COW-CALF GRAZING DEMONSTRATIONS SHOW POTENTIAL FOR RANGE FERTILIZATION

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Grassland fertilization has long been advocated as a production tool for increasing forage available for hay and grazing. In North Dakota, its use has been primarily on tame grass stands to maintain high yields of forage and to put new life into old sod-bound stands. Native grasslands are being fertilized to a limited extent, but primarily in renovation programs to improve species composition which deteriorated through many years of excessive grazing use.

Fertilization offers a number of advantages to the livestock producer. They include increased forage yield, earlier spring growth, higher forage protein content, greater water use efficiency, a longer green feed period and increased root growth which provides the grass plant with a greater soil moisture and nutrient foraging capacity. On native grasslands it may be used as a tool to obtain uniform grazing throughout individual grazing units and to maintain a more desirable mix of individual grasses if livestock are properly managed. The result is a greater pasture carrying capacity and increased livestock gain per acre.

Grassland fertilization, especially native grasslands, is not for everyone. Regardless of the grassland type being fertilized you must need the additional forage. There may be a more economical forage source, the forage stand may not be adequate to support high forage yields, the soil and climate of the area may not possess adequate potential for profitable yield increases and the general economic climate may not increase the dollar return from additional animal products produced to cover fertilizer and application costs.

Native grasslands possess a lower potential for increased forage production compared to seeded tame grass forages. Their productive potential is less than rotation forages due to the kind and proportion of the various grasses present, land slope and topography and the poorer quality of soils. Regardless of these negative aspects of native grassland fertilization, the more productive native pastures offer potential for increased profits under a favorable cost-price climate.

Native grassland forage production can also be maintained or improved through the application of proper grazing management and range improvement practices. These practices, in addition to fertilization, include proper livestock numbers, timely use based on seasonal growth of the grass plant, use of improved grazing systems, good water distribution, proper salting practices, weed control, fencing, interseeding and furrowing on adapted range sites. In general, the application of good livestock grazing management practices will enhance and maintain native grasslands in a good 'state of health'.

Grazing studies have been conducted in the state by the North Dakota Agricultural Experiment Station and the USDA, ARS, Northern Great Plains Research Center, Mandan, N.D. using two-year old and yearling steers under various grazing intensities and grazing systems. These studies have shown that as grazing intensities increase, gain per acre increases and seasonal animal gain decreases, the grazing season is shortened due to less forage

Acknowledge the assistance of Dan Linster, Bowbells, former Burke County Extension Agent and John Peterson, Mountrail County Extension Agent in conducting the demonstrations and the U.S.D.A., Soil Conservation Service technical staff for range evaluation.

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available per animal for body maintenance and gain; there is a greater change in kinds, proportion and amounts of the different grasses contributing to the total forage yield; that a deferred-rotation grazing system is most desirable for maintaining a more desirable mixture of native grasses compared to continuous seasonlong grazing when forage use is heavy; that yearling steers perform best under a continuous grazing system compared to a deferred-rotation grazing system; that the grazing season can be lengthened by grazing native grasslands at proper intensities or by using tame grass pastures during the spring and fall seasons and native pasture during the summer; and that forage production on native grasslands can be increased by deferring or delaying the use of native pastures in the spring, resulting in an increased pasture carrying capacity.

Grazing studies have not been conducted in North Dakota using cow-calf pairs to measure animal production potential on native and/or tame grass pastures except under irrigated conditions at the Carrington Branch Irrigation Experiment Station. This study shows a potential of about 270 pounds of calf gain per acre. A dryland cow-calf grazing study was initiated in 1977 at the Dickinson Experiment Station using a three-pasture (crested, native and Russian wildrye) grazing system. Dryland cow-calf grazing investigations under yearlong stocking of native range at the U.S. Range Livestock Experiment Station, Miles City, Montana shows a potential for the production of about 10 pounds of calf (adjusted weaning weight) per acre under a yearlong system of grazing. The field demonstrations discussed in this report were initiated to compare the potential calf production on fertilized and unfertilized native range located in the Missouri Plateau area of northwestern North Dakota.

METHODS AND PROCEDURES

Cooperators for the cow-calf grazing demonstrations were secured by County Extension Agents in Burke, Divide, Mountrail and Williams counties. The farmer cooperators were Donald Biwer, Tioga, N.D. in Williams county and Joyce Knudsvig, Alamo, N.D. located in Divide county.

Each grazing demonstration consisted of two quarter sections of adjoining native range which was cross-fenced prior to initiation of the study. Urea fertilizer, 45-0-0 analysis, was applied in early April to 160 acres of each grazing unit. The same pasture unit in each demonstration received 50 pounds of actual nitrogen per acre annually throughout the duration of the study. Fertilizer for the demonstrations was purchased by individual cooperators in cooperation with the Tennessee Valley Authority (TVA) fertilizer demonstration program and various local fertilizer dealers in the area.

