Influence of Beginning Body Condition Scores on Net Returns From Feeding Cull Cows

Zakou Amadou,[1]

Kellie Curry Raper,[1]

Jon T. Biermacher,[2]

Billy Cook[2]

and

Clement Ward[1]

Abstract

The impact of beginning body condition scores on returns from feeding cull cows was investigated in a two year experiment. In each of two culling years, physical performance data and financial data were measured at approximately monthly intervals for culls on pasture versus dry lot. Specifically, data was collected for cows culled in October 2007 and held through April 2008 and for cows culled in October 2008 and held through March 2009. We examine the sensitivity of net returns relative to the choice of body condition score as a sorting trigger for heavy versus thin cows. In this two year study, while a pasture system was generally more profitable than a drylot system, thin cows were typically more profitable than cows with higher BCS, regardless of the feeding system. The importance of the sorting criteria is highlighted in year two. Using the lower BCS criteria for sorting is the only scenario that generates positive net returns, albeit small. Thus, decisions regarding cull cow retention and feeding should consider body condition scores.

[1]Oklahoma State University
[2]Samuel Roberts Noble Foundation

Selected Paper prepared for presentation at the Agricultural & Applied Economics Association 2010 AAEA, CAES, & WAEA Joint Annual Meeting, Denver, Colorado, July 25-27, 2010

Introduction

Anecdotal evidence suggests that cow-calf producers usually leave money on the table when it comes to marketing cull cows. Studies have shown that 15 to 30 percent of cow-calf producers' profit is earned from marketing cull cows; most cow-calf producers devote their energy, money and time to producing and marketing steers and heifers, giving little attention to marketing cull cows. Most cull cows are sold when markets are at the seasonal low and body condition scores are less than optimal. The primary objective of cow- calf producers is to optimize ranch profitability, given limited resources. Thus, cow- calf producers could increase profitability by considering the body condition score (BCS) of cull cows, the availability and affordability of feeds, and seasonal price increases when deciding whether to retain and feed cull cows or market them at culling time. [1]

Blevins (2009) reported that cull cows significantly contribute to the net income to beef producers. He concluded that management and marketing strategies enhancing the value of these cows should be taken into consideration. Roeber et al (2001) indicated that beef producers could increase returns from cull cows by $70 or more when quality defects, health, and condition of cull cows are well managed and marketed in a timely manner. A recent study conducted by Amadou et al (2009) revealed added value in holding cull cows beyond culling on native grass for 90 to 120 days. This practice takes advantage of the normal seasonal pattern in cull cow prices at a relatively low feed cost.

Feeding cows beyond culling on a specified forage or concentrate ration may allow producers to capture additional value from the seasonal price upswing, as well as potentially increasing pounds sold and the slaughter quality grade of the animal (Feuz, Stockton, and

[1] Body conditions scores (BCS) are an estimate of the external fat carried by a cow.

Bhattachary 2006). The value added to cull cows depends highly on feed costs and availability, cow carcass quality, and days on feed. Strohbehn and Sellers (2002) suggested that feeding sound, healthy cows with thin to moderate body condition scores would significantly increase the overall profitability of cull cows. Similarly, Peel and Doye (2004) concluded that there is a relationship between body condition scores, marketing classification and estimated dressing percentage. Many have suggested that the BCS is a useful tool when making culling decisions. However, there has been little information on the influence of beginning body condition scores on net returns from feeding cull cows. The literature has instead focused on the impact of ending body condition score on overall carcass value.

Apple (1999) studied the influence of ending body condition score on live and carcass value of cull beef cows using eighty eight cull cows. As expected, cows with higher BCS scores (7 to 8) had the highest gross and net carcass values and cows with lower BCS scores (2 to 3) has less value, suggesting that additional intensive feeding would improve their value. Apple recommended that keeping cull cows beyond the culling period and feeding them on a high energy diet would greatly improve body condition score and carcass quality characteristics, thereby increasing returns. However, his study considers only the end revenue rather than the returns, with no accounting for the cost to the cow-calf producer of holding and feeding cull cows. Carter (2007) also stated that cows with higher ending body condition scores (BCS) and weight would optimize economic returns by having both a higher carcass value and a higher live value. In contrast to previous research, the objective of this research is to determine the influence of beginning body condition score on net returns from feeding cull cows. We hypothesize that cull cows with lower beginning BCS will have higher net returns from feeding than cows with higher beginning BCS.

Methods, Procedures, and Data

This study evaluates net returns for two management systems over five feeding intervals and analyzes net returns according to the beginning BCS for culled cows. We use data from a two year experiment carried out at the Samuel Roberts Noble Foundation in Ardmore, Oklahoma. In each of two culling years, data were measured at approximately monthly intervals for culls cows retained on native pasture versus fed in a dry lot setting. Specifically, data was collected for cows culled in October 2007 and marketed in April 2008 and for cows culled in October 2008 and marketed in March 2009. Data are collected approximately monthly on weight, USDA grade, dressing percentage, costs (feed, animal health, etc.), and market value. Estimated USDA grade and dressing percentage were used to assign a price to each cow at each feeding interval, based on prices reported by the Agricultural Marketing Systems (AMS). In treatment one, cows were fed in a dry lot environment (dry lot) with a grain supplement and forage. In treatment two, cows were fed in a grazing environment with forage only (grass). In year one, a total of 48 cows were fed, with 24 in the dry lot and 24 on grass. In year two a total of 43 cows were fed, with 22 in the dry lot and 21 on grass.

