COST EFFECTIVENESS OF ON-FARM SEMI-CONFINEMENT SYSTEMS FOR COW-CALF PRODUCTION

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ABSTRACT: Texas and the Great plains has experienced record drought during 2011-2012, prompting record cowherd liquidation. During extreme drought, forage is unavailable for grazing and hay is likewise unavailable or expensive. Cow-calf systems that minimize land and forage use are needed. Feed and labor costs in confinement cow-calf systems using concentrate diets are not well established. Cows were wintered in semi-confinement on diets differing in forage and grain composition and costs were determined. Results indicate that high concentrate confinement systems diets may provide viable alternatives to forage based cow-calf systems..

Key Words: Confinement cow-calf systems, cow costs, drought management

Introduction

Traditional cow/calf beef production operations utilize grazing lands as a primary forage source for their herds. However, several conditions and pressures have emerged in recent years that increasingly challenge producers to retain or secure viable grazing lands. Agricultural land available for cow/calf production is decreasing. Grazing lands lost to urbanization or cultivation rarely return to cow-calf production. Urbanization has long been recognized as a strong competitor for agricultural lands. King observed the antagonism between population growth and grazing lands: “With an increase in population came a breaking up of the pastures and ranges that have always been associated with the beef cow and beef-cattle production” (1925 p. 183). Agricultural land values are positively correlated with proximity to urban areas. The demand for land that can be developed for urban use is the most significant non-farm factor affecting farmland values in urbanized areas that are experiencing significant population growth (Livanis et al., 2006; Hardie et al., 2001). In addition, agricultural land values are trending sharply upward both nationally and locally due to favorable commodity prices and economic opportunities associated with cultivation. Cow-calf producers are therefore increasingly forced to compete for grazing lands. Many new producers face challenges as they seek to develop or sustain cow/calf operations on an ever-shrinking land base.

The Texas Panhandle and all of Texas has experienced historic drought in 2011-2012. The Great Plains region likewise suffered severe drought in 2012. The severity and widespread nature of the drought has produced both direct and indirect economic losses across all of agriculture both in Texas and throughout the Great Plains states. Record economic losses in the agriculture sector have placed strain on agriculturally dependent rural communities, including those in the Texas Panhandle.

During extreme drought, forage for grazing is greatly reduced or unavailable. In addition, producers recognize the need to preserve and sustain rangeland resources during drought, and therefore follow well-established range management principles that often require total destocking (Crider, 1948; National Drought Mitigation Center, 2011). Rangelands in Texas need additional time, perhaps years, to recover from the drought in 2011-2012. Many native pastures in Texas show indications of permanent damage. Restocking of regional rangelands to historical levels in the near term risks further irreversible damage. Hay is likewise unavailable or prohibitively expensive during severe drought, forcing cow-calf producers to liquidate herds, move cows to another region, or provide feed.

The current drought has led to the largest single-year numerical drop in Texas' beef cow inventory in history (TAHC, 2011), with more than twice as many beef cows leaving Texas in 2011 as in 2010 (TAHC, 2011). Over 600,000 cows have been harvested or removed from Texas, resulting in a historically low breeding cow inventory (TAHC, 2011). Record liquidation of cows continued in 2012 throughout the Great Plains region, and has contributed to a historically low Texas and U.S. breeding cow inventory. However, efforts to rebuild the cowherd are limited by several factors. Less land is available for cow-calf production, due to competing interests and drought–related loss of rangelands. Many aging producers that liquidate herds during drought will not rebuild their herds, and young producers seeking to enter cow-calf production are faced with financial barriers due to increasing land values. Farm real estate is the principal source of collateral for farm loans (ERS, 2010).

No significant increase in cattle inventory is anticipated for some time. This situation is of concern regionally and nationally, as it has implications for long-term cattle supply, the regional stocker and fed cattle industries, food prices, and regional economies. Inadequate supplies of feeder cattle are threatening long-established industry infrastructure such as feedyards and beef processors in the Texas Panhandle. Low cattle numbers in Texas and nationally are resulting in a reduced beef supply and rising beef prices. Breeding cow herds also represent lifelong efforts at genetic improvement and a significant income source for many producers. There is therefore great incentive for both individual producers and the industry to retain breeding herds if possible.