Growing season precipitation, although not recorded was normal or above normal during the study period. Soil tests obtained from the North Dakota State University Soil Testing Laboratory indicated that the soil phosphorus level was in the 4 to 6 pound-per-acre range for each demonstration. Although this soil phosphorus level may be borderline for optimum nitrogen response, no additional phosphorus-containing fertilizer was applied.

Grazing was initiated on the Donald Biwer demonstration in the spring of 1973 and was continued through the 1976 grazing season. The grazing system used was a two-pasture deferred rotation. The fertilized pasture was grazed first during 1974 and 1976 and the unfertilized pasture during 1973 and 1975. This was done to provide both pastures a period of rest in the spring to improve general health of the grass stand. This grazing sequence equalized the effect of early vs. deferred grazing, independent of fertilizer treatment, over the four-year study period. The cow herd grazed was primarily Hereford, along with Hereford-Charolais and Angus-Charolais crosses.

The Joyce Knudsvig grazing demonstration was initiated in 1975 and was continued through 1976. The unit was grazed using a split herd under a continuous season-long grazing system. The cow herd was divided as uniformly as possible according to age, size, breed and breeding between the two pastures. The herd consisted of Hereford, Angus and Herford x Angus crossbreds.

Cows and calves were individually weighed onto pastures in the spring and at the close of the grazing season or when demonstration pastures appeared properly utilized. The weighing was done with a portable livestock scale.

RESULTS AND DISCUSSION

Grazing was initiated in late May to very early June based on normal grazing practices for the area. The earliest date of grazing was May 18 in 1974 and the latest date June 9 in 1976 on the fertilized and unfertilized deferred-rotation Biwer pastures respectively (table 1). The Biwer deferred-rotation pastures were grazed an average of 82 days, 29 days on the unfertilized pasture and 53 days on the fertilized portion. The greatest number of grazing days were obtained in 1975 and 1976. The continuously grazed Knudsvig pastures averaged 110 days of grazing on the unfertilized and 93 days on the fertilized area. The differences in days grazing on the Knudsvig pastures are due mainly to judgments in initial pasture stocking rates. The initial stocking rate on the fertilized Knudsvig pasture was more than doubled in 1975 compared to the unfertilized pasture. A more realistic stocking rate increase would have been about 75 per cent, the same as in 1976, to obtain the proper degree of use. Once grazing was terminated on the demonstration pastures, the cattle were transferred to other pastures available and crop aftermath growth.

Table 1 — Grazing Dates and Days of Grazing on Unfertilized and Fertilized Pastures

Cooperator	Years 1973	1974	1975	1976	Ave.
Donald Biwer: (Deferred-Rotation)					
Dates Grazed:					
Unfertilized	6/4-6/28	6/29-7/18	5/30-7/6	8/10-9/10	xx
Fertilized	6/29-8/16	5/18-6/28	7/8-9/5	6/9-8/9	xx
No. Days Grazed:					
Unfertilized	25	20	38	32	29
Fertilized	49	42	60	62	53
Totals	74	62	98	94	82
Joyce Knudsvig: (Continuous Grazing)					
Dates Grazed:					
Unfertilized	xx	xx	5/29-9/3	6/1-9/30	xx
Fertilized	xx	xx	5/29-8/8	6/1-9/23	xx
No. Days Grazed:					
Unfertilized	xx	xx	98	122	110
Fertilized	xx	xx	71	115	93

The pastures were stocked to obtain nearly double the grazing pressure on the fertilized grazing units. The number of livestock grazing the 320-acre Biwer deferred-rotation grazing unit was 105 cows and 100 calves. The Knudsvig demonstration was grazed continuously with about 25 cow-calf pairs on the 160-acre unfertilized pasture and about 51 cow-calf pairs on the fertilized quarter section. The cows entered the Biwer pasture weighing an average of about 870 pounds, compared to about 930 pounds on the Knudsvig pastures. The average cow weight off pasture was about 1,045 pounds on the Knudsvig pasture. Ending weights on the Biwer pasture are not available. However, the cows were in excellent condition. The calves entered the Biwer pasture grazing units at about 135 pounds, compared to approximately 150 pounds for the Knudsvig calves.