A general linear model having both random and fixed effects on the dependent variable was selected. The model compares net returns for pasture fed thin and heavy cull cows and dry lot fed thin and heavy cull cows across five feeding intervals in each experiment year, including 35 days, 70 days, 98 days, 133 days and 155 days. Net returns are defined as follows as:

$$N_i = P_{end} Wt_{end} - P_{begin} Wt_{begin} - \sum_{i}^{n} C_{ij} \quad (1)$$

where N_i is net returns for the i^{ith} feeding period, P_{begin} represents the price per hundred weight at culling, Wt_{begin} represents cow weight at culling P_{end} represents the price per hundredweight at marketing, Wt_{end} represents the ending weight of the cow, , and C_{ij} is the cost of j^{th} inputs for the i^{th} feeding interval.

Maximum likelihood estimation was employed using the following model:

$$N_{ijklm} = \mu + \alpha_i + \beta_k + \chi_l + \delta_m + \alpha\beta\chi\delta_{iklm} + \theta_{j(ik)} + \varepsilon_{ijklm} \qquad (2)$$

where N is net returns, i is dry lot or pasture, k is the cow's BCS, l is feeding interval , m is experiment year, , μ is a constant representing the overall mean, α_i is feeding treatment effect, β_k is the beginning BCS category (thin or heavy), χ_l is feeding interval effect , δ_m is year effect, $\alpha\beta\chi\delta_{iklm}$ is the treatment* BCS* Days* Year interaction effect, $\theta_{j(i)}$ is the random effect due to i^{th} treatment effect , and $\varepsilon_{ijklm} \approx \mathrm{N}(0,\sigma^2{}_{\varepsilon})$. Likelihood ratio tests indicated that the unstructured covariance matrix was the most appropriate for the model.

Beginning body condition scores were not collected in the first year of the experiment. Thus, the relationship of beginning BCS and initial weight, initial dressing percentage, and quality grade in the second year was estimated using a logit regression as:

$$\beta_k \ (\leq \mathrm{S}\ \text{then } 0, > \mathrm{S}\ \text{then } 1) = \beta_1 + \beta_2 Weight + \beta_3 DP + \beta_4 Boner + \beta_5 Breaker$$

where β_k is a 0-1 variable, S is the BCS trigger for dividing cows into the "thin" group and the "heavy" group, weight is initial weight, DP is initial dressing percentage, Boner is a dummy variable (1 boner, 0 otherwise), and Breaker is a dummy variable (1 breaker, 0 otherwise). Regression results were then used to predict beginning body condition score range (heavy or thin) for cows included in the first year of the experiment.

We also examine the sensitivity of net returns relative to the choice of body condition score as a sorting trigger for heavy versus thin cows. We compare net returns for cows where BCS<5.5 is considered" thin" and BCS>5.5 is considered "heavy". Additionally, we also analyze net returns using BCS=4.5 as the divider of thin and heavy cows. Results of these two models are then compared.

Results

Table 1 presents the detailed comparison of net returns where the BCS sorting trigger for heavy versus thin cows, S, is 4.5 and where S=5.5. For ease of presentation, selected results are then illustrated by graphical comparisons. Figures 1through 4 show net returns in year one of thin cows on pasture and dry lot with BCS 4.5 and 5.5 peaked at 98 days and 133 days, respectively. However, net returns for heavy cows on pasture and dry lot (Figure 3) when BCS=4.5 is used as the sorting criteria peaked at 133 days while net returns of heavy cows with a sorting criteria of BCS=5.5 (Figure 4) peak at 133 days and 98 days for pasture and dry lot, respectively. Overall, in year one, feeding thin cows was more profitable than feeding heavy cows, regardless of which BCS sorting criteria was used. However, profitability of feeding increased when a lower BCS sorting criteria was employed. Additionally, in year one, the pasture feeding system was more profitable than the dry lot system, overall. Figures 5 through 8 present results from year 2. Figure 5 indicated that net returns of thin cows on pasture and dry lot in year two peaked at 70 days and 133 days, respectively, when BCS=4.5 was used as the sorting criteria. Figure 6 shows that when the BCS sorting criteria moves toward heavier cattle at 5.5, net returns peak at 133 days, but only grass-fed is profitable.

Figures 9 through 16 summarize differences average daily gain for alternative BCS sorting criteria for years one and two. For year one, ADG generally decreased over time, regardless of sorting criteria. Year two ADGs were less stable, regardless of treatment and sorting criteria. This fluctuation is characterized by an increase followed by a decrease, then increase in both cases.

Figures 17 through 24 report differences in average weight of cull cows under different sorting scenarios. In general, the beginning weights of cull cows were similar. However, across feeding intervals, the average weight of cows in the dry lot treatment was higher than for those in the pasture treatment. This implies that cull cows in the dry lot setting gained more than those on pasture.

