GRAZING MANAGEMENT: A CASE STUDY FOR SUSTAINABLE BEEF PRODUCTION IN SOUTH TEXAS

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ABSTRACT: Our objective is to report on results of the application of sustainable grazing and beef cattle management practices on productivity and profitability of a small commercial operation in south Texas. The enterprise consists of approximately 40 cows on 360 acres of native grasses with Kleberg bluestem (*Bothriochloa ischaemum*) and bermudagrass (*Cynodon dactylon*). Crossbred cows are comprised of Red Angus, Senepol, and Tuli breeds (via rotational crossbreeding), the latter two breeds noted for heat and drought tolerance. Most land is leased free to the cattle owner so that land owners benefit from tax deductions for agricultural use, whereas the leasee agrees to maintain fences and prevent brush and weed encroachment. Stocking rate was reduced from 1 AU/3.4 ac in 2001 to at least 1AU/5.7 ac in most of the years from 2003 to 2008, a reduction of over 40%. Forage is stockpiled in pastures following rains. Pastures are never fertilized or aerated. Cattle are rotated through subdivided pastures to the extent that approximately half of the forage remains. Cattle have not been fed hay or cereal grains in over 5 years. Calves are weaned following fall or spring rains so that cows can recoup body condition before summer or winter to minimize need of feed supplements. In severe droughts, an energy-protein supplement is provided (whole cottonseeds). An all-natural calf management system is maintained. Most heifers are retained for breeding. Bull and remaining heifer calves are mostly sold for breeding to local ranchers. Calves not sold for breeding are sold to partners who operate a grass-finished enterprise. In 2008, brush management involved spraying individual plants with a 3.1% Remedy solution at a cost per acre of $8.17 compared to $25.79 in 2003. Cover of grass is over 80% in every pasture. Weaning rate from 2001 to 2008 was over 90%. Weaning weight (205-day adjusted) increased from 442 to 645 pounds from 2001 to 2008, respectively. Average feed cost per cow decreased from $291 to $41 from 2001 to 2008. In April of 2009, an estimated 2,630 kg/ha of stockpiled forage was available during an extreme drought period. Net profit per cow was a loss of $191 in 2001compared to a gain of $252 in 2008. A moderate to light stocking rate, flexibility to adjust the grazing program and stockpiling forage for winter and dry seasons has maintained pasture health and body condition scores in cows, increased weaning weights, and minimized feed supplementation costs. Independently of moisture availability net profit per cow and per acre were increased dramatically.

Keywords: Grazing, Beef Production, Stockpiling, Brush Control, Drought, South Texas

Introduction

In south Texas, the climatic environment poses a major challenge to beef cattle ranchers. The region is classified as sub-tropical and semi-arid which is often devastated by hurricanes and prolonged droughts. In 2009, due to a severe drought, south Texas was the driest region in the nation. By August 24, 2009, total rainfall was only 20% of normal with a cumulative total of only 3.7 inches for the year. Many area ranchers sold off their herds when the forage supply was depleted and/or when hay became either unavailable or too expensive.

To have a successful beef production enterprise, it is critical to manipulate forage production and grazing management, as well as beef cattle genetics, into an integrated system that can be sustained in this adverse environmental region. In the Gulf Coast region, most breeds of cattle raised by ranchers are Brahman-influenced (e.g., Beefmaster, Brangus, and Santa Gertrudis). Breeds of Zebu origin (*Bos indicus*), such as Brahman, possess critical genes for heat tolerance and resistance to specific insect-borne diseases. However, a growing general criticism of Brahman, and Brahman-influenced cows, is that they have become excessively large in mature body size, being less efficient from a reproductive and feed efficiency standpoint, as well as having delayed age at puberty, large teat size, disposition problems, and beef marbling and tenderness issues (Thrift and Thrift, 2003).

