1984

G84-690 Estimating Soil Moisture by Appearance and Feel

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G84-690-A

Estimating Soil Moisture by Appearance and Feel

This NebGuide provides a guide to determining how much mositure is in different soil textures, and where it is located in the soil profile.

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- Sampling and Evaluation Procedures
- Photo Guides and Descriptions for Judging Soil Moisture Levels
- Calculating Soil Moisture Status

Evaluating soil moisture is one of an irrigator's most important management tools. Determining the status of the soil moisture reservoir guides the decision of not only how much to irrigate, but also when to irrigate. The "appearance and feel" method of monitoring soil moisture using a soil probe is still a valid procedure no matter how sophisticated the irrigation scheduling system. A measurement of soil moisture is essential to update knowledge of the need for and timing of irrigation, and the "appearance and feel" method can be used to obtain that information.

In addition to indicating how much moisture is in the soil, this method also reveals where that moisture is located in the profile. This information is important to the irrigator as well as the dryland farmer. The depth of water penetration from irrigation or rainfall is useful in planning and making management decisions. For example, problem areas with compacted soil layers that restrict water penetration may be detected with the soil probe.

Table I. Available water capacity for soils.

Soil texture	*Available water* *inches/foot*
Fine sand *or* loamy sand	1.0 to 1.1
Sandy loam	1.4
Loam *or* silt loam	2.0 to 2.5
Silty clay *or* clay loam	1.8

Soil texture, the relative amounts of sand, silt or clay contained in a soil, is an indicator of the amount of water a soil will hold. Available water capacity is the maximum amount of moisture the soil will hold that plants can use. The values of available water for four basic textural classes are given in *Table I.*

The textural classification of a soil is important not only for knowing how much water potentially can be held for crop use, but also for visual inspection. Different soil types respond differently to the methods described in this NebGuide, which is one of the keys to making the soil moisture determination. The county soil survey, which can be obtained through your Cooperative Extension Service office or the Soil Conservation Service, includes discussions on soil texture and available water capacity of your soils.

Sampling and Evaluation Procedures

A soil probe, soil auger, or spade can be used to extract a soil sample. Evaluate the soil moisture at one foot intervals from the surface to the bottom of the active root zone. The active root zone for most irrigated crops is approximately 3 feet deep. When checking for water penetration or soil moisture for dryland crops, probe to the depth of 4 to 5 feet.

To begin learning the appearance and feel of your soil at particular moisture contents, start early in the spring one or two days after a heavy rain. At this point the soil moisture level should be near field capacity, or holding 100 percent of the water that it can naturally retain. Likewise, probe the soil at the end of the growing season when the profile is likely to be dry. Knowing the appearance and feel of your soil at the wet and dry ends of the spectrum will help make determinations during the midseason. Use the photos and description in the following section when assessing soil moisture. The number and location of sampling sites depends on both the uniformity of the soils in the field and the irrigation procedures. Check problem areas in the field in addition to the starting and stopping areas of your particular irrigation system. Sample a minimum of four sites in different parts of the field.

Guides for Estimating Soil Moisture

When using a soil probe to extract the samples, the following procedures will make the job easier.

a. Scrape a clean, level area on the soil surface before inserting the probe.
b. Insert the probe to the desired depth (at one foot increments) and turn the probe once clockwise before pulling it back to the surface.
c. After inspecting the soil, remove all of the soil from the tube, including the tip. A fitted dowel may help. Soil left in the tip may tend to compact the next sample.
d. Clean the probe after each use to prevent rust and hard caked soil.
e. Replace or sharpen the tip as needed.

Procedure for evaluating soil moisture using photo guides and descriptions:

1. Determine texture of soil.
2. Squeeze small handful of soil firmly.
3. Observe the condition of the ball and your hand.
4. Attempt to form a ribbon of the soil between your thumb and forefinger.
5. Observe what happens.
6. Compare your observations with the photos and descriptions in the guides.

Photos guides and soil moisture descriptions for four soil types are provided. (Courtesy of *Estimating Soil Moisture by Feel and Appearance*, USDA Natural Resources Conservation Service.)

Fine sand and loamy fine sand soils

Percent available: Currently available soil moisture as a percent of available water capacity.

Available Soil Moisture Remaining	Appearance of soil
0-25 percent available	Dry, loose, will hold together if not disturbed, loose sand grains on fingers with applied pressure.
25-50 percent available	 Slightly moist, forms a very weak ball with well defined finger marks, light coating of loose and aggregated sand grains remains on fingers.
50-75 percent available	 Moist, forms a weak ball with loose and aggregated sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon.
75-100 percent available	Wet, forms a weak ball, loose and aggregated sand grains remain on fingers, darkened color, heavy water staining on fingers, will not ribbon.
100 percent available	Wet, forms a weak ball, moderate to heavy soil/water coating on fingers,wet outline of soft ball remains on hand.

