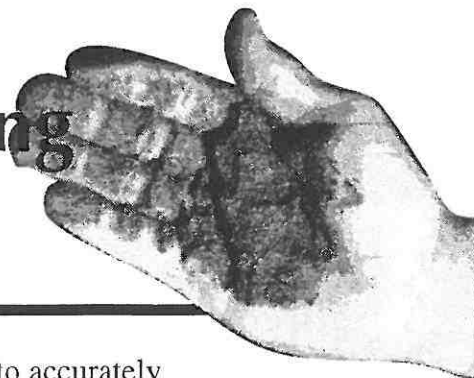


Simple irrigation scheduling

Using the “look and feel” method

F. Niederholzer and L. Long



Why schedule irrigation?

Accurate irrigation scheduling maximizes the benefits of irrigation while minimizing potential negative impacts of over-irrigation or under-irrigation.

Over-irrigation (too much water):

- Drowns roots, thus stressing plants
- Encourages root diseases
- Reduces nutrient uptake
- Cools soil, thus reducing root growth
- Leaches nutrients and pesticides from the root zone to groundwater
- Reduces crop quality
- Wastes money

Under-irrigation (too little water):

- Reduces crop yield
- Reduces crop quality (fruit and vegetable size)
- Reduces plant growth
- Weakens plants

Many people schedule irrigation by the calendar rather than by plant need. Calendar-based scheduling can be very inaccurate since plant water needs and the amount of soil water available to plants are affected by factors such as climate, plant size, soil type, and rooting depth.

The goal of accurate irrigation scheduling is to replace soil water lost by evaporation and plant use as precisely as possible. To accomplish this

goal, you need to accurately assess soil moisture content. Then you can determine the need for irrigation and how much water to deliver.

Irrigation scheduling can seem complicated. It doesn't have to be. Anyone can use a simple, effective method known as the “look and feel” (or “soil appearance and feel”) method to determine when to irrigate.

How does it work?

This method is based on three simple ideas:

- Soil is at “field capacity” when it is holding as much water as possible after the excess has drained away. (A wet sponge is at “field capacity” when it holds all the water it can without any dripping away.)
- It's best to irrigate when half of this water is depleted.
- Your goal when irrigating is to return the soil to field capacity.

So, all you need to know to schedule irrigation is:

- How much water will the soil hold within the plants' rooting zone when it's at field capacity?
- What does the soil look like when half of that water is gone?
- How much water should be applied to return the soil to field capacity?

Franz Niederholzer, Extension horticulture agent, Hood River County; and Lynn Long, Extension horticulture agent, Wasco County; Oregon State University. Photos are from Estimating Soil Moisture by Feel and Appearance, and are reproduced courtesy of USDA/NRCS. Special thanks to Mr. Diego León for his excellent work with English/Spanish translation.



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Instructions

► 1. Gather the information you need.

- Determine the rooting depth of the trees or plants to be irrigated based on site-specific considerations. Consult your OSU Extension agent if you have questions.
- Determine the soil water-holding capacity of the different soil horizons within this rooting depth. You can obtain this information from the OSU Extension Service or the Natural Resources Conservation Service (NRCS). The source usually is a table in the county soil survey. This table often is titled "Physical and Chemical Properties of Soils." Look in the Summary of Tables section to find the right table.

► 2. Estimate your soil's moisture content at field capacity.

- To determine how much water is in the rooting zone when the soil is at field capacity, multiply the rooting depth times the water-holding capacity. For example, if the rooting depth is 10 inches and the water-holding capacity is 0.2 inch of water per 1 inch of soil, then the rooting zone holds 2 inches of water at field capacity ($10" \times 0.2" = 2"$).

► 3. Evaluate soil moisture.

- Use a probe, auger, or shovel to take a soil sample from the rooting depth(s).

- Squeeze each sample until it forms a ball. Usually, gentle pressure is sufficient.
- Look carefully at the soil ball:
 - Are there loose sand grains or small clumps of soil?
 - Are there clay stains on your fingers? A little? A lot?
 - Does the ball hold together when bounced gently in your hand? (A very fragile ball breaks up with one bounce; a fragile ball breaks up with two or three bounces.)
- Using the field card that best matches the soil texture, compare the soil ball appearance with the photos to determine how much water is left in the soil. **If soil moisture is 50 percent depleted (a 2.5 rating on the field cards), it's time to irrigate.**

► 4. Apply the correct amount of irrigation water.