Historically in south Texas, native forage species once represented a plethora of grasses, legumes, forbs, shrubs, etc., that were remarkably adaptable, and especially resilient to prolonged droughts. However, introductions of exotics, such as buffelgrass (*Cenchrus ciliaris*), coastal Bermuda grass (*Cynodon dactylon*),

guineagrass (*Urochloa minima*), and Kleberg bluestem (*Bothriochloa ischaemum*), have largely displaced native stands. Moreover, traditional continuous grazing and overstocking practices have resulted in poor range condition and severe brush encroachment. A popular system of forage production is a monoculture of "improved" pastures in coastal bermudagrass that is regularly treated with fertilizers and herbicides, and often continuously overstocked. Hay is routinely fed in winter and during droughts. Because of rising production costs (chemicals, fossil fuels, and machinery), the sustainability of this system is now questionable. Alternative practices, such as the use of moderate stocking rates, establishing polyculture pastures, rotational grazing, and stockpiling forage for winter grazing as a buffer against drought, are uncommon.

This paper reports on an alternative, sustainable production system based on 60 and 70 total head on 360 acres of mostly leased land. The management system for this cow-calf operation consists of: 1) adjusting stocking rate to match forage availability; 2) conserving the forage base to enhance native plant diversity; 3) eliminating the need for feeding hay; 4) safeguarding the environment and promoting wildlife by providing better forage cover and(or) protecting the soil (while limiting use of chemicals and fossil fuels); 5) utilizing appropriate cattle breeds via crossbreeding to cope with the adverse environment; and 6) creating opportunities for developing local niche markets (to minimize risk) for increased profits.

The objective of our paper is to report on applied grazing and forage management practices and cattle breeding used in a small commercial operation in south Texas.

Background

Forage production system

Between 1994 and 2001, traditional management practices prevailed in this operation, such as continuous grazing, overstocking (about 2 to 3 acres per cow), fertilization and aeration of pastures, minimal brush control, and feeding hay. During this time, it was observed that the manager was always running out of forage.

In 2003, a newly-hired range scientist at TAMUK recommended the adoption of a conservative stocking rate of 8 acres per cow. Another major management shift was to a rotational grazing system, allowing a rest period for pastures, stockpiling of surplus forage, and discontinuing the feeding or dependency on hay. Considering the highly variable environment, it was advised that stockpiling of forage would be a great buffer against drought. Since 2003, pastures have not been fertilized or aerated.

The operation presently manages about 360 acres that have been subdivided into 25 smaller pastures or paddocks using cross-fencing. Concerning land management and ownership, land is mostly leased (over 90%), to minimize risk. Simple contracts are renegotiated at the end of each year. Overall, the leasee agrees to maintain fences, control brush, and improve the landowner's pasturelands. Most landowners do not charge a lease fee because they are pleased to qualify for a significant tax exemption since their land is in Ag use. In some cases, their land value has increased over time due to the improvements in pasture quality.

Since 2003, pasture conditions have been frequently monitored by foot or horseback to determine when to move cattle and/or stockpile forage. However, because interactions between pasture rest time and other variables (e.g., rainfall, temperature, available forage supply, and stocking density) are unique to season, it was critical that flexibility be maintained, rather than merely referring to a calendar. One positive outcome is that cattle have adapted to frequent pasture rotations and have not developed a fear of humans. Moreover, since 2003, no cows have been purchased and all heifer replacements have come from within the herd.

One advantage that the sub-tropical region occasionally offers is frost-free winters. In smaller pastures where fences are surrounded by mature Mesquite trees, the effective wind breaks have resulted in the maintenance of green forage that was available for grazing throughout warm winters. Energy and protein supplementation was not necessary in most years; only free-choice, loose minerals were offered. However, for cattle in larger pastures directly exposed to wind and/or in years with a hard freeze (including drought periods) that resulted in dormant pastures, whole cottonseeds and/or cottonseed cubes were fed. Feeding level depended on the cow's body condition and stage of production. Compared to grain that provides mostly starch, the natural protein and fat from limit-fed cottonseeds support rumen microbes that utilize fiber from forages, which may enhance fertility. Some ranchers sow ryegrass seed for winter grazing, but because the region receives little rainfall in late fall or early winter, this investment is associated with high risk.

Cattle breeding system

Angus is the most popular breed in the U.S. beef cattle industry. Red Angus serves as the basis of the breeding component of this operation. Although Red Angus cattle share the same original genetic foundation as Black Angus cattle, red rather than black color is important with regards to heat tolerance. In the region,

black cattle are often observed during summers to be seeking shade by mid-morning rather than grazing or breeding. In addition, the choice of Red Angus does have the advantage of more accurate expected progeny differences (EPD's) due to the association's (http://redangus.org/) large data base relative to other potential candidate breeds, such as Devon, Red Poll, and Shorthorn. For example, one recently used Red Angus AI bull is Leachman's Above and Beyond (registration number: 26773) who has a birth weight EPD of -8.1 pounds with an accuracy value of 93% and who is in the top 1 percentile of the breed.

