

The combined effect of beef cattle frame score and forage grazing sequence on yearling steer grazing and feedlot performance, carcass trait measurements, and systems economics

Senturklu, S^{1,2}, D.G. Landblom¹, R.J. Maddock³, and S.I. Paisley⁴

¹Dickinson Research Extension Center, North Dakota State University, Dickinson, ND

²Animal Science Department, Canakkale Onsekiz Mart Universitesi, Canakkale, Turkey

³Animal Sciences Department, North Dakota State University, Fargo, ND

⁴Animal Science Department, University of Wyoming, Laramie, WY

Project Brief

Ninety-six steers originating from two beef cattle herds maintained at the Dickinson Research Extension Center (DREC) were divided into two frame score groups identified as small frame (**SF**: average 3.40; range 1.58 to 4.13) and large frame (**LF**: average 5.31; 4.48 to 6.65). After weaning in the fall of 2012, the steers were managed as a single group and backgrounded grazing unharvested corn and as the available corn diminished the steers were also fed mixed hay (alfalfa-bromegrass-crested wheatgrass) until the end of April 2013. During the backgrounding period, the steers grew at a modest ADG of 1.10 lb/day. On May 1, 2013, the steers were randomly assigned to either feedlot (FLOT) or grazing (GRAZ) treatments. Within these two main treatments, two feedlot groups (LF: n=24 and SF n=24) and two grazing groups (LF: n=24 and SF n=24) were established. The FLOT steers were shipped to the University of Wyoming, Sustainable Agriculture Research Extension Center (SAREC), Lingle, Wyoming on May 1, 2013 and started on trial May 8, 2013, and fed until December 9, 2013; a feeding period of 216 days. The GRAZ steers grazed native range from May 1 to August 27, 2013, a period of 113 days before being moved to graze annual forage fields of field pea-barley intercrop (30 days) followed by grazing unharvested corn (77 days). The total grazing period was 220 days. At the end of corn grazing, the GRAZ steers were shipped to the SAREC, Lingle, Wyoming for a short final finishing period of 74 days. When each of the systems treatment groups were finished, the groups were delivered by commercial truck to the Cargill Meat Solutions packing plant, Ft. Morgan, Colorado. Due to the system's differences, the FLOT group was delivered to the packing plant on December 9, 2013 and the GRAZ group was delivered on March 4, 2014.

All expenses and returns associated with this alternative growing and finishing systems study were recorded. Native range grazing costs were assessed using the custom grazing rate determination shown in Table 1 and farming expenses for the annual forages in the GRAZ system are shown in Table 2. Steer frame score grazing performance, cost/steer, and

cost/lb of gain are shown in Table 3. Feedlot finishing performance, feed intake and efficiency, and finishing economics for the LF and SF treatment groups are shown in Table 4. Carcass trait measurements and total carcass value are shown in table 5. The effect of steer frame score and extended grazing on system net return is shown in Table 6.

Results of this systems investigation show that the SF steers grew at a significantly slower rate under both grazing ($P = 0.034$) and feedlot ($P = <0.0001$) conditions. Under grazing conditions, the SF steers had a lower cost/steer (\$285.05 vs. \$278.04); however, due to their slower growth rate, grazing cost/lb of gain was higher (\$0.53 vs. \$0.598). In the FLOT group, feed cost/lb of gain was significantly higher for the SF steers (\$0.8543 vs. \$0.9349; $P = 0.001$). However, during the short 74 day final finishing period, feed cost/lb of gain was the same for the LF and SF steers. Comparing the average FLOT and GRAZ systems feed cost/lb of gain, finishing feed cost/lb of gain for the GRAZ system averaged 41% less ($P = 0.001$).

Carcass trait measurements identified economically important differences. Small frame steer HCW was 14.6% lighter ($P = 0.001$) and ribeye area was 9.5% smaller than the LF steers. Small frame steers did have higher marbling score ($P = 0.08$). Numerically, SF steers had a higher percentage of carcasses that graded Choice or greater, but statistically, there was no difference ($P = 0.20$). Carcass value for LF steers in both the FLOT and GRAZ system treatments was 13.8% higher.

Systems net return has been summarized in Table 6. To determine system net return, expenses (e.g. steer placement cost, grazing and feedlot finishing expenses, transportation and brand expenses) were deducted from the gross carcass value. Net return for the FLOT treatment was considerably lower than the GRAZ treatment. Within the FLOT treatment, net return for SF steers was much lower, too. The combination of lower grazing and feedlot expenses for GRAZ steers resulted in greater net return than that received for the FLOT steers, but also sales price increased 13.3% from the December sales date to the

March sales date. In this first year of a 2-year study, LF steers were more profitable than SF steers. The data indicates that a much longer grazing season and

a significantly abbreviated finishing period favors profitability.

Table 1. Native range pasture custom grazing rate calculation (**Per Head/Day Basis**)

GRAZ Sm Frame	Grazing Cost/Lb	Weight	Cost/day	Days	Period Total	Grazing Cost/Steer/Day
Date In		In Wt				
May 1	0.0010	579	\$0.579	56	\$32.42	
Date Out		Out Wt				
Aug 27	0.0010	814	\$0.814	57	\$46.40	
Pasture Cost/Steer				113 Days	\$78.82	\$0.698
GRAZ Lg Frame						
Date In		In Wt				
May 1	0.0010	665	\$0.665	56	\$37.24	
Date Out		Out Wt				
Aug 27	0.0010	937	\$0.937	57	\$53.41	
Pasture Cost/Steer				113 Days	\$90.65	\$0.802

Table 2. Farming input cost for annual forages pea-barley and unharvested corn that were grazed

