1977 ANNUAL REPORT

Soil Fertility Trials
O.S.U. Extension Service
and
Agricultural Experiment Station
Cooperating

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Cooperators

The projects discussed in this report represent a cooperative effort of several people and organizations. Oregon county Extension agents who conducted the field trials were: Mike McCarthy (Jackson County), Gary Schneider (Josephine), Paul McCormick (Lake), Gale Gingrich (Marion), Lynn Cannon and Arthur Poole (Coos), and Mike Weber (Jefferson). Other O.S.U. cooperators were: Tom Bedell (Range Management), Tom Jackson, Marlene Berg, and Tom Doerge (Soil Science), and Malcolm Johnson (Central Oregon Experiment Station). Several farmers and ranchers provided land and other facilities, and Conrad Kresge, T.V.A., Pullman, provided ideas and support.

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1. Irrigated Clover/Grass Pasture - Jackson and Josephine Counties

The response of irrigated clover/grass pasture to P, K, S and B fertilization was studied in 4 replicated field experiments by Michael McCarthy and Gary Schneider, Jackson and Josephine County Agents.

The soil series and soil test values for the non-fertilized plots are indicated in Table 1.

Table 1: Soil Test Values[1/]

Soil	pH	P	K[2/]	SMP[3/]
		ppm		
Siskiyou	6.2	18	129	7.0
Newberg	5.9	9	146	7.0
Agate	6.3	4	108	6.8
Coker	6.2	9	229	6.9

1/ Soil test results based on procedures used by the OSU Soil Testing Laboratory. (Ore. Agr. Exp. Sta. Spec. Rep. 321. 1976.)

2/ Soil test values for 0-6" soil depth for plots not fertilized with P & K respectively.

3/ Shoemaker, McLean, and Pratt lime requirement soil test values.

The fertilizer treatments were applied in April with potassium being applied again in July. The fertilizer treatments are outlined in Table 2.

Table 2: 1976 Fertilizer Treatments.

Treatment	N	P_2O_5	K_2O[1/]	S	B
1	0	0	0	0	0
2	40	80	60+60	40 G*	2
3	40	80	60+60	40 G	0
4	40	80	60+60	0	2
5	40	80	60+60	40 E**	2
6	40	80	60+60	400 E	2
7	40	80	0	40 G	2
8	40	0	60+60	40 G	2
9	40	40	60+60	40 G	2
10	40	120	60+60	40 G	2

G* Gypsum
E** Elemental Sulfur - coarse (>10 mesh)

1/ A split application of K_2O is applied: 60 lbs in April and 60 lbs in July.

Yield responses to P fertilization were not recorded on the Newberg or Coker soils which had P soil test values of 9 ppm in each case. This has been considered a fairly low soil test value for P and a P response had been anticipated on these soils. Both of these locations had a prior history of P fertilization. It is possible that P fertilization is influencing soil test P critical levels.

Response to K Fertilizer

Significant responses to K fertilization were not realized at any of the locations. Soil test values for K varied from 108 to 229 ppm (Table 1). The K concentration in clover was increased by K fertilization at the Siskiyou location (Table 5).

Response to S and B Fertilizer

S fertilization at 40 lbs/A failed to significantly increase forage yields and in most instances failed to significantly increase the S content of the clover. The S content of the clover ranged from 0.10% to 0.19%.

B applications did not increase forage yields in spite of initial low B soil test values at some locations (Agate 0.29 ppm B, Siskiyou 0.13 ppm B).

Table 4: Effect of rate of P fertilization on the P content of clover.

		Sampling Date					
		June 30			Sept. 26		
		Rate of Application of P_2O_5 - (lbs/A)					
		0	80	120	0	80	120
		P Content of Clover					
	Rep.	% of P					
Siskiyou	1	0.23	0.29	0.30	0.17	0.19	0.27
	2	0.19	0.30	0.30	0.16	0.24	0.28
	3	0.18	0.23	0.41	0.18	0.25	0.30
	4	0.27	0.37	0.31	0.22	0.32	0.32
	Ave.	0.22	0.30	0.33	0.18	0.25	0.29
Newberg	1	0.21	0.26	0.27	0.23	0.25	0.26
	2	0.20	0.23	0.22	0.22	0.25	0.22
	3	0.17	0.22	0.21	0.22	0.26	0.26
	4	0.19	0.20	0.21	0.23	0.23	0.28
	Ave.	0.19	0.23	0.23	0.22	0.25	0.25
Agate	1	0.21	0.25	0.25			
	2	0.18	0.24	0.25			
	3	0.21	0.24	0.23			
	4	0.21	0.23	0.23			
	Ave.	0.20	0.24	0.24			
Coker	1	0.27	0.29	0.28	0.25	0.26	0.24
	2	0.24	0.27	0.26	0.24	0.21	0.25
	3	0.22	0.26	0.26	0.20	0.24	0.23
	4	0.25	0.28	0.27	0.23	0.25	0.27
	Ave.	0.24	0.27	0.27	0.23	0.24	0.25

Table 6: Effect of S fertilization on the S content of clover.