About 10 years ago, a review of the literature was conducted by the cattle owner in search of potentially suitable breeds from evaluation studies conducted in adverse tropical and/or drought-proned environments similar to that of south Texas. In addition, the search was for easy care breeds that represented nutritional (metabolic) efficiency, avoiding those breeds that had excessive bone and flesh and/or mature size and milk production.

In Florida, Hammond and Olson (1994) reported that in two summer seasons the Senepol breed of cattle had comparable (if not superior) body temperatures to purebred Brahman cattle. Hammond and co-workers (1998) demonstrated that Senepol and Tuli heifers had comparable body temperatures to purebred Brahman. In Texas, Holloway et al. (2005) reported that Tuli X Angus cows had an initial advantage over Brahman X Angus cows due to earlier age at puberty and/or higher reproduction rates that impacted lifetime cow productivity. In addition, Sanders et al. (2005) showed that Tuli-sired cows reared by Angus or Hereford dams had lighter mature body weights than Brahman-sire crossbred cows. Also, Tuli crossbred compared to Brahman crossbred steers had superior meat tenderness and marbling scores.

Briefly, Senepol was developed on the island of St. Croix in the Caribbean, based on crossings of N'Dama cows to Red Poll bulls. N'dama, also referred to as Senegalese cattle, is a breed found in West Africa. Tuli originated in Zimbabwe in southeast Africa. Both N'dama and Tuli breeds evolved in Africa for over 5,000 years, being subjected to the harsh elements of the tropical environment, including prolonged droughts and endemic parasites. As a consequence to intense natural selection, these cattle became genetically molded into highly adapted breeds. Traditionally, N'dama and Tuli cattle are never fed feed supplements; they fatten off grass. In addition, there is seldom extremism found in degree of bone, flesh or body size or in milk production level, which exemplifies functional, easy care cows. Their body conformation, hair type and skin color, hide structure, sweating properties, fat storage sites, and grazing behavior are also genetically pre-programmed for effective thermoregulation (ergo heat tolerance). Available websites contain useful information on Senepol and Tuli breeds (www.senepolcattle.com; www.studbook.co.za/Society/tuli/).

These websites provide useful information including that both Senepol and Tuli breeds are classified as *Bos taurus* and so are more related genetically to European than to Zebu breeds (*Bos indicus*). Also, bull and heifer calves reach puberty early, even as early as 6 to 7 months. At maturity, cows are small to moderate in body size, produce enough milk, and do not carry excessive flesh or bone. Cows also thrive on mature, coarse forage during summer and winter seasons with limited supplementation. At weaning, it is not uncommon for cows to wean 60 to 70% of their own body weight. Their calves are also most suitable for all-natural, grass-finishing operations.

The Red Angus, Senepol, and Tuli breeds are compatible in regards to body type and conformation. Since 2000, the Red Angus, Senepol, and Tuli breeds have been used in a rotational crossbreeding program, but the process started with the production of F_1 crosses. However, it was not until 2007 that most cows in the herd were a cross of all three breeds. The genetic melting pot has produced a crossbred animal with a combination of desirable traits that include: the polled condition, yellow or red coat colors, slick hair coats, early age at puberty, light birth weights yet thrifty calves, small-sized teats, optimal milk production, low parasite infestation, and superior marbling and tenderness. This combination of desired traits reflects breed complementation. From the Senepol breed, the gene for a slick hair coat is inherited, as well as genes for numerous vertical skin folds that increase body surface area, which critically aids in evaporative cooling. The choice of Red Angus, Senepol, and Tuli breeds has also resulted in mature cow weights that mostly range between 1,000 and 1,100 pounds and between 4 and 4-1/2 frame scores. Body condition scores are usually a minimum 6 score, a reflection of the easy care feature of cows, as well as good management. The annual cow culling rate is less than 10%.

