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COMPARISON OF PRODUCTION EFFICIENCIES WHEN CALVES ARE FED IN SOUTH DAKOTA OR TEXAS

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Summary

South Dakota's reputation for harsh winters is frequently cited as a limitation to our competitiveness in cattle feeding. To help quantify the impact of climate on cattle feeding, heifers produced in western South Dakota were fed in eastern South Dakota or in the Texas panhandle. Heifer calves were obtained from two ranches, assembled at SDSU, and sorted into three similar groups. Group 1 remained at the SDSU feedlot, Group 2 was shipped half-way to Texas and returned to SDSU, and Group 3 was sent on to Texas for feeding. These groups allow consideration of climate and transit stress on feedlot performance. Similar diets, health programs, and implants were used at each location. The 144 heifers were started on test November 8, 1991, and slaughtered on May 14 (SD) and May 15, 1992 (TX). Cumulative average daily gain (3.01 lb) was similar among locations. Interim gains differed among locations as weather conditions varied. Heifers consumed 4% more ($P<.05$) feed and were 4.5% less ($P<.05$) efficient when fed in South Dakota. Final weights and carcass weights were similar after 188 days on feed. Acute disease problems only occurred in Groups 2 and 3. The lower feed prices in South Dakota and lower costs for trucking and health made feeding more profitable in South Dakota.

(Key Words: Cattle, Feedlot, Climate.)

Introduction

During the last two decades, cattle feeding has become concentrated in the southern high plains. The large increase in numbers of cattle on feed in that region has had a significant impact on the cattle feeding industry of the midwest. Iowa, Illinois and other eastern and central cornbelt states have experienced dramatic reductions in cattle feeding activity. Reducing the number of cattle fed in a region reduces demand for, and consequently the price of feed grains. Supply and packing industry activities decline as well. Iowa economists determined that in the early 1980's each steer fed in the state generated $1,000 in personal income when related industry activities were considered. Accordingly, any reduction in cattle feeding activity has a significant impact on the overall economy of a state or region.

South Dakota has not suffered the significant reduction in numbers of cattle fed other cornbelt states have experienced. Even so, our economy has been affected by prevailing regional trends. The area has experienced a reduction in packers and corn prices suffer from the decline in demand in this region. As a state, we currently export most of the feeder cattle and feed grains we produce. It is important for our economy that we identify factors that will reverse the trend of exporting our feeder calves and grains and the revenues they can generate to the southern high plains. Addressing these concerns before cattle feeding activity falls in South Dakota reflects prudent management. Iowa failed to address these concerns until after their industry collapsed. Now they have lost the infrastructure needed for rebuilding cattle numbers. The sporadic fluctuation in Iowa cattle feeding activity in recent years is indicative of the troubles they face in rebuilding.

The expertise, technological support and financing needed to feed cattle can be made available anywhere in the United States. Industry observers also

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realize that feeder cattle and packers can be moved. Feed supplies and environmental conditions are the factors that have the greatest impact on the competitiveness of cattle feeding. South Dakota has an excellent rating for the quantity and prices of feeds available. Unfortunately, the climate here is considered too harsh to accommodate efficient cattle feeding and this perception is affecting our industry. Much of today's cattle feeding activity is supported by second party investors that typically believe it is too cold to feed cattle in South Dakota. This concern must be addressed if South Dakota will successfully compete for the investment capital necessary for a healthy and growing cattle feeding industry.

Computer simulation modelling indicates that the climate in South Dakota is competitive with the climate in the southern plains. In the model, regional advantages shift as seasons change. During periods when the climate puts South Dakota at a disadvantage to the southern plains, it appears that lower grain prices in South Dakota can offset the costs associated with poorer feed efficiency. These are only projected results and actual production data are needed before arguments promoting cattle feeding in South Dakota can be effectively presented.

The experiment described here makes a direct evaluation of the production efficiencies when South Dakota calves are fed in Brookings, SD, or New Deal, TX. New Deal is in the Texas panhandle region where approximately 4 million head of cattle are on feed. By minimizing genetic, diet and management variation, we can develop a clear picture of the impact of climate in South Dakota on the economics of feeding cattle. This information will be useful to individual producers, corporate feeding operations and financial organizations that are currently discriminating against cattle feeding in our region.

