Jack Kelly Clark

Cotton plants.

Analysis: Demonstration projects compared

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In this discussion of the two projects and their different results, the Five Points project is denoted as DWR, for the sponsoring California Department of Water Resources, and the Stratford project is denoted as UC, for the sponsoring UC Salinity and Drainage Task Force. (Ed.)

Subsurface drip irrigation was the most profitable method at the DWR Five Points site and the least profitable at the UC Stratford site. (See DWR table 3, page 10, and UC table 5, page 7.) We believe that this is a consequence of the presence of a shallower saline water table at Five Points. More responsive water and fertilizer management probably reduced root zone salinities and consequently increased crop yields. However, the sustainability of increased yields at the Five Points site may ultimately be influenced by the shallow saline water table and potential problems related to salinity control at depths above the drip tubing.

A valid comparison of the crop financial return data from subsurface drip irrigation at the two sites is obscured by the fertilizer and fumigant applications at the UC Stratford site (UC table 4). These practices adversely affected profits and would probably not be used by the grower. Even with better fertilizer and fumigant management, we believe that net financial benefits from subsurface drip irrigation at the Stratford site will be more difficult to achieve because of soil and shallow groundwater table conditions that are more favorable to crop production when compared to those at the DWR Five Points site.

Upgraded and surge irrigation resulted in equivalent or slightly lower seasonal irrigations when compared to subsurface drip at the Stratford site (UC table 2). Here water conservation with the subsurface drip system occurred as a result of lower preirrigation applications. At the Five Points site (DWR table 1), careful irrigation management (deficit irrigation) allowed for consumptive use from the shallow water table, which resulted in a significant water savings during crop irrigations when compared to the furrow irrigation systems.

It may be possible to achieve water conservation from carefully designed and operated improved furrow irrigation systems equivalent to that obtainable from subsurface drip and LEPA. The question and conclusion will ultimately revolve around the costs and benefits of the alternatives. Increases in crop production may not be significant as a result of water conservation from improved furrow irrigation; however, subsurface drip and LEPA may, in some cases, provide a financial benefit, as demonstrated by the subsurface drip results in 1989 at DWR's Five Points site (DWR table 3).

The financial benefit derived from water conservation and reduced deep percolation losses is, in reality, the only incentive a grower has to improve his irrigation practices. Present economic conditions offer little incentive to install improved furrow irrigation systems. Subsurface drip and LEPA irrigation may offer the additional potential benefit of higher crop returns from increased yield resulting from more responsive water and fertility management. However, in highly productive fields (UC Stratford site), the increased yield may not be sufficient to compensate for increased irrigation system costs, even if fertilizer and fumigant costs are similar to those of the DWR site (DWR table 3, UC table 4).

Subsurface drip irrigation needs to be carefully evaluated over the life of the installed system, considering the economic benefit relative to the crop rotation. Neither the 40-inch spacing at the UC site nor the 80-inch spacing at the DWR site is very well suited to the range of crops grown in rotation in the western San Joaquin Valley. Additional long-term demonstrations are needed to address these issues. It is premature to draw conclusions relative to the long-term viability of subsurface drip and LEPA irrigation in the western San Joaquin Valley based on the limited data available from the two demonstrations.

Long-term environmental impacts and hazards of drainwater disposal in the valley provide a strong incentive to investigate irrigation strategies that could minimize drainage volumes required to sustain crop production. Pressurized irrigation systems may offer the flexibility and control necessary to significantly limit unnecessary water additions to the shallow groundwater table. The consequential cost reductions for drainwater collection and disposal would increase the economic benefits to farmers with shallow water tables. The potential may exist to substantially reduce the areal extent of the drainwater problem in the valley, assuming large-scale usage of these types of irrigation systems. Additional work needs to be performed to study the long-term costs and benefits of these pressurized irrigation systems. These future studies should address design and operating alternatives based on the requirements of a diversified cropping pattern and consider various long-term environmental problems related to water quality, pesticide applications, and crop nutrients.

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