Nitrogen for Dallisgrass PASTURES In the Black Belt

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DALLISGRASS and white clover have been the most important forage crops for improved permanent pasture in the Black Belt area of Alabama for many years.

Dallisgrass is so well adapted to this region that the prairie soils are often referred to locally as "Dallisgrass land." White clover is not as hardy and persistent as Dallisgrass, but is well adapted. It is the only perennial pasture legume to achieve widespread usage in the area.

During years of favorable growing conditions, white clover produces an abundance of early forage that is high in quality and palatability. With adequate summer rainfall, it usually remains vegetative and lengthens the grazing season 30 to 60 days over that of Dallisgrass alone. With severe summer drought the clover frequently fails to survive as a full stand and natural reseeding is desirable. Since 1950 unfavorable conditions have resulted in erratic clover performance. Many pastures have not had a good clover crop for at least 5 years and Dallisgrass has become rather unproductive because of insufficient nitrogen.

In 1952 an experiment was begun at the Black Belt Substation, Marion Junction, to determine the value of supplemental nitrogen in commercial form when applied to Dallisgrass-white clover pasture.

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[1] The contribution of the late W. B. Kelley, Superintendent, Black Belt Substation, is acknowledged.

EXPERIMENTAL AREA and PROCEDURE

Four grazing paddocks, each 3 acres in size consisting of about 2 acres of West Point Clay[2] and 1 acre of Sumter and Houston clay were selected for study. Prior to the first grazing season, the pastures were treated uniformly with 100 pounds each of P_2O_5 and K_2O per acre. The same rate of mineral fertilization was continued each year to ensure that mineral nutrients were not limiting factors.

Cattle Management

The plots were grazed by beef type yearling steers except for the 1954 grazing season when 2-year-old steers were used. The "put and take" system of stocking was used to adjust stocking rate. More steers were added as the amount of forage on the paddocks increased beyond the ability of the steers to graze it in a reasonable time. As forage declined in quantity, the stocking rate was correspondingly reduced. Two-day weights of steers were obtained prior to placing them on pastures and again as they were removed from the experiment. While on test steers were weighed at 28-day intervals. Beef yields reported are net gains for all steers used in the experiment for that season. Since a conservative stocking rate was used with gradual adjustment of steer numbers per paddock, these values should be about what might be expected under farm conditions.

Forage Management

Stocking was usually delayed until sufficient forage growth had accumulated to support two steers per paddock. Nine standard welded wire cages 4 feet square were placed on each pasture prior to grazing for measurement of forage growth. At the end of each 28-day period, forage was harvested from the protected areas with a small sickle bar mower. At the same time a similar harvest was made from grazed areas. The cages were rotated to a grazed area after each harvest. This system is known as the "cage difference technique" and permits measurement of growth made by comparing yields from caged areas with those from grazed areas that were harvested 28 days before. This technique makes no distinction between forage lost because of trampling and that actually eaten, but with

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[2] Formerly known as Bell Clay.

conservative stocking the technique provides a satisfactory index for grazing efficiency.

Botanical Composition

At the beginning of the experiment in 1952, there was a fair stand of white clover on all paddocks, but it was lost probably because of drought during the first 2 years of the experiment. Although efforts were made to regain the stand by reseeding, close grazing of Dallisgrass, and light disking in the fall, the clover was not satisfactorily reestablished during the course of the experiment. A special effort was made in 1956 to favor the clover. There was a fair stand of seedling clover and stocking was delayed until June 26 to permit clover seed to mature. This plus early removal of steers in the fall (Sept. 10) resulted in a short grazing season for that year.

Wild barley *(Hordeum pusillum)*, a low-growing, cool-season annual grass, increased on pastures as the experiment progressed. Although variable from year to year, the stand was usually dense during early spring and was competitive with seedling white clover.

The severe drought of 1954 limited growth and so weakened Dallisgrass that data were not recorded the following year.

Nitrogen Fertilization

One of the primary objectives of the experiment was to study the response of Dallisgrass to nitrogen applied in addition to that supplied by the clover. The timing of the nitrogen fertilization was set to follow the normal clover season. Rates of 0, 40, 80 and 160 pounds of nitrogen per acre were used. The first increment of nitrogen was applied around the first of June. Two plots received 40 pounds and a third 80 pounds of nitrogen at that time. Two of the plots received additional nitrogen at the rates of 40 and 80 pounds near July 1. Sodium nitrate was the source of nitrogen, except during 1957 when ammonium nitrate was applied.

TABLE 1. ANNUAL AND SUMMER RAINFALL FOR THE PERIOD 1952-57 COMPARED WITH THE LONG-TIME AVERAGE, BLACK BELT SUBSTATION[1]

Item	1952	1953	1954	1956	1957	23-yr. average
	In.	*In.*	*In.*	*In.*	*In.*	*In.*
Annual rainfall	42.91	56.20	27.43	41.1	55.70	50.56
April 1 to Sept. 30 rainfall	16.39	24.52	10.36	13.98	32.55	24.83

[1] Rainfall data for 1955 are not shown as forage data were not obtained that year.