Figures 25 through 32 present the effect of alternative BCS sorting criteria on the cost per pound of gain across feeding intervals. Figures 25 through 28 show that in year one, with the exception of thin cows on pasture at 35 days with a sorting criteria of BCS=5.5, cost per pound of gain for dry lot cows was higher than that of cows on pasture.

Table 2 presents the overall sensitivity analysis of net returns with alternative BCS sorting criteria at 4.5 and 5.5. Overall, the use of a lower BCS for sorting results in higher net returns for feeding cull cows considered “thin”. Retention of cull cows on pasture is measured as more profitable than retention in a drylot setting. Additionally, in this experiment, net returns are maximized with fewer feeding days when a lower BCS score is used as a sorting trigger. A BCS trigger of 4.5 results in maximum net returns at day 98, while a BCS trigger of 5.5 results in maximum net returns at day 133.

Conclusions and implications

This study investigated the impact of body condition scores on both net returns and physical attributes from feeding cull cows on dry lot and pasture and from 2007-2008 to 2008-2009. Results indicated that the net returns in year one for thin cows on pasture and dry lot with BCS of 4.5 and 5.5 and heavy cow on pasture and dry lot with BCS of 4.5 and 5.5 almost followed the same pattern; both were negative at the beginning, followed by an increase and then a drastic drop. Thin cows on pasture were more profitable than heavy cows on pasture, regardless of BCS sorting criteria. Year two illustrates the importance of BCS sorting criteria in that the sorting trigger makes the difference between cull cow retention of thin cows being profitable and unprofitable. When the higher BCS criterion is used, no feeding scenarios are profitable. When the lower BCS criterion is used, retaining thin cows is (barely) profitable in a pasture setting.

Beginning BCS appears to be an important factor in determining which cull cows to retain and feed. In the context of producer decisions regarding feeding cull cows, the results suggest that producers should carefully consider the body condition score of cows when making the decision to retain and feed versus marketing cows at culling. In this two year study, while a pasture system was generally more profitable than a drylot system, thin cows were typically more profitable than cows with higher BCS, regardless of the feeding system. The importance of the sorting criteria is highlighted in year two. Using the lower BCS criteria for sorting is the only scenario that generates positive net returns, albeit small. Thus, decisions regarding cull cow retention and feeding should consider body condition scores.

References

Amadou, Z. Management Production Systems and Timing Strategies for Cull Cows." Unpublished Master thesis, Oklahoma State University, May 2009.

Apple .J .K .1999. Influence of body condition score on the live and carcass values of cull beef cows. J. Anim Sci.77:2610-2620

Adams.D.C. 2003. Strategically Feeding Protein and Energy During Winter and Managing Cow Condition Range Beef Cow Symposium.

Blevins P. 2009 .Marketing Cull Cows in Virginia, Virginia Cooperative Extension Service, E-761, 2009

Carter J.N and John. D.D 2007. Improving the Value of Cull Cows by Feeding Prior to Slaughter. Florida Cooperative Extension Services, AN-169.

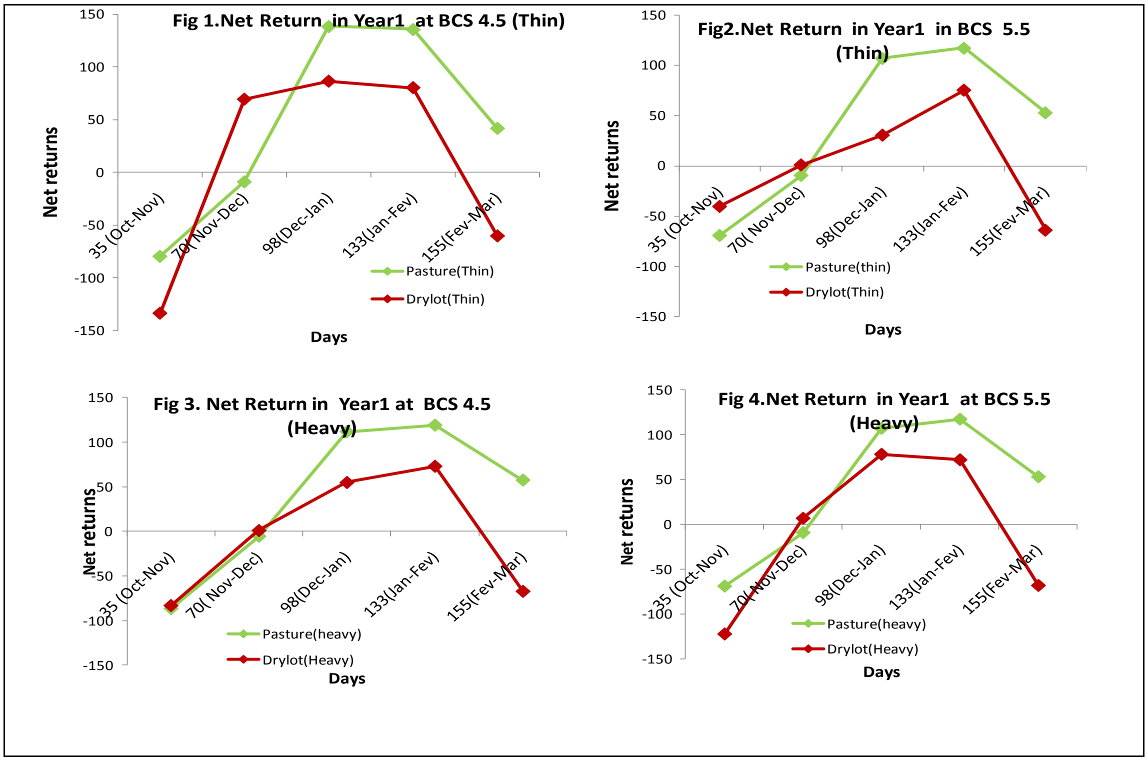
Feuz, D. M., Matt C .Stockton, and, Suparna. Bhattachary. The Relationship of U.S. and Canadian Cull Cow Price to Lean Beef Price: A DAG Analysis." Paper selected for presentation at the *American Agricultural Economics* Association Annual Meeting July 2006.