Development of the crossbreeding program

Specifically, the planned crossbreeding program is largely based on use of artificial insemination (AI) of heifers. With regards to growth and milk traits, bulls used as AI sires were, in general, representative rather than extreme specimens of the three breeds. A representative bull could be considered as having trait performance values that are close to the breed average (e.g., EPD values close to zero for weaning weight and milk). Although EPD information is available, and is in

many cases useful, the use of extreme animals is not justified because such use likely translates later into higher costs (e.g., increasing mature weights resulting in less efficient cows).

Concerning matings, each replacement heifer was inseminated to a bull of that breed that appears farthest back in her pedigree (i.e., as the maternal great-grandsire). For example, if a heifer was Red Angus-sired and her dam was by a Senepol bull, then the heifer was inseminated to a Tuli bull. The three-breed rotational crossbreeding program has worked well because all heifers have been managed in the same pasture. Most heifer calves have been saved as cowherd replacements, whereas AI bull calves have not been castrated but sold to area ranchers for breeding. In most years, first-calf heifers were joined with the cow herd shortly after calving.

More recently, cows have mated naturally to three-breed composite bulls that themselves were born in the same herd and sold at weaning to local ranchers, but leased back from the original owner for breeding. The breeding season was usually about 60 days and bulls were fully vaccinated. Outstanding heifers from such matings were also retained as replacements.

With regards to the planned breeding program, after a few generations of three-breed rotational matings, the combined proportions of "tropical genetics" infused by Senepol and Tuli sires should stabilize at a minimum of 43% in any animal, being considered adequate to impart desired heat-tolerance and/or adaptation qualities. Also, a high level of hybrid vigor (86%) potentially exists due to the choice of these genetically divergent breeds. In addition, because of common ancestry from linebreeding (e.g., use of the same or closely-related AI bulls of the same breed) and hybrid vigor from crossbreeding, these genetic effects should translate into cows and calves that are highly uniform.

Results

Grazing management, forage production, and feed costs

The basis for the remainder of this section will follow from the detailed information from 2001 to 2008 of cow-calf production and expenses and profits that was compiled into Table 1. By 2004, the recommended stocking rate was adopted at 8.4 acres per cow (including adjustments of heifers to a mature cow basis), being achieved by adding new leases and moving cattle rather destocking. Also, in 2002 and 2003, an aggressive effort was made to control bush (e.g., mesquite and huisache) involving mostly foliar spray application using a Remedy-diesel (3.1% concentration) solution. By 2007, cost of brush control was $2.64 per acre, but was $8.17 per acre in 2008 because of more contract labor (Table 1).

Since 2004, as pasture quality in terms of carrying capacity improved, stocking density was readjusted with a gradual increase from 8.4 acres in 2004 to 5.2 acres per cow by 2008 (linear rate of -0.61 $\pm$ 0.39 acres per cow per year; Table 1). In addition, the impact of the rotational movement of cattle through pastures, followed by timely rest periods, has likely concentrated more nutrients from feces and urine.

Based on observation, as pasture conditions improved over a five-year period a gradual transition from a primarily monoculture- to a polyculture-based forage base has prevailed. Each year the return of about five native forage species, mostly grasses, are observed as pastures continue to flourish. Too, because of the increased plant density of forage species, and less bare ground and brush and weed invasion, there is less runoff and evaporation following rains. Organic matter content and nutrient availability to plants have most likely improved, although data are not available. Of interest, more bobwhite quail and turkey have been observed with the improvement of habitat quality.

Apparent profitability of the land on the basis of net profit per acre is shown in Table 1 and Figure 1.

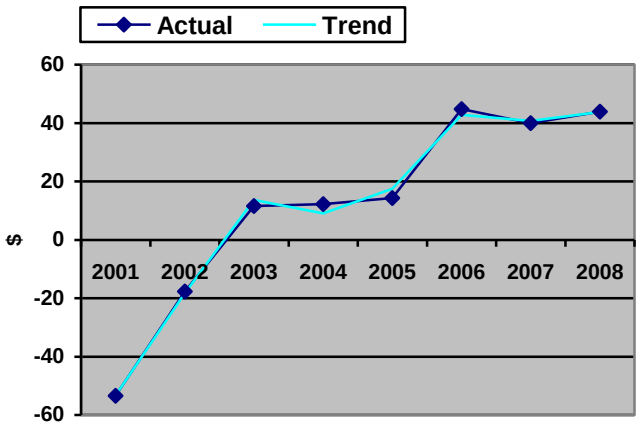

Figure 1. Market-based net profit per acre trend over eight years.

