CROP CHARACTERISTICS

INTRODUCTION

Information concerning crop, soil, and irrigation system characteristics are used to determine when to apply water to a field--and how much to apply. Crop characteristics that affect the scheduling of irrigations to maintain optimum yields are rooting depth, critical growth stage, rate of development, and the amount of water that can be withdrawn from the soil profile without affecting production. Additional information is available from NRCS on this topic in (PDF format 321K) the National Engineering Handbook, part 652.

- Root Zone Development
- Allowable Depletion

ROOT ZONE DEVELOPMENT

The depth of the crop root zone determines the volume of soil from which the crop can draw water. Perennial crops, such as almonds or grapes have root zones which increase in depth over a number of years and them become more or less fixed in depth when the trees or vines mature. Cotton and safflower are crops that have deep roots which expand downward throughout much of the growing season. Lettuce and onions have roots which grow densely in the top 1 to 1.5 feet of the soil profile.

The moisture in the upper portions of the rootzone will be depleted at a faster rate than the moisture in the lower portion of the root zone because the roots are more dense in the upper portion.

The soil type and structure play a large role in determining the maximum depth of the rootzone. Course and medium textured soils usually allow deeper root zone development than fine textured soils. The depth of a crop root zone can be estimated for a type of soil, but compacted layers or shallow water tables will limit the expansion of the root zone. The location of these restricted zones must be known to establish the depth of soil from which the crops can withdraw water.

The depth of the root zone can be established by using a soil probe. The soil samples removed from various depths of the soil profile can be examined for roots and compared. It is difficult to see roots in a sample of course textured soil. However, the depth of the root zone can be determined by locating the change in soil moisture because the soil is drier where the roots are removing water.

ALLOWABLE DEPLETION

The portion of available moisture which the crop can use without reducing yields is the major factor to be considered when the allowable depletion is determined.

The allowable depletion is a management decision which should consider the crop root zone, root density, growth stage, weather conditions, soil texture , irrigation system capacities, and cultural practices.

Root density and depth changes as the crop develops. Crops such as lettuce and onions have shallow dense root systems and low allowable depletion percentages which require frequent irrigations with small amounts of water. Cotton, alfalfa, and tree crops require less frequent irrigations because that have a deeper rootzone and higher allowable depletions percentages.

An irrigation may be required when the allowable depletion reaches 30 percent for shallow rooted, cool season crops. The allowable depletion can be as high as 90 percent for deep rooted crops near harvest, but 50 percent is generally a parctical figure for most crops. The allowable depletion varies for different crops at different times during the growing season. The table below shows suggested allowable depletion percentages for selected crops grown in Westlands.

Suggested Range of Allowable Depletions for Selected Crops		
Crop	Seasonal Allowable Depletion (%)	Harvest Allowable Depletion (%)
Alfalfa Hay	*	*
Alfalfa Seed	50	90
Almonds	*	*
Barley	*	*
Beans (Dry)	50-60	80
Cantaloupes	*	*
Corn (Field)	50-60	75
Cotton	*	*
Garlic	30-40	70
Grapes	50	80
Lettuce	30-40	--
Onions	20-30	70
Safflower	*	*
Milo	50-60	80
Sugar Beets	*	*
Tomato	*	*
Wheat	*	*
* See Individual Crop Data Sheets		

CROP DATA SHEETS

Specific water management information for various crops grown in the District has been assembled for the crops listed below.

- Alfalfa Hay
- Almonds
- Barley
- Cotton
- Melon
- Safflower
- Sugarbeets
- Tomato
- Wheat

Other crop specific water management information for crops not listed above is also available.

The growth stage of a crop must also be considered when determining the allowable depletion. The soil moisture must be closely monitored during the stress sensitive growth stages of a crop, which usually correspond to the flowering and/or fruiting periods. Serious yield reductions may occur if the recommended allowable depletion during these critical periods is exceeded. Also, the allowable depletion at the end of the growing season may be greater than the early portion of the season for most crops.

Weather conditions must be considered when determining allowable depletion. The allowable depletion can be greater during periods of low evaporative demand (cool

temperatures and/or fog) than during periods of high evaporative demand (hot temperatures and/or winds).

Soil texture is another consideration when determining allowable depletion. Generally the available moisture in coarse textured soils can be depleted to a greater percentage than the available moisture in fine textured soils. However, since there is more available moisture in fine textured soils, the allowable depletion measured in inches of water can be greater than in coarse textured soils. Crops grown on soil with a high salt content require a lower allowable depletion percentage because the salts restrict the water uptake by the roots.

Allowable depletion is expressed as a percentage of available moisture allowed to be removed from the root zone by the crop. The amount of water required to refill the current crop root zone or soil profile is expressed in inches of water and can be calculated as shown in the following example:

Known: Allowable Depletion=40%Current Root Zone = 4 ft. Allowable Moisture = 1.0 in./ft.

Solution: $\frac{40\%}{100} \times 4 \text{ ft.} \times \frac{1.0 \text{ in.}}{\text{ft.}} = 1.6 \text{ in./ft.}$

The allowable depletion in inches of water is the amount of water that must be replaced to return the active rootzone to field capacity.