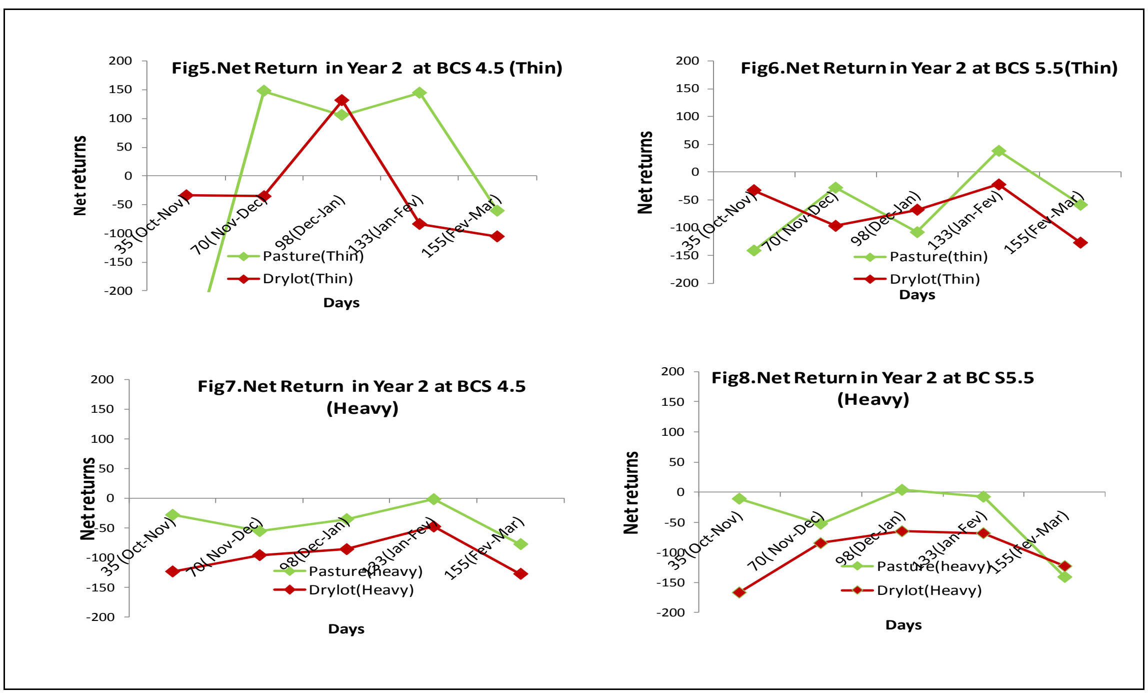
Peel, D. S. and D. Doye. "Cull Cows Grazing and Marketing Opportunities." Oklahoma Cooperative Extension Service Fact Sheet AGEC-613. Stillwater, Oklahoma 2004. http://pods.dasnr.okstate.edu/docushare/dsweb/Get/Document-5148/AGEC-613web.pdf

Strohbehn, Daryl R. and Joe Sellers. "Economics of Adding Values to Cull Cows.", Iowa Beef Center. http://www.iowabeefcenter.org/pdfs/IQCCP/cc_econ_presnt.pdf. December 2002. Retrieved December 20, 2009.