The carrying capacity (table 2) of the unfertilized pastures averaged 0.6 animal unit months (AUM's) per acre on the Biwer pasture compared to 0.56 AUM's on the Knudsvig pasture. The fertilized pastures had a carrying capacity of 1.14 and 0.91 AUM's per acre on the Biwer and Knudsvig pastures respectively. The application of 50 pounds of nitrogen fertilizer increased the carrying capacity of the native pasture grazing units 90 per cent at Biwers and approximately 80 per cent at Knudsvig's. Fertilization increased the amount of forage available for grazing. As a result, the animal unit days of grazing per acre was increased from about 18 to 34 days on the Biwer pasture and 17 to 27 days on the Knudsvig pastures. The acres required per animal unit month of grazing on the Biwer pasture was about 0.9 on the fertilized and 1.7 acres on the unfertilized pasture. At Knudsvigs, 1.1 acres and 1.8 acres were required per animal unit month of grazing on the fertilized and unfertilized pastures respectively.

Table 2 — Average Pasture Carrying Capacity and Animal Unit Grazing Days per Acre; and Acres per Animal Unit Month of Grazing on Unfertilized and Fertilized Native Pastures.

ITEM	Biwer 0-N	Biwer 50-N	Knudsvig 0-N	Knudsvig 50N
AUM's Grazing/acre	.6	1.14	.56	.91
Animal Unit Days/acre	18.3	34.1	16.6	27.3
Acres/AUM of Grazing	1.69	.88	1.78	1.1

Beef production on the unfertilized and fertilized native pastures was determined based only on calf performance. Calf performance was determined by weighing on a portable scale at the start of the grazing season, between grazing rotations and at the close of the test pasture grazing period.

Comparison of the calf performance data between the Biwer and Knudsvig herds may not be entirely accurate because of differences in herd management practices. There may also be differences in cow herds, breeding programs, length of the study periods, differences in initial calf weights and grazing systems. Data presented in table 3 show similar calf performances between herds regardless of grazing system used and other differences noted above.

Table 3 — Calf Performance on Unfertilized and Fertilized Native Pasture.

ITEM	Biwer (4 Yr. Ave.) Deferred-Rotation Grazing			Knudsvig (2 Yr. Ave.) Continuous Grazing	
	0-N		50-N	0-N	50-N
Days Grazed	29		53	110	93
Initial Calf wt. lbs.	. . .	136	. . .	159	156
Ending Calf wt. lbs.	. . .	283	. . .	366	327
Total Calf Gain/hd. lbs	. . .	147[1]	. . .	207	171
Gain by rotation Past.	50		97	xx	xx
Ave. Daily Gain/hd. lbs	. . .	1.78[1]	. . .	1.90	2.01
Gain by rotation Past. lbs.	1.74		1.81	xx	xx
Ave. Galf Gain/acre lbs	. . .	45[1]	. . .	31.4	51.7
Gain by rotation Past.	30.5		59.4	xx	xx

[1]*Ave. based on 320 acre grazing unit, half fertilized.*

In general, the data indicate that calf daily gain tended to be higher on the fertilized pastures. The average gain per acre on each of the 320 acre grazing units was similar (45 lbs/acre on the Biwer unit and 46.5 lbs on the Knudsvig unit) when one-half of the acreage was fertilized with 50 pounds of actual nitrogen per acre. In comparison, calf gain per acre on unfertilized pastures was nearly identical — 30.5 and 31.4 pounds per acre on the Biwer and Knudsvig pastures respectively.

Fifty pounds of nitrogen fertilizer increased calf gain per acre to about 60 pounds on the Biwer pasture and 52 pounds on the Knudsvig grazing unit. This was due to a greater grazing intensity on fertilized pastures compared to unfertilized pasture.

Assuming nitrogen fertilizer cost $.18 cents per pound of 'N' and the cost of application is one dollar per acre, an application of 50 pounds of actual nitrogen would cost $10.00 per acre. To break even, cattlemen must obtain 25 pounds of additional beef per acre if beef is valued at $40 per cwt, 22 pounds when valued at $45 per cwt and 20 pounds if beef is valued at $50 per cwt. Another approach would be to fertilize half of a productive grazing unit each year. This would reduce the fertilizer cost by 50 per cent thereby substantially reducing cost per acre on the entire grazing unit. This would require an increase in beef produced per acre of about 14, 12 and 11 pounds when valued at $.40, $.45 and $.50 cents per pound of beef. In this study, fertilizing one-half of the grazing units increased calf beef produced 10 to 15 pounds per acre.

In summary, fertilizer is a grazing management tool. It is not intended for use on all native grasslands, only the most productive. Based on these demonstrations, native grasslands on the Missouri Plateau in northwestern North Dakota will produce about 30 pounds of calf per acre grazed when not fertilized. If fertilizer is applied, beef gains per acre may increase as much as 20 to 28 pounds. The less productive native grasslands can be improved or maintained in a healthy condition through the application of intensive livestock and grazing management practices.

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