Materials and Methods

Limousin x Angus and Charolais x Angus heifer calves were purchased from two ranches in western South Dakota and assembled at the South Dakota State University research feedlot. Heifers were eartagged, weighed, vaccinated for IBR, BVD, BRSV, H. somnus, PI_3, Clostridia spp and brucellosis; treated for internal and external parasites; and implanted with Synovex-H on November 7, 1991. The following day they were sorted into three groups of 48 head, balancing the ranch of origin and weight distribution in each group. On November 8, all heifers were weighed again and this represented the initial test weight. Group 1 heifers were then placed in 6 pens of 8 heifers at the SDSU feedlot. Group 2 heifers were loaded on a truck and shipped half way to the Texas destination before returning to the SDSU feedlot. Group 3 heifers were loaded on a second truck and shipped to the Texas Tech University research feedlot at New Deal, Texas. Shipment of Group 2 heifers was done to eliminate transit effects from climate comparisons. Transit time was 1,000 miles and took 23 hours for Groups 2 and 3.

Diets were standardized among locations. The receiving diet was fed for 31 days and abruptly switched to the finishing diet on day 32 (Table 1). Except during the step-up periods, feed was provided ad libitum. Individual weights and feed intakes were summarized 31, 60, 88, 116, 146 and 188 days after initial processing. These are represented as Periods 1 through 7 in subsequent discussions. The heifers were fed in pens of 8 head with solid concrete floors at SDSU. The Texas heifers were fed in pens of 6 or 8 head. The flooring was partially slatted concrete. Feeding was done once daily. Heifers were reimplanted with Synovex-H after 116 days.

Final weights were obtained on May 13 in South Dakota and May 14 in Texas. Heifers were slaughtered the day after final weights were obtained and carcass traits were noted for each group.

Data were analyzed as appropriate for a completely random designed experiment. All performance data were evaluated using mean data for each pen replicate. Statistical analysis was conducted using the GLM procedures of SAS. Mean separation tests were made using Duncan's New Multiple Range tests.

Results and Discussion

One heifer from Group 1 died of bloat after 39 days on feed. One heifer from Group 2 died of broncho pneumonia 15 days after initial weights were taken. A second heifer was eventually removed (March 3) from the same pen for apparent chronic lung

Table 1. Feedlot diets used for comparing climatic effects on feedlot performance of heifers

	Diet[a]	
Ingredient	Receiving[b]	Finishing[c]
Alfalfa, %	15.00	-
Corn silage, %	40.00	13.00
Cracked corn, %	32.77	26.22
Whole shelled corn, %	-	50.00
Molasses, %	2.75	2.75
Soybean meal, %[d]	8.88	6.42
Calcium carbonate, %[d]	.25	1.11
Potassium chloride, %[d]		.25
Trace mineralized salt, %[d]	.35	.25
Crude protein, %	13.74	12.00
NE_m, Mcal/cwt	81.4	93.7
NE_G, Mcal/cwt	51.0	62.6

[a] Dry matter basis.
[b] Provided 1,000 IU vitamin A/lb diet.
[c] Provided 1,000 IU vitamin A/lb, 27 g monensin/T and 10 g tylosin/T.
[d] Included as a pelleted supplement containing feed additives (except AS-700).

problems. One heifer was removed from Group 3 for similar reasons.

Heifers shipped 1,000 miles exhibited a 4.6% body weight shrink and all of the chronic or terminal respiratory problems were associated with these groups. The lower initial 31-day average daily gain (ADG) for shipped heifers indicates that they did not fully recover this shrink during the initial month on feed (Table 2). The ADG shown is based on preshipment body weights. If postshipment body weights are used, the ADG during Period 1 was 4.63 and 3.84 ($P<.05$) for Groups 2 and 3, respectively.

During winter months, heifers fed in South Dakota consumed more feed ($P<.05$) than the heifers fed in Texas (Table 2). Interim ADG fluctuated during these periods. Gains were better ($P<.05$) in South Dakota during December but poorer ($P<.05$) in March. Overall, gains were similar between locations and feed efficiency was 4.5% better when cattle were fed in Texas (Table 3). These results are similar to previous computer simulations. It is important to recognize that pen conditions in South Dakota were much poorer than usual in March. The South Dakota pens were concrete, but the manure pack was reduced to a sloppy consistency that could not be cleaned for an extended period of time. As a result, heifers were particularly wet and cold during this period.