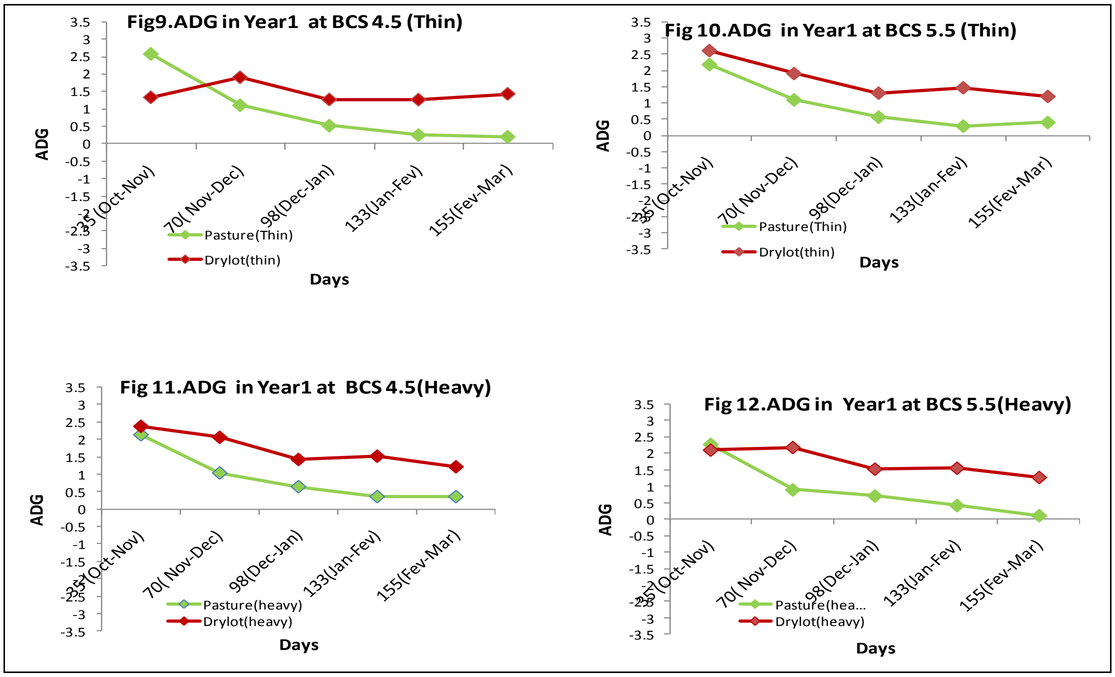
Table 1. Net Returns Comparison for Alternative Body Condition Score Sorting Criteria

