1 IRRIGATION AND CROP PRODUCTION.

When crop stress from moisture shortage is eliminated by proper and timely irrigation, other factors become inhibitors to production. These factors include poor soil structure and tilth, low fertility, poor stands, weeds, insects, and diseases. Much of the water applied through irrigation may be wasted unless sound farming practices are followed.

Soil structure and tilth must be favorable in order to have good aeration, good initial water intake, and good soil permeability. Good soil tilth prevents runoff and water waste. Tilth and structure can be maintained or improved by avoiding cultivation of wet fields, addition of manure or plowing under green manure crops, using grass and legumes in rotation, and conservation systems.

Low fertility or an imbalance of nutrients are often the limiting factors on irrigated land. The well-fed plant uses water much more efficiently than a plant that is starved or lacking in some nutrient elements. Total water use by a healthy, well-fed plant is greater than for a plant deprived of plant food; and the production per unit of water is much greater for the well-fed plant. Fertility problems should be corrected by the application of barnyard manure and commercial fertilizer. Soil tests, observations, and field experiences help determine the type and amount of fertilizers to use. Crop quality may be more important than crop production. Quality can be greatly improved by **proper** fertility.

Adequate moisture and fertility and good soil physical conditions will not insure high production unless the irrigation farmer controls pests, uses high quality seed of adapted varieties, and uses timely operations. Weeds, insects, and diseases may be a greater problem on irrigated than on dryland. Crops and varieties should be selected to fit the soil and irrigation system. Plant population should be increased in most cases to take advantage of water added by irrigation.

682.2 PLANTS.

To design an efficient irrigation system, the designer must know the rooting characteristics of plants and how plants use moisture. Since a continuous supply of available moisture is necessary for good plant growth, the irrigation system for any given crop must be designed to supply the right amount of water during that crop's peak-use period. To determine the amount of soil moisture available to that crop, it is necessary to know from what depth of soil the plants get their moisture, or their moisture-extraction pattern, and how fast they use moisture.

The size of the soil reservoir that holds water available to a plant is determined mostly by that plant's rooting characteristics. The distribution of its roots determines its moisture-extraction pattern. See figures 682-1 to 8 for sketches of plant roots growing in soils without tight layers, dry layers, or high water tables.