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Effects of Creep Supplementation While Grazing Improved Irrigated Pastures

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Introduction

Livestock producers are shifting to management-intensive grazing irrigated pastures for three reasons: first, lowered production costs; second, improved animal health; and third, a perceived better quality of life for the farm family (Sanderson et al. 2005). Utah is no exception, with the increased pressure from the public for producers to graze on private land. Producers in the state have seen the benefits of using management-intensive grazing, especially, when using high-growth terminal crossbred calves, but questions have been raised regarding the possible improvements in production with the use of a calf creep supplement.

The objective of this study was to determine the biological and economic viability of creep feeding spring-born, high-growth beef calves grazing with their dams on improved, irrigated pastures composed of either a monoculture of grass or a mixture of grass and legumes using management-intensive grazing procedures.

Methods and Materials

Two adjacent sprinkler-irrigated plots (9.64 acre, 600 x 667 ft) were divided into two (4.82 acre) adjacent paddocks. One pasture was a monoculture (MONO) of tall fescue 'Seine' (*Festuca arundinacea* Scherb.), which is an endophyte-free variety. The second pasture was a mixture (MIX) of tall fescue 'Seine' (50%), alfalfa 'AC Grazeland' (*Medicago sativa* L.) (37.5%), and birdsfoot trefoil 'Norcen' (*Lotus corinculatus* L.) (12.5%) seeded into alternating strips (12 x 600 ft). Due to a pre-existing study on soil nutrient flow, using deferred grazing the MONO pasture was slightly smaller than the MIX pasture

The pastures were oriented with the long side being east to west. Cattle grazed in a west to east direction with grazing beginning on May 30. Grazing allotments were calculated based on the previous year's forage production and boundaries for daily allotment were controlled by portable polywire electric fence. Cattle were moved into new allotments every 24 hours. The design of the study was to have cattle graze over the pastures in a month-long period, so that the west side would be ready to graze when the cattle finished grazing to the east end. Grazing periods did, however, fluctuate due to available forage. Forage quality samples were taken daily from each species in the paddocks using a $0.1m^2$ clip-plot method allowing for dry matter production to be calculated (Table 1). These forage samples were then composited by week and analyzed using NIR spectroscopy (see Table 2).

Table 1. Average pasture carrying capacity based on calculated cow-calf pair DM intake versus harvested forage over the four grazing periods.

	MONOC[1]	MONOS[2]	MIXC[3]	MIXS[4]	SEM[5]	P-value[6]
Forage needed, lbs/acre	1354[a]	1147[a]	1305[a]	1176[a]	34.77	.0169
Forage harvested, kg/ha	2808[b]	2722[b]	3931[a]	3999[a]	34.52	<.0001
carrying capacity, pair/ha	2.07[d]	2.38[c]	3.05[b]	3.37[a]	.0435	.0002

[1] Monoculture pasture of Seine tall fescue no supplement.
[2] Monoculture pasture of Seine tall fescue with supplement
[3] Mixture 50% Seine tall fescue, 37.5% AC Grazeland alfalfa, 12.5% Norcen birdsfoot trefoil no supplement.
[4] Mixed Mixture 50% Seine tall fescue, 37.5% AC Grazeland alfalfa, 12.5% Norcen birdsfoot trefoil with supplement.
[abc] Within a row means without a common subscript differ (P<.05).

Table 2. Nutrient content of paddocks grazed by cattle.

