The objective of the Patterson Hollow Water Quality Project is to improve the quality of water in the Arkansas River through better water management while maintaining yields and returns, and this objective is being accomplished.

LOWER GUNNISON BASIN SALINITY CONTROL SURGE RESEARCH AND DEMONSTRATION PROJECT

by

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PROJECT DESCRIPTION

Eighty cooperators participated in the surge irrigation research and demonstration project. Irrigation Water Management (IWM) and surge training workshops were held for the participants in conjunction with field training. Cooperators of the demonstration program were provided with management knowledge and provided a surge system.

Colorado State University Cooperative Extension staff monitored producers' fields for a period of two years. The Delta-Montrose Cooperative Extension team monitored 191 conventional and surge irrigation events of which 128 produced usable data. Some data was not usable due to furrow washouts, irrigation water crossover between furrows, floats disturbed by wildlife, malfunctioning of the data gathering equipment, and siltation buildup in the furrow flumes. In some cases, surge and/or conventional data for a particular event was not available for comparison because of the unavailability of equipment to meet high peak demands.

The crop acres monitored included 226.54 acres irrigated conventionally and 366.16 acres irrigated by surge. Two furrows or corrugations were selected at random, and irrigations (surge and conventional) were monitored. Generally, non-compacted furrows or corrugations were chosen to be monitored. This provided a condition conducive to deep percolation, which is the normal scenario. Inflow and outflow of the furrows were measured using specially constructed V-notch furrow flumes fitted with

stilling wells and potentiometers. The flumes were connected to a datapod where the data was collected and stored on a computer chip. Upon completion of each irrigation event, the equipment was removed from the field to be used elsewhere. The computer chips were removed from the datapods and downloaded. The information was then processed using two computer programs that were specially designed for the surge demonstration project.

Trials on surge fertigation also were conducted. One of the surge manufacturing companies cooperated in the project and developed a controller with a chemigation program.

RESULTS

The results of 1994 indicate that deep percolation by surge irrigation was reduced by 306.77 acre/inches as compared to conventional irrigation. This translated to a salt load reduction of 913.85 tons of salt.

The fertigation trial by surge helped the grower accomplish split applications of nitrogen. It also eliminated some cost, but the yield difference in broccoli was not measurable. The reasons were that the field was not uniform in its texture, nutrient status, etc. The scope of the study did not permit controlled research; moreover the farmer tended to over-fertilize so as not to risk the total yield.

OBSERVATIONS AND DISCUSSION

It was observed that surge irrigation performed best on row crops where the furrows were free of debris and in good condition. Debris in the furrows affected irrigation water movement. Where surge was used, it out-performed conventional application. Irrigation water applied via corrugations, as often used in pastures and hay fields, crossed over into other corrugations, making it difficult to accurately monitor the irrigation flow. Corrugations often breakdown because of heavy wheel impact during the haying process. Therefore, it is beneficial to remark the fields after cutting hay for better irrigation water distribution. It also was observed that first irrigations on newly planted fields required more set adjustments and follow-up procedures under surge. Some operators feel that surge does not adequately wet the soil so as to germinate seed. Their preference is to use conventional irrigation methods to accomplish seed germination, and then revert to the use of surge once the crop has been established. Our field trials have indicated that the number of surge advances and time of advance cycles may be adjusted to achieve the desired amount of soil soaking needed for seed germination.

