GRAIN SUPPLEMENTATION OF YEARLING STEERS GRAZING IRRIGATED PASTURE

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Introduction

Forage crops have responded well to irrigation in North Dakota. The increasing costs of mechanically harvesting, transporting, storing and feeding large tonages of irrigated forages suggest an evaluation of other harvesting methods. Several studies have been reported on steers grazing irrigated improved pastures. Beef production per acre varies greatly depending on length of grazing season, species of grass, fertilization and grazing management. Increased beef production is due largely to increased carrying capacity rather than higher individual gains.

Nebraska studies have concluded that irrigated pastures produce a large volume of high quality, lush forage that is not balanced for nitrogen and energy resulting in impaired gains. Reduced dry matter intake due to high moisture content of lush forages is not considered a gain limiting factor (Lake, 1974). Energy supplementation may improve nitrogen energy balance and increased dry matter intake. Two grazing trials were conducted at the Carrington Irrigation Station Livestock Unit in 1978 and 1979 to evaluate supplementation of yearling steers grazing improved irrigated pastures.

Materials and Methods

Ten 1.67-acre pastures under gated pipe gravity irrigation were grazed in a rotation designed to minimize the effects of differences in pastures. The predominate species in the pastures were Sterling orchardgrass, smooth bromegrass and alfalfa. The cattle were rotated when approximately 60% of the available forage had been harvested. Actual forage production and utilization were estimated by random plot clippings before and after each pasture had been grazed.

Experiment 1 was conducted during the grazing season of 1978. The average initial weight of the steers used in the experiment was 869 pounds. They were Hereford and Red Angus X Hereford steers raised on the Carrington Irrigation Branch Station. The steers were used in previous experiments and had been on a relatively high plane of nutrition throughout their lives. Steers were allotted randomly to the control and supplemented groups on the basis of weight, breed and experimental background. Steers in both groups received trace-mineralized salt and mineral supplement free choice while grazing. The supplemented group received 6 pounds of cracked corn per head per day.

Experiment 2 was conducted during the 1979 grazing season. Predominately Hereford and Hereford X Angus steers were used in the experiment. Average initial weight was 587 pounds. Allottment to the control group and supplemented group was done on the basis of weight and breed. Bloat Guard (Poloxalene) was available to all steers in block form. Supplemented steers were fed 5 pounds of rolled barley per head per day.

Results and Discussion

During the 1978 growing season, pastures receives 16.63 acre-inches/acre of irrigation water in addition to 7.37 inches of rain. Dry matter production per acre was 7,092 pounds (Table 1). This is equivalent to 4.2 tons of sun-cured hay per acre (85% dry matter). Steers in the control group utilized 52% and steers in the supplemented group utilized 54% of the dry matter produced.The supplemented group gained 41% faster than the control group. This corresponds favorably with results reported by Lake **et al.** (1974) in which steers fed 6 pounds of supplemented corn per head per day while grazing irrigated pastures gained 31% faster than steers receiving no grain. Beef production per irrigated acre was 259 and 284 pounds, respectively, for the control and supplemented group.

Steer gains in Experiment 2 (Table 2) were greater due in part to differences in the initial weight of the cattle, previous management and weather. Heavier steers in fleshy condition do not gain as rapidly as on irrigated pasture due to increased maintenance requirements.

The grazing season was limited to 98 days in 1979 because of the late spring, compared to 112 days in 1978. Pastures received 16 acre-inches/acre of irrigation water in addition to 8.89 inches of rain during the 1979 grazing season. Forage production was approximately 4 tons/acre, of which 51% and 59% was utilized by steers in the control and supplemented groups, respectively. Daily gains for the grazing period were considered very good. The control group gained 1.54 lbs per head per day versus 1.85 lbs per head per day for the

supplemented group. The supplementation of 5 lbs of barley improved gains 20%. Beef production per acre was 410 and 581 lbs, respectively, for steers in the control and supplemented groups.

The average daily gains for the control steers in Experiment 2 are very similar to the 1.43 lbs average daily gain for yearling steers grazing irrigated pastures reported by Lake **et al.** (1974). However, Dodds **et al.** (1973, 1974) reported steers of similar weight gaining 1.73 lbs per head per day. Nichols and Lesoing (1980) reported 500-lb steers grazing irrigated pastures gaining over 2 lbs per head per day.

