PREPLANT IRRIGATION LOSSES WITH SPRAY, LEPA, AND SUBSURFACE DRIP SYSTEMS James P. Bordovsky Texas Agricultural Experiment Station Lubbock/Halfway, TX

<u>Abstract</u>

A three-year field experiment was conducted during the growing seasons of 1999 through 2001 to determine preplant irrigation water losses and the effect of those losses on cotton lint yield resulting from irrigation by three different irrigation methods. The treatment factors included preplant scenario, irrigation capacity, and irrigation delivery method. Preplant scenario treatments included *limited* preplant that provided sufficient soil water for germination and early plant development followed by early in-season irrigations in excess of evaporative demand to try to fill the soil profile. The *full* preplant treatment elevated soil water to approximately 80% of field capacity. Irrigation capacity treatments limited the maximum irrigation delivery rate to 0.1 and 0.2 in./d. Each of the previously mentioned treatment combinations was irrigated by spray, LEPA, and SDI methods resulting in 12 primary treatments. The goal of this experiment was to determine preplant irrigation management options that would improve water use efficiencies of commonly used irrigation systems on the High Plains.

Estimates of water losses were made by intense measurements of volumetric soil water content with neutron and apparent dielectric constant (ThetaprobeTM) methods. Water loss was defined as the ratio of change over time of volumetric water content to cumulative rainfall and irrigation within a cross section of the soil profile that was 2 rows wide by 5 feet deep. The average losses over the three-year period for spray, LEPA, and SDI treatment plots with irrigation capacity of 0.1 in./d were 67%, 60%, and 47%, respectively. High losses were attributed to surface evaporation and deep percolation below the five-foot root zone.

<u>Limited</u> preplant irrigations significantly reduced cotton lint yields compared to <u>full</u> preplant in treatments irrigated by spray (18% reduction) and LEPA (15% reduction) at the 0.1in./d irrigation capacity and in LEPA treatments at the 0.2 in./d irrigation capacity (11% reduction). There was little justification to provide full preplant irrigation in SDI treatments since the average additional irrigation quantity of 2.5 in./year of the <u>full</u> treatments over the <u>limited</u> treatments resulted in lint yield differences of -12 and 79 lb/acre for the 0.1 and 0.2 in./d capacities, respectively. With identical irrigation capacities, SDI increased cotton lint yields by 24 to 59% compared to spray and by 9 to 29% compared to LEPA. Total water use efficiencies of the SDI treatments were increased by 25 to 29% over spray and 14% over LEPA.