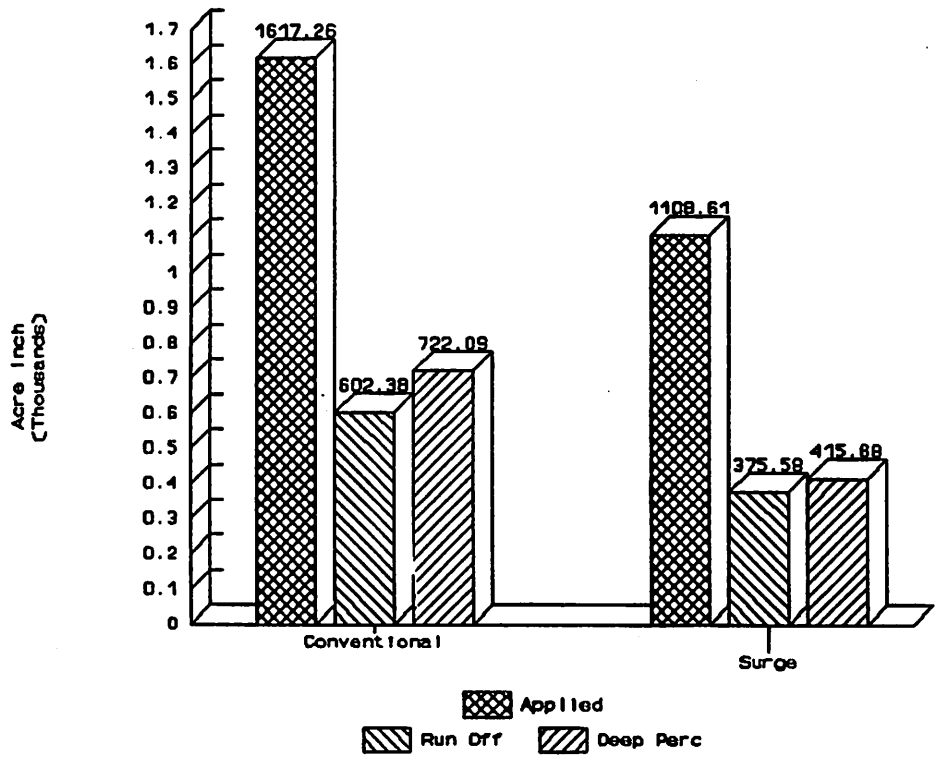
A major misconception by producers is that surge will solve all their irrigation problems; therefore, they have used the surge system on their poorest fields. Producers and planners need to recognize that surge is only a management tool; it cannot be used to overcome field constraints such as land leveling needs, slope variations, gravelly soil, poor furrow and corrugation conditions, or unusually long runs, etc. Some participants

perceive that surge systems can operate by themselves; thus, they do not spend enough time in the field during the irrigation. This creates over-watering or under-watering situations even though surge should reduce the amount of water used, and thereby, total time spent in the field. Initially, it has been found that the producer may need to spend more time with the surge unit until becoming familiar with the different programs and what will work best for a particular field. The surge controller is like a computer in that, if it is incorrectly programmed, the individuals will be unable to achieve their objectives.

There were instances where surge irrigation showed under-irrigation. This also could be the result of improper monitoring, or it may have been due to the assumption of a higher soil moisture deficit. Estimated soil moisture deficit was established, in part, on the basis of NRCS information on soil water-holding capacity. Soil moisture was monitored by the use of soil probes, gypsum blocks, hand-feel method, and Aquaterr instruments. Soil moisture depletion also was monitored by tracking the daily evapotranspiration (ET) of the various crops being grown. This was accomplished by the use of a weather station that was established within the project area (Olathe, Colorado). The weather data obtained was then used to compare soil moisture conditions observed. This information also was used for irrigation scheduling. In addition, agricultural producers and the general public could obtain ET information through the Montrose and Delta news media.

A major challenge was to convince producers in the area that it is okay to reduce the amount of water used, even though water in this area is so abundant and inexpensive. In some cases, over-irrigation tends to be the norm because producers fear that they will lose their water rights. The old adage is: If you don't use it (irrigation water), you lose it.

1994 Surge Irrigation Demonstration Results Delta and Montrose Combined



Deep Percolation Reduction by Surge was 306.77 Acre Inches of Water.
Salt Load Reduction by Surge was 913.85 Tons.
(128 Irrigation Events)