Alfalfa Fertility Experiment

In the spring of 1961, an alfalfa fertility experiment was established at the N. L. Weigand location, to determine the effect of trace elements in combination with lime and gypsum on the stand and yield of alfalfa. The soil analysis of this location was presented in the 1961 report.

The fertilizer treatment established are shown in Table No. 22. A base treatment (A) shown below was applied uniformly to the entire plot area:

A - 75 lbs. P_2O_5/A. as single Superphosphate
75 lbs. K O/A. as Sulphate of Potash
75 lbs. S/A. from the Superphosphate and Sulphate of Potash

Other experiments from Central Oregon and greenhouse experiments at Oregon State University indicated that Gypsum and Lime may have an effect on the performance of some of the trace elements, therefore, the trace elements were in combinations with lime and gypsum. Lime was applied at the rate of 2000 lbs. per acre of 100 mesh limestone, Gypsum at the rate of 1000 lbs. per acre of gypsum (18%).

The trace elements were sprayed on the soil surface. All materials were disced into the soil before seeding. The trace elements were applied at the following rate per acre and source:

B - Boron	1 lb. as Solubor
Cu - Copper	8 lb. as Copper sulfate
Zn - Zinc	8 lb. as Zinc sulphate
Mo - Molybdenum	4 oz. of Molygrow
Co - Cobalt	8 oz. of Cobalt nitrate

A Selenium plot was planned but the material did not arrive in time for application.

The entire area was seeded to Vernal alfalfa. The growing season was unfavorable for the establishment of an alfalfa seeding, hot weather while the alfalfa was in the seedling stage encouraged weeds and necessitated frequent irrigation. Under these conditions, the seedlings would grow to about one and a half inches in height, turn yellow and die. It was thought at the time that this was due to water scald from the frequent irrigations during the heat of the day. he widespread occurence of this condition among seedings in the Powell Butte area during that year and the differences in irrigation methods. and seeding times precluded water scald as the cause. Future plantings will be observed in that area and samples sent to pathologists to determine if disease plays a part in the death of seedling alfalfa plants in this area.

Weeds and quackgrass were heavy in the plot area and were clipped twice during the season. Even though a large number of plants died during establishment, a fair stand of alfalfa was obtained.

During the spring of 1962 (the last week of April) a stand count was made of alfalfa, grass and other legumes in each plot. Twenty-one 1 square-foot units chosen at random were counted in each treatment for each replicate. The results for the alfalfa count are shown in Table No. 22. The large coefficient of variation indicates the extreme variation in stand encountered. There were no significant differences in stand due to treatment.

The hay was harvested in two cuttings and the variation encountered in stand tended to carry through into the yields. As shown by the Total Yield (Table No. 23), the average yields varied by 2 tons per acre but the differences were not significant. The total yield would appear to be quite satisfactory, up to seven tons, however, the second cutting was passed full bloom when cut and this exagerated the average yield.

It is impossible to indicate from this data that any treatment affected yield.

A second trace element experiment was established at the Weigand location during the summer of 1962. The objective was to determine the the effect of trace elements on stand and yield, also deep phosphate placement was included in two treatments.

A base treatment of 80 pounds of K_2O as sulphate of potash and 80 pounds of S supplied from the sulphate of potash and made up with gypsum. On all plots but the deep placement, 80 pounds of P_2O_5 supplied as treblesuper phosphate was also included in the treatment. These treatments were weighed and applied separately for each plot. The deep placement phosphate was applied into augered holes 16" deep as phosphoric acid with 200 pounds of P_2O_5 placed and 30 pounds will be surface applied annually for four years, making a total application in a four year application of 320 pounds per acre of P_2O_5 on both the surface and deep placed phosphate.

The trace elements were sprayed onto the surface of the soil and disced in along with the base treatment.

Rates and sources of fertilizers applied are as follows:

Sulfur - 80 lbs. per acre as 15% Gypsum
17.5% S (Sulphate of potash)
P_2O_5 - 80 lbs. per acre as 45% Treblesuper phosphate
and as phosphoric acid on deep placement
K_2O - 80 lbs. per acre as 52% Sulphate of potash

Table No. 22

Effect of Trace Elements in Combination with Lime and Gypsum on Stand of Alfalfa
N.L. Weigand Location - Powell Butte, Oregon - 1962