- Multiply the field capacity of the rooting depth (from Step 2) times the depletion level to find out how much irrigation water you need to apply to return the soil to field capacity. For example, if your field capacity is 2 inches, and the soil moisture is 50 percent depleted, then $2" \times 0.5 = 1"$.
- Apply only the amount of water needed to return the soil to field capacity. Consider the efficiency of your irrigation system when calculating how much water to apply. Check with your county OSU Extension agent for irrigation system efficiency estimates.

Example

You manage a mature apple orchard growing on a loam soil. The recommended sampling depth for mature fruit trees is 6–12 inches and 18–24 inches.

From your county soil survey, you find that the available water-holding capacity of your soil is 0.2 inch of water per 1 inch of soil. Thus, the top 24 inches of soil can hold 4.8 inches of water at field capacity ($24" \times 0.2" = 4.8"$).

You take soil samples from the 6–12 inch and 18–24 inch depths and rate the moisture content of the samples by comparing them to the loam/sandy loam field card. You determine that the soil has a moisture rating of 3 (50–75 percent plant-available

water) at the 6–12 inch depth and a moisture rating of 2 (25–50 percent plant-available water) at the 18–24 inch depth. You then average the ratings for the two depths and find that the average rating is 2.5, which means the plant-available water is 50 percent. In other words, the soil moisture is 50 percent depleted over the entire 0–24 inch depth. Thus, it's time to irrigate.

How much water should you apply? At 50 percent moisture depletion, the soil in the rooting depth can absorb and hold 2.4 inches of irrigation water ($4.8" \times 0.5 = 2.4"$). If you use a solid set sprinkler irrigation system (80 percent efficiency rating), then you'll need to apply 3 inches of water ($2.4" \div 0.8 = 3"$).

Arena fina y franco arena fina

Aparencia a diferentes niveles de humedad

Clasificación 1 (0–25% de humedad disponible)

La tierra está seca; se mantiene unida si no se molesta; granos de arena quedan en los dedos.

Clasificación 2 (25–50% de humedad disponible)



La tierra se encuentra ligeramente húmeda; forma una bola muy frágil; las impresiones de los dedos quedan bien marcadas en la bola de tierra; granos de arena individuales y agrupados se quedan en los dedos.

Clasificación 3 (50–75% de humedad disponible)



La tierra está húmeda; forma una bola frágil; granos de arena individuales y agrupados cubren los dedos; color oscuro; los dedos quedan ligeramente e irregularmente manchados.

Clasificación 4 (75–100% de humedad disponible)



La tierra está muy húmeda; se puede formar una bola frágil; granos de arena individuales y agrupados cubren los dedos, dejándolos muy manchados; color oscuro; no forma una tira (“gusano”) de tierra al enrollar tierra entre el pulgar y los dedos.

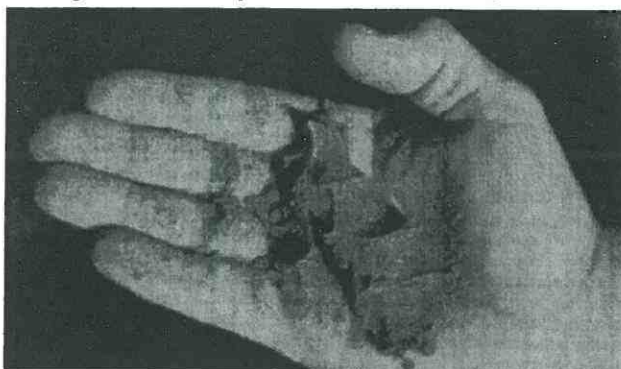
Fine sand and loamy fine sand

Soil appearance at several moisture contents

Rating 1 (0–25% plant-available water)

Soil is dry; holds together if not disturbed; loose sand grains on fingers.