		Sampling Date			
		June 30		Sept. 26	
		Rate of Application of S - (lbs/A)			
		0	40	0	40
		S Content of Clover			
	Rep.	% S			
Siskiyou	1	0.15	0.13	0.13	0.12
	2	0.10	0.14	0.12	0.14
	3	0.14	0.14	0.16	0.15
	4	0.11	0.17	0.13	0.17
	Ave.	0.12	0.14	0.13	0.14
Newberg	1	0.13	0.13	0.11	0.12
	2	0.11	0.15	0.11	0.12
	3	0.13	0.14	0.13	0.15
	4	0.10	0.15	0.12	0.12
	Ave.	0.12	0.14	0.12	0.13
Agate	1	0.13	0.13		
	2	0.10	0.15		
	3	0.13	0.18		
	4	0.12	0.14		
	Ave.	0.12	0.15		
Coker	1	0.16	0.18	0.17	0.15
	2	0.16	0.17	0.14	0.13
	3	0.15	0.17	0.13	0.15
	4	0.15	0.19	0.15	0.17
	Ave.	0.15	0.18	0.15	0.15

P Fertilization and P Soil Test Values

The effect of P fertilization on P soil test values was variable. No doubt considerable variability was introduced as a result of grazing animals and manurial deposits. At the Siskiyou location P fertilization appreciably increased P soil test values in the 2-6" soil depth (Table 7) but an increase in the 0-2" depth was not observed. P fertilization increased P soil test values in the 0-2" depth of the Coker soil. P soil test values for the Newberg and Agate soils were not significantly altered by P fertilization. It seems that the reaction products of P fertilizers in Newberg and Agate soils have a low solubility in the acidified ammonium fluoride extracting solution used in the P soil test.

Table 9: Yield of wet meadow grass hay on N fertilized plots.

	N Fertilizer Application - (lbs/A)								
	0	50	100	150	200	250	300	350	400
	Air-dry Hay Yields - lbs/A								
Robinson	4,943	7,262	7,758	9,595	9,245	-	11,506	-	10,303
Taylor	1,885	2,136	3,435	4,073	5,536	-	7,471	-	7,267
Bluejoint	8,673	9,613	10,041	11,429	12,796	-	11,557	-	11,750
Maxwell 1	1,727	2,958	3,322	3,646	3,952	-	4,646	-	4,085
Maxwell 2	2,159	3,159	5,227	3,636	4,636	-	5,068	-	4,999
Ave.	3,875	5,025	5,955	6,475	7,235	-	8,050	-	7,680

The response of wet meadow grass hay to P fertilization was measured at the Taylor site which had a low P soil test value of 6 ppm. The yield responses from P applications which indicate a substantial yield response to the application of 40 lbs P_2O_5/A are reported in Table 10. Increasing the rate of P_2O_5 application to 80 and 120 lbs/A did not increase yields over the 40 lb rate. The rate of N application was 100 lbs/A.

Table 10: The effect of P fertilization on the yield of wet meadow grass hay.

P Fertilizer Application - (lbs P_2O_5/A)			
0	40	80	120
Air-dry Hay Yields - lbs/A			
3435	7178	7178	5267

3. Grass Seed - Marion County

The effect of fertilizer and lime on grass seed yields is being evaluated in two field trials by Gale Gingrich, Marion County Extension Agent.

Location - Fisher Farm
Grass species - Bentgrass
Soil - Nekia Si C L

The 1977 and average yield data (Table 11 and 12) do not indicate a significant yield response to L, P, K, Mg or S in 1977 or on a long term yield basis.

The soil test results (Table 13) indicate that annual applications of P and K have resulted in higher soil test values for these nutrients. The 1970 application of lime is reflected in higher soil test values for Ca, pH, and SMP in 1976-77, particularly in the 0-6" soil depth.

Table 13: Soil test values (Jan. 1977) - Fisher grass seed trial.

Soil Depth	Treat[1]	pH	P	K	Ca	Mg	SMP[2]
ins		— ppm —			- meq/100g -		
0-6	+	5.5	22	325	7.0	.25	6.0
	-	4.9	17	244	1.3	.20	5.6
6-12	+	5.2	10	189	3.4	.27	5.8
	-	5.0	8	136	1.5	.20	5.7

1/ + in the case of pH, P, K, Ca, Mg, SMP represents the application of lime, P, K, lime, Mg, and lime respectively.

- in the case of pH, P, K, Ca, Mg, SMP means that no lime, P, K, Ca, Mg, and lime respectively was applied.

