formity is 93%. The system runs approximately 8.5 hours per day to meet the average peak cotton evapotranspiration of 0.32 inches. Preirrigation was applied using hand-move sprinklers.

LEPA. The low-energy precision application (LEPA) system is a linear converted to hose-drag operation. It is approximately one-quarter mile long and is constructed of 6 ⅝-inch piping. There are seven spans of 178 feet each with a 40-foot overhang at the end. There are 43 booms attached to the main linear pipe. Most of the booms have nine outlets spaced 40 inches apart. At each outlet, there is a ¾-inch, 15-psi pressure regulator and 15⁄128-inch brass nozzle connected to a ⅝-inch by 7-foot drop tube, and a furrow bubbler.

Water is pumped from a small reservoir using a diesel engine driven pump. The water is filtered by a rotating suction screen. This 18-mesh screen has interior water jets that rotate the screen and remove exterior debris. Pressurized water for the jets is supplied by the pump discharge. The pump feeds a surface aluminum pipe mainline going to the LEPA system. Six-inch riser valves are located about 340 feet from each end of the field, providing an attachment point for a 4-inch, 360-foot flexible drag hose.

The approximate discharge rate of each drop tube is 1.6 gallons per minute. Overall system capacity is about 610 gallons per minute. Assuming 85% to 90% uniformity, the system must be operated 10.5 to 11 hours per day to meet the average peak cotton evapotranspiration of 0.32 inches. Preirrigation was applied using hand-move sprinklers.

Furrow. Both the scheduled and existing furrow irrigation systems consisted of 10-inch gated pipe used on 40-inch beds. The scheduled furrow plot consisted of computer-aided irrigation scheduling, whereas the existing furrow plot was managed by the grower (check plot). Furrow length was approximately 1,190 feet with a slope of about 0.2%. Energy dissipation socks were placed on the gates to prevent soil erosion. Water supply was provided through a buried PVC pipeline connected to Westlands Water District facilities. A 10-inch flow meter was connected at the pipeline discharge to record the volume of irrigation water applied.

Preirrigation was applied using all furrows. Alternate furrows were used for each of the four crop irrigations. The field was irrigated using blocked ends because tailwater collection/reuse facilities were not available. Set times were determined based on soil-water depletion and estimated soil intake rates.

Irrigation scheduling

Water content of the soil was monitored weekly with a neutron probe at three locations in each irrigation treatment with two access tubes per location. Irrigation scheduling was based on measured soil-water content, weather, and predicted plant evapotranspiration. Climate data was provided by the U. S. Department of Agriculture's California Irrigation Management Information System (CIMIS) weather station located at the University of California Westside Field Station. A computer program was used to model plant evapotranspiration.

For the subsurface drip and LEPA irrigation systems, the computer program was used to predict the total number of operating hours needed to satisfy plant evapotranspiration for the next 7 days. A water balance for the previous week was used to check the accuracy of the irrigation schedule.

For the scheduled furrow irrigation system, the computer program was used to predict frequency and duration of irrigation. The prediction limits were set by inputting the allowable soil moisture depletion, which was based on root zone depth, soil water-holding capacity, estimated soil intake rate, and irrigation system design and performance. Irrigations were scheduled by the grower on the existing furrow irrigation system based on experience.

Irrigation water application

Irrigation water applications summarized in table 1 were based on meter readings from each irrigation treatment. Preirrigation for the subsurface drip and LEPA treatments was applied using hand-move impact sprinklers. Lateral spacing was 45 feet with a 24-hour set time using 7⁄64-inch nozzles. Both furrow treatments were preirrigated using gated pipe and all furrows. The LEPA irrigation system had the lowest infiltrated water, which reflects operational and mechanical problems that constrained our ability to properly apply irrigation water. Irrigation scheduling provided little benefit with water infiltrated for both furrow treatments being nearly equivalent at 29.6 and 30.5 acre-inches per acre for the scheduled and existing furrow systems, respectively.

Net income for 1989

Crop yield and value for each irrigation treatment are summarized in table 2. The treatments were harvested individually using grower-owned and -operated equipment, and yield and value were determined from grower records. Variable and fixed crop production costs were obtained from grower records. Net crop return for the different irrigation treatments is summarized in table 3. Crop yield increases for the subsurface drip and decreases for the LEPA irrigation system affected the net income. Subsurface drip irrigation had the highest net income in 1989 ($268.58 per acre). The furrow plots had nearly identical net incomes: $130.03 per acre for the existing furrow and $127.65 per acre for the scheduled.

The LEPA irrigation system did not recover the production costs (net loss of $81.63 per acre). Operational and mechanical problems caused irrigation interruptions, which may have resulted in plant stress and subsequent reduced boll set. The 1989 results from the LEPA treatment do not fairly represent yields and returns that may be achieved from this system under normal operating conditions.

Summary and conclusions

Based on the 1989 results from the DWR demonstration project, the following conclusions can be drawn:

- Pressurized irrigation systems are more costly to install, operate, and maintain compared to furrow irrigation.
- Increased crop yield and gross returns are needed to compensate for increased subsurface drip and LEPA irrigation system costs.
- Computer-aided scheduling of furrow irrigation did not result in significant water savings.
- Reductions in subsurface drainwater disposal costs and increases in the ability to sustain long-term irrigation and agriculture in the western San Joaquin Valley may be additional economic benefits.
- Pressurized irrigation systems need further evaluation under western San Joaquin Valley conditions to develop a better understanding of the long-term management requirements and profitability.

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