Rating 2 (25–50% plant-available water)



Soil is slightly moist; forms a very fragile ball with strong finger marks; light coating of loose and clumped sand grains remains on fingers.

Rating 3 (50–75% plant-available water)



Soil is moist; forms a fragile ball with loose and clumped sand grains on fingers; darkened color; light, uneven staining on fingers.

Rating 4 (75–100% plant-available water)



Soil is wet; forms a fragile ball; loose and clumped sand grains remain on fingers; darkened color; heavy staining on fingers; will not form a ribbon (“worm”) when rolled between thumb and fingers.

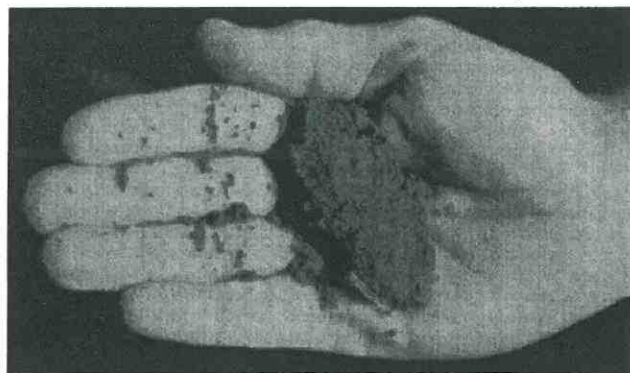
Suelo arena franco arcillosa y suelo franco

Aparencia a diferentes niveles de humedad

Clasificación 1 (0–25% de humedad disponible)

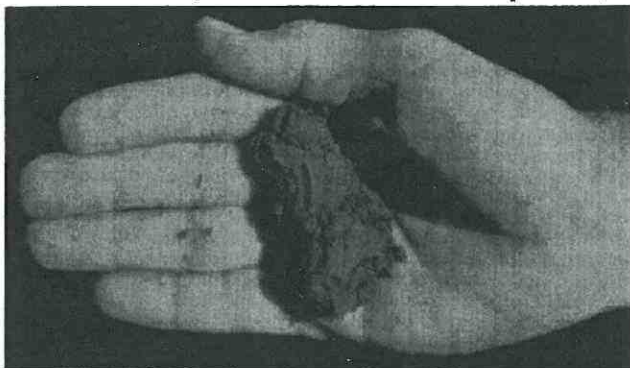
La tierra está seca; forma una bola muy frágil; no se pega la arcilla en los dedos; la bola se deshace con poca presión.

Clasificación 2 (25–50% de humedad disponible)



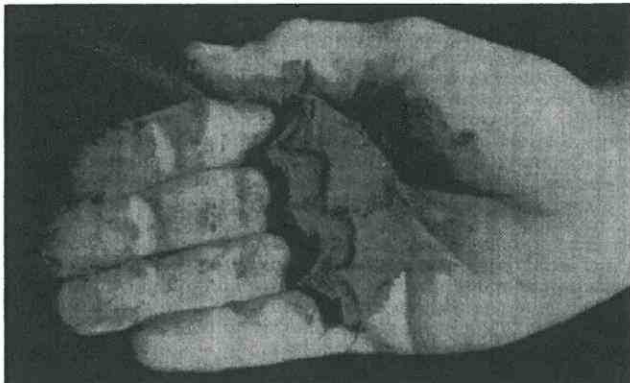
La tierra se encuentra ligeramente húmeda; forma una bola frágil de tierra; no se pega la arcilla en los dedos; algunos pedazos pequeños se caen de la bola de tierra.

Clasificación 3 (50–75% de humedad disponible)



La tierra está húmeda; forma una bola; la arcilla se pega en los dedos, manchándolos ligeramente; la bola de tierra es flexible y no se rompe muy fácil; los dedos quedan ligeramente marcados en la bola de tierra.

Clasificación 4 (75–100% de humedad disponible)



La tierra está muy húmeda; se puede hacer una bola de tierra flexible en la cual fácilmente se notan las marcas de los dedos.

