

Forage-Based Stair-Step Replacement Heifer Development

S. Senturklu^{1&2*}, D.G. Landblom¹, and G.A. Perry³

¹North Dakota State University, Dickinson Research Extension Center

²Canakkale Onsekiz Mart Universitesi, BMYO, Biga/Canakkale, Turkey

³South Dakota State University, Department of Animal and Range Science

Introduction:

Traditionally heifers have been grown to 65% of mature BW using high energy diets to encourage early puberty and multiple estrous cycles. Poland and Ringwall (2001) were able to show that, compared to constant rates of gain, conception and pregnancy rates could be improved using a fluctuating energy “stair-step” method for heifer development. Funston and Deutscher (2004) reported lower development cost by reducing breeding target weight to 53-58% of mature BW while grazing lower quality forages with supplementation; and Freetly et al. (2011) reported that 56-58% of mature BW at puberty is optimal.

Objective:

The objective of this project was to evaluate the effect of a forage-based, stair-step, energy management system on the reproductive performance of small and large framed heifers grown to a breeding target weight of 57%.

Procedure:

- 100 heifers used from two separate frame score herds: 50 (< 4.3); 50 (> 4.5)
- Heifers grazed unharvested corn and corn residue plus supplemental hay for 209 days (Table 1)
- Heifers grazed crested wheatgrass for 58 days (Table 1)
- Heifers confined to drylot for 85 days and were fed a diet of 80% alfalfa hay and 20% co-product supplement (Table 1) (Supplement contained 30% DDGS, 30% barley malt sprouts, 15% wheat midds, 7.75% soybean hulls, and 7.5% fat)
- Circulating progesterone concentration was used to determine puberty at the end of the winter period (May) and at the start of breeding (Aug).
- Heifers were bred naturally. Pregnancy determined with ultrasound. Breeding cycle determined using ultrasound cranial width measurement 30 d after 50 d breeding season

Summary:

The stair-step procedure used is depicted in Figure 1 and the Timeline is shown in Table 1. Results from this heifer development study, which was designed to evaluate a stair-step energy system to determine the response among small frame (SF) and large frame (LF) heifers estimated to weigh 1220 and 1470 pounds as mature cows, have been summarized in Table 2 and Figures 2 - 6. As a percentage of mature BW, heifer weight at the start of the breeding season was 57.8 and 57.2% for SF and LF heifers, respectively.

Heifer growth and average daily gain (ADG) (Figures 2 and 4) and the percentage of heifers that were pubertal at the end of the dormant forage grazing and supplemental hay feeding period was low (SF – 18.0%; LF – 40.0%); however, by the start of the breeding season in August 90.0% of the SF and 96.0% of the LF heifers were determined to be pubertal ($P = 0.07$)

(Figure 3). SF heifers consumed less feed throughout the study and had a lower pasture stocking rate. While grazing crested wheatgrass, the SF heifers were stocked at 0.60 acre/animal unit month (AUM) and the LF heifers were stocked at 0.70 acre/AUM. In the feedlot, SF heifers consumed 20.1% less feed ($P < 0.01$) and feed cost was 16.2% less than the LF heifers; however, there was no difference in feed efficiency ($P = 0.41$) or feed cost/lb of gain ($P = 0.41$) between the two heifer frame sizes.

There were 352 days in the investigation from the start of the study in October 2010 to the end of study in September 2011. The stair-step development cost per heifer was \$251.26 for the SF heifers and \$300.95 for the LF heifers. For the 352 day period, daily development cost was \$0.7138/day for the SF heifers and \$0.8550/day for the LF heifers (Figure 5).

First, 2nd, and 3rd breeding cycles and the total percent pregnant did not differ ($P > 0.10$) (Figure 6). These results agree with those reported by Funston and Deutscher, (2004), Martin et al., (2008), and Freetly et al., (2011) suggesting that heifers reaching 55-57% of mature BW at the start of the breeding season have similar pregnancy rates as heifers grown to 60-65% of mature BW. These data suggest that a stair-stepped heifer development system that uses dormant season crop residues with supplemental hay as a way to limit energy, followed by elevated energy from spring and early summer crested wheatgrass grazing, and a forage-based drylot breeding period can be used to obtain above average reproductive performance.

Figure 1.

