RESEARCH PROGRESS REPORT

Irrigation Well Water Quality Project 1983

by

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OBJECTIVES

Over the past years, higher amounts of fertilizers, including micronutrients, have been recommended by various fertilizer dealers and added to our soils. Many acres of barley lodge each year due to possible over-fertilization. Micronutrients are being added to soils on "gut feelings" without any justification or research.

The objective of this research project was to determine:

1. If the NO_3 levels from the irrigation well water have changed compared to previous studies.
2. The amounts of major and some micronutrients in irrigation water that are added to the soil each crop year.
3. If items 1 and 2 should be used in making fertilizer recommendations.
4. The importance of testing each irrigation well used for crop production.
5. If some of the barley lodging problems are water-related.
6. General irrigation water quality.

RESULTS

Fifty irrigation well water samples were taken randomly across the San Luis Valley in the month of July. Approximately one pint of water was taken from each running pivot. Each sample was analyzed by Servi-Tech, Inc., Dodge City, Kansas, for nitrate-nitrogen (NO_3-N) and sulfate-sulfur (SO_4-S). Routine irrigation water analysis was run on 20 of the 50 selected samples (Table 1). Nine random samples were selected for trace element analysis (Table 2). Ranges and averages were compiled to simplify the results (Table 3).

SUMMARY AND CONCLUSIONS

The U. S. Geological Survey Report of 1982 has not been released to date. Nitrate levels will be compared upon the release of the Report, and will be available through the Extension office at the San Luis Valley Research Center.

The two main elements of interest in this survey are NO_3-N and SO_4-S. NO_3-N levels in irrigation water should be considered in the N recommendation if levels exceed 20 lbs/A-ft. of water, especially for small grains. Twenty-six percent of the 50 wells sampled were above the 20 lbs/A-ft. (Figure 1). High soil fertility levels plus nitrates in the water may contribute to the barley lodging problems.

When considering the nitrogen recommendation on potatoes, all the NO_3-N in the water should be considered if proper irrigation practices are utilized. If excess water is applied, some of the NO_3-N will be lost due to leaching.

A number of fertilizer recommendations in the Valley have included sulfur. The justification was that the plants need sulfur to grow. Plants do need approximately 30 to 40 pounds per acre of sulfur, depending on yield. Disregarding the residual sulfur levels in the soil, which are usually sufficient to grow a potato crop, 56% of the wells sampled supply enough SO_4-S in one acre-foot of water to grow the crop to maturity (Figure 2).

The well water analyses also showed substantial amounts of trace elements are being supplied to the crop and soil (Table 2); in some cases, enough to grow a crop without the residual soil elements.

Most of the sampled wells fall within the CSU Irrigation Water Quality Criteria Guidelines as suitable for most crops. Due to the extreme ranges of some elements, especially NO_3, supplied by irrigation well water, it is recommended that each well used for crop production should be tested for available nutrients every 3-4 years. The results should be used in a crop fertility program.

TABLE 1. Irrigation well water quality results, 1983.

Sample No.	pH	Cond (mmho/cm)	Na	Ca	Mg	HCO_3	CL	S (SO_4-S)	N (NO_3-N)	Total Dissolved Solids	% Na of Cations	Adj SAR
			lbs/Acre Foot							(ppm)		
1	7.3	.40	41	116	15	498	38	22	8	256	21.2	0.6
2	7.4	.52	50	196	24	579	43	133	16	333	15.7	0.55
3	7.5	.54	69	169	23	564	58	53	35	346	22.4	0.8
4	7.5	.57	79	209	30	797	76	79	43.5	365	21.3	0.8
5	7.5	.68	114	188	26	448	145	125	14	435	29.5	1.2
6	7.4	.72	94	242	33	597	77	121	38	461	21.4	0.9
7	7.6	.53	92	136	19	730	48	54	27	339	32.6	1.2
8	7.3	.28	43	81	27	446	38	16	5	179	23.3	0.7
9	7.6	.48	71	185	25	712	57	49	24	307	21.1	0.8
10	9.3	.27	90	52	8	348	57	22	3	173	53.8	1.8
11	7.8	.28	41	92.5	14	581	77	33	11	179	25	0.68
12	7.8	.36	33	82	14	498	19	17	3	230	20.8	0.5
13	7.6	.41	33	171	22	747	72	43.5	14	262	11.4	0.36
14	7.8	.47	52	133	16	548	48	61	16	301	21.1	0.7
15	7.7	.50	60	150	21	514	39	54	33	320	22.7	0.8
16	7.7	.50	62	164	23	498	48	44	41	320	21.3	0.7
17	7.7	.49	59	156	23	498	48	68	5	314	20.0	0.7
18	7.8	.90	96	359	52	796	198	245	11	576	15.5	0.74
19	7.7	.48	68	162	27	527	49	68	22	307	22.4	0.8
20	8.1	.12	6	19	4	299	19	3	0	768	18.2	0.2
21								3	5			
22								22	19			
23								41	3			
24								44	16			
25								46	16			
26								171	22			
27								19	0			
28								11	5			
29								11	8			
30								87	22			
31								2	8			
32								38	16			
33								21	14			
34								16	5			
35								27	3			
36								166	41			
37								367	27			
38								272	19			
39								63	5			
40								41	3			
41								19	14			
42								57	3			
43								157	5			
44								19	3			
45								22	19			
46								242	11			
47								27	16			
48								14	3			
49								25	16			
50								16	22			

Water Analyses were by Servi-Tech, Inc., Dodge City, KS.