	Pea-Barley	Unharvested Corn
Custom Drilling or Planting/ac, \$	12.00	15.00
Custom Chemical Application/ac, \$	5.00	5.00
Custom Fertilizer Broadcast Application/ac, \$	-	5.00
Windrowing/ac, \$	10.00	-
Fertilizer/ac, \$	-	40.25
Seed (Perfection pea, Haybet Barley; Pioneer P9690R Corn)/ac, \$	47.00	62.50
Innoculant/ac, \$	4.33	-
Chemical – Pea-Barley (Glyphosate, AMS, Helfire, Rifle D)	12.62	
Chemical – Corn (Glyphosate, AMS, Helfire)		7.92
Crop Insurance/ac, \$	15.00	15.00
Land Rent/ac, \$	35.00	35.00
Subtotal	140.95	185.67
Interest @ 5.0%	7.05	9.28
Total Crop Input Cost/ac, \$	148.00	194.95
Cost/Steer, \$	83.25	104.79

Table 3. Effect of frame score on extended grazing performance of steers

	GRAZ Lg ^c	GRAZ Sm ^c	SE	P-Value
Number of Steers	24	24		
Frame Score	5.23 ^a	3.39 ^b	0.21	0.0006
Days Grazed	220	220		
Growth Performance:				
Start Wt., lb	665 ^a	579 ^b	34.68	0.0001
End Wt., lb	1201 ^a	1044 ^b	36.71	0.0042
Gain, lb	536 ^a	465 ^b	10.62	0.033
ADG, lb	2.43 ^a	2.11 ^b	0.047	0.034
Grazing Cost:				
Perennial Pasture (113 Days), \$	90.65	78.82		
Field Pea-Barley (30 Days), \$	78.99	83.25		
Unharvested Corn (77 Days), \$	104.23	104.79		
32% Crude Protein Suppl. (0.81 lb/d), \$	11.18	11.18		
Grazing Cost/Head, \$	285.05	278.04		
Grazing Cost/Lb of Gain, \$	0.5318	0.5979		

^cGRAZ steers grazed a forage sequence of native range, field pea-barley intercrop, and unharvested corn.

Table 4. Effect of steer frame score and extended grazing on feedlot finishing performance, efficiency, and economics

	FLOT Lg ^e	FLOT Sm ^e	GRAZ Lg ^e	GRAZ Sm ^e	SE	P-Value
Number of Steers	24	24	24	24		
Frame Score	5.29	3.41	5.31	3.40		
Growth Performance:						
Grazing Days	-	-	220	220		
Feedlot Days Fed	216	216	74	74		
Start Weight, lb	653 ^a	582 ^b	1143 ^c	985 ^d	34.51	<0.0001
End Weight, lb	1410 ^a	1217 ^b	1493 ^c	1293 ^d	37.39	<0.0001
Gain, lb	757 ^a	635 ^b	350 ^c	308 ^d	12.25	<0.0001
ADG, lb	3.51 ^a	2.94 ^b	4.73 ^c	4.16 ^d	0.077	<0.0001
Feed Intake and Efficiency:						
DM Feed/Steer/Day, lb	20.70 ^a	19.00 ^a	26.85 ^b	23.72 ^c	0.81	0.002
DM Feed/Lb of Gain, lb	5.90	6.46	5.70	5.70	0.30	0.52
Finishing Economics:						
Feed Cost/Steer, \$	646.67 ^a	593.67 ^b	219.55 ^c	193.97 ^d	16.92	<0.0001
Feed Cost/Steer/Day, \$	2.99	2.75	2.97	2.62	0.10	0.063
Feed Cost/Lb of Gain, \$	0.8543 ^a	0.9349 ^a	0.6273 ^b	0.6298 ^b	0.039	0.001

^eFLOT steers moved directly to the feedlot for growing and finishing; and GRAZ steers grazed a sequence of native range, field pea-barley intercrop, and unharvested corn before transfer to the feedlot at the University of Wyoming.

Table 5. Effect of steer frame score and extended grazing on carcass trait measurements and value

	FLOT Lg	FLOT Sm	GRAZ Lg	GRAZ Sm	SE	P-Value
Number of Carcasses	24	24	24	24		
Hot Carcass Weight, lb	809 ^a	702 ^b	825 ^a	724 ^b	23.47	0.0014
Fat Depth, in	0.35 ^a	0.39 ^a	.025 ^b	0.33 ^a	0.029	0.05
Ribeye Area, sq. in.	12.8 ^a	11.6 ^b	12.6 ^a	11.6 ^b	0.21	0.004
Yield Grade	2.0	2.2	1.91	2.2	0.088	0.108
Marbling Score	578	624	552	615	18.54	0.08
Percent Choice, %	83.3	91.7	79.2	95.8	5.51	0.20
Carcass Value/Steer, \$	1728.55 ^b	1515.66 ^c	2004.38 ^a	1763.68 ^b	57.25	0.0005

Table 6. Effect of steer frame score and extended grazing on system net return

	FLOT Lg	FLOT Sm	GRAZ Lg	GRAZ Sm	SE	P-Value
Number of Steers	24	24	24	24		
Income:						
Carcass Value/Steer, \$	1728.55	1515.66	2004.38	1763.68	57.25	0.0005
Expenses:						
Cost/Steer, \$	990.38	899.68	970.90	913.37		
Grazing Cost/Steer, \$	-	-	285.05	278.04		
Feedlot Cost/Steer, \$	646.67 ^a	593.67 ^b	219.55 ^c	193.97 ^d	16.92	<0.0001
Transportation & Brand	23.93	23.93	28.23	28.23		
Total System Expense/Steer, \$	1660.98	1517.28	1503.73	1413.61		
System Net Return/Steer, \$	67.95	-1.62	500.65	350.08		