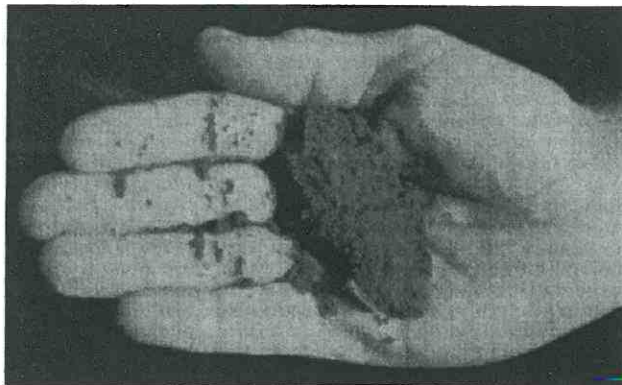
Sandy clay loam and loam

Soil appearance at several moisture contents

Rating 1 (0–25% plant-available water)

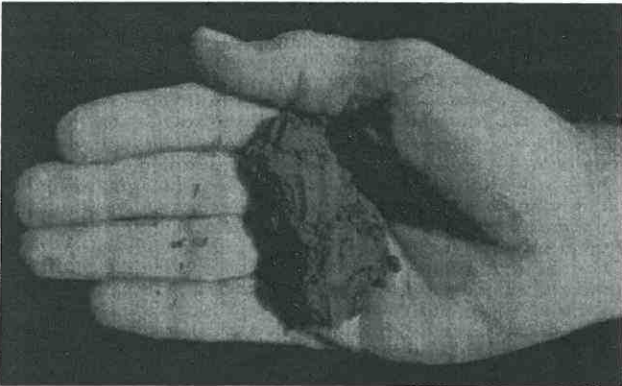
Soil is dry and forms a fragile ball; no clay stain on fingers; ball crumbles with pressure.

Rating 2 (25–50% plant-available water)



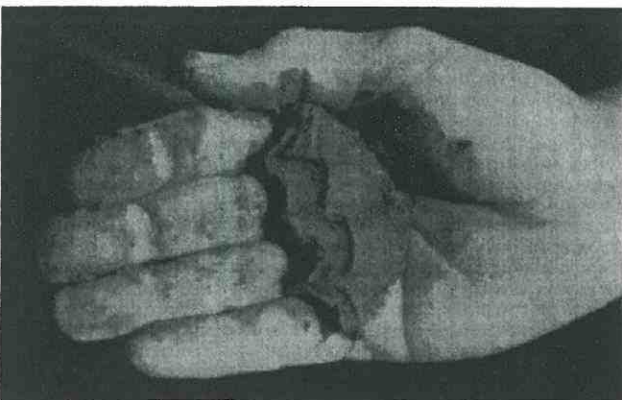
Soil is slightly moist; forms a fragile ball; no stain on fingers; few soil particles break off.

Rating 3 (50–75% plant-available water)



Soil is moist; forms a ball; light stain on fingers; darkened color; ball is pliable, does not break easily; soil forms a weak ribbon when rolled between thumb and fingers.

Rating 4 (75–100% plant-available water)



Soil is wet; forms a soft, pliable ball with easy-to-see finger marks; light to heavy stains on fingers; easily forms ribbon ("worm") when rolled between thumb and fingers.

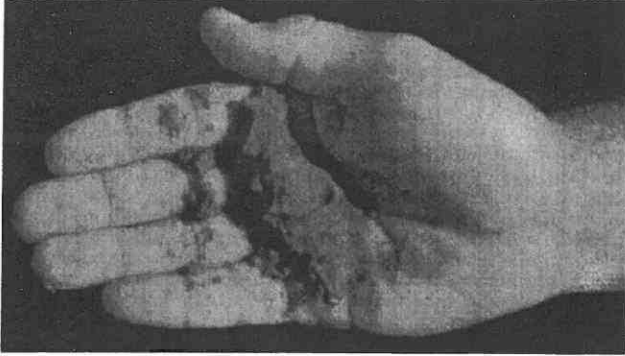
Suelo franco arenosa y franco arenosa fina

Aparencia a diferentes niveles de humedad

Clasificación 1 (0–25% de humedad disponible)