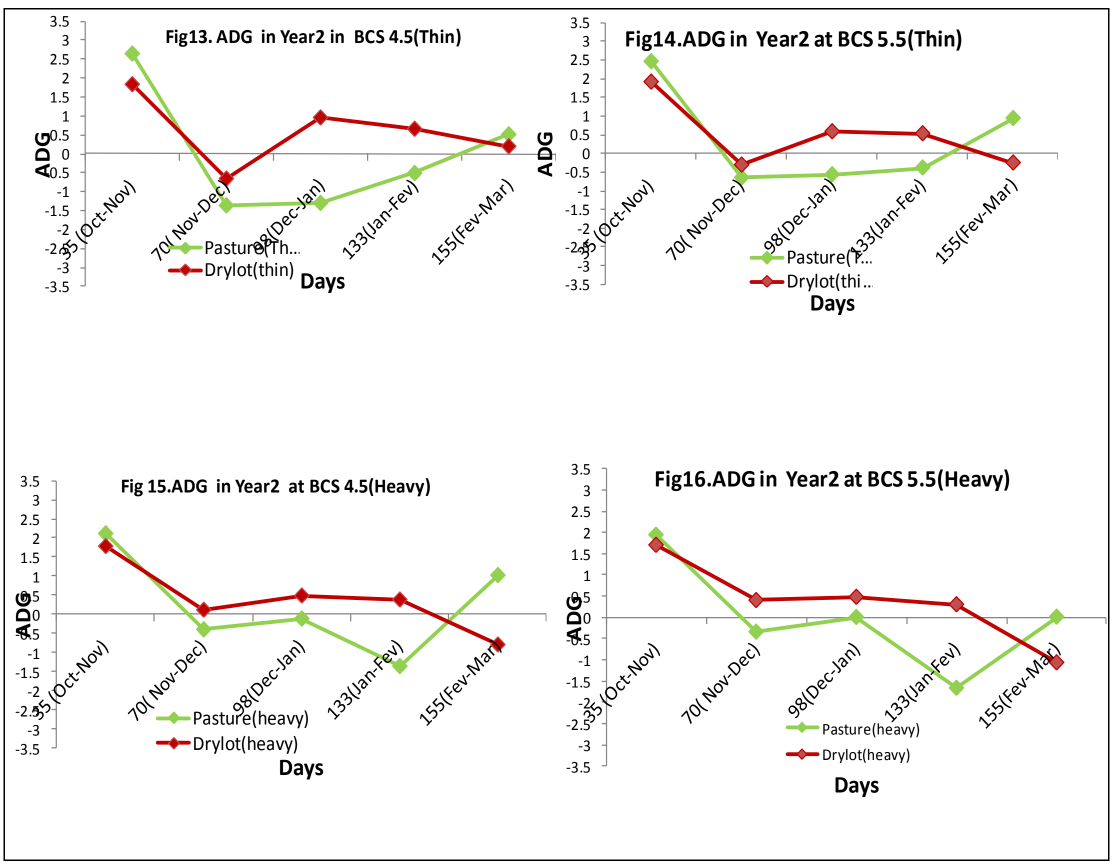
BCS Sorting Criteria = 4.5						BCS Sorting Criteria = 5.5					
Treat-ment	BCS Category	Year	Feeding Interval (Days)	Estimate	p-value	Treat-ment	BCS Category	Year	Feeding Interval (Days)	Estimate	p-values
Feed	thin	1	35	-133.860	0.222	Feed	thin	1	35	-40.433	0.226
Feed	thin	1	70	69.086	0.547	Feed	thin	1	70	0.871	0.982
Feed	thin	1	98	86.162	0.481	Feed	thin	1	98	30.458	0.476
Feed	thin	1	133	80.043	0.386	Feed	thin	1	133	75.225	0.029
Feed	thin	1	155	-60.543	0.312	Feed	thin	1	155	-64.068	0.064
Pasture	thin	1	35	-79.431	0.151	Pasture	thin	1	35	-69.234	0.012
Pasture	thin	1	70	-8.738	0.883	Pasture	thin	1	70	-9.389	0.776
Pasture	thin	1	98	138.580	0.032	Pasture	thin	1	98	107.190	0.004
Pasture	thin	1	133	135.750	0.007	Pasture	thin	1	133	117.360	0.000
Pasture	thin	1	155	42.017	0.411	Pasture	thin	1	155	52.985	0.090
Feed	heavy	1	35	-82.920	0.001	Feed	heavy	1	35	-122.790	0.000
Feed	heavy	1	70	1.146	0.970	Feed	heavy	1	70	6.606	0.857
Feed	heavy	1	98	55.009	0.102	Feed	heavy	1	98	78.179	0.054
Feed	heavy	1	133	73.188	0.011	Feed	heavy	1	133	71.992	0.028
Feed	heavy	1	155	-67.002	0.025	Feed	heavy	1	155	-68.490	0.039
Pasture	heavy	1	35	-86.693	0.001	Pasture	heavy	1	35	-124.940	0.003
Pasture	heavy	1	70	-5.714	0.856	Pasture	heavy	1	70	1.481	0.975
Pasture	heavy	1	98	111.560	0.002	Pasture	heavy	1	98	137.590	0.008
Pasture	heavy	1	133	118.770	<.0001	Pasture	heavy	1	133	134.320	0.002
Pasture	heavy	1	155	57.243	0.057	Pasture	heavy	1	155	61.057	0.121
Feed	thin	2	35	-33.840	0.604	Feed	thin	2	35	-32.762	0.378
Feed	thin	2	70	-35.402	0.676	Feed	thin	2	70	-96.798	0.018
Feed	thin	2	98	131.500	0.145	Feed	thin	2	98	-67.797	0.124
Feed	thin	2	133	-83.487	0.368	Feed	thin	2	133	-22.520	0.540
Feed	thin	2	155	-105.140	0.045	Feed	thin	2	155	-126.970	0.001
Pasture	thin	2	35	-344.420	<.0001	Pasture	thin	2	35	-141.190	0.000
Pasture	thin	2	70	147.830	0.207	Pasture	thin	2	70	-27.673	0.588
Pasture	thin	2	98	105.800	0.393	Pasture	thin	2	98	-108.090	0.053
Pasture	thin	2	133	144.500	0.123	Pasture	thin	2	133	38.802	0.363
Pasture	thin	2	155	-61.068	0.099	Pasture	thin	2	155	-58.549	0.069
Feed	heavy	2	35	-123.900	<.0001	Feed	heavy	2	35	-166.210	<.0001
Feed	heavy	2	70	-96.291	0.003	Feed	heavy	2	70	-84.714	0.037
Feed	heavy	2	98	-86.220	0.017	Feed	heavy	2	98	-65.059	0.140
Feed	heavy	2	133	-47.933	0.108	Feed	heavy	2	133	-68.261	0.039
Feed	heavy	2	155	-127.910	<.0001	Feed	heavy	2	155	-122.630	0.001
Pasture	heavy	2	35	-27.934	0.302	Pasture	heavy	2	35	-11.283	0.735
Pasture	heavy	2	70	-55.351	0.088	Pasture	heavy	2	70	-52.878	0.136
Pasture	heavy	2	98	-35.122	0.328	Pasture	heavy	2	98	3.461	0.929
Pasture	heavy	2	133	-1.536	0.960	Pasture	heavy	2	133	-7.935	0.804
Pasture	heavy	2	155	-77.355	0.026	Pasture	heavy	2	155	-141.330	0.008