The annual rainfall data and rainfall during the Dallisgrass season are shown in Table 1.

RESULTS and DISCUSSION

Forage Production

Yields of dry forage per acre by years are given in Table 2. The response of forage to nitrogen fertilizer was considerable except in 1953 when good clover growth apparently supplied sufficient nitrogen for Dallisgrass under prevailing moisture conditions. The nitrogen-treated plots produced more summer forage that resulted in an increase in beef gain even though less total forage was produced.

The first 40-pound increment of nitrogen increased forage production by about 1,500 pounds of dry matter per acre. The second

TABLE 2. FORAGE PRODUCTION DALLISGRASS-NITROGEN GRAZING EXPERIMENT, 1953-1957

Nitrogen treatment, pounds per acre	Yield of dry forage per acre[1]				
	1953	1954	1956	1957	4-yr. av.
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*
0	8,264	1,891	1,053	2,938	3,536
40	7,396	3,322	2,495	7,211	5,106
80 (40 June, 40 July)	8,707	3,374	2,447	7,850	5,594
160 (80 June, 80 July)	9,173	4,277	3,960	8,705	6,529

[1] No forage yields were taken during 1952. No data were collected during 1955.

Dallisgrass-white clover pasture typical of areas where little response to nitrogen would be expected.

Yearling beef animals grazing pasture typical of areas where good response to nitrogen would be expected.

increment, making a rate of 80 pounds of nitrogen, further increased yields by 418 pounds. The increase in nitrogen from 80 to 160 pounds increased the dry forage yields by 927 pounds per acre. From appearance of the pastures it was evident that there was some carry-over of nitrogen from year to year. This was especially noticeable following a dry summer and fall.

Beef Production

The rainfall and type of grazing management greatly influenced the length of the grazing season, which in turn had a marked influence on beef gains, Table 3. Although the average number of days per grazing season was 170, this varied from a low of 77 calendar days in 1956 to a high of 230 in 1957. The grazing produced during the

TABLE 3. BEEF YIELDS, DAILY GAINS, STOCKING RATE, AND LENGTH OF GRAZING SEASON[1] AS INFLUENCED BY NITROGEN FERTILIZATION

Nitrogen treatment pounds per acre	Beef yields from yearling steers. 1952-1957					5-year average		
	1952	1953	1954	1956	1957	Average gain per acre	Daily gain per steer	Stocking rate
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*Steers/acre*
0	155	214	166	75	228	168	1.30	.76
40	187	297	245	156	419	261	1.68	.91
80	173	353	288	154	485	291	1.57	1.08
160	205	353	285	190	529	312	1.59	1.15

[1] Length of grazing season was 191, 207, 146, 77, 230 days, respectively, with an average of 170 days per year.

latter season was not all from Dallisgrass. During the first 30 to 40 days of that season, the sward consisted mostly of wild barley. Daily gains of yearling steers were quite satisfactory. However, the grazing was not enough to provide for growth and a high degree of finish on this age animal. Most of the steers would grade standard for slaughter at the end of the season. There was some improvement in the quality of forage on the nitrogen-treated plots over that of the check plot (no nitrogen), as shown by the daily gain of animals. All of this improvement came with the first 40-pound increment.

There was a countinuous improvement of beef gains per acre with increasing rates of nitrogen up to 80 pounds per acre. Most of the increase (93 pounds per acre) can be attributed to the first increment of 40 pounds of nitrogen. The second 40 pounds resulted in an average increase of 30 pounds of beef per acre. The cost of the additional nitrogen as related to value of the increased beef production would determine the desirability of applying the higher rate.

The relationship between pounds of forage produced to pounds of beef gain realized is a measure of grazing efficiency. A comparison of the treatment receiving no nitrogen with the 40- and 80-pound rates, Table 4, shows a trend to greater efficiency with increasing rates of nitrogen. Increasing the nitrogen rate to 160 pounds per acre reduced the grazing efficiency to about the level of the untreated paddock.

TABLE 4. EFFECT OF NITROGEN FERTILIZATION ON GRAZING EFFICIENCY

Nitrogen treatment, pounds per acre	Forage produced per pound of beef gain				
	1953	1954	1956	1957	4-yr. av.
	Lb.	*Lb.*	*Lb.*	*Lb.*	*Lb.*
0	38.6	11.4	14.0	12.9	19.2
40	24.9	13.5	16.0	17.2	17.9
80 (40 June, 40 July)	24.6	11.7	15.9	16.2	17.1
160 (80 June, 80 July)	25.9	15.0	20.8	16.4	19.5

CONCLUSIONS and RECOMMENDATIONS

Nitrogen applications can be of considerable value in strengthening stands and improving yields of Dallisgrass pastures that do not have productive stands of clover. Applications of nitrogen to such pastures resulted in increased yields of forage and beef, permitted heavier stocking rates, and improved grazing efficiency.

It is recommended that 40 to 80 pounds of nitrogen per acre be applied annually to Dallisgrass pastures until productive stands of white clover are established. If moisture supply is adequate and beef prices are favorable, the higher rate of nitrogen would be preferred.