2/ SMP - Shoemaker, McLean, and Pratt lime requirement test.

Location - Riches farm
Grass species - fine fescue
Soil - Nekia Si Cl

Grass seed yields were not obtained at the Riches location in 1977.

Soil samples were taken in January, 1977 from plots receiving nutrient and lime applications and plots not receiving nutrients and lime. The results in Table 14 show increases in P, K, from applications of P and K fertilizers and increases in pH, Ca, and SMP from the 1971 application of lime.

Table 14: Soil test results - Riches grass seed trial.

		soil test data				
Soil Depth	Treat[1]	pH	P	K	Ca	SMP[2]
ins			ppm		meq/100g	
0-6	+	5.9	19	278	8.5	6.0
	-	5.4	11	106	5.1	5.7
6-12	+	5.7	9	94	5.9	6.0
	-	5.6	6	60	5.5	5.9

1/ + in the case of pH, P, K, Ca, SMP represents the application of lime, P, K, lime, and lime respectively.

- in the case of pH, P, K, Ca, SMP means that no lime, P, K, lime, or lime were applied respectively.

2/ SMP - Shoemaker, McLean, and Pratt lime requirement test.

5. Sulfur-Coated Urea

Plans were completed for a demonstration project involving the use of SCU on cranberries in Coos County. This project is being conducted by Coos County Extension Agent Arthur Poole. Cranberry bogs are currently fertilized using several small applications during the growing season. Substitution of a single application of a slow release N fertilizer is attractive to the cranberry growers. The use of SCU on cranberry bogs in Washington is showing promise. The soil in the Coos County bogs differs from that in Washington but similar responses to SCU are probable. The Coos County project involving about 20 growers will commence in the spring of 1978.

Other SCU projects planned for 1978 include SCU application to young fruit trees in Jackson County and further comparisons of SCU with other slow release fertilizers on ornamentals at the North Willamette Experiment Station.

6. Phosphorus Soil-Plant Relations - Southwest Oregon

Soil fertility field experiments in Josephine and Jackson Counties of southwest Oregon have indicated that soil test sufficiency levels presently recommended for some crops and soils are too high. Work has been initiated to evaluate the P status of these soils and the present soil testing procedure. The research is being conducted by Tom Doerge, a graduate student in soil science. Techniques being employed include a comparison of P uptake by wheat with P extracted by three different soil test procedures. Soils from 28 sites on 9 soil series are being studied. P status of these soils, including P fractions, is included in the study.

7. Soil Acidity Studies - Central Oregon

Several cooperators including Jefferson County Extension Agent Mike Weber and Malcolm Johnson, T. L. Jackson and Marlene Berg of the OSU Agricultural Experiment Station investigated the developing soil acidity problem in central Oregon and Klamath County. Results to date indicate that soil pH values vary by as much as a pH unit during the growing season. Reasons for this are being investigated. The entrapment of acidic fertilizer solution in pores in pumice particles in these predominantly coarse-textured soils is being investigated as one possible reason for the unstable pH readings. The pH values in Table 16 show considerable variation among sampling dates but the dates when pH changes occurred varied among sampling sites. The pH variations could be related to fertilizer application. Lime applications resulted in substantial pH increases.

8. Publications

1977 OSU publications in soil fertility to which the Extension program contributed were:

Fertilizer Guides

FG 1 Irrigated Clover-Grass Pastures - Western Oregon (revised)
FG 3 Liming Materials for Oregon (revised)
FG 9 Winter Wheat - Western Oregon (revised)
FG 15 Peppermint - Western Oregon (revised)
FG 16 Perennial Grass Pasture (Non-Irrigated) - Western Oregon (revised)
FG 23 Apples - Oregon (revised)
FG 24 Prunes - Oregon (revised)
FG 25 Sweet Cherries - Oregon (revised)
FG 40 Irrigated Semi-Dwarf Wheat - Eastern Oregon (revised)
FG 48 Loganberries, Boysenberries, and Marion Blackberries - Western Oregon (revised)
FG 58 Irrigated Clover-Grass Pastures - Southwest Oregon (new)

Gardner, E. Hugh. 1977. Some results of P soil testing and sampling in Oregon. Proc. 27th Phosphate Conference, Riverside, CA.

Kauffman, M. D. and E. H. Gardner. 1977. The effects of partial and thorough mixing of lime on the yield, root growth, and total phosphorus uptake of winter wheat. Agron. Abst:127. Paper presented at 1977 ASA meetings, Los Angeles, CA.

Gardner, E. Hugh. 1978. Phosphorus in soils and plants. OSU Dept. Soil Science Mimeo Rep. S 124.

Berg, M. G. and E. H. Gardner. 1977. Summary of 1976 OSU soil test results. OSU Dept. Soil Science Mimeo.