Based on actual weaning rates and weights of calves at weaning, market values at local auctions, and acres in use each year, net profit per acre was -$53.39 and $17.66 in 2001 and 2002. In 2003 with the adoption of the recommendation to reduce stocking rates and implementation of a rotational grazing system, a three-year lag period or phase was observed between 2003 and 2005 ($11.62 to 14.30 per acre) during which time pastures presumably to recovered from previous managerial abuse. By 2006, once pastures had improved, net profit per acre was $44.78. Although a seeming

plateau of net profit figures was observed between 2006 and 2008, it is likely that an upward trend will ensue in response to further pasture condition improvements. In Figure 1, the trend line followed a 6th order polynomial function ($R^2 = 0.99$).

According to Figure 2, a dramatic decline in average feed costs per cow was realized largely due to the discontinued practice of feeding hay. Feed costs for weaned calf and heifer development were figured into cow feed costs and so can be considered conservative. In 2001 and 2002, the two years when hay was last fed, feed costs were $290.80 and $214.40 per cow (54.8 and 40.7% of total business costs). By 2008, the average feed cost per cow was only $40.94 (mostly from purchase of cottonseed cubes fed during winter), which was largely a reflection of a good balance or match between stocking rate to the available forage supply base with easy care cows.

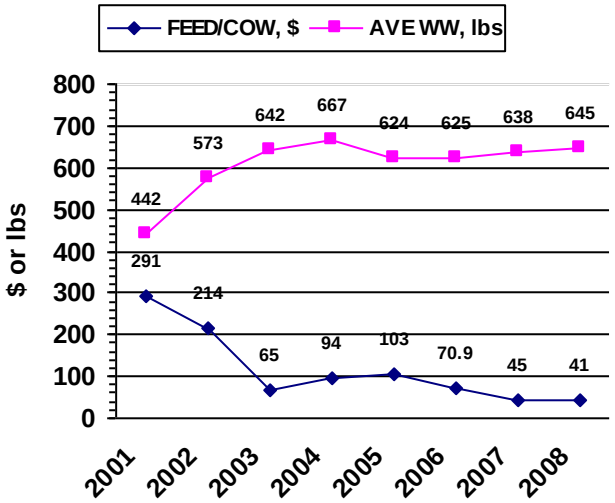

Figure 2. Feed cost per cow ($) and average 205-adjusted weaning weight (lbs) over eight years.

Cow-calf production

In all years, cow pregnancy and weaning rates were high due presumably to appropriate genetics and to intensive management of the operation (Table 1). The trend for calf weaning weights has stabilized (Figure 2). To show a meaningful trend across years, calf weaning weights were adjusted to a 205-day constant, as well as for age of dam and gender of calf (steer-basis) using correction factors from the Red Angus Association of America and the Beef Improvement Federation (RAAA, 2009; BIF, 2009).

In 2003 and 2008, average weaning weights (205-adjusted) were 642 and 645 pounds, likely reflecting stabilization of genes from the same or closely-related sires of the three breeds used in the rotational crossbreeding program. These weaning weight figures also demonstrate remarkable cow efficiency considering that most cows weight between 1,000 and 1,100 pounds (Photo 1). The cow in the photo had a BCS of 6 and was pregnant. The photo was taken in the fall of 2008 following a dry spring, while the average feed cost per cow was $40.94.

Mature cow weights aside, another plausible reason for the high efficiency is that the cattle are more genetically adapted to the environment (e.g., lower nutritional requirements, afternoon grazing during summer, and optimal as opposed to maximal milk production). In addition, routine fecal samples submitted to a local veterinary clinic mostly yield negative results in terms of presence of internal parasites, being largely attributed to rotational grazing.

Photo 1. A three year-old cow (Tuli sire and Red Angus X Senepol dam) with a Senepol-sired, 6 month-old calf.