Traditional cow-feeding strategies during drought focus on hay-based feeding programs. In addition, confinement cow-calf systems have been studied (Wyatt, 1977), but most rely heavily on forage-based diets. However, due to the enduring and geographically widespread drought, hay is scarce and prices are at all-time highs, with some hay valued at a 75% markup compared to 2010 (Agri-life, 2011). Traditional forage-based feeding systems may not be economically viable under such conditions. Reduced acreage cow-calf production systems that remain productive and cost effective are therefore being sought. Feed and labor costs in on-farm, semi-confinement cow-calf systems using concentrate diets are not well established. In addition, little research has been published related to optimum combinations of confinement and grazing cow-calf systems.

Objectives

The objective of this research is to determine the economic viability of limited-roughage diets fed to wintering cows in an on-farm, semi-confinement system. Feed and labor costs associated with three systems are evaluated, This research seeks to determine cost information related to these mixed confinement-grazing systems with emphasis on identification of simple, manageable systems that could be easily implemented by producers in the Texas Panhandle. Cost information can then be used to develop optimization models for evaluating alternative cow-calf production systems,

Methods

The WTAMU Ranch suffered loss of rangeland in 2011 due to drought and wildfire, necessitating partial liquidation of the cow herd. Remaining cows were insufficient in number to conduct comparative studies. However, cost information for semi-confined feeding systems was collected. Pregnant Angus cross cows (n=36) were divided into three equal groups at the WTAMU Nance Ranch and fed in semi-confinement from January 10 to March 31, 2012. The cows were weighed on three consecutive days at the beginning of the study and an average weight was obtained for each cow and group. Cows were stratified by weight into three feeding groups; conventional confinement (CC), conventional remote (CR), and high concentrate (HC). Cows were subsequently weighed individually at regular intervals and at the end of the confinement feeding period. Scales were validated before weighing and all weights were taken in the afternoon of the same day for all groups of cows. All cows were provided with free choice mineral supplement.

Feeding Procedures

Diets and diet composition for each group are shown in Table 1. The CC group was confined to a four acre trap at the ranch headquarters and provided with free choice, low quality grass hay, three pounds per head per day of whole corn, and 2.5 pounds per head per day of 38% crude protein range cubes. Range cubes were delivered on Mondays, Wednesdays and Fridays. All hay bales were weighed and delivered to CC cows using a tractor equipped with a bale spike. Hay was replenished when a visual inspection of the feeder showed that less than one day's worth of hay remained in the ring type round bale feeder. The CR group was provided the same diet as CC cows, but was located 1.85 miles from the headquarters and allowed access to 20 acres of rangeland in order to simulate a pasture situation where rangeland resources were exhausted and supplemental feed had to be provided to a pasture location. Forage in the 20 acre pasture was insufficient to meet the nutritional needs of the cows, and provided very limited dry matter. Feed for CR cows was delivered and hay was replenished using the same procedures as for CC, except that all feed, including hay, was transported to the CR feeding site by truck. Cattle at the CR site were fed and observed once daily. The HC group was confined to a three acre lot located at the ranch headquarters. The HC group went through a three week adaptation period beginning with three pounds per head per day of whole corn. Corn was increased gradually over this period until a target of 12 pounds per head per day was achieved. The HC cows were also provided with six pounds per head per day of hay and 2.5 pounds per head per day of range cubes. At the start of the feeding period, the HC cows received corn and hay at the same time. However, it was observed that some cows quickly consumed hay, and other cows quickly consumed corn at the first opportunity. This situation resulted in some cows consuming more than their allotment of corn, while some cows consumed hardly any corn. The procedure was adjusted so that corn was fed first and time was allowed for corn consumption. After ample corn consumption, hay and range cubes were delivered. Corn purchase price was $7.56 per bushel, range cubes were $385 per ton, and hay was $205 per ton.