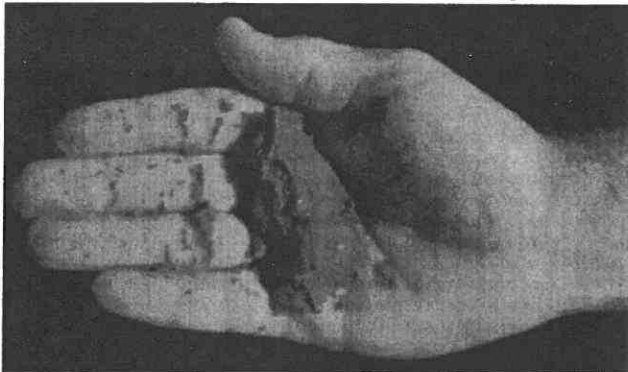
La tierra está seca; forma una bola muy frágil y fácilmente se separa en pedazos; la arcilla no mancha los dedos.

Clasificación 2 (25–50% de humedad disponible)



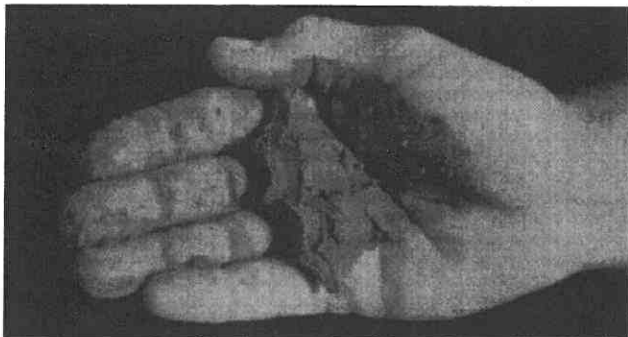
La tierra se encuentra ligeramente húmeda; forma una bola muy frágil con impresiones de los dedos; muy pocos pedazos se separan de la bola.

Clasificación 3 (50–75% de humedad disponible)



La tierra está húmeda; se puede formar una bola con fuertes impresiones de los dedos, los cuales son ligeramente manchados; color oscuro; se forma una tira de tierra al enrollar tierra entre el dedo índice y el pulgar.

Clasificación 4 (75–100% de humedad disponible)



La tierra está muy húmeda; se puede formar una bola de tierra suave y flexible, la cual mancha los dedos; las impresiones digitales son muy visibles; se forma una tira de tierra (“gusano”) al enrollar tierra entre el dedo índice y el pulgar; la arcilla se pega en los dedos.

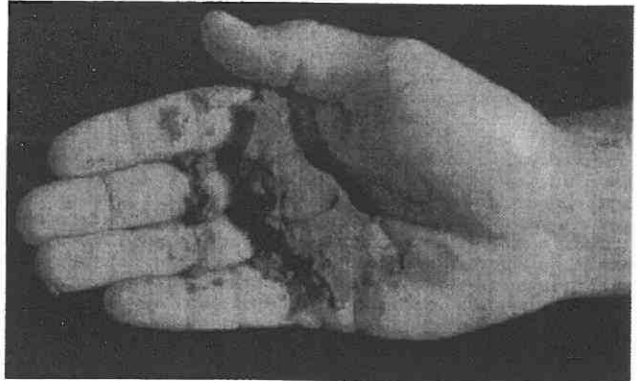
Sandy loam and fine sandy loam

Soil appearance at several moisture contents

Rating 1 (0–25% plant-available water)

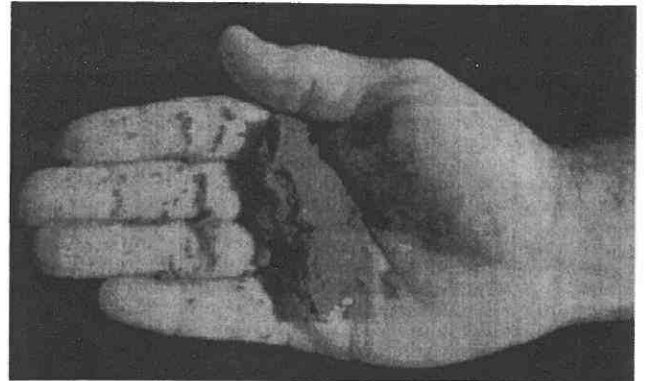
Soil is dry and forms a fragile ball; no clay stain on fingers; soil particles easily break off ball.