Actual calf weight averages at weaning are presented in Table 1. It should be mentioned that decision of when to wean usually coincided with the timing of an early fall rain, which allowed cows a larger window to recoup body condition before winter. To be more conservative in our calculations, actual calf weights (as opposed to 205-day adjusted) and market prices at local auctions (as opposed to premium prices of calves sold as breeding stock) were the basis for profit per cow and per acre figures. In 2001, the average calf weights per cow of only 436 pounds, which reflected a drought year. Between 2002 and 2008, average calf weight at weaning was 561 pounds. Ignoring years 2001 and 2002 when hay was fed, actual pounds of weaned calves per acre ranged from 83 to 98 pounds per acres in 2003 and 2008, respectively.

From 2001 to 2005, the market values of calves were from actual local auction sales. In 2006, the $539.03 market value of calves was from a combination of calves sold at local auctions and calves sold for breeding but at local market prices without premiums. In

2007 and 2008, a niche local market was developed in which calves not sold for breeding were sold to an all natural, grass-finishing operation. In 2007, bull calves were castrated and sold as steer calves at local market value for an average $567.53. In 2008, bull calves not sold for breeding were sold at the local market value of number 2 steers of $542.95. However, in 2007 and 2008, the majority of heifer and bull calves were sold for breeding at $700 and $800 a head.

In Table 1, total costs per cow are presented which are also broken down into feed, lease, veterinary, and maintenance (other costs including cow depreciation and brush control). Feed costs have previously been discussed. Most landowners did not demand lease payments over all years. However, again to be conservative, the standard local lease rate of $18 per acre per year was applied to all available acreages for each year. In actuality, since 2006, the largest business expenditure (30.8%) was in land lease payments, amounting to $82.3 per cow. Nonetheless, this item represents less business risk than owning land. Veterinary costs ranged between $17.86 and $36.98 per cow. Maintenance costs were lowest in 2008 at $116.11. Cow depreciation costs were represented for years 2001 through 2005. No cattle purchases have been made for several years.

Using the same weaning weight and market-based calf value and total cost figures from Table 1, net profit per cow show values of -$191.30 and -$109.51 for 2001 and 2002. During the lag phase in which pasture recovery occurred from 2003 to 2005, marginal profits of $82.04, $125.23, and $96.52 were calculated, consistent with the industrial thumb profit figure of $100. However, from 2006 to 2008, net profits per cow dramatically increased to a high of $251.68 in 2008 (Figure 3). The trend line represented a linear plus quadratic response ($R^2 = 0.94$). (Sales of culled cows and heifers were not included in profit calculations.) This level of profitability was the outcome of good grazing and forage management and cattle breeding programs.

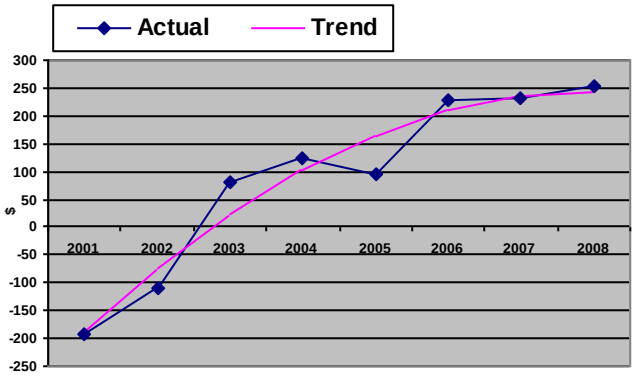

Figure 3. Market-based net profit per cow trend over eight years.

The historic drought of 2009

The year 2009 was an exceptionally severe drought year. In July and August of 2008, nearly seven inches of rain was recorded, although rainfall was below average in both spring and fall. Nonetheless, following weaning of calves and movement of cows to other rested pastures, forage was stockpiled in pastures in early fall. Prior to winter, total quantity of forage was estimated in these pastures and calculations were made to match total forage intake requirements of a specific number of animal units for one year to avoid hay feeding and as insurance against possible drought. Also, cows had body condition scores of at least 6, which they maintained throughout the winter period.

Photo 2. Stockpiled pasture photographed on October 4, 2008.