Treatments	Alfalfa Plants by Replicates Total of 21 sq. ft. count				Ave. Stand
	I	II	III	IV	
A	63	93	112	63	83
A, G	67	75	128	72	86
A, G, B	175	89	96	124	121
A, G, Mo	67	55	89	170	95
A, G, Mo, B	101	56	73	71	75
A, L	109	97	121	118	111
A, L, B	73	120	94	85	93
A, L, Mo	64	118	178	150	128
A, L, Mo, P	41	79	47	92	65
A, G, B, Mo, Cu	60	115	194	103	118
A, G, B, Mo, Zn	66	74	148	120	102
A, G, B, Mo, Zn, Cu	90	113	108	70	95
A, L, B, Mo, Cu	102	185	85	126	125
A, L, B, Mo, Zn	60	61	87	81	72
A, L, B, Mo, Zn, Cu	89	130	69	158	112
A, B	45	87	104	73	77
A, Mo	102	79	102	69	88
A, Mo, B	72	54	166	126	105
A, G, Mo, B, Cu, Zn, Co	131	76	118	119	111
A, G, Mo, B, Cu, Zn, Se	139	129	131	128	132
					NS

Coefficient of Variation - 32.4%

Count made last week of April, 1962

Table No. 23

Effect of Trace Elements on the Yield of Alfalfa Hay,
Seasons Total, in Tons Per Acre
N. L. Weigand Location -- Powell Butte, Oregon - 1962

Fertilizer Application	Air Dry Hay Yield - Tons Per A. Total for Season - By Replicate				Mean
	I	II	III	IV	
A	4.62	5.92	8.13	6.51	6.30
A, G	5.11	5.26	6.64	6.40	5.85
A, G, B	6.28	5.61	6.36	6.96	6.30
A, G, Mo	5.69	5.65	6.34	7.42	6.28
A, G, Mo, B	6.27	6.19	5.52	6.09	6.02
A, L	5.82	6.16	6.05	6.23	6.07
A, L, B	4.92	7.40	7.57	7.55	6.86
A, L, Mo	6.08	7.03	6.62	6.04	6.44
A, L, Mo, B	5.43	5.69	5.06	6.64	5.71
A, G, B, Mo, Cu	3.72	5.56	6.96	4.96	5.30
A, G, B, Mo, Zn	5.18	6.49	6.59	7.21	6.37
A, G, B, Mo, Cu, Zn	6.16	7.32	8.24	5.80	6.88
A, L, B, Mo, Cu	5.66	6.04	7.07	7.22	6.50
A, L, B, Mo, Zn	5.75	6.33	7.32	8.65	7.01
A, L, B, Mo, Cu, Zn	5.07	5.63	7.51	6.00	6.05
A, B	4.64	6.43	7.53	6.04	6.16
A, Mo	6.41	6.59	7.11	6.12	6.56
A, Mo, B	4.46	5.97	8.25	7.20	6.47
A, G, B, Mo, Cu, Zn, Co	6.87	6.61	7.59	6.99	7.02
A, G, B, Mo, Cu, Zn, Se	4.95	6.67	7.20	6.60	6.36
					N.S.

Coefficient of Variation - 11.4%

Seeded - 1961
First Harvest - June 22, 1962
Second Harvest - Sept. 11, 1962

Boron - 1 lb. per acre Solubor 25.5% B
Zinc - 8 lb. per acre Zinc sulphate 40% Zn
Copper - 8 lb. per acre Copper sulphate 40% Cu
Molybdenum - 8 oz. per acre Ammonium molybdate
Cobalt - 8 oz. per acre Cobalt sulphate $7H_2O$
Manganese - 8 lb. per acre Manganous sulphate 30%

Dates of applications and seedings:

May 28 - Eptam applied
June 7 - Trace elements sprayed
June 14 - Base treatment applied
June 20 - Deep placement of phosphate
Aug. 1 (approx.) Alfalfa seeded

The soil analysis of samples taken just prior to first fertilizer application are as follows:

Soil Depth Inches	Soil pH	P	Potassium		Ca	Mg	B	OM
		Pd./A.	Pd./A.	me/100g.	me/100g.	me/100g.	ppm	%
0-8	5.7	60.50	234.0	0.30	5.0	3.4	0.38	0.80
8-16	6.2	23.50	296.4	0.38	5.4	4.1	0.40	1.22
16-24	7.5	17.50	421.2	0.54	8.6	7.1	0.47	0.72

These results vary from the sample taken a year before in the same general area of the field. The 1961 results show that the topsoil had approximately 32 pounds per acre phosphorus in the top soil and approximately 12 pounds in the sub-soil. The success of the deep placement treatments probably depends on the original sample being correct.

A very satisfactory weed free stand of alfalfa was obtained on all plots. Unless the appearance of the plots change by spring of 1963 no stand counts will be made.