TABLE 2. Irrigation well water quality. Trace element results for nine random samples - 1983.

Sample No.	B	Fe	Cu	Zn	Mn
	lbs/Acre Foot				
1	0.79	0.03	0	0	0
2	0	0	0	0.25	0.03
7	0.76	0.11	0	0	0.05
10	0.27	0	0.27	0	0
11	0.76	0.14	0	0.03	0.03
13	0	0.05	0	0	0
14	0.87	0.08	0	0.03	0.03
15	0.68	0.14	0.03	0	0.03
20	0.68	0.11	0	0.03	0.03

Water analyses were by Servi-Tech, Inc., Dodge City, KS.

TABLE 3. Ranges and averages of analyses of SLV irrigation well water samples* - 1983.

	pH*	Cond* (mmho/cm)	Na*	Ca*	Mg*	HCO_3*	CL*	S** (SO_4-S)	N** (NO_3-N)	Total Diss. Solids*	% Na of Cations*	Adj SAR
			lbs/Acre-Foot							(ppm)		
Range												
Low	7.3	0.12	6	19	4	299	19	2	0	173	11	0.2
High	9.3	0.90	114	359	52	797	198	367	44	768	54	1.8
Average	7.7	0.43	63	153	22	561	63	68	15	339	23	0.8

*Survey of 20 wells
**Survey of 50 wells

FIGURE 1. Distribution of NO_3-N in 50 irrigation wells in the San Luis Valley.

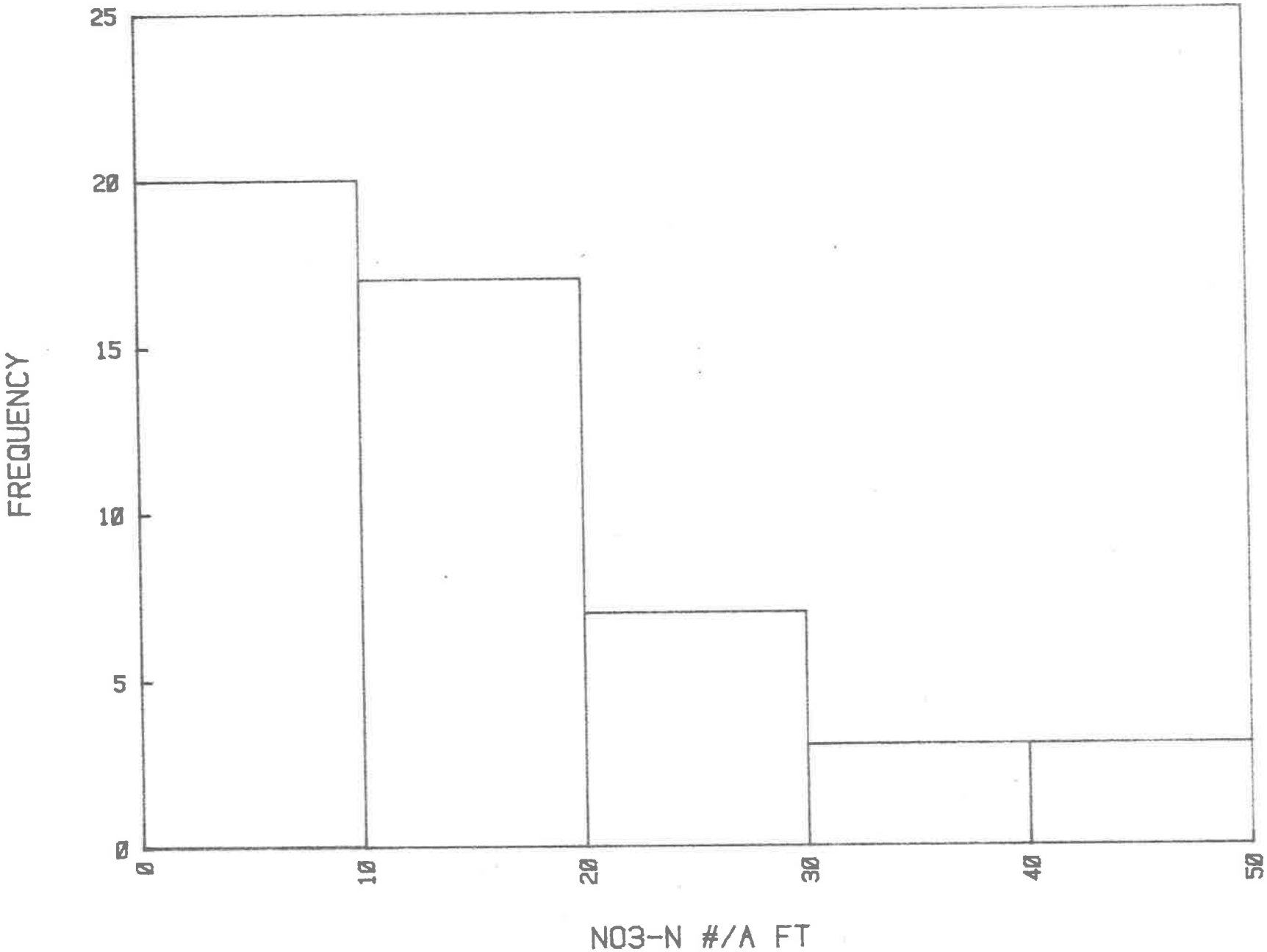

FIGURE 2. Distribution of SO_4-S in 50 irrigation wells in the San Luis Valley.