

IMPACT



Canyon County, 501 Main; Caldwell, Idaho 83605 (208) 459-6003 Fax (208) 454-6349

Management of Furrow Irrigated Sugarbeets for Maximum Production and Environmental Protection

The Situation

Canyon County, Idaho, contains areas that are experiencing elevated nitrate levels, as well as degradation of surface water resulting from irrigation. Nitrate levels are not generally found in the groundwater at concentrations above the EPA standard (10 ppm), but the county's groundwater is highly vulnerable and nitrate concentrations in groundwater are on the rise. In addition, Canyon County has approximately 14,000 acres of sugarbeets that have potential to contribute to nitrogen leaching and surface water degradation from irrigation.

Several factors related to irrigation contribute to groundwater degradation. First, the depth to groundwater in Canyon County is generally shallow. Irrigation water containing agricultural chemicals does not have far to travel before reaching groundwater. Second, although several irrigation methods including sprinklers and drip are used in the area, the majority of agricultural land is still furrow irrigated. Comparatively, furrow irrigation uses the largest quantity of water and often has the greatest potential for erosion and deep percolation. Third, many farm managers are still over-watering their crops regardless of the irrigation system used. The Idaho State Department of Agriculture found that the excessive use of water, rather than improper fertilizer application is the major contributor to groundwater degradation.

Excessive irrigation of sugarbeets also contributes to several production problems. Soil nitrogen is often leached from the root zone early in the season

resulting in reduced growth at a critical time, sometimes forcing farmers to apply additional nitrogen to maintain growth. Leached nitrogen becomes available late in the growing season as roots move deeper into the soil, which then results in depressed sugar content. Severity of the major root disease problems, specifically rhizomania and rhizoctonia root and crown rot, are also tied directly to excessive irrigation.

Our Response

A demonstration project was conducted south of Nampa in 2001. The 2001 results are presented here. A 22 acre silt loam field was divided into treatment (10.85 acres) and control (11.53 acres) plots. The treatment was irrigated according to soil moisture and fertility data, and visual observation. The control was managed according to the grower's normal production practices.

Granular matrix soil moisture sensors and neutron probe access tubes were installed in the root zone in the bottom half of the field. Sensors were connected to a datalogger that recorded the soil moisture measurements three times a day. In addition, Tieg's Ag Consulting used a neutron soil moisture probe to collect soil moisture data once a week. Soil samples were also taken to a depth of three feet at the beginning and end of the growing season.

The objective was to demonstrate the use of a soil moisture monitoring program to achieve proper irri-

gation based on known principles for the reduction of soil erosion and nutrient leaching while maintaining production and quality.

Program Outcomes

Agrimet weather station water use for sugarbeets during the 2001 growing season was 35.8 inches. The treatment was irrigated 12 times with seven of those irrigations using 24-hour sets and five using 12-hour sets. The control was irrigated 14 times with 11 of those irrigations using 24 hour sets and three using 12 hour sets. Approximately 54 inches of water was applied to the treatment and 67 inches applied to the control for efficiencies of 66 and 53 percent. All the water was groundwater that was pumped. The pumping cost for the treatment was \$27.93 per acre while the pumping cost for the control was \$34.58 per acre. Labor costs per acre to set the siphon tubes on the treatment and control were \$13.40 and \$14.56 respectively.

The decision of whether or not to fertilize the treatment was based upon a threshold level of 100 pounds of N in the top foot of soil, and approximately 280 pounds of N in the top three feet of soil assuming a yield goal of 35 tons per acre (8 lbs. N per ton of beets). No fertilizer was applied to the treatment, while 50 units of urea ammonium nitrate were applied to the control.

Data provided by The Amalgamated Sugar Company showing production and quality is shown in Table 1. The treatment yield was 1.7 tons per acre greater than the control and had lower nitrates. As seen in Table 2, production costs for the treatment were \$94.11 less than the control. In addition, soil water was extracted from four feet below the soil surface and analyzed by a laboratory. The data indicates considerably less nitrate leaching took place in the treatment than the control.

Table1. Sugarbeet Production Data

	Treatment	Control
Beet Value (\$/ac)	36.30	36.30
Net yield (T/ac)	35.65	33.95
Sugar (%)	16.93	16.51
Nitrate (ppm)	298.	368.

Table 2. Difference in Costs (\$/ac.)

	Trtmnt	Cntl	Difference
Pumping Costs	27.93	34.58	6.65
Siphon Tube Labor	13.50	14.56	1.06
Fertilizer Costs	0.0	15.40	15.40
Fert. App Costs	0.0	9.75	9.75
Net Value of Sugarbeets	1294.10	1232.85	61.25
	Total Difference		\$94.11

Future

If funding is available, this project will be expanded to sprinkler irrigated sugarbeets and conducted in several sugarbeet growing areas across southern Idaho.

Cooperators

Steve Reddy, Wa. County Ext. Educator; U of I
 Dr. John Gallian, Sugarbeet Specialist; U of I
 Tiegs Ag Consulting
 The Amalgamated Sugar Company

Funded by: Snake River Sugarbeet Growers and University of Idaho

For More Information

Jerry Neufeld, Extension Educator
 University of Idaho
 Canyon County Extension
 501 Main Street
 Caldwell, Idaho 83605
 Phone: 208.459.6003, Fax: 208.454.6349
 E-Mail: jerryn@uidaho.edu