

Name of Project: **Equipment Installation for the Evaluation of Crop Row Direction and Offset Distance from Subsurface Drip Irrigation Laterals**

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Objectives

Past research has shown that well designed and managed subsurface drip irrigation (SDI) systems are more water efficient than LEPA and spray irrigation systems, particularly at low irrigation capacities (Bordovsky and Lyle, 1998, Bordovsky and Porter, 2003). However, maintaining crop rows in SDI fields at precisely the same relative location to underground water supply lines, year after year, is *very* difficult. Crop row position relative to buried drip laterals directly affects seed germination as well as plant development, particularly in areas of limited irrigation capacity. The effects on cotton production of crop row to drip tape location in alternate-furrow SDI installations has not been determined. In addition, planting perpendicular to buried drip laterals occurs in some areas of the South Plains, simplifying the use of SDI systems in certain situations. Crop response and the effects of long-term tape deterioration resulting from planting crops perpendicular to drip tape laterals is not known. The overall objectives of this research are to:

- 1) quantify the effects on cotton germination, yield, and WUE of planting row distances (horizontal, not depth) from drip tape laterals at two irrigation levels; and,
- 2) quantify the effects on soil compaction, cotton germination, yield, and water use efficiency of plant row orientation relative to drip lateral direction (perpendicular vs. parallel) at two irrigation levels.

This proposal requests assistance in funding the appropriate test equipment and its installation for this research.

Methods

The proposed research will be conducted at the TAES research facility at Halfway. It will involve the installation of approximately 5 acres of SDI with sets of drip tape laterals oriented parallel and perpendicular to crop rows. Drip tape will be installed with an auto-steer equipped tractor capable of centimeter positioning accuracy. Plantings will be conducted using this same tractor to provide accurate offset distances from SDI tape laterals. The planned

experiment will be a two factor-split plot design. The main factor will be irrigation capacity with treatments of approximately 2.5 and 4.0 gpm/acre. The sub-factor will be plant row orientation or location relative to drip tape position. The six proposed sub-factor treatments will be parallel-planted row offsets to SDI tape laterals of zero, 5", 10", and 15" (treatments 1-4) and perpendicular planted rows relative to SDI laterals with lateral spacings of approximately 30" and 60" (treatments 5 and 6). Planted rows will be 30" apart with plot size of 8 rows x approximately 100'. Four blocks will provide replication. Each treatment block will be within one irrigation zone. The proposed SDI installation (much more complicated than standard SDI installation) will be conducted by TAES staff in 2005 with the first crop year in 2006. Following initial installation, data collection will include plant population at germination, volumetric soil moisture, soil compaction (across and along drip tape), lint yield, and WUE. Opportunity for root pattern and fertilizer placement studies will exist in the future.

Anticipated Results

Seed germination in dry years and soil compaction around drip tape have caused problems or reduced yields in two of the past three years at the TAES research site at Halfway/Helms (Bordovsky, 2004). In general, documenting crop response relative to drip tape position and orientation will help address management problems and provide information for economic decisions concerning conversion to more efficient drip irrigation systems. This experiment will also help determine the value of precision-guided tractors in terms of production efficiency (i.e. water conservation) on the South Plains. Specific benefits of this experiment include improve management by determining the economic loss (or gain) of crop row placement "offset" from optimum position relative to drip tape laterals, and of increasing planting flexibility by planting cotton perpendicular versus parallel to SDI laterals.

In addition, an objective of a recently funded Cotton Incorporated project deals with seed germination in SDI fields as a function of precision placement of soil wetting amendments in the seed row. If laboratory tests are positive in 2005, field trials will be attempted under "rainout" shelters that would be located in this proposed SDI field.

References

- Bordovsky, J.P. and W.M. Lyle. 1998. Cotton irrigation with LEPA and subsurface drip systems on the Southern High Plains. Proceedings 1998 Beltwide Cotton Conferences, San Diego, CA, 409-412
- Bordovsky, J.P. and D.O. Porter. 2003. Comparison of spray, LEPA, and subsurface drip irrigated cotton. Paper No. 032008. American Society of Agricultural Engineers International Meeting, Las Vegas, Nevada. Pp. 1-11.
- Bordovsky, J. P. 2004. Subsurface drip irrigation design and management for cotton production. Project 02-210 TX. 2003 Annual Report to Cotton Incorporated. 13 pp.

**TAES/TWRI
Water Resources Research
Project Budget Form**

Expenditure Description	Amount Requested	Other Sources	Total
Staffing Requirements:			
1) Principle Investigator	\$0	\$6,482.67	\$6,482.67
2) Support Staff	\$0		
Fringe		\$1,391.3	\$1,391.3
Total Staff Costs	\$0	\$7,873.96	\$7,873.96
Materials and Supplies	\$0		\$0
Travel	\$0		\$0
Equipment (filter, controller,etc)	\$4,500		\$4,500
Other (equipment rental, service providers – water well, electrical)	\$5,500		\$5,500
Indirect Costs of Sponsor @ 45.5%	\$0	\$4,550	\$4,550
Total Project Costs	\$10,000	\$12,423.97	\$22,423.97