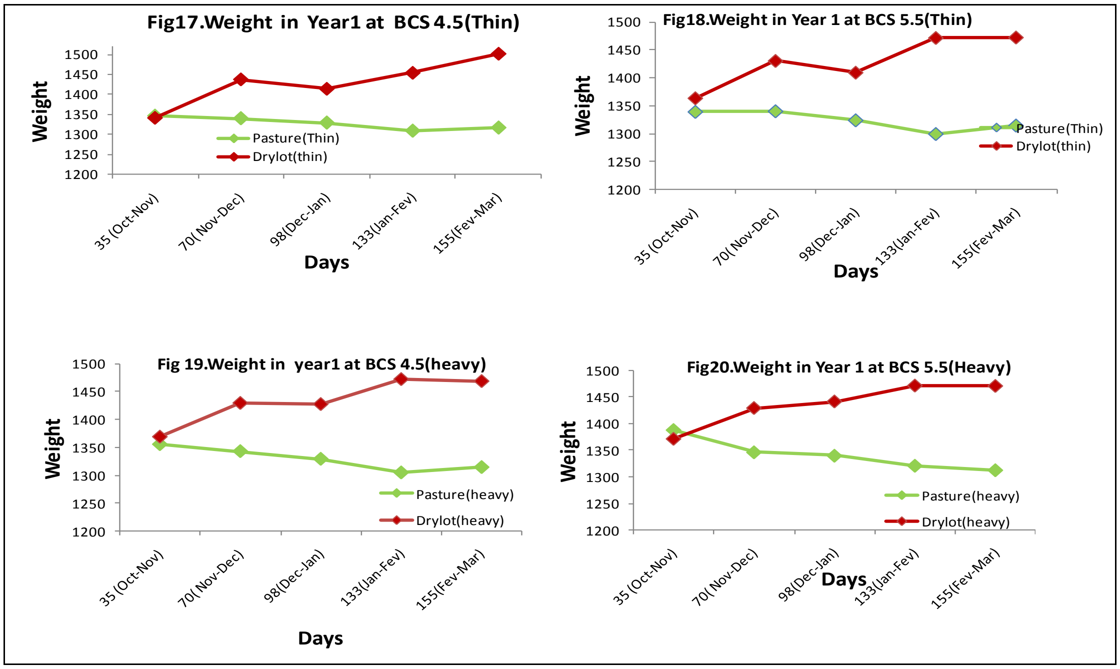


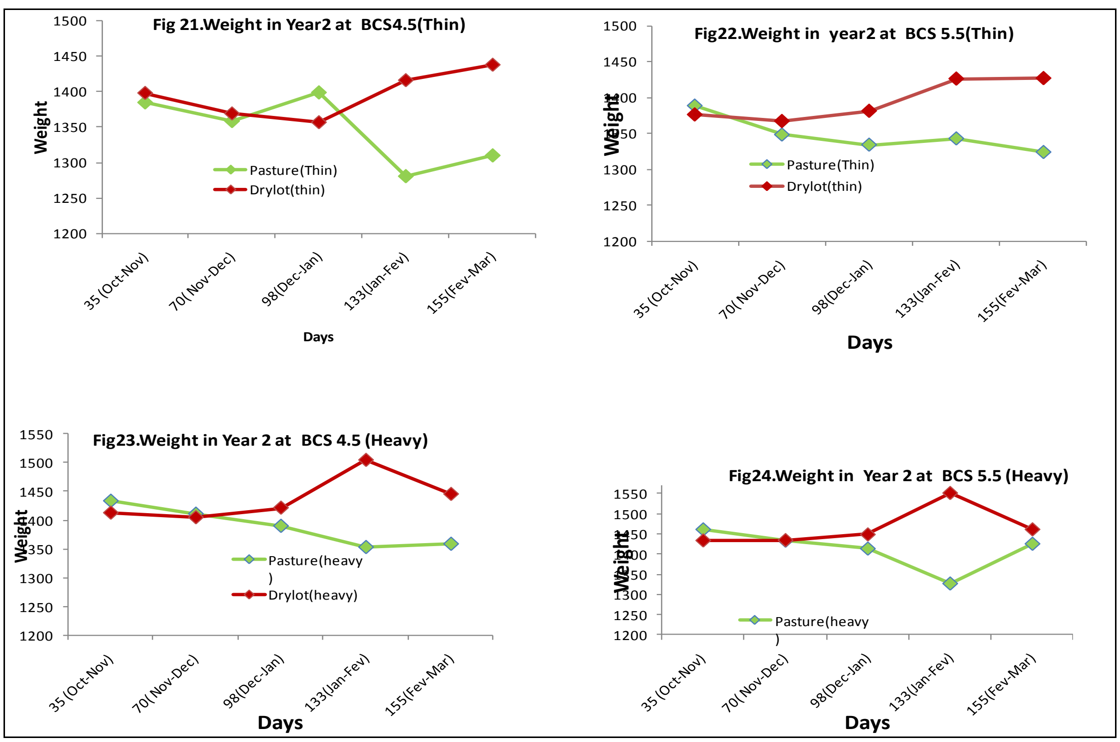
Figures 1-8. Comparison of Net Returns Across Years for Different Body Condition Score Sorting Criteria.