	MONOC[1]	MONOS[2]	MIXC[3]	MIXS[4]	SEM[5]	P-vlaue[6]
CP, %	14.5[b]	14.9[b]	21.3[a]	20.8[a]	0.3161	.0007
NDF, %	54.5[a]	53.8[a]	43.0[b]	43.2[b]	0.3201	.0001
TDN, %	63.3[a]	63.8[a]	67.4[a]	67.0[a]	0.6302	.0103
DMD, %	62.1[c]	62.4[bc]	65.5[a]	65.3[b]	0.4460	.0057
NE_m, Mcal/kg	1.42[a]	1.43[a]	1.55[a]	1.53[a]	0.0202	.0105
NE_g, Mcal/kg	0.83[a]	0.85[a]	0.95[a]	0.94[a]	0.0179	.0105

[1] Monoculture pasture of Seine tall fescue no supplement.
[2] Monoculture pasture of Seine tall fescue with supplement.
[3] Mixture 50% Seine tall fescue, 37.5% AC Grazeland alfalfa, 12.5% Norcen birdsfoot trefoil no supplement.
[4] Mixed Mixture 50% Seine tall fescue, 37.5% AC Grazeland alfalfa, 12.5% Norcen birdsfoot trefoil with supplement.
[5] Standard error of mean.
[6] P-value greater than f score.
[abc] Within a row means without a common subscript differ (P<.05).

Fertilizer (33% Nitrogen- 50% urea, 50% ammonium sulfate) was applied to tall fescue only, once prior to grazing in May and then following grazing in July, August, and September, with a rate of application at 30 lbs of N per acre. Pastures were irrigated using hand-line sprinkler running in a north-south orientation across the 182 m side of the pasture. Sets ran for 12 hours which applied 4.1 inches of water. Fertilization and irrigation followed cattle through each grazing circuit.

A group of 24 spring-calving cow-calf pairs were stratified into four groups of six cow-calf pairs based on calf sex, weight and breed, cow weight, cow body condition score (BCS) and cow breed. Groups were then randomly assigned to each of the four paddocks:

- Monoculture tall fescue, no calf creep supplement (MONOC)
- Monoculture tall fescue, with calf creep supplement (MONOS)
- Grass-legume mixture, no calf creep supplement (MIXC)
- Grass-legume mixture, with calf creep supplement (MIXS)

Calf supplement consisted of corn hominy feed, wheat middlings and limestone (Table 3). All cows were between 5 and 10 years old, had an average weight of 1285 lbs. Cows also averaged a BCS of 5.4 and were crossbred consisting of primarily Black Angus, with various proportions of Hereford, Gelbvieh, and Tarentaise. All calves were considered terminal being sired by a Charolais bull. Average weight of the calves at the beginning of the study was 348 lbs. Following each grazing period and prior to a new period, cows and calves were weighed, cows given a BCS and checked for pregnancy. Cattle were weighed unshrunk so care was taken to weigh cattle at approximately the same time of day (0800 h) at each weighing period to avoid variation in fill.

Each group of cattle was placed on their paddock beginning May 30. The first grazing period end on June 23 for MONO groups and June 27 for groups on the MIX pasture. Cattle were then placed on an overflow pasture due lack of regrowth on their designated pastures. Cattle were returned to their respective groups and paddock on July 7 and remained through the duration of the study. The

grazing season for the MIX groups was 116 days and 103 days for the MONO groups. Typical grazing seasons would commence around May 10 through October 15; however, cool spring temperatures did not allow cattle to start grazing until the end of May reducing the grazing season.

Calves in MONOS and MIXS were offered a creep supplement grain. The consistency of the creep was a powder to improve palatability and decrease adjustment time typically seen for more processed feeds. This decrease in adjustment period is attributed to the powder-like creep feed sticking to the muzzle of the calf encouraging the calves to lick their muzzles and ingest more creep feed. The creep supplement did not arrive until June 9. Due to this delay, grazing period 1 was used to help acclimate calves to creep feed and feeders. In grazing periods 2 through 4 creep supplement was offered at approximately 1percent of calf body weight. Creep supplement was offered through the use of a creep feeder that was moved across the pasture with the cattle.

Table 3. Amount of total creep supplement offered per grazing period and nutrient analysis.