Labor

Labor costs directly associated with each winter feeding scenario were estimated. The total time required to feed and check the cows was measured daily with a stopwatch and recorded. For each group, time measurement began as an employee entered the barn. Feed required for the day was prepared, weighed, loaded onto a truck, and driven to the respective feeding locations. The feed was placed into 15 foot metal feeders, and daily procedures were performed. Daily procedures included checking water and breaking ice as needed, careful observation of cows and calves, new calf processing, calf care, maintenance of feeders, waterers, and fences, and record keeping. The pickup was then driven back to the barn and the time was stopped. Only one trip per day was made for CC and CR groups. The HC group required two separate trips from the barn as corn and hay were fed at an interval. When hay was needed for the CC lot, time was started when entering the tractor, the hay was delivered with a bale spike, and time was stopped when the tractor was returned to the barn. Time devoted to separate tasks was recorded so that labor costs could be assessed by category. Detailed notes were recorded each day to document weather-related difficulties or other atypical occurrences. A wage rate of $7.00 per hour was used to calculate labor costs.

Calving Procedures

Calving began on February 29, 2012 and continued through May 16, 2012. All calves were tagged within two days of birth with a Z-tag which contained a unique calf number along with their dam's number. Elastic castration bands were applied to all bull calves within two days of birth. Two calves were surgically castrated due to complications with banding. There was no dystocia experienced by any of the cows during the calving season. A small amount of labor was required periodically to sort calves back into correct lots after crawling through fences. All calf care time for tagging, banding, and sorting was recorded for each treatment group.

One winter storm occurred during the calving season that required placing extra bales in the lots for shelter. The dry lots at the headquarters stayed relatively dry during the calving season. The winter was generally mild and presented no major weather-related challenges.

Fuel Costs

Distance from the barn to each feeding site was measured and multiplied by the number of trips to each site for the duration of the winter feeding period. The CC and HC feeding sites were adjacent to each other and approximately .1 miles from the barn. The CR feeding site was 1.85 miles from the barn. A 2008 GMC pickup was used to deliver feed to each group. Fuel usage and mileage during ranch driving was recorded and an average fuel usage rate of 7.35 miles per gallon was calculated for the truck. The same truck was used for each feeding. The miles traveled were multiplied by the average fuel use rate in order to calculate total fuel use. A fuel cost of $3.50 per gallon was multiplied by the gallons consumed to calculate fuel costs associated with each feeding site.

Grazing Season Procedures

The three feeding treatments were discontinued at the end of March 2012 and all cows were placed together and allowed to graze available rangeland. Estrous was synchronized and all cows were artificially inseminated on June 1st, 2012 and subsequently turned out with a bull for a 54 day breeding season. Pregnancy was diagnosed via ultrasound on July 24, 2012 to identify cows that conceived during the first 30 days of the breeding season. Ultrasound determination of pregnancy is not reliable for cows that are pregnant for less than 30 days. Cows not confirmed pregnant via ultrasound were subsequently rechecked via rectal palpation at the time of weaning in October. All calves were vaccinated on or about June 1 against IBR, BVD types 1 & 2, BRSV, and PI 3, (Bovi-Shield Gold 5, Pfizer) and for clostridial diseases (Vision 7, Schering Intervet). Appropriate boosters were given to all calves per label instructions. In addition all steer calves were implanted with Synovex C.   All heifer calves were weaned early in keeping with the normal replacement heifer development program. Heifer calves were weaned on August 10th and were fed a receiving ration at the rate of 2.5% of body weight per day. All heifer calves were given a metaphylaxis treatment of Draxxin (Pfizer) during the weaning process. After weaning heifers were turned out onto pasture to graze. One heifer calf that was treated while nursing was deemed a chronic and was removed from the herd. The heifer removed from the herd was from the HC group. Steer calves were left with their dams and weaned on October 24th. Steer calves were fence-line weaned and grazed dormant native pasture while receiving supplementation of 1.5 lbs per head per day of 38% protein cubes.

Weaning weights of steer and heifer calves were adjusted to a common age. Prices for the respective calves were determined from reported prices (USDA Market News) at the time of steer weaning, and adjusted based on individual calf weights. Total returns for each calf were then calculated.

Results and Discussion

Cow Weight and Body Condition Score

Average cow weight gain from the beginning of the winter feeding period until February 24 was 90 lbs, 112 lb, and 84 lb for CC, CR, and HC groups, respectively. No cows calved until February 29, so this weight change provides the clearest indicator of group response to the feeding regimens during late gestation. Cow weights at the end of the winter feeding period were lower than at the start as expected, since most but not all cows calved during this period. Few if any inferences can be made regarding cow weight changes during the feeding period, since some cows had calved and some had not. No differences in average cow body condition score (BCS) were observed between the winter feeding groups, although individual variation did exist. Specifically, some individual cows in the HC group were observed to have lower BCS at the end of the winter feeding period. However, all groups had average BCS of 5 or greater at the time of A.I. on June 1, and were considered to be in typical and acceptable condition for breeding.