Rating 2 (25–50% plant-available water)



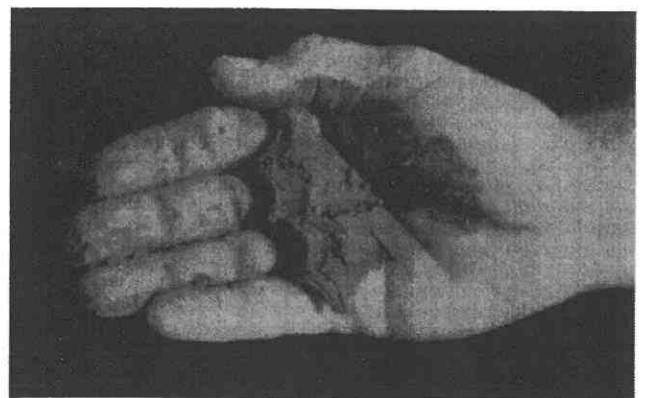
Soil is slightly moist; forms a fragile ball with distinct finger marks; few soil particles break off.

Rating 3 (50–75% plant-available water)



Soil is moist; forms a smooth ball with strong finger marks; light stain on fingers; darkened color; a soil ribbon (“worm”) can be made with thumb and fingers.

Rating 4 (75–100% plant-available water)



Soil is wet; forms a soft, pliable ball with easy-to-see finger marks; medium to heavy stains on fingers; soil easily forms ribbon (“worm”) when rolled between thumb and fingers.

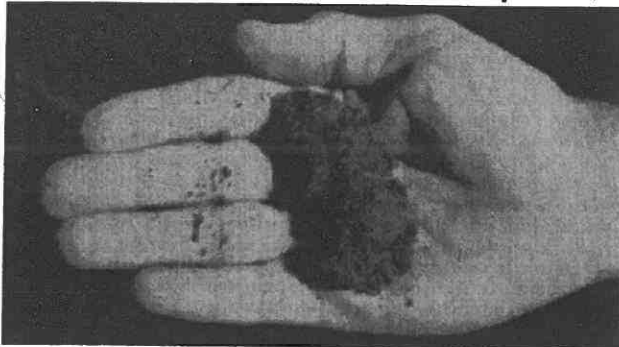
Suelo arcilloso, franco arcilloso, y franco arcilloso limoso

Aparencia a diferentes niveles de humedad

Clasificación 1 (0–25% de humedad disponible)

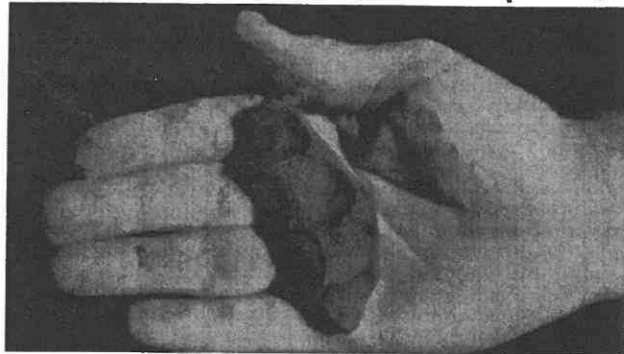
La tierra está seca; los pedazos se separan fácilmente; los terrones no se rompen fácilmente.

Clasificación 2 (25–50% de humedad disponible)



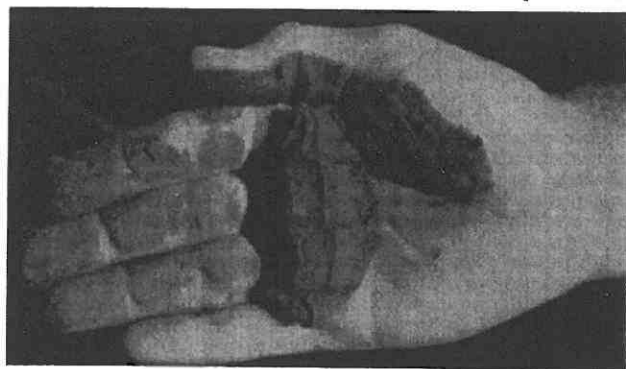
La tierra se encuentra ligeramente húmeda; forma una bola frágil; pocos pedazos se separan de la bola; no se pega en los dedos; los terrones se aplastan con presión.