Pasture	Period	Supplement offered, lbs		%DM	%CP	NDF	EE
MONOS	1	161		89.05	9.55	16.21	2.88
	2	757		88.90	9.54	17.18	2.96
	3	942		88.65	9.82	19.48	3.00
	4	1012		88.65	9.71	18.54	2.85
	Total	2872	Average	88.81	9.65	17.85	2.92
MIXS	1	57		89.12	9.51	16.91	3.18
	2	755		89.25	9.73	18.19	3.08
	3	1089		88.82	9.53	18.22	2.82
	4	1225		88.98	9.68	19.57	2.90
	Total	3126	Average	89.04	9.61	18.22	2.99

Results and Discussion

Average forage requirements per cow/calf pair were calculated based on NRC cattle NE_m and NE_g requirements. Included in these estimates were cow and calf maintenance, heat stress, activity, lactation, fetal development, and calf net energy gain requirements. Forage requirements did not differ among treatments even with the presence of creep feed offered to the supplement groups, but this can most likely be attributed to limiting creep supplement to 1% of calf body weight.

Carrying capacity was calculated by taking the total forage harvested (lbs/acre) and dividing by the forage needed (lbs/acre) over the course of the grazing season. This will then give the number of pairs that could be grazed per acre. The highest carrying capacity was observed in the MIXS group at 3.37 pair/acre followed by the MIXC group at 3.05 pair/acre. The difference of .32 pairs/acre between MIXS and MIXC was significant (P= 0.0404), (P-value less than or equal to .1 indicates difference is fairly reliable). Both carrying capacities for the MIX pasture were higher than the carrying capacity for the MONO treatments. MONOS had a carrying capacity of 2.38 pair/acre that did differ from the carrying capacity of MONOC, which was the lowest at 2.07 pair/acre (P= 0.0405). Supplementation increased pasture carrying capacity when compared to control groups on both pasture types (P= 0.0054).

Overall cattle preformed well on each of the four treatment types (Table 4). No real differences were seen in calf ADG and cows were able to increase in body condition and overall body weight throughout the grazing season. Some differences were observed with ending calf body weight with MIXS calves outgaining MONOC calves by 99 lbs.

Determining efficiency of creep supplementation (Table 5) was calculated by taking the kg of creep supplement offered and dividing by the added gain (creep supplement offered / (MONOS calf gain- MONOC calf gain)). For MONOS calves it required 12 lbs of creep feed for 1 pound of gain and MIXS calves required 18 lbs creep feed for each pound of added gain. The high quality of pastures offered is most likely the cause of the lack of efficiency as calves were already performing near their genetic potential.

Table 4. Performance of cow-calf pairs grazing improved irrigated pasture as affected by treatment.

	Treatment					
	MONOC[1]	MONOS[2]	MIXC[3]	MIXS[4]	SEM[5]	P-value[6]
Initial Calf BW, lbs	347[a]	343[a]	352[a]	355[a]	20.8589	.9748
End Calf BW, lbs	656[b]	692[ab]	723[ab]	755[a]	27.3408	.0272
Calf BW Change, lbs	309[c]	349[b]	371[ab]	400[a]	15.2171	.0362
Calf ADG, lbs	3.00[a]	3.39[a]	3.20[a]	3.45 [a]	0.1384	.0034
Initial Cow BW, lbs	1283[a]	1285[a]	1298[a]	1284[a]	79.8962	.9425
Cow BW Change, lbs	159[a]	164[a]	210[a]	176[a]	24.86	.5640
Initial Cow BCS	5.2[a]	5.4[a]	5.3[a]	5.6[a]	0.394	.6764
Ending Cow BCS	6.6[a]	6.8[a]	7.2[a]	7.4[a]	0.311	.4305

[1] Monoculture pasture of Seine tall fescue no supplement.
[2] Monoculture pasture of Seine tall fescue with supplement
[3] Mixture 50% Seine tall fescue, 37.5% AC Grazeland alfalfa, 12.5% Norcen birdsfoot trefoil no supplement.
[4] Mixed Mixture 50% Seine tall fescue, 37.5% AC Grazeland alfalfa, 12.5% Norcen birdsfoot trefoil with supplement.
[5] Standard error of mean.
[6] P-value greater than f score.
[abc] Within a row means without a common subscript differ (P<.10).

