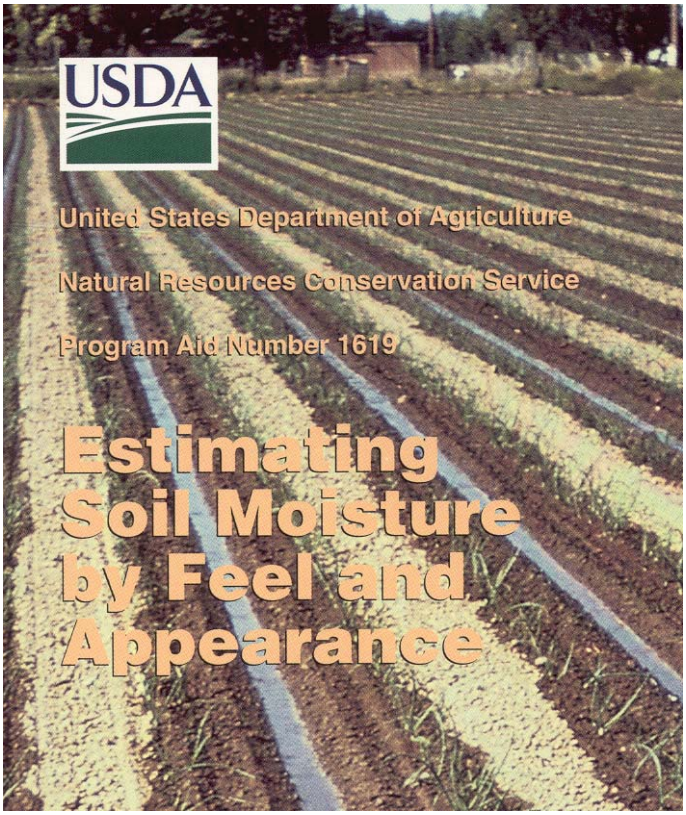
Estimating Soil Moisture by Feel and Appearance

Irrigation Water Management (IWM) is applying water according to crop needs in an amount that can be stored in the plant root zone of the soil.



The "feel and appearance method" is one of several irrigation scheduling methods used in IWM. It is a way of monitoring soil moisture to determine when to irrigate and how much water to apply. Applying too much water causes excessive runoff and/or deep percolation. As a result, valuable water is lost along with nutrients and chemicals, which may leach into the ground water.

The feel and appearance of soil vary with texture and moisture content. Soil moisture conditions can be estimated, with experience, to an accuracy of about 5 percent. Soil moisture is typically sampled in I-foot increments to the root depth of the crop at three or more sites per field. It is best to vary the number of sample sites and depths according to crop, field size, soil texture, and soil stratification. For each sample the "feel and appearance method" involves:

1. Obtaining a soil sample at the selected depth using a probe, auger, or shovel;
2. Squeezing the soil sample firmly in your hand several times to form an irregularly shaped "ball";
3. Squeezing the soil sample out of your hand between thumb and forefinger to form a ribbon;
4. Observing soil texture, ability to ribbon, firmness and surface roughness of ball, water glistening, loose soil particles, soil/water staining on fingers, and soil color. [Note: A very weak ball will disintegrate with one bounce of the hand. A weak ball disintegrates with two to three bounces;
5. Comparing observations with photographs and/or charts to estimate percent water available and the inches depleted below field capacity.

Example:

Sample Depth	Zone	USDA Texture	AWC*for Zone	Soil Moisture Delpetion**	Percent Depletion
6”	0-12"	sandy loam	1.4"	1.0"	70
18"	12-24"	sandy loam	1.4"	.8"	55
30"	24-36"	loam	2.0"	.8"	40
42"	36-48"	loam	2.0"	.5"	25
			6.8"	3.1"	

Result: A 3.1" net irrigation will refill the root zone.
** Available Water Capacity*
*** Determined by “feel and appearance method”*

Available Water Capacity (AWC) is the portion of water in a soil that can be readily absorbed by plant roots of most crops.

Soil Moisture Deficit (SMD) or Depletion is the amount of water required to raise the soil-water content of the crop root zone to field capacity.

Appearance of fine sand and loamy fine sand soils at various soil moisture conditions.

Available Water Capacity 0.6-1.2 inches/foot

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

In/ft. Depleted: Inches of water currently needed to refill a foot of soil to field capacity.

0-25 percent available
1.2-0.5 in./ft. depleted

Dry, loose, will hold together if not disturbed, loose sand grains on fingers with applied pressure. (Not pictured)

25-50 percent available
0.9-0.3 in./ft. depleted

Slightly moist, forms a very weak ball with well-defined finger mark

50-75 percent available
0.6-0.2 in./ft. depleted

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
0.3-0.0 in./ft. depleted

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
0.0 in./ft. depleted (field capacity)

Wet, forms a weak ball, moderate to heavy soil/water coating on fingers, wet outline of soft ball remains on hand. (Not pictured)

Appearance of sandy loam and fine sandy loam soils at various soil moisture conditions.

Available WaterCapacity 1.3-1.7 inches/foot

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

In/ft. Depleted: Inches of water currently needed to refill a foot of soil to field capacity.

0-25 percent available 1 7-1.0 in/ft. depleted

Dry, forms a very weak ball, aggregated soil grains break away easily from ball. (Not pictured)

25-50 percent available 1.3-0.7 in/ft. depleted

Slightly moist, forms a weak ball with defined finger marks, darkened color, no water staining on fingers, grains break away.

50-75 percent available 0.9-0.3 in./ft. depleted

Moist, forms a ball with defined finger marks, very light soil/water staining on fmgers, darkened color, will not slick.

