AG ENGINEERING

FURROW IRRIGATION INITIATION IN CORN ON A DUNDEE/FORESTDALE SILTY CLAY LOAM SOIL

Lyle Pringle

INITIATING IRRIGATIONS THREE TO FIVE DAYS AHEAD OF TASSELING WHEN AVERAGE SOIL WATER POTENTIAL IS –50 TO –100 KPA WILL RECHARGE THE SOIL PROFILE JUST AHEAD OF THE TASSELING AND POLLINATION GROWTH STAGES WHICH IS THE MOST SENSITIVE TO DROUGHT STRESS AND WILL MAXIMIZE YIELD AND APPARENT WATER-USE EFFICIENCIES.

Ground water supplies are decreasing in the Mississippi Delta and at the same time irrigated acreage is increasing and development of efficient use of water pumped, new surface water supplies and/or government regulation are the tools available to bring our agricultural water needs into balance. In the Mississippi Delta, furrow irrigation is the most popular method of irrigating, yet generally one of the least efficient methods. Continuation of furrow irrigation in our area will depend on improving furrow irrigation efficiencies with proper irrigation scheduling and management. Changing the common philosophy of "irrigating to avoid stress and/or maximize yield" to "irrigating to maximizing yield economically with the least amount of water" is a step in the right direction to help conserve our water resources while reducing fuel consumption.

Initiation of irrigations is one of the most critical decisions a producer has to make when scheduling irrigations in corn to maximize yield economically with the least amount of water. In irrigation initiation research in Mississippi, it has been found that there is an "Initiation Window" that lasts maybe 5 to 10 days and sometimes longer if rainfall occurs. Initiating irrigations anytime within this window will produce yields that are not statistically different. The location of this "Window" usually occurs during late vegetative stages and closes 3 to 5 days ahead of VT or at V15 – V17. Initiations at this time will recharge the soil profile just ahead of the tasseling and pollination period which is the most sensitive to drought. Generally, the closer the actual irrigation initiation is to the back side of this "Initiation Window" the more efficient and cost effective.

Irrometer Watermark soil water potential sensors were installed in a furrow irrigation initiation study on a Dundee/Forestdale silty clay loam soil to monitor moisture tension and root activity. These sensors indirectly measure the negative pressure (kPa) the plant has to put on the soil to remove water. The sensors have a limited range of 0 to -250 kPa, but more than 50% of the readily available soil moisture can be removed within this range. "Field Capacity" is when the moisture content of the soil cannot hold any more moisture after all free water has drained away and is generally said to occur at -10 kPa for sandy soils and -30 kPa for clayey soils. The "Wilting Point" refers to the situation when there is no more available moisture in the soil. This generally occurs at -1500 kPa for most crops. Thus, the closer the values are to zero the wetter the soil and the easier it is to remove moisture. The more negative the values the drier the

Typical poly pipe watering configuration in corn.

soil and the more difficult it is to remove less moisture. The sensors were installed at depths of 9, 18, and 27 inches which approximated the depth of the effective rooting zone of this soil/crop for most years. Since the sensors are site specific and only measure a small volume of soil, there is some inherent variability in the readings. The "Trigger Values" to initiate irrigations to maximize yield and apparent water-use efficiencies in this research study occurred while initiating irrigations when the average sensor readings of all three depths over all replications reached -50 kPa in a hot, dry year and -65 to -100 kPa in cooler, wet years. Variations in the negative pressures to trigger initiations indicates that there may be more total available moisture in the rooting zone on these relatively deep but low infiltration rate soils. Initiating irrigations prior to any root activity at the deeper 27 inch depth was less efficient and did not increase yield statistically. Allowing the roots to start utilizing moisture stored in the lower portion of the effective zone from winter rainfall before initiating irrigations will help reduce water use in corn. Soil moisture sensor systems are useful tools that can be used to aid in irrigation scheduling decisions.