

PASTURE FERTILITY SECTION

Irrigated pastures are becoming a more important factor in the economy of Central Oregon. Improved grasses are replacing the bluegrass-white clover pastures where practical in Deschutes and Crook Counties. The pastures in Jefferson are being planted to improved grasses and Ladino clover.

Along with this change in relative importance in the economy and the fact that grasses such as orchard grass and Alta fescue will respond to fertile conditions, comes the necessity of knowing the proper fertilization program to make the pastures profitable when properly managed.

In answer to this need, a pasture fertility experiment was established during 1953 on the Dave Frost farm at Madras.

During the 1953 year, a virus disease damaged the Ladino stand severely and as a consequence the data taken indicated substantial benefits in nitrogen fertilization.

During 1954, this trial was maintained and a second trial was established on the Loyd Friday farm at Terrebonne.

The experiment was designed to give information on the range of nitrogen requirement and on the number of applications - 1, 2, or 3 - required for maximum production of forage. Five levels of fertilization were used - 0, 40, 80, 120 and 160 pounds of nitrogen. The 40 pound application was applied only at one application date; the 80 pound rate at two application dates (1 & 2 and 1 & 3); the 120 and 160 pound rates were applied as one application at the first date; as two applications the first and second application dates; and as three applications on the first, second, and third application dates.

The experiment was a randomized block with three replications. The plots were 8 x 25 feet. Fertilizers were surface applied by hand with a pound coffee can of zonolite (plaster aggregate) mixed with each lot of fertilizer in order to obtain a more uniform distribution of the fertilizer and to prevent the wind from blowing the fertilizer to adjoining plots.

On the grass plots, forage was allowed to attain the average height of 9-11 inches.

At harvest the plots were trimmed to 18 feet and a three foot strip down the center of each plot was cut with a Jari power mower. The strip was cut at a height of $3\frac{1}{2}$ inches.

The plots were raked and field weights taken. A sample of approximately two pounds was gathered at random from the harvested material and moisture percentage was determined. Forage was calculated in pounds of air dry forage per acre.

Dave Frost Farm

The Dave Frost farm is approximately 7 miles northwest of Madras. The trial area has the following legal description:

SE $\frac{1}{4}$ of the SE $\frac{1}{4}$ of the SW $\frac{1}{4}$ of Sec. 28, R 13E, T9S

The field had been in dryland wheat and fallow prior to 1948. During 1950 and 1951 the field was leveled and was seeded to Alta fescue and Ladino clover.

The field had been cut heavy at the head end and filled heavy at the bottom end but the area where the trial was placed had been relatively undisturbed.

As previously stated, the trial was established during 1953 using ammonium nitrate as fertilizer. During 1954 ammonium sulphate was used as the nitrogen carrier. However, the ammonium nitrate-sulphate comparison plots were same each year.

The soil analysis Table No. 46 indicates the area to be adequate in phosphate and high in potassium, calcium and magnesium. The organic matter was considerably lower than average.

In 1954 Ladino clover flourished and offered strong competition to the Alta fescue.

Table No. 45 presents the results obtained in pounds of air dry forage for the cuttings and for the total forage for the season. Also shown are the fertilizer application dates and the cutting dates.

The results from this trial indicate that 160# N was required as one or two applications to increase the yield significantly over no treatment.

There were no significant differences in yield, whether the fertilizer was applied as one, two or three applications until the 160# N level was reached and then the one and two applications were significantly higher yielding than when the fertilizer was applied in three applications.

No significant differences were obtained when 160# N in three applications was applied as ammonium sulfate compared to ammonium nitrate.

At the 80# level it made no difference whether the two 40# N applications were made on the first and second application dates or the first and third application dates.

At the first cutting, it required 80# of N to significantly increase yield.

Fertilization had a pronounced effect on botanical composition. There were some differences by replication which may indicate the influence of the original stand. The average effect of fertilization on botanical composition as determined by observation at the end of the growing season are as follows:

Table No. 45
 Yield of Pasture Forage from Four Levels of Nitrogen Fertilization
 Applied as One, Two & Three Fertilizer Applications
 Yield in Pounds Per Acre Air Dry Forage
 Ladino Clover & Alta Fescue
 Dave Frost Farm - Madras, Oregon - 1954