Calving performance

No cows from any groups experienced dystocia. One cow from the CC group aborted in February and was removed from the group. One cow from the CR group gave birth to a calf with contracted tendons in the front legs. The cow and calf were removed from the pasture and taken to the headquarters in order to provide proper care to the calf. One calf in the HC group showed symptoms of respiratory illness during the summer and was treated.

Breeding performance

Cows responded to estrous synchronization as expected and were artificially inseminated without complication. Pregnancy rates determined on July 24 were 50%, 92%, and 83% for CC, CR and HC groups, respectively. These rates reflect the cows that conceived via A.I. or within the first 30 to 35 days of the breeding season. The rates are not unusual results for a 30 day breeding period that includes only one estrus for most cows. In addition, each cow represents a relatively large percentage since groups were small (n=12). All but one cow (CR group) was confirmed pregnant when rechecked in October. No conclusions can be made regarding differences between groups. However, confined winter feeding did not appear to have any adverse effect on breeding performance.

Calf Performance and Returns

Heifers at weaning weighed 642, 615, and 578 lbs for CC, CR, and HC groups, respectively. Steer calves at weaning weighed 688, 742, and 723 lbs for CC, CR, and HC groups, respectively. Weights were adjusted to a common age since heifers and steers were weaned on different dates. Market prices at time of weaning were obtained from USDA Market News and individual calf prices ($/cwt) based on weight and sex were derived using a sliding scale. Gross return for each calf was then calculated. Average gross returns per head were $910.92, $898.22, and $907.19 for CC, CR, and HC groups respectively. The number of steers and heifers in each group differed, contributing to differences in returns and making direct comparisons difficult.

Feed Cost

Feed costs for the 82-day winter feeding period are given in Table 2. The HC group had the lowest cost of winter feeding. This is not unexpected, as the greater energy density of corn means that it provides a lower cost per unit of energy. In addition, the HC group consumed significantly less hay on the limit-fed diet. Hay consumption was 27.8, 18.7, and 4.9 lb per day for CC, CR, and HC groups, respectively. Cows in the CC group consumed 9.1 lb per head per day more hay during the winter feeding period than CR cows. The difference in hay consumption, and the resulting cost difference, between CC and CR groups is not readily explained since the remote location was the primary difference in the feeding procedure between the two groups. The CR group did have access to 20 acres of dormant rangeland, while the CC cows were confined to a four acre trap, suggesting that limited grazing had a substitution effect resulting in lower hay consumption by CR cows. However, the annual forage inventory in fall 2011 indicated that the CR pasture had less than 300 lb per acre of standing forage. Even if CR cows harvested all available forage in the 20 acre pasture, it could only provide about 6 lb per head per day of forage, well short of the actual difference observed between the groups. The results suggest that winter feeding in pasture locations, even if forage appears inadequate, may reduce hay consumption compared to lot feeding. An alternate explanation is that the CC group location close to the headquarters facilitated observation and therefore the CC group was simply offered more hay. Visual observation of the CC feeding site indicated more noticeable scattering and wasting of hay than in the CR group's pasture.

Labor Cost

Labor costs for the winter feeding period are presented in Table 3. Average feeding times were 12.5, 25.4, and 21.2 minutes per day for CC, CR, and HC groups, respectively. All groups were very similar in terms of calf care time as one group did not require considerably more time than another for calf care. Labor costs required for the winter feeding period were somewhat lower than might be expected. Workers were well trained and efficient, and the mild winter presented few if any weather related challenges. Results suggest that labor requirements are not necessarily prohibitive for semi-confinement feeding and calving systems, even systems like HC that make use of high concentrate, limit-fed diets. Additional data is needed to assess labor requirements in years that have more severe weather challenges.

Fuel Cost

Fuel costs and total specified cost of the winter feeding period, including feed, labor, and fuel required for feeding are presented in Table 3. Both the CC and HC groups were located at the headquarters while the CR group was in a pasture 1.85 miles away (3.71 miles round trip). The feed truck traveled 36.2, 245.2, and 53.6 total miles delivering feed to CC, CR, and HC groups, respectively during the winter feeding period. Fuel cost for HC cows was higher than for CC because two trips were used in order to allow HC cows to consume corn prior to feeding hay.