Clasificación 3 (50–75% de humedad disponible)



La tierra está húmeda; forma una bola flexible en la cual se notan las impresiones de los dedos; se manchan los dedos ligeramente; se forma una tira de suelo (“gusano”) al enrollar tierra entre el dedo índice y el pulgar.

Clasificación 4 (75–100% de humedad disponible)



La tierra está muy húmeda; se puede hacer una bola; tierra y agua cubren irregularmente los dedos; fácilmente se forma una tira de suelo (“gusano”) al enrollar tierra entre el dedo índice y el pulgar.

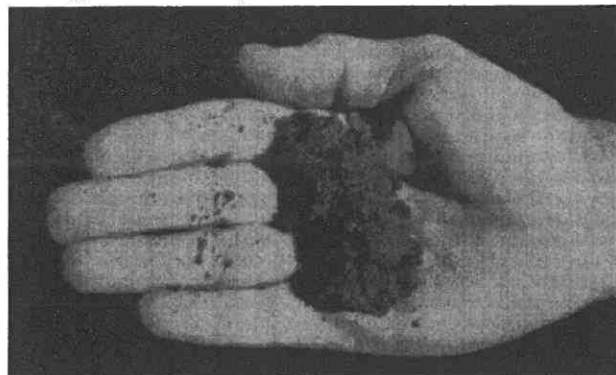
Clay, clay loam, and silty clay loam

Soil appearance at several moisture contents

Rating 1 (0–25% plant-available water)

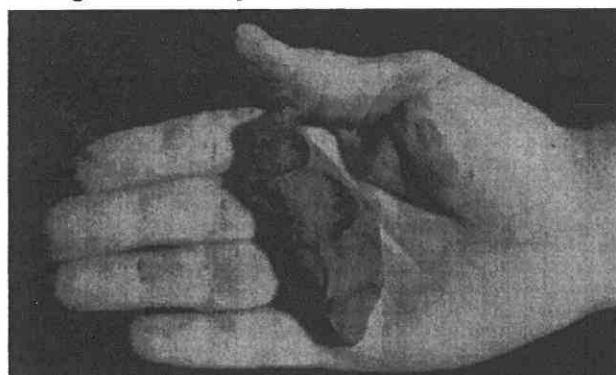
Soil is dry; soil particles separate easily; clods are hard to crumble with applied pressure.

Rating 2 (25–50% plant-available water)



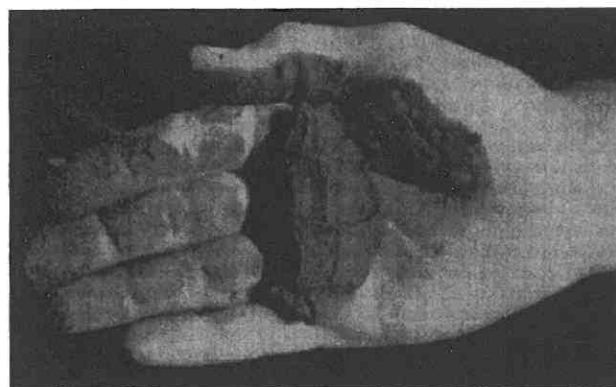
Soil is slightly moist; forms a fragile ball; very few soil particles break away; no stains; clods flatten with applied pressure.

Rating 3 (50–75% plant-available water)



Soil is moist; forms a smooth ball with distinct finger marks; light staining on fingers; forms a soil ribbon (“worm”) when rolled between thumb and fingers.

Rating 4 (75–100% plant-available water)



Soil is wet; forms a ball; uneven medium to heavy soil/water coating on fingers; soil easily forms ribbon (“worm”) when rolled between thumb and fingers.