LIVESTOCK AND RANGELAND PERFORMANCE TO NITROGEN FERTILIZATION IN SOUTH-CENTRAL NEW MEXICO

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SUMMARY

Biennial application of 45 kg per ha N fertilizer resulted in significantly increased production of upland, hill land, and bottomland pastures. Animal gain of fertilized pastures also was greater when evaluated on per day or kg per ha basis.

INTRODUCTION

Increased rangeland production is an important component of meeting long-term increased demands for red meat production. Improved livestock and range management are required to increase production. Nitrogen fertilization has been shown as an effective way to improve rangeland production and livestock performance. This study was initiated in the summer of 1979 to measure cattle and plant response to biennial applications of nitrogen fertilizer on foothill rangelands in south-central New Mexico.

MATERIALS AND METHODS

Two pastures in good condition on the Fort Stanton Experimental Ranch were chosen for study. Each contained nearly equal amounts of three range sites, upland, hillside, and bottomland. Characterization of the sites has been described by Pieper et al. (1971).

Forty five kilograms of actual nitrogen per hectare in the form of urea was applied in alternate years of the study to one of the pastures (55 ha) in mid-June. A tractor and fertilizer spreader were used for application. A 63 ha pasture adjacent to the fertilized pasture was used as a control.

Herbage samples were taken from 25 systematically located caged plots on each of the three range sites in the fertilized and unfertilized pastures. Current year standing crop was collected in late September from 0.3 by 0.6 m quadrants. Cages were relocated each year.

Pastures were stocked approximately one week following initiation of summer growth and grazed until late September. Length of grazing periods varied according to initiation of growth. Stocking rate was kept as constant as possible, and was approximately two times greater on the fertilized pasture. Pastures were grazed with yearling heifers. Heifers were weighed prior to going on the pastures and again when they were removed. Livestock and herbage data were subjected to an analysis of variance and appropriate LSD tests.

RESULTS AND DISCUSSION

Donart et al. (1978) reported that 45 kg/ha of actual nitrogen per year improved livestock performance and vegetation production. Species composition was not altered nor was the period of green forage appreciable lengthened. Further work by Havstad et al. (1979) showed minimal nutritional benefits during the dormant season. To improve harvest of nutrients and to reduce costs of fertilization, biennial applications of fertilizer were made, starting in 1978. Stocking rates were established to remove useable herbage by the end of the growing season.

Herbage production from fertilized and unfertilized pastures was variable throughout the four years of study (Table 1). The variation, however, was not as great as was observed during 9 years of annual fertilization reported by Donart et al. (1978). The reduced variation may be the result of more moderate climate conditions during this study. Differences in herbage production between fertilized and unfertilized pastures were not as great as when annual applications of urea were made. Maximum herbage production was observed in 1981, a residual year. This indicates that biennial applications are adequate for plant growth.

Table 1. Average annual herbage production (kilograms per hectare) for three range sites on nitrogen fertilized (F) and unfertilized (U) rangelands, 1979-1982.

	Sites					
Years	F	U	F	U	F	U
1979	1199*	653*	839*	371*	1081	1037
1980	1448*	903*	769*	602*	887*	645*
1981	1936*	1406*	1594*	744*	1379*	990*
1982	1560*	1075*	628	554	1413*	730*

*Indicates significant differences ($P<.05$) within treatments per site and year.

No noticeable changes in botanical composition of the pastures were observed. Blue grama (Bouteloua gracilis) is the dominant plant on both pastures and has approximately doubled in amount under fertilization. In 1979, a much higher standing crop of forbs was recorded for the unfertilized pasture, but by 1982, was lower than on the fertilized pasture. The variations in production and composition of species is considered to be a function of climatic variation.

Livestock production increased even more than total production as a result of fertilization. The increase in livestock production was 2.34 times greater on the fertilized pasture. This increase came with only a doubling of stocking rate on the fertilized pasture (Table 2). The rate of gain per ha showed considerable variation, especially on the fertilized pasture. Generally, increased gain per ha was associated with increased length of grazing season. While animal gain per day averaged 20 percent greater from the fertilized pasture, the rate of gain per day generally decreased with an increased period of grazing.

The length of grazing season was established by initiation of growth. The maximum length is about 120 days, but often is much shorter. Shorter growing seasons usually have a more rapid rate of vegetative growth which results in more comparable animal performance. This can be noted by comparing forage production (Table 1) with days of grazing and animal performance (Table 2).

Table 2. Days of grazing, stocking rate and average livestock gains on nitrogen fertilized (F) and unfertilized (U) rangeland.[¶]

		Stocking Rate		Animal Gain			
	Days	ha/animal		kg/ha		per day	
Year	Grazing	F	U	F	U	F	U
1979	110	2.9	1.3	73.0	25.0	0.96	0.73
1980	68	2.9	1.4	44.6	20.6	1.1	0.9
1981	85	2.5	1.2	52.4	23.5	0.74	0.51
1982	55	2.9	1.4	59.9	28.9	1.4	1.3

[¶]Differences between treatments within years are significant at $P<.01$.

LITERATURE CITED

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