Measurement of Soil Moisture by Direct Methods

Dr. Vikas Gupta, College of Horticulture, Rehli

The soil moisture is determined by two methods (1) direct and (2) indirect methods.

Gravimetric Methods: In this method soil moisture is determined directly. It involves removing water from a soil sample by evaporation, leaching or chemical reaction. Soil moisture content is calculated from the mass of water removed and the mass of dry soil. They are simple and inexpensive, hence widely used.

1. **Oven Drying:**

   This is a standard method to which all other methods are referred. Soil samples are collected from the desired depth with an auger. They are placed in aluminium boxes and weighed. These samples are dried in oven at 105-110 ^{O}C at least for 24 hrs. Then weight of dried samples is taken. The moisture content is calculated as under –

$$\text{Moisture content (\%)} = \frac{\text{Wt.of wet soil (W1) - Wt.of dry soil (W2) x 100}}{\text{Wt. of dry soil (W2)}}$$

$$\text{Volumetric water content (\%)} = \frac{\text{W1-W2}}{\text{W2}} \text{ x 100 x Bulk density}$$

2. **Alcohol Burning Method:**

   Soil moisture from the sample isevaporated by adding alcohol and igniting. 1.0 ml of alcohol per g of soil at field capacity (FC) and 0.5 ml at permanent wilting point (PWP) is adequate for evaporating soil moisture. This method is not recommended for soil with high organic matter.

3. Hot Air Drying: Hot air around $110^{O}C$ is passed on a screen with weighed samples of moist soil. Samples must be pulverized before the experiment. Hot air is passes till the constant weight is obtained.

4. Gypsum Sorption Plugs: Gypsum plugs placed in soil comes into equilibrium with surrounding soil moisture. They are removed and weighed to determine soil moisture content. It is necessary to calibrate the wt. of porous cup with soil moisture content for different soils.

5. Infrared Balance: It gives fairly reliable moisture estimate in about 5 minutes. It consists of a 250 watt infrared lamp and autotransformers, all housed in an aluminium cabinet. The radiation emitted by infrared lamp quickly vaporize the soil moisture.The instrument is directly calibrated in percentage moisture.

6. Physical Appearance and Feel Method: A common method, used by farmers and irrigation technicians alike, is the "feel or physical appearance method." Soil moistures are judged by manipulating soil with hand and fingers. This is a fairly accurate method of measuring soil moisture in the field by taking a soil sample with a soil tube or auger at various depths. In soils containing fine gravel, it is frequently difficult, and sometimes impossible, to obtain samples with a soil auger. With a soil tube, it is sometimes possible to cut through gravel layers and still obtain satisfactory samples. The tubes are designed so that (1) they can be pushed into the soil with a minimum of effort, (2) the soil will readily enter the tube, and (3) the tube can be easily extracted from the soil. A portion of the tube is cut away so the soil sample can be inspected when it is taken up. After the texture of the soil has been determined, the soil sample is first "ribboned" between the thumb and forefinger. If a fairly good ribbon is extruded, soil moisture is usually above 50 percent in the heavier soils. Soils with a very small percentage of clay will not form a continuous ribbon, and the "ball" method should be used.