Conservation of Groundwater Resources in the Mojave High Desert Region through Producer Education of Irrigation Management

Grant Poole (Professional + Producer Grant Program)

Project Number: FW03-318

Title: Conservation of Groundwater Resources in the Mojave High Desert Region through Producer Education of Irrigation Management

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Grant Poole checks soil moisture levels through in-field monitors.

Situation:

Development and agriculture are clashing over water on the Mojave High Desert of Southern California. Agriculture has thrived for 100 years in this area, producing alfalfa, tree fruit, and vegetable crops. At the same time, people are moving to the less expensive High Desert from Los Angeles, and lawsuits have resulted in the curtailment of producer irrigation water, mostly drawn from poorly recharged groundwater systems.

Area growers are increasingly conscious of conserving water to save energy and pumping costs. Groundwater depletion, competition for water, and increased pumping expenses behoove Mojave High Desert alfalfa growers to apply water with even greater care with the aid of soil sensors to monitor soil moisture.

Objectives:

Implement a soil moisture-monitoring program with growers in the Mohave High Desert to:

1. Conserve groundwater
2. Reduce runoff and leaching detrimental to the environment from overwatering
3. Increase productivity and optimize irrigation application
4. Provide resources and education to the surrounding agricultural community
5. Promote the expansion and sustainability of this conservation practice

Actions:

To accomplish these objectives, soil moisture monitoring equipment was installed in cooperation with three alfalfa growers and one onion grower. Electrical resistance blocks were installed at 1, 2, and 4 feet in the alfalfa and at 8 inches and 20 inches in the onions. These blocks were connected to computerized data loggers that collected daily readings from the sensors.

Moisture readings can be monitored on an office computer.

Grant Poole, left, chats with producer-cooperator Joe Harter.

Results:

We learned that in the first year of alfalfa stand establishment it is necessary to install an additional sensor 6 inches deep. The 4-foot sensor dried to -33 centibars during July when the crop water use rates were high.

We also learned that because soil conditions can vary widely within a field, it is important to place the sensors in a location that is representative of the entire field. When using electrical resistance blocks in the local Cajon sandy loam soils, the soil surrounding the sensor may need to be amended with a loamy sand soil with better water conductivity to ensure good sensor-to-soil contact and accurate readings.

In alfalfa, there was enough moisture throughout the season with applications rates of 11-12 gallons per minute per acre. The sensors show, however, that water can be conserved by eliminating some water applications in the spring and fall when moisture is adequate.

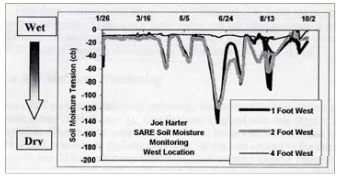
The soil moisture monitoring data in onions show that there can be significant moisture loss under drip irrigation below the onion root zone with long irrigation sets. Irrigation sets were shortened and the intervals increased to keep soil moisture more stable. The sensors showed that onions increase water use at the fifth and sixth leaf stages. With this information, the grower cooperator was able to make better assumptions of the water use and reduce applications to conserve water.

Potential Benefits:

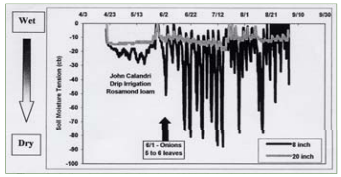
From the beginning of this project, there has been an emergence of water availability issues and Los Angeles County has begun the process of establishing water rights in the Antelope Valley, which represents over three-fourths of the total agricultural acreage in the Mojave High Desert Region.

Three alfalfa growers and one onion grower used this technology in the 2004 season. There are about 20,000 acres of agriculture in Northern Los Angeles County of the Mojave High Desert. These growers and additional alfalfa, fruit tree, and vine growers invested in this technology once it had been demonstrated through the project and field days.

Funding from this project allowed for the installation and demonstration of soil moisture monitoring equipment, which had not been introduced previously into this area. Outreach was conducted through newsletters, two field days, and grower meetings. Once the local growers saw the demonstration of this equipment, they became more inclined to adopt it. Growers are beginning to realize the benefit of using this technology to schedule crop irrigations to maximize yields and reduce water use.



Soil moisture at the 1-, 2-, and 4-foot depths from Jan. 26, 2004, to Oct. 5, 2004, in a three-year-old alfalfa field under center pivot, output = 11 gpm/ac.



Soil moisture at the 8- and 20-inch depths from May through September 2004 in drip-irrigated onions planted March 16.