Table 5. Calf productivity as effected by treatment type and creep supplement efficiency.

	Treatment			
	MONOC[1]	MONOS[2]	MIXC[3]	MICS[4]
Calf gain, lbs/acre	436	476	441	493
Average calf gain, lbs	309	349	371	400
Creep supplement offered[5], lbs /calf	-	479	-	521
Lb creep/ lb added gain		12.0		18.0

[1] Monoculture pasture of Seine tall fescue no supplement.
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[4] Mixed Mixture 50% Seine tall fescue, 37.5% AC Grazeland alfalfa, 12.5% Norcen birdsfoot trefoil with supplement.
[5] Mixed at 72.06% corn hominy, 25.04% wheat mids, and 2.90% limestone.

Due to the biological inefficiency of the creep supplementation with regard to added gain, economic efficiencies of creep fed calves were compromised. Profit/loss calculations showed creep feeding to be $70.20 cow/yr and $53.28 cow/yr less profitable for MIXS and MONOS groups when compared to MIXC and MONOC groups, respectively (Table 6). Difference in profitability between MIX and MONO pastures is caused mainly by the need to apply fertilizer to all the forage in the MONO paddocks while only the tall fescue (50% of MIX forage composition) required fertilization. The MIXC group was $84.22 cow/yr more profitable than MONOC and $137.5 cow/yr more profitable than MONOS. The difference in profitability can be explained by increased maintenance costs for the monoculture due to fertilization and lower total DM yields when compared to the MIXC paddock as well as calf supplement costs for MONOS.

Table 6. Economic analysis for cow-calf production on improved irrigated pastures and total cost/year on four treatments.

	Pasture			
	MONO[1]		MIX[2]	
	Control	Supplement[3]	Control	Supplement
Pasture Feed Costs, ($/ pair)	105.17	92.02	64.81	56.67
Other Feed Costs[4], ($/ pair)	293.89	293.89	293.89	293.89
Calf Supplement Cost[5], ($/ calf)		93.26		101.56
Total Feed Costs, ($/ pair)	399.06	479.17	358.70	452.12
Non-Feed Costs[6], ($/ pair)	155.65	155.65	155.65	155.65
Total Annual Cow Costs, ($)	554.71	634.82	514.35	607.77
Profit/(Loss)[7] ($/ cow)	(13.19)	(66.47)	71.03	0.83
Profit/(Loss) ($/acre)	(6.50)	(37.66)	44.96	0.58

[1] Monoculture pasture of Seine tall fescue.
[2] Mixture 50% Seine tall fescue, 37.5% AC Grazeland alfalfa, 12.5% Norcen birdsfoot trefoil.
[3] Mixed at 72.06% corn hominy, 25.04% wheat mids, and 2.90% limestone.
[4] Grass hay diet (October 1 to May 29) at 1.1Mcal NE_m/lb and $.04/lb.
[5] Calf supplement $.195/lb.
[6] Average for cow-calf producers in Utah (Utah Ag Statistics).
[7] Calculated based on (market value[8] of calf - ranch breakeven value of calf).
[8] Based on calf prices for Salina Utah October 14, 2008.

Conclusions

The results in this study indicate that when grazing terminal-sired calves with their mothers while using management intensive grazing strategies, creep supplementation was not economically favorable. High feed costs and low added gain per unit of creep supplement offered are the main factors effecting the profit or loss of a given treatment with calves on the MIX pasture without supplement having the highest profit return in this study, although their end weight and overall weight change was less than that of MIXS calves.

Thus based on this study it is recommended that producers graze spring-calving cow-calf pairs on a mixed forage pasture and the use of creep supplementation, although capable of producing larger weaning weights, is economically unfavorable.

Reference

Sanderson, M. A., K. J. Soder, L. D. Muller, K. D. Klement, R. H. Skinner, and S. C. Goslee. 2005. Forage mixture productivity and botanical composition in pastures grazed by dairy cattle. Agron. J. 97:1465–1471.