Courtesy of the United States Department of Agriculture, Natural Resource Conservation Service,
Estimating Soil Moisture by Feel and Appearance (Program Aid 1619)

Sandy loam and fine sandy loam soils

Percent available: Currently available soil moisture as a percent of available water capacity.

Available Soil Moisture Remaining	Appearance of soil
0-25 percent available	Dry, forms a very weak ball, aggregated soil grains break away easily from ball.
25-50 percent available	 Slightly moist, forms a weak ball with defined finger marks, darkened color, no water staining on fingers, grains break away.
50-75 percent available	 Moist, forms a ball with defined finger marks, very light soil/water staining on fingers, darkened color will not stick.
75-100 percent available	 Wet, forms a ball with wet outline left on hand, light to medium staining on fingers, makes a weak ribbon between the thumb and forefinger.
	Wet, forms a soft ball, free water appears briefly on

100 percent available	soil surface after squeezing or shaking, medium to heavy soil/water coating on fingers.

Courtesy of the United States Department of Agriculture, Natural Resource Conservation Service, *Estimating Soil Moisture by Feel and Appearance* (Program Aid 1619)

Sandy clay loam, loam, and silt loam soils

Percent available: Currently available soil moisture as a percent of available water capacity.

Available Soil Moisture Remaining	Appearance of soil
0-25 percent available	Dry, soil aggregations break away easily, no staining on fingers, clods crumble with applied pressure.
25-50 percent available	 Slightly moist, forms a weak ball with rough surfaces, no water staining on fingers, few aggregated soil grains break away.
50-75 percent available	 Moist, forms a ball, very light staining on fingers, darkened color, pliable, forms a weak ribbon between the thumb and forefinger.

75-100 percent available	 Wet, forms a ball with well-defined finger marks, light to heavy soil/water coating on fingers, ribbons between thumb and forefinger.
100 percent available	Wet, forms a soft ball, free water appears briefly on soil surface after squeezing or shaking, medium to heavy soil/water coating on fingers.

Courtesy of the United States Department of Agriculture, Natural Resource Conservation Service,
Estimating Soil Moisture by Feel and Appearance (Program Aid 1619)

Clay, clay loam, and silty clay loam soils

Percent available: Currently available soil moisture as a percent of available water capacity.

Available Soil Moisture Remaining	Appearance of soil
0-25 percent available	Dry, soil aggregations separate easily, clods are hard to crumble with applied pressure.
25-50 percent available	 Slightly moist, forms a weak ball, very few soil aggregations break away, no water stains, clods flatten with applied pressure.

50-75 percent available	 Moist, forms a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.
75-100 percent available	 Wet, forms a ball, uneven medium to heavy soil/water coating on fingers, ribbons easily between thumb and forefinger.
100 percent available	Wet, forms a soft ball, free water appears on soil surface after squeezing or shaking, thick soil/water coating on fingers, slick and sticky.

Courtesy of the United States Department of Agriculture, Natural Resource Conservation Service,
Estimating Soil Moisture by Feel and Appearance (Program Aid 1619)

Calculating Soil Moisture Status

After estimating the soil moisture, the amount of water in the soil reservoir can be calculated using *Table I.* The following example illustrates the calculation:

1. Soil: Silt loam (from soil survey classification).
2. Available moisture at field capacity = 2.4 inches/foot.
3. Current soil moisture status = 50% available soil moisture remaining (from appearance and feel method evaluation).
4. Amount of soil in sample = 1 foot.
5. Available moisture remaining in sample = (50) x (2.4 inches/foot) x (1 foot) = 1.2 inches.

Complete this calculation for each sample extracted. The total of the moisture remaining for all samples is the water still available in the sampled profile.

For more information on using this remaining available moisture for scheduling irrigations, refer to Extension Circulars EC 79-723 *(Irrigation Scheduling Using Soil Moisture Blocks in Deep Soil)* or EC 80-724 *(Irrigation Scheduling Using Tensiometers and Evapotranspiration on Deep Sandy Soils)*. Both are available from your local Cooperative Extension Office, or by order.

File G690 under: IRRIGATION ENGINEERING
B-12, Irrigation Operations & Management, 12,000 printed
Issued February 1984

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Elbert C. Dickey, Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.