The feed conversion for the additional grain supplement was 15.4 in 1978 with heavy steers and 16.0 in 1979 with light steers. This is similar to results reported by Lake **et al.** (1974) where 6 lbs of supplemental corn per head per day was converted at the rate of 13.6 lbs per pound of gain. However, supplementation above 4 lbs per head per day did not improve gain, indicating that this may be the maximum justifiable energy supplementation for grazing steers.

Lake **et al.** (1974) suggest that impairment of weight gains for cattle grazing irrigated forages was due more to excessive levels of protein in relation to energy rather than reduced dry matter intake because of the high moisture content of the forages. Feeding 3 lbs of corn daily to steers receiving fresh clipped irrigated pasture forages increased dry matter digestibility and nitrogen retention.

It has been hypothesized that supplemental grain serves to increase the digestible energy content of the diet and improve the protein to energy ratio. The results of Experiment 2 support this hypothesis. Grain supplementation improved the amount of beef harvested per acre by 41%. Developing a supplement that precisely balances the energy, protein and mineral needs of cattle grazing irrigated pastures could be the subject of future research.

The 410 lbs of beef per irigated acre for the control group in Experiment 2 is much lower than those reported by Dodds **et al.** (1974) and Nichols **et al.** (1976). This may be due to the differences in the length of grazing season, location of the experiment and previous management of the cattle used.

The grazing season in 1979 at Carrington was 98 days versus the 133-day grazing season in North Platte, Nebraska reported by Nichols **et al.** (1976) and the 130-day grazing season at Ft. Yates, North Dakota (Dodds **et al.**, 1974). Other work at the Carrington Irrigation Branch Station (Dunn and Olson, 1978) has shown beef produced per acre by cows with nursing calves to be 328 lbs of combined cow and calf gain. It would appear that by grazing yearling steers rather than cows and calves more beef can be harvested per irrigated acre.

Summary

Ten 1.67-acre pastures were used in two experiments studying grain supplementation of yearling steers grazing irrigated pastures. Experiment 1 was conducted in 1978 using steers with an initial average weight of 868 lbs. Steers receiving 6 lbs of rolled corn per head per day gained 1.33 lbs per head per day versus 0.94 for steers grazing without supplementation. The amount of beef produced per acre also favored the supplement group, 284 lbs versus 259 lbs, respectively. Experiment 2 was

Table 1. Results of yearling steers grazing irrigated pastures in 1978.

Treatment	Control	Supplemented[a]
Number of Head	14	14
Average Initial Weight (lb)	870	868
Average Final Weight (lb)	975	1017
Average Daily Gain (lb)	.94	1.33
Feed/Gain	—	15.4
Dry Matter/Acre (lb)	7092	7092
Forage Utilization (%)	52	54
Aum's/Acre	7.5	7.5
Beef Produced/Acre (lb)	259	284

[a]Supplemented with 6 lbs. of cracked corn per head per day.

Table 2. Results of yearling steers grazing irrigated pastures in 1979.

Treatment	Control	Supplemented[a]
Number of Head	20	20
Average Initial Weight (lb)	587	587
Average Final Weight (lb)	738	768
Average Daily Gain (lb)	1.54	1.85[b]
Feed/Gain	—	16.0
Dry Matter/Acre (lb)	6744	6899
Forage Utilization (%)	51	59
Aum's/Acre	5.8	6.8
Beef Produced/Acre (lb)	410	581

[a]Supplemented with 5 lbs of rolled barley per head per day.
[b]Significantly different ($P < .05$).

conducted in 1979 with steers initially averaging 587 lbs. The grain supplementation was 5 lbs of rolled barley per head per day. Control steers gained 1.54 lbs per head per day and produced 410 lbs of beef per acre. Supplemented steers gained 1.85 lbs per head per day and produced 581 lbs of beef per acre. In both experiments grain supplementation improved daily gains and the total gain harvested per acre. Feed conversion for supplemented grain was similar for light and heavy steers. These results support the hypothesis that grain supplementation increases the digestible energy content and improves the protein to energy ratio of the grazing animals diet.

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ported on sunflower seeds in the natural state. Because of this demonstrated aflatoxin formation, more extensive surveys and research programs may be established for North Dakota sunflower seeds.

Table 2. Research Sunflower Seeds Data

SAMPLE NUMBER	SAMPLE TYPE	STORAGE TYPE	AFLATOXIN ppb B_1
1	Surface Mold	Bin	1100
2*	Composite	Truck	100
3*	Surface Mold	Shed	240
4	Subsurface Mold	Shed	560

*Same storage source

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