SECTION 686.15

Electrical resistance blocks.

a. Electrical resistivity can be used to measure a change in soil water content.

b. The equipment used to measure changes in soil water content consists of a portable resistance meter and electrodes imbedded in small blocks made of nylon, fiberglass, or gypsum. The electrodes are attached to lead wires which are plugged into a meter. When the blocks are placed in contact with the soil, the moisture content of the block tends to equal the moisture content of the soil. Because the electrical resistance in the block varies with the moisture content, a measurement of electrical resistance by the meter is a good indication of the soil moisture content. The drier the soil, the greater the electrical resistance, and vice versa. This method will work satisfactorily in any fine textured soil that does not exhibit saline or alkaline problems.

c. The location and depth of installation of these blocks is the same as for tensiometers. The blocks should be placed in the soil, in the rooting zone of the crop as early in the season as is practical, and left in the soil throughout the growing season. The following procedure is suggested for installing the blocks.

(1) The electrical resistance blocks should be thoroughly soaked for one hour in a pail of water and allowed to dry for about a day. (An oven can be used to speed up the cycling of the blocks.) Repeat this cycle two more times before installing. Soaking removes air from the blocks and helps insure accurate readings of the soil moisture. (See manufacturer's recommendations for soaking time.) Carry the cycled blocks to the field in a pail of water.

(2) A soil probe or auger can be used to bore a hole in the row slightly larger than the electrical resistance block.

(3) The last 3 inches of soil removed from the hole should be crumbled and put back into the hole. About ½ cup of water should be poured into the hole so a slurry of mud is formed in the bottom.

(4) The blocks should be pushed into the hole with ½-inch diameter electrical conduit or wooden dowel setting them solidly in the bottom with a firm push. Firm contact between the blocks and surrounding soil must be made.

(5) The hole should then be filled with soil, 3 or 4 inches at a time, tamping the soil firmly as the hole is filled.

(6) The wire leads from the blocks should be brought to a single station, midway between the holes and tied to a stake with the wires separated. The wires should be color coded with colored plastic tubing or knotted to show different depths or some other means of identification used.

d. Electrical resistivity readings should be correlated with the soil water content for the soil profile at each station. This can be done by using the gravimetric method in 686.12. To insure accuracy, gravimetric measurements should be made for several different electrical resistivity readings and plotted on a graph. Figure 686-10 shows an example of such a plotting.

e. Irrigations should be rescheduled when the meter readings from the most active root zone reach the desired level of soil water depletion using the graphs developed for a given site.

   (1) Guides have been developed for interpreting meter readings as they relate to soil water content which are given in Table 686-3.

   (2) Meter readings that indicate the need for irrigation will be different for various textured soils and MAD. Table 686-4 gives a guide for irrigating corn and grain sorghum.

   (3) There will be differences in electrical resistance readings due to the frequency of the A.C. resistance meters. Each company selling these meters for measuring soil water content has instructions which are provided with the meters. Because of these problems, it is desirable to develop site specific graphs.

   (4) In using the guideline values in Table 686-3, irrigations should be started when the average meter readings from the shallow blocks reach the indicated readings. Adjustments have been made in the recommended meter readings to allow for 5 to 8 days to completely irrigate all fields supplied by one water source.

f. To determine when and how much water to apply requires the development of a relationship between resistivity readings and soil water content for the given soil profile. An example of the development of this relationship and use is given on page 686.16. The following procedure should be used to collect data.

   (1) Measure the soil water content in the root zone. Record the resistivity or meter reading at time of soil water content measurements.