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Irrigation Scheduling with the Feel Method

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Monitoring soil moisture is one of the most important management procedures available for irrigation management. Estimating soil moisture using the feel method is one of the easiest methods available for monitoring soil moisture, and can be used to determine the proper frequency of irrigations. Proper irrigation depth can be determined from known plant and soil characteristics. Determining when to irrigate and how much water to apply with each application are the goals of the management practice termed irrigation scheduling.

Soil Water-Holding Capacity and Available Water

Soil in the plant root zone acts as a reservoir for water. Soil texture is the primary factor influencing the amount of water that the soil reservoir can store. Available water is defined as amount of water that plants are able to withdraw from the soil and use. Fine textured soils, such as clays, silt loams, or loams, are able to hold much more available water than sandy, coarse-textured

TABLE 1. Influence of Soil Texture on Available Water-Holding Capacity

Soil Texture	Available Water-Holding Capacity (inches of water per foot of soil)
Sand	0.25 - 1.00
Loamy sand	0.75 - 1.50
Sandy loam	1.25 - 1.75
Loam and Silt loam	2.00 - 2.75
Clay loam	1.75 - 2.50
Clay	1.50 - 2.25

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soils (see Table 1). Soil water-holding capacity is an important factor to consider in determining the proper irrigation depth.

The water storage capacity of soils is also influenced by soil depth. Nearly all vegetables and agronomic crops grown under irrigated conditions extract water from the top 2 feet of the soil profile, even though the roots of some crops can extend much deeper. In fact, in most crops, 75%-95% of the roots are in the top 12 inches of the soil profile. For this reason, manage irrigation events with the top 12 inches of the root zone in mind. Water which seeps beyond this depth may not be used by the crop. Together, soil water-holding capacity and plant rooting depth can be used to determine the appropriate irrigation depth.

The appropriate irrigation frequency is influenced by soil water-holding capacity and by the rate at which plants use water, and can be determined by monitoring soil moisture. The feel method is a simple and inexpensive procedure which can be used to monitor soil moisture.

Soil Sampling and Evaluation

Samples evaluated using the feel method can be extracted from the plant root zone using a soil probe, auger, or spade. Be certain to evaluate a number of samples from between 3 inches and 9 inches below the soil surface. This is likely to be the most active root zone. Test samples from various locations in the field where soil texture, plant size or vigor, or plant species are different. Sample a minimum of four sites from a single management zone.

Remove a small handful of soil from your sampling tool and squeeze the soil firmly. Open your hand and observe the condition of the soil. For fine- or medium-textured soils, try to ribbon the soil by working it between your thumb and forefinger. Use Table 2 to estimate the amount of available moisture remaining in the soil. Field capacity is the moisture content at which a soil is holding the maximum amount of water it can against the force of gravity. Wilt point is the moisture content at which plants wilt and are adversely affected by moisture stress. The water that a soil releases to plants between field capacity and wilt point is termed available water. Irrigate when 50% of available water has been depleted. Allowing the soil to dry below this moisture level may jeopardize obtaining maximum yields.

Learning to accurately predict soil moisture with the feel method requires practice. To learn the feel of your soil at particular moisture contents, start early in the spring when soils are wet, or start a day or two after a saturating rain or irrigation. Soil sampled under these conditions will be at or near field capacity. Likewise, sample soil in which plants are growing that are beginning to wilt. Soil at this moisture content is at the wilt point. Knowing the feel of soil at these endpoints will help you estimate soil moisture at points between these moisture contents.

As an example of how to schedule irrigations using the feel method, assume tomatoes are being grown on soils of fine sand texture, and that the plants have a 1-foot root zone depth. Use Table 1 to determine that these soils have an available water-holding capacity of 1 inch per foot of soil depth. After using the feel method and estimating that available soil moisture in the crop root zone is at 50% and that irrigation is required, determine the appropriate irrigation depth by multiplying the root zone depth by the available water-holding capacity of the soil and by the percent available water depletion. In this case:

$$\text{Irrigation depth} = \text{1-ft root zone depth} \times \frac{\text{1 in. available water}}{\text{foot of soil}} \times 50\% = \text{½ inch}$$

TABLE 2. Irrigation Guidelines for Using the Feel Method

Available Soil Moisture Depletion	Soil Textures		
	Sand, Loamy sand	Sandy loam, Loam, Silt loam	Clay loam, loam
0% (Field Capacity)	forms ball, wet outline of ball is left on hand, will not ribbon	forms ball, wet outline of ball is left on hand, ribbons easily	forms ball, wet outline of ball is left on hand, ribbons easily
50% (Irrigation Range)	forms weak ball, breaks easily when bounced in hand, will not ribbon	forms ball, will ribbon with some difficulty	forms ball, will easily ribbon
100% (Wilt Point)	will not form ball, crumbles into small aggregates	crumbly, but will hold together under pressure, will not ribbon	somewhat pliable, holds together under pressure

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