

PROPOSAL
TO
TWRI RESEARCH GRANT PROGRAM

Title of Proposal: Assessing Low Ear Placement Corn Hybrids as a Way of Increasing Water Use Efficiency

Focus Categories: Agriculture, Irrigation, Water Use

Keywords: Limited irrigation, water use efficiency, corn ear height

Duration: March 1, 2011 through February 28, 2012

Federal Funds Requested: \$5,000

Non-Federal (matching) Funds Pledged: \$14,760

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Congressional District: 13th

Abstract:

Texas corn producers are able to obtain corn yields that rival that of any region in the world. Without irrigation from the declining Ogallala aquifer, these yields would not be possible. Over the past 50 years, tremendous advances have been made in improving irrigation efficiency. However, many producers are turning to limited irrigation, because of the dwindling water supply. Many factors come into play when discussing water use efficiency (WUE). Planting population, hybrid height, or hybrid maturity can all be important factors. The primary location for the study will be the Texas AgriLife Experiment station in Etter, TX. Dr. Xu, a corn breeder for Texas AgriLife has developed a hybrid with a low ear placement. Another hybrid, who shares the same female, has a normal ear height. These two hybrids will be planted alongside a popular commercial corn hybrid in the region. Irrigation water will be applied at 75% and 60% of evapotranspiration (ET). We believe that lowering the ear height will increase the harvest index. By placing the ear closer to the ground, it will be closer to critical water and nutrients. This, in turn, can raise the WUE.

Statement of Critical Regional Water Problems:

The Southern High Plains sits at the Southern edge of the largest aquifer system in the world. The Ogallala aquifer is a confined aquifer that can vary in water depth from 0 feet to 1200 feet. The recharge rate from percolation through the soil is essentially zero. With above ground municipal water supplies falling to all time lows, cities are looking towards the aquifer to meet their needs. With agriculture pumping 70% of the water out of the aquifer, increased pressure will be continually placed on producers to limit their water use. Water restrictions placed on producers or a dwindling water supply would be detrimental to a major cropping system in the Southern High Plains. Corn is a major irrigated crop in the Texas Panhandle. With producers' water supply becoming more limiting year after year, WUE must be increased to conserve water in the Ogallala while maintaining a sustainable cropping system that includes corn.

Nature, Scope, and Objectives of the Research:

The main objective of this study is to determine if low ear placement hybrids will increase the water use efficiency of corn by raising the harvest index. This study will have three locations. The main location will be the Texas AgriLife Research station at Etter, TX. This station will have two irrigation regimes of 75% and 60% evapotranspiration (ET). The other two sites will be located at AgriLife Research stations in Uvalde, and Halfway, TX and will have one irrigation regime. All three sites will be irrigated by center pivot equipped with low or mid elevation spray application systems. One hybrid with a low ear placement, and one sister hybrid with a normal ear height will be provided by Dr. Xu. One commercial hybrid will also be planted as a check in all locations. The plots will be four rows wide by twenty feet long and will consist of four replications at the Etter site, and three replications at the other two, because of a limited amount of available seed. Stand counts, photosynthetic rate, light interception, internode length and harvest index will all be taken at Etter. Stand counts, internode length, and harvest index will be taken at the other locations. The idea behind this research is that most corn hybrids have about

the same number of internodes from the ground to the ear. If plant breeding is able to shorten these internodes, then more sources of yield, such as water and nutrients, will be able to be accumulated into the ear.

Results Expected from this Project:

The results from this experiment can be utilized by plant breeders and corn producers around the world. If the harvest index of corn can be increased by lowering ear placement, then, in turn, the water use efficiency of corn can be increased by simple breeding techniques; thus, limited irrigation would be able to play a vital role in the sustainability of crop production in the Texas Panhandle.