Conclusions

During drought, all feeding options are likely to be unattractive due to cost increases associated with short supplies of feedstuffs, especially forages. Diets high in grain provide an attractive alternative to traditional feeding programs for cow-calf producers, due to the lower cost per unit of nutrient. Management of cows and calves fed high concentrate diets is often a concern, as producers anticipate increased facility, processing, and labor costs. This study revealed minimal problems related to feed handling or labor requirements for the HC feeding strategy, a factor that contributed to the relative low cost of the HC system compared to the others evaluated. In addition, no adverse effects on cow herd performance were observed as a result of the HC system, either when compared to the other feeding approaches studied here, or to traditional herd performance. An additional concern of semi-confinement systems is the potential for adverse health challenges that are presented to the calves in confined areas. The dry and mild winter during this study period allowed adverse health issues to be averted, but additional study is warranted. Hay consumption by CC group suggests that limit feeding strategies have potential to reduce feed costs in semi-confined feeding systems.

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Table 1. Daily Per Head Feed Allowances for Cows Fed in Confinement

	CC[a]	CR[b]	HC[c]	Crude Protein	TDN
Grass Hay	FC	FC	6 lb	3.5%	47.1%
Range Cubes	2.50 lb	2.50 lb	2.5 lb	42.7%	78.0%
Whole Corn	3.0 lb	3.0 lb	12.0 lb	9.0%	88.0%

[a] Confined Conventional - hay based feeding system in small lot.
[b] Confined Remote – identical to CC system but located remotely.
[c] High Concentrate – limit fed diet with increased.

Table 2. Feed Costs for Cows During an 82-Day Winter Feeding Period

	CC[a]	CR[b]	HC[c]
Corn			
Lbs/h/d	2.45	2.45	9.60
Cost/h	$27.13	$27.90	$106.25
Cost/h/d	$0.33	$0.34	$1.30
Range Cubes and Mineral			
Lbs/h/d	2.29	2.29	2.29
Cost/h	$36.47	$37.50	$36.47
Cost/h/d	$0.44	$0.46	$0.44
Grass Hay			
Lbs/h/d	27.78	18.71	4.90
Cost/h	$233.49	$161.70	$41.21
Cost/h/d	$2.85	$1.97	$0.50
Total Winter Feed			
Lbs/h/d	32.52	23.45	16.79
Cost/h	$296.71	$227.10	$183.54
Cost/h/d	$3.62	$2.77	$2.24

[a] Confined Conventional - hay based feeding system in small lot.
[b] Confined Remote – identical to CC system but located remotely.
[c] High Concentrate – limit fed diet with increased.

Table 3. Labor, Fuel and Combined Costs for Cows During an 82-Day Winter Feeding Period

	CC[a]	CR[b]	HC[c]
Feed Labor			
Labor, Min	819	1,686	1,403
Rate, $/h	7.00	7.00	7.00
Total Cost	$95.62	$196.75	$163.70
Cost/h	$7.97	$16.40	$13.64
Cost/h/d	$0.10	$0.20	$0.17
Calf Labor			
Minutes	58	71	61
Rate, $/h	7.00	7.00	7.00
Total Cost	$6.78	$8.36	$7.10
Cost/h	$0.57	$0.70	$0.59
Cost/h/d	$0.01	$0.01	$0.01
Fuel			
Miles traveled	36.18	245.22	53.60
Efficiency, mpg	7.35	7.35	7.35
Fuel cost	$3.50	$3.50	$3.50
Total Cost	$17.22	$116.76	$25.52
Cost/h	$1.44	$9.73	$2.13
Cost/h/d	$0.02	$0.12	$0.03
Totals			
Labor and Fuel Cost	$119.62	$321.87	$196.32
Labor and Fuel Cost/h	$9.97	$26.82	$16.82
Total Feed Cost/h	$296.71	$227.10	$183.54
Feed, Labor and Fuel Cost/h	$306.68	$253.92	$200.36

[a] Confined Conventional - hay based feeding system in small lot.
[b] Confined Remote – identical to CC system but located remotely.
[c] High Concentrate – limit fed diet with increased.