75-100 percent available 0.4-0.0 in./ft. depleted

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.

100 percent available 0.0 in./ft. depleted (field capacity)

Wet, forms a soft ball, free water appears briefly on soil surface after squeezing or shaking, medium to heavy soil/water coating on fingers. (Not pictured)

Appearance of sandy clay loam, loam, and silt loam soils at various soil moisture conditions.

Available WaterCapacity 1.5-2.1 inches/foot

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

In/ft. Depleted: Inches of water currently needed to refill a foot of soil to field capacity.

0-25 percent available
2.1-1.1 in./ft. depleted

Dry, soil aggregations break away easily, no staining on fingers, clods crumble with applied pressure. (Not pictured)

25-50 percent available
1.6-0.8 in./ft. depleted

Slightly moist, forms a weak ball with rough surfaces, no water staining on fingers, few aggregated soil grains break away.

50-75 percent available
1.1-0.4 in./ft. depleted

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
0.5-0.0 in/ft. depleted

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
0.0 in/ft. depleted (field capacity)

Wet, forms a soft ball, free water appears briefly on soil surface after squeezing or shaking, medium to heavy soil/water coating on fingers. (Not pictured)

Appearance of clay, clay loam, and silt clay loam soils at various soil moisture conditions.

Available WaterCapacity 1.6-2.4 inches/foot

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

In/ft. Depleted: Inches of water currently needed to refill a foot of soil to field capacity.

0-25 percent available
2.4-1.2 in/ft. depleted

Dry, soil aggregations separate easily, clods are hard to crumble with applied pressure. (Not pictured)

25-50 percent available
1.8-0.8 in/ft. depleted

Slightly moist, forms a weak ball, very few soil aggregations break away, no water stains, clods flatten with applied pressure.

50 - 75 percent available
1.2-0.4 in./ft. depleted

Moist, forms a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger.

75-100 percent available
0.6-0.0 in./ft. depleted

Wet, forms a ball, uneven medium to heavy soil/water coating on fingers, ribbons easily between thumb and forefinger.

100 percent available
0.0 in./ft. depleted (field capacity)

Wet, forms a soft ball, free water appears on soil surface after squeezing or shaking, thick soil/water coating on fingers, slick and sticky. (Not pictured)

Guidelines for Estimating Soil Moisture Conditions

	Coarse Texture- Fine Sand and Loamy Fine Sand	Moderately Coarse Texture Sandy Loam and Fine Sandy Loam	Medium Texture - Sandy Clay Loam, Loam, and Silt Loam	Fine Texture- Clay, Clay Loam, or Silty Clay Loam
	Available Water Capacity (Inches/Foot)			
	0.6-1.2	1.3-1.7	1.5-2.1	1.6-2.4
Available Soil Moisturre Percent	Soil Moisture Deficit (SMD) in inches per foot when the feel and appearance of the soil are as described.			
0-25	Dry, loose, will hold together if not disturbed, loose sand grains on fingers with applied pressure. SMD 1.2-0.5	Dry, forms a very weak ball, aggregated soil grains break away easily from ball. SMD 1.7 -1.0	Dry. Soil aggregations break away easily. no moisture staining on fingers, clods crumble with applied pressure. SMD 2.1-1.1	Dry, soil aggregations easily separate, clods are hard to crumble with applied pressure SMD 2.4-1.2
25-50	Slightly moist, forms a very weak ball with well-defined finger marks, light coating of loose and aggregated sand grains remain on fingers. SMD O.9-0.3	Slightly moist, forms a weak ball with defined finger marks, darkened color, no water staining on fingers, grains break away. SMD 1.3-0.7	Slightly moist, forms a weak ball with rough surfaces, no water staining on fingers, few aggregated soil grains break away. SMD1.6-0.8	Slightly moist, forms a weak ball, very few soil aggregations break away, no water stains, clods flatten with applied pressure SMD 1.8-0.8
50-75	Moist, forms a weak ball with loose and aggregated sand grains on fingers, darkened color, moderate water staining on fingers, will not ribbon. SMD O.6-0.2	Moist, forms a ball with defined finger marks. very light soil/water staining on fingers. darkened color, will not slick. SMD O.9-0.3	Moist, forms a ball, very light water staining on fingers, darkened color, pliable, forms a weak ribbon between thumb and forefinger. SMD 1.1- 0.4	Moist. forms a smooth ball with defined finger marks, light soil/water staining on fingers, ribbons between thumb and forefinger. SMD I.2-0.4
75-100	Wet, forms a weak ball, loose and aggregated sand grains remain on fingers, darkened color, heavy water staining on fingers, will not ribbon. SMD O.3-0.0	Wet, forms a ball with wet outline left on hand, light to medium water staining on fingers, makes a weak ribbon between thumb and forefinger. SMD O.4-0.0	Wet, forms a ball with well defined finger marks, light to heavy soil/water coating on fingers, ribbons between , thumb and forefinger. SMD O.5 -0.0	Wet, forms a ball, uneven medium to heavy soil/water coating on fingers, ribbons easily between thumb and forefinger. SMD O.6-0.0
Field Capacity (100 %)	Wet, forms a weak ball, moderate to heavy soil/ water coating on fingers, wet outline of soft ball remains on hand. SMD 0.0	Wet, forms a soft ball, free water appears briefly on soil surface after squeezing or shaking,medium to heavy soil/water coating on fingers. SMD 0.0	Wet, forms a soft ball, free water appears briefly on soil surface after squeezing or shaking, medium to heavy soil/water coating on fingers. SMD 0.0	Wet, forms a soft ball, free water appears on soil surface after squeezing or shaking, thick soil/water coating on fingers, slick and sticky. SMD 0.0

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