Fertilizer ⁽¹⁾ Application			Total Pounds of N for Season	Pounds Per Acre Air Dry Forage Cuttings by Date			Total Forage for Season
Pounds of N Per Acre By Date of Application				5/27/54	7/25/54	10/1/54	
0	0	0	0	2315.8	1244.9	2923.7	6484.4
40	0	0	40	3189.7	1355.2	3054.5	7599.4
40	40	0	80	2359.5	1753.1	2382.3	6494.9
40	0	40	80	2927.5	965.3	2436.1	6328.9
80	0	0	80	4369.4	1696.7	1175.0	7241.0
40	40	40	120	2184.7	1699.4	3111.0	6995.1
60	60	0	120	2752.7	1839.2	1581.1	6173.0
120	0	0	120	4587.9	2062.4	1065.1	7715.4
53.3	53.3	53.3	160	2927.5	1987.1	2231.7	7146.3
80	80	0	160	5155.9	2385.0	1632.1	9173.0
160	0	0	160	5592.8	2285.6	871.2	8749.6
53.3	53.3	53.3	160	3320.8	2097.3	2153.8	7571.9
Treatment L.S.D. 5%				1829.2	537.8	1073.0	1670.7
C.V.				31.1%	17.8%	23.7%	13.5%

Table No. 46

Soil Analysis
 Pasture Fertility Trial
 Dave Frost Farm
 Madras, Oregon
 1954

Madras Loam

Range of Depth	pH	Pounds Per Acre				Organic Matter %
		P	K	Ca	Mg	
0-8	7.2	24.0	1540	3240	1680	.85
		22.0	1500	3240	1680	
8-16	6.9	15.2	1120	3380	1840	.87
		15.2	1094	3320	1840	
16-24	7.3	10.8	850	4320	2180	.74
		10.8	870	4200	2130	

No.	Total #N	Applications	Ladino Clover	Alta Fescue
1	0	0	100	0
2	40	1	100	0
3	80	2 (1-2)	95	5
4	80	2 (1-3)	95	5
9	80	1	100	0
5	120	3	60	40
8	120	2	70	30
11	120	1	50	50
7	160	3	35	65
10	160	2	40	60
12	160	1	30	70
6	160 (Am Nit)	3	10	90

The variations from these observations as noted in other replications were:

Total #N	Applications	Ladino Clover	Alta Fescue
120	1	35	65
80	1	20	80
160	2	10	90
120	3	80	20
80	2 (1 & 3)	50	50
120	2	50	50

The stand in the pasture area was not perfect and variations would be expected. Ammonium nitrate has, as would be expected, a much more drastic effect on the clover population than does ammonium sulphate.

The maximum increase in forage was obtained from 160# N applied as two applications. This gain was 2688.6 pounds and was obtained from \$24.50 fertilizer cost. The forage was obtained at a cost of \$18.20 a ton. This price would probably be prohibitive when based on production.

Loyd Friday Farm

The Loyd Friday farm is located three miles north of Redmond on Highway 97. The trial area has the following legal description: NW $\frac{1}{4}$ of the NW $\frac{1}{4}$ of the SE $\frac{1}{4}$ of Sec. 28, R 13 E, T 14 S.

The pasture has been in production for two or three years and has not been high producing. The farmer had difficulty establishing clover in the pasture but at the time the trial area was selected it was thought that the clover population was adequate for the pasture. Small plants could be observed in the entire field. The clover stand deteriorated to such an extent that the pasture should be considered a grass pasture.

Orchard grass was the principal grass in the pasture with some perennial ryegrass and just a trace of narrow leaf fescues.

Table No. 47
 Yield of Pasture Forage from Four Levels of Nitrogen Fertilization
 Applied as One, Two & Three Fertilizer Applications
 Yield in Pounds Per Acre of Air Dry Forage
 Orchard grass & Perennial Ryegrass
 Loyd Friday Farm - Terrebonne, Oregon - 1954

Fertilizer Application ⁽¹⁾			Total Pounds of N for Season	Pounds Per Acre Air Dry Forage Cuttings by Date			Total Forage for Season
By Date of Application				5/20/54	7/22/54	9/28/54	
0	0	0	0	1223.4	1018.5	260.8	2502.7
40	0	0	40	3364.5	1917.4	242.0	5523.9
40	40	0	80	2840.1	3089.2	400.6	6329.9
40	0	40	80	3451.8	1443.1	726.0	5620.9
80	0	0	80	4413.1	2175.0	271.6	6859.7
40	40	40	120	4151.0	3312.4	1126.6	8590.0
60	60	0	120	5723.9	3652.8	790.5	10167.2
120	0	0	120	5374.4	3140.3	459.8	8974.5
53.3	53.3	53.3	160	3451.8	3701.5	1245.0	8389.3
80	80	0	160	4544.2	3944.9	1000.3	9489.4
160	0	0	160	7034.8	4246.3	693.7	11974.8
53.3 ⁽²⁾	53.3	53.3	160	3670.3	3625.1	1193.9	8489.3
Treatment L.S.D. 5%				1423.3	756.1	299.0	1974.3
C.V.				20.5	15.2%	25.2	15.1

(1) Applied as ammonium sulfate except where noted.