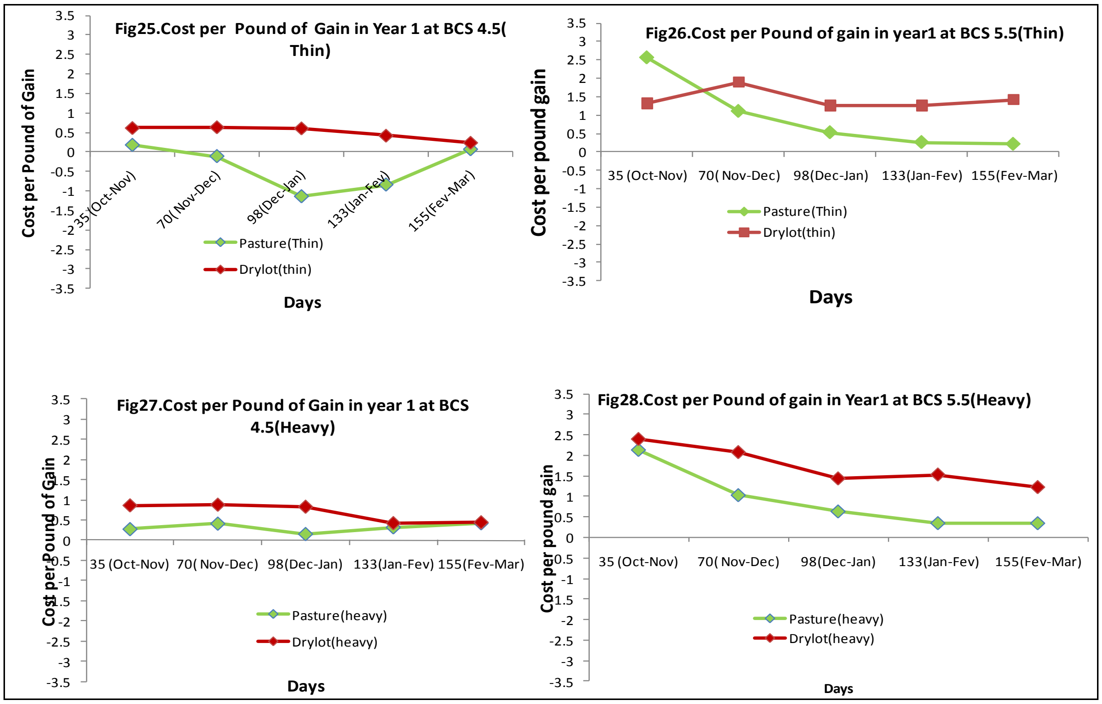


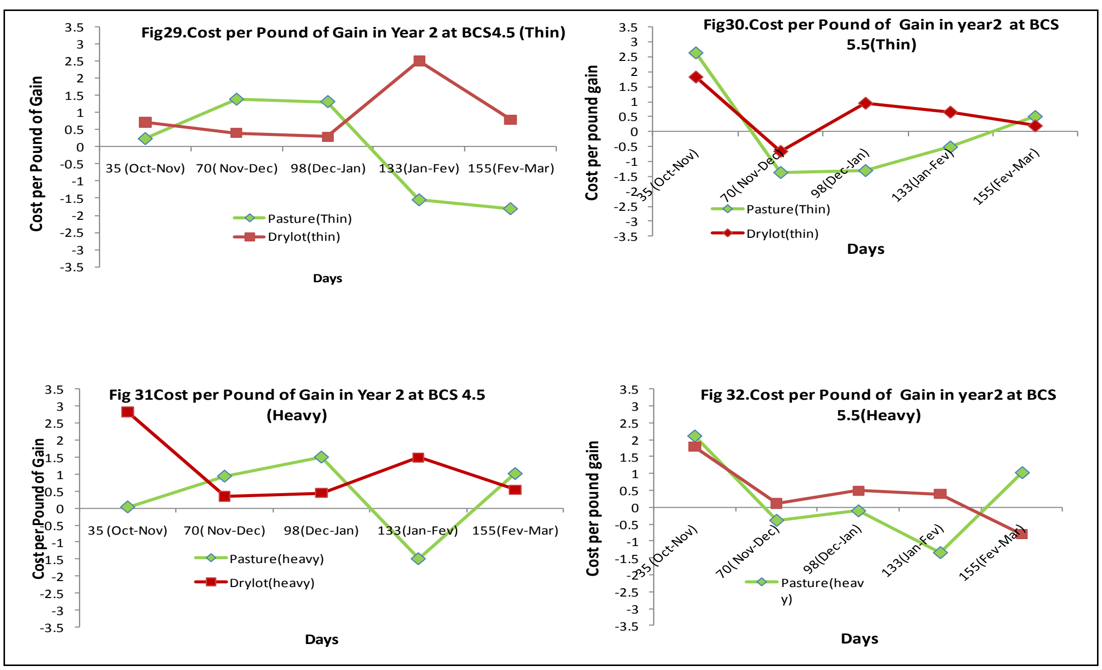
Figures 9-16. ADG Comparison Across Years for Different Body Condition Score Sorting Criteria.





Figures 17-24. Comparison of Weight Across Years for Different Body Condition Score Sorting Criteria





Figures 25-32. Comparison of Cost per Pound of Gain Across Years for Different Body Condition Score Sorting Criteria

Table 2. Sensitivity of Net Returns Under Alternative BCS Sorting Criteria

					BCS 4.5		BCS 5.5	
Effect	Trmt	BCS	Year	Days	Estimate	P-values	Estimate	P-values
BCS		Heavy			-25.248	0.015	-27.092	0.023
BCS		Thin			6.767	0.735	-22.129	0.056
Trmt	Feed				-29.416	0.121	-44.309	0.002
Trmt	Pasture				10.935	0.530	-4.912	0.740
Day				35	-114.120	<.0001	-88.606	<.0001
Day				70	2.071	0.937	-32.812	0.038
Day				98	63.408	0.027	14.492	0.406
Day				133	52.413	0.028	42.373	0.005
Day				155	-49.970	0.005	-58.500	0.000
Year			1		22.183	0.213	18.799	0.184
Year			2		-40.664	0.030	-68.020	<.0001