STAIR – STEP PROCEDURE

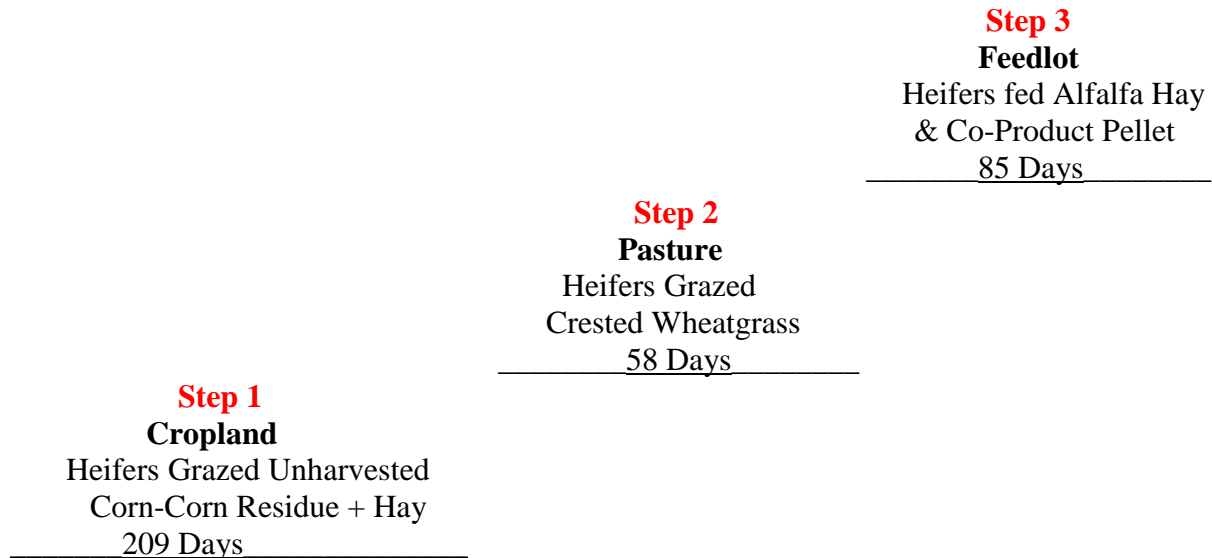


Table 1. Heifer Development Timeline – Stair-Step Feeding Schedule

Dormant Grazing Period	Spring Grazing Period	Feedlot Period
Oct13-May 10 209 Days	May 10-July 6 58 Days Progesterone (May 10)	July 6 – Sept. 29 (85 Days) August 11 (Start 50 day Breeding Period) Progesterone (Aug 11)

Table 2. Stair-Step Heifer Development System: Frame Score, Growth Performance, Feed Efficiency, Overall Cost, and Reproductive Performance

	Small Frame	Large Frame	SE	P-Value
Number of Heifers	50	50		
Heifer Frame Score	3.50	5.56	0.33	0.001
Dormant Season Residue Grazing (Oct 13-May10):				
Days	209	209	0.66	0.511
Weaning Wt., lb	477	588	22.52	0.002
May 10, 2011 Wt., lb	596	687	21.02	0.003
Gain, lb	118.4	98.9	9.67	0.191
ADG, lb	0.56	0.47	0.045	0.187
Feed Cost/Heifer, \$	98.98	123.88		
Feed Cost/Day, \$	0.4736	0.5927		
Spring Crested Wheatgrass Grazing (May 10-July 6):				
Days	58	58		
Start Wt., lb	596	687	21.02	0.003
End Wt., lb	655	765	22.46	0.001
Gain, lb	59	78	3.29	0.005
ADG, lb	1.03	1.34	0.06	0.004
Grazing Cost/Heifer, \$	17.10	19.95		
Grazing Cost/Day, \$	0.2948	0.3440		
Drylot Growth Performance (July 6 to Sept.29):				
Days	85	85		
Start Wt., lb	655	765	22.46	0.001
Start Breeding Wt. (Aug 11), lb	705	841	24.33	0.001
Estimated Pct. of Mature Body Wt., %	57.8	57.2		
End Wt., lb.	813	944	28.68	0.001
Gain, lb	158	179	8.63	0.087
ADG, lb	1.86	2.11	0.10	0.087
Drylot Feed Efficiency:				
Feed/Head/Day (DM), lb	20.82	25.0	0.74	0.001
Feed/Lb of Gain (DM), lb	11.19	11.85	0.48	0.406
Feed Cost/Heifer, \$	135.18	157.12	5.00	0.025
Feed Cost/Day, \$	1.5906	1.913	0.056	0.001
Feed Cost/Lb of Gain, \$	0.8650	0.9102	0.037	0.413
Combined Stair-Step Cost				
Total Cost/Heifer To Pregnancy, \$	251.26	300.95		
Cost/Heifer/Day (352 Days), \$	0.7138	0.8550		
Reproductive Performance:				
First Cycle, %	62.0	70.0	9.33	0.528
Second Cycle, %	16.0	10.0	4.78	0.402
Third Cycle, %	8.0	4.0	3.88	0.486
Total, %	86.0	84.0	5.57	0.622