(2) Applied as ammonium nitrate.

Table No. 48

Soil Analysis
 Pasture Fertility Trial
 Loyd Friday Farm
 Terrebonne, Oregon
 1954

Deschutes Sandy Loam

Range of Depth	pH	Pounds Per Acre				Organic Matter %
		P	K	Ca	Mg	
0-8	6.6	9.0	380	2390	1420	1.47
		8.6	386	4060	1440	
8-16	6.6	2.6	426	2820	2140	.88
		4.0	440	2820	2180	
16-24	6.9	2.0	1140	5280	5120	.66
		2.6	1120	4980	4920	

The soil test (Table No. 48) probably shows the reason for the clover going out of the pasture. The phosphate level in the trial area is very low. The pH was favorable for clover growth and the other tested elements, potassium, calcium and magnesium, while not high for Central Oregon were probably adequate.

Since the legume did not grow in this pasture, the pasture responses were from the grasses.

Table No. 47 shows the results obtained by cutting and for the total forage obtained during the season. Fertilizer application by date and cutting dates are indicated.

The results indicate that for each 40# of N increment there were significant increases in yield.

There were no differences in yield due to number of applications until the 160# N level was reached. One hundred and sixty pounds of N as one application significantly exceeded the yield of 160# N as three applications.

The 160# N as two applications did relatively poorer in this trial than in the Dave Frost trial. This may be accounted for by the fact that in the third replication this treatment was on a high spot and did not receive a normal amount of water.

The disadvantage of applying the fertilizer as one application compared to three applications can be observed in the results. Seven thousand pounds of the total 12,000 pound yield was obtained in the first cutting and the third cutting was not, from the practical standpoint, much greater than no fertilizer. Applying the fertilizer in three cuttings overcomes this disadvantage to a limited extent at the sacrifice of early forage and total forage.

In this trial the increase from the first 40# N increment was obtained at a fertilizer cost of \$4.25 a ton while the increase at the 160# N level was obtained at a fertilizer cost of \$6.50 per ton.

There were no differences in yield between ammonium nitrate and ammonium sulfate when applied as 160# N in three applications.

There were no significant differences in yield at the 80# N when the fertilizers were applied as two applications as first and second application dates or first and third application dates.

These facts would indicate that on a grass pasture in Central Oregon a farmer can produce inexpensive forage with nitrogen fertilization.

Summary

A pasture fertility experiment was designed to determine the approximate range of nitrogen requirement on an irrigated pasture and whether these nitrogen levels should be applied as one, two, or three applications.

Two locations were established. On one, the Dave Frost farm, conditions were favorable for the legume, and the other, the Loyd Friday farm, conditions were unfavorable for the legume.

The results indicate that where conditions are favorable for legume growth, that it required during 1954 160# N as one or two applications to increase yield over no fertilizers.

There were no differences in yield whether the fertilizers were applied as one, two, or three applications until the 160# level was reached, and then 160# N as one application significantly outyielded 160# N applied as three applications.

No differences in yield between ammonium sulfate and ammonium nitrate. Nitrate was more effective in controlling the clover population.

Treatments receiving 80# of N or less were at least 90% legume, by observation, at the close of the season.

In this trial the maximum increase in forage, 2688.6 pounds per acre, was obtained at a fertilizer cost of \$24.50 or \$18.22 a ton.

When conditions are unfavorable for the growth of legumes and grasses dominate the pasture, as at the Friday location, the effectiveness of nitrogen application greatly improves.

With each 40# N increment, the yield of forage was significantly increased.

Below the 160# N level, yield was not significantly influenced by the number of applications. At the 160# N level, there was a significant difference between the one and three applications in favor of the one application.

The two and three application treatments succeeded in leveling out the forage production over the season but whether it was improved sufficiently to be practical is doubtful.

At the 40# N level the forage was obtained for a fertilizer cost of \$4.25 a ton. At the 160# N level (one application) forage was obtained at a fertilizer cost of \$6.50 a ton.

In this trial there was no difference in yield, whether the fertilizer was applied as ammonium nitrate or ammonium sulphate.