

IRRIGATION SCHEDULING FOR MAXIMUM WATER EFFICIENCY

**Jerry Calvani
Calvani Farms
Carlsbad, NM**

The most expensive input a cotton grower applies in the desert regions of the southwest is irrigation water. It doesn't matter if the irrigation is applied by sprinkler, drip, or flood the cost of the water is usually the highest input. It is extremely important to make applications at the correct time to maximize water efficiency. Irrigation applied even one day too soon can be a small waste. Irrigation applied one day too late may cause damage to the crop and can result in decreased yields. Water distribution can also cause problems related with scheduling. Most producers can not apply water to all fields on the correct day. Most fields take several days to get the water across. Therefore some parts of the fields will have to be irrigated early, while other parts will receive water after the correct day. Some farms in Reclamation Water Projects require several days advance time for water to be ordered for delivery. This advance ordering requirement, combined with the necessity to begin irrigation before the desired application time and to allow sufficient time to cover the entire field, makes irrigation scheduling a difficult headache.

On my farm in Carlsbad, NM we irrigate using the flood method. Every field is laser leveled perfectly flat, that is, with no slope. We irrigate with about 7,000 gallons per minute carried through concrete ditches. The water is applied through four 12 inch pipe gates to each border. We apply only enough water to cover the entire border with water before moving the next border. In cotton this usually necessitates about 8 inches of water pre-plant, and about 4 inches for each irrigation thereafter.

During the past years we have tried several methods to determine the best time to schedule irrigations. There are four methods that have been used on our farm during the last 30 years. This is not to say these are the best on the market today, but these have proven valuable on our farm.

The soil probe is probably the most widely used device to check soil moisture today. This handy tool removes a core sample for inspection. By removing portions of the core, a producer can feel the soil from different depths. You should be able, by feel, to determine if the soil is wet or dry. If the soil feels wet don't irrigate, if it is dry you should irrigate. In my opinion that is about all you can determine. The information provided is questionable at best. However this method has two good points. The tool is relatively inexpensive and it requires the farmer to get into the field.

Walking and making observations of the crop may provide more information than the soil probe.

The second technique is finding a smart neighbor with the same soil type and irrigate when he applies water. This is the oldest method and may be the most widely used process today. Although not very high tech, this method guarantees you yields comparable with your neighbors.

The use of gypsum blocks to determine the amount of moisture in the soil is a very useful tool. A gypsum block is buried at the desired depth in the soil and by connecting the two wires from the block to a hand held moisture meter you receive visual information. It is a good practice to bury blocks at different depths to receive a complete picture of the soil profile. Usually three blocks are buried at the 8 inch, 16 inch, and the 24 inch depths. Soak the blocks in water overnight before placing in the soil, and tie one knot in the electric wires for the 8 inch, two knots for the 16 inch, and three knots to mark the 24 inch block. This method is relatively inexpensive. Each gypsum block cost about \$5.00 and the instrument to read them cost about \$150.00. The information provided is very accurate. The major drawback to this technique is it does not provide any forecasting. The information provided is a reading of the soil moisture at that time only. It is recommended to use a chart to formulate a pattern predicting plant moisture requirements. I have also observed that the blocks will read 100% moist and then begin to drop off rapidly, over a three to five day period. This short period of time doesn't give the producer much advance time to prepare for an irrigation.

Computer assisted irrigation scheduling is the best method in use today. The use of a computer connected by modem to a weather station provides the grower with all the information necessary to make decisions as to the correct day to irrigate, how much water to apply, and how this will effect yields. Information provided can predict crop moisture stress weeks in advance, therefore allowing the producer to plan for each irrigation. This method allows pinpoint accurate usage of water and should provide the most efficient irrigation. I have used the Gossym-Comax software program on my farm for many years, and have found it to be an excellent tool. Not only does the program detect the needs for moisture and fertilizer, but has the ability to predict yield increases for each application. This procedure is not inexpensive. Besides the expense of a computer and weather station, a complete soil core sample must be gathered and analyzed by a soil laboratory. If your farm has different soil textures for different fields than each field will need to be core sampled. The core sampling needs to be obtained only once, thereafter a fertility test for nitrogen need to be run each year. The weather station will provide data for an eight to ten mile radius, thereby allowing several producers to share the expense of the purchase and maintenance. The information provided by the program outweighs all of the negatives of the expense.

There are several different software programs on the market today, and even though I have no experience with these other programs I believe each program will provide the information needed to make efficient irrigations.

Remember, water is your most expensive input in the West. It is in your best interest to make your water applications in

the most efficient method possible. Just as producers rely on crop consultants and entomologist for other inputs, it is in their best interest to use the best tools available today to schedule irrigations.