In May, conditions became extremely hot in South Dakota and cattle showed signs of heat stress including a decline in feed intake. This caused feed conversion to worsen in Periods 6 and 7 and probably contributed to lower quality grades. Local packers found that cattle were grading 35 to 40% choice during this period.

These results show a slight advantage in biological production efficiencies when cattle are fed in

Table 2. Feedlot performance patterns for heifers fed in South Dakota or Texas

Item	Group 1	Group 2	Group 3
Period 1 November 9 - December 9			
Average daily gain	4.10[a]	3.79[b]	3.06[c]
Dry matter intake	15.07[ab]	14.58[a]	15.50[b]
Feed/gain	3.68[a]	3.86[a]	5.10[b]
Period 2 December 10 - January 6			
Average daily gain	3.92[a]	3.76[a]	2.38[b]
Dry matter intake	17.52[a]	16.63[a]	14.65[b]
Feed/gain	4.53[a]	4.45[a]	6.19[b]
Period 3 January 7 - February 3			
Average daily gain	2.99	3.23	3.45
Dry matter intake	20.61[a]	19.82[ab]	18.10[b]
Feed/gain	7.03[a]	6.21[ab]	5.37[b]
Period 4 February 4 - March 2			
Average daily gain	2.93	2.65	2.47
Dry matter intake	20.67[a]	19.70[a]	17.72[b]
Feed/gain	7.25	7.61	7.41
Period 5 March 3 - March 30			
Average daily gain	2.33[a]	2.56[a]	3.60[b]
Dry matter intake	19.81[a]	19.00[ab]	18.10[b]
Feed/gain	8.82[a]	7.56[a]	5.10[b]
Period 6 March 31 - April 27			
Average daily gain	2.15[a]	2.42[a]	3.30[b]
Dry matter intake	20.73	20.22	20.02
Feed/gain	9.68[a]	8.91[a]	6.24[b]
Period 7 April 28 - May 13			
Average daily gain	2.06	2.57	2.61
Dry matter intake	18.80[a]	19.08[a]	21.15[b]
Feed/gain	9.74	8.18	8.41

[a,b,c] Means without common superscripts differ ($P<.05$).

Table 3. Cumulative effect of shipping and climate on the feedlot performance of heifers

Item	Group 1	Group 2	Group 3
Initial weight, lb	546	550	545
Off-truck weight, lb	-	527	521
Shrink, %	-	4.73	4.45
1-188 day			
Average daily gain, lb	3.01	3.04	3.01
Dry matter intake, lb	18.95[a]	18.31[ab]	17.64[b]
Feed/gain	6.30[a]	6.03[ab]	5.88[b]
Final weight	1109	1118	1107
Carcass weight, lb	674	686	674
Dressing percent	60.8	61.4	60.9
Percent choice	55	50	74
Yield grade 1, %	-	4	-
Yield grade 2, %	38	46	33
Yield grade 3, %	57	48	16
Yield grade 4, %	5	2	-

[a,b] Means without common superscripts differ (P<.05).

Texas. Cattle grew as rapidly in South Dakota but required slightly more feed per pound of gain. Economic efficiency should be considered when making these comparisons. The 4.5% difference in feed/gain could be offset if diets cost 4.5% less in South Dakota. Corn prices are typically 10 to 15% lower in South Dakota than they are in Texas, more than offsetting the cost of poorer feed conversions.

The winter of 1991 was warmer and muddier than typical for eastern South Dakota. Coupled with the hot spring, this may have been the poorest feeding conditions we have experienced in several years. To obtain a truer comparison of environmental effects on competitiveness in cattle feeding, this research should be repeated. The pens used in this study had a concrete base. Most of the cattle pens in the plains states have an earthen base. Both of the facilities used in this research now have earthen pens to simulate a more typical feedlot environment. In pursuing additional climatic data, the use of earthen pens would strengthen the applicability of results.