This experiment will be harvested for four years with maintenance levels of potash phosphate and sulfur applied annually.

Appendix Table No. 20

Effect of Trace Elements in Combination with Lime and Gypsum on Yield of Alfalfa Hay, By Replicate and Average, and on Plant Height - First Cutting N. L. Weigand Farm - Powell Butte, Oregon - 1962

Fertilizer Application	Air Dry Hay - Tons Per Acre By Replicate				Ave. Yield	Plant Height Inches
	I	II	III	IV		
A	2.35	2.35	3.46	2.44	2.65	20.75
A, G	1.61	1.74	2.57	2.89	2.20	20.00
A, G, B	1.91	2.61	2.83	3.40	2.69	19.75
A, G, Mo	1.87	2.08	2.63	3.50	2.52	19.75
A, G, B, Mo	2.61	2.23	2.17	2.00	2.25	21.25
A, L	2.52	2.07	2.43	1.85	2.22	20.00
A, L, B	1.51	3.58	3.84	3.19	3.03	21.75
A, L, Mo	2.03	3.01	2.93	1.96	2.48	20.75
A, L, B, Mo	2.07	2.66	2.11	2.31	2.29	19.50
A, G, B, Mo, Cu	.97	1.98	2.83	3.30	2.27	20.25
A, G, B, Mo, Zn,	2.08	3.07	2.87	2.64	2.67	21.00
A, G, B, Mo, Cu, Zn	2.19	3.02	3.56	2.68	2.86	21.75
A, L, B, Mo, Cu	1.89	2.07	3.09	3.37	2.61	19.25
A, L, B, Mo, Zn	2.07	2.56	3.29	4.25	3.04	21.00
A, L, B, Mo, Cu, Zn	2.01	2.51	3.03	2.18	2.43	20.75
A, B	1.49	2.38	3.07	2.15	2.27	19.25
A, Mo	2.77	2.67	2.88	2.23	2.64	21.25
A, B, Mo	1.77	2.03	4.01	2.55	2.59	19.25
A, G, B, Mo, Cu, Zn, Co	3.17	3.10	3.50	2.96	3.18	23.00
A, G, B, Mo, Cu, Zn, (Se)(1)	1.64	3.21	3.19	2.65	2.67	21.50

Harvested - June 22, 1962

(1) Selenium was not applied

Appendix Table No. 21

Effect of Trace Elements in Combination with Lime and Gypsum on Yield of Alfalfa Hay, By Replicate and Average, and on Plant Height - Second Cutting
N. L. Weigand Farm - Powell Butte, Oregon - 1962

Fertilizer Application	Air Dry Hay - Tons Per Acre By Replicate				Ave. Yield	Plant Height Inches
	I	II	III	IV		
A	2.27	3.57	4.67	4.07	3.65	32.75
A, G	3.50	3.52	4.07	3.51	3.65	34.00
A, G, B	4.37	3.00	3.53	3.56	3.62	35.50
A, G, Mo	3.82	3.57	3.71	3.92	3.76	36.50
A, G, Mo, B	3.66	3.96	3.35	4.09	3.77	35.75
A, L	3.30	4.09	3.62	4.38	3.85	35.75
A, L, B	3.41	3.82	3.73	4.36	3.83	34.00
A, L, Mo	4.05	4.02	3.69	4.08	3.96	35.75
A, L, B, Mo,	3.36	3.03	2.95	4.33	3.42	35.00
A, G, B, Mo, Cu	2.74	3.58	4.13	2.66	3.28	34.50
A, G, B, Mo, Zn	3.10	3.42	3.72	4.57	3.70	36.25
A, G, B, Mo, Cu, Zn	3.97	4.30	4.68	3.12	4.02	37.75
A, L, B, Mo, Cu	3.77	3.97	3.98	3.85	3.89	38.25
A, L, B, Mo, Zn	3.68	3.77	4.03	4.40	3.97	33.50
A, L, B, Mo, Cu, Zn	3.06	3.12	4.48	3.82	3.62	36.00
A, B	3.15	4.05	4.46	3.89	3.89	34.50
A, Mo	3.64	3.92	4.23	3.89	3.92	35.25
A, B, Mo	2.69	3.94	4.24	4.65	3.88	33.00
A, G, B, Mo, Cu, Zn, Co	3.70	3.51	4.09	4.03	3.83	37.75
A, G, B, Mo, Cu, Zn, (Se)(1)	3.31	3.56	4.01	3.95	3.71	35.25

Harvested September 11, 1962

(Selenium was not applied)