Between January and August 24, 2009, a total of only 3.7 inches was recorded. Nonetheless, no hay was fed during this period although energy and protein supplements were provided. On 10 February, cottonseed range cubes providing ½ pound of crude protein were first provided as cows were in the last stage of pregnancy. At this time there were no cows with a body condition score of less than 6.Throughout the drought period, there was always some, albeit limited, green forage at the base of tall mature plants, the latter serving as a buffer preventing evaporative losses from limited bouts of rain and dew. In late March of 2009, an estimated 2,630 kg/ha of stockpiled forage was available during an extreme drought period. Random forage samples were collected and crude protein was determined at 4.54%. From March through August, whole cottonseeds and range cubes (37% crude protein) were fed regularly to provide at least 1 pound of protein and 1 pound of fat for energy per cow per day.

On July 25, a three-breed composite bull was introduced for 60 days into a pasture containing cows that calved in the spring. Most calves were early weaned at 4 to 5 months on August 14, 2009, to allow cows to dry up and to ensure conception. Cows were soon re-evaluated for body condition. Mean BCS was 5.47+0.15,

and was significantly greater ($P<0.01$) than the minimum recommended score of 5. Only one cow had a BCS less than 5 and one cow had a BCS of 7 (mode of 5.5).

On August 28, forage samples were again collected and crude protein was determined at 4.36%. It was also estimated that 50 days remained for cattle to graze 25% of the residual forage supply. Fortunately, within the next two weeks, over 4 inches of rain was received. Also, later in the fall, palpation results revealed 100% conception of cows exposed to a bull in summer during the serious drought.

Photo 3. The same pasture photographed on July 24. 2009.

Conclusions

The emphasis of this paper has been on good grazing and forage management. Beef producers must be patient to allow time for pastures to recover from previous managerial abuses. Results of this case study demonstrate that proper grazing and forage management with maximum flexibility - in combination with a good cattle breeding program - can improve pasture conditions that increase profits. During the severe 2009 drought in south Texas, it was demonstrated that it is possible to take hay out of the cattle business, and to avoid destocking. The breeds utilized – Red Angus, Senepol, and Tuli – are available to industry, although other breeds may be suitable. In Table 2, a comparison of features of traditional versus alternative practices is provided. Because the results presented in this paper were based largely on empirical observations, management practices, and records, it would be useful to conduct controlled experiments to confirm these reported benefits.

Acknowledgements

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Table 1. Productivity, Expenses, and Profits of a Cow-Calf Grazing Operation in South Texas.

Item	2001	2002	2003	2004	2005	2006	2007	2008
Stocking rate (AC/AU)	3.4	5.8	6.6	8.4	5.7	4.7	6.0	5.2
Cost of Brush Management Practices/AC ($)	0	20.82	25.79	14.62	7.93	5.20	2.64	8.17
Pregnancy Rate (%)	91.7	100	100	100	100	94.4	95.5	100
Weaning Rate (%)	100	100	100	100	93.8	100	100	100
Actual Lbs of Weaned wt/Cow	436	585	586	608	527	511	551	562
Actual Lbs of Weaned Calves/AC*	122	94	83	59	78	101	84	98
Calf Market Value ($)	339.17	417.29	501.31	606.71	552.74	539.03	567.53	542.95
Feed Cost/Cow ($)	290.80	214.40	65.31	93.72	103.11	70.92	44.80	40.94
Lease Cost/Cow ($)**	64.50	111.60	127.13	184.15	121.50	91.00	118.20	103.20
Veterinary Cost/Cow ($)	31.12	32.50	17.86	23.76	19.98	25.21	36.98	31.07
Maintenance Cost/Cow ($)	144.05	168.30	208.98	179.85	211.63	125.48	137.22	116.11
Total Costs ($)	530.47	526.80	419.27	481.48	456.22	312.61	337.20	291.32
Market-based Net Profit/AC ($)	-53.39	-17.66	11.62	12.24	14.30	44.78	40.02	43.90
Market-based Net Profit/COW ($)	-191.30	-109.51	82.04	125.23	96.52	226.39	230.33	251.68
Rainfall	Dry spring	Normal	Dry summer and fall	Normal	Normal	Normal	Dry spring	Dry spring and fall

*Based on weight of calves that were recorded and sold at local auctions or actual weight at weaning whereby auction prices at time of weaning were accessed on-line and applied to calculate market value).

**Based on standard lease rate of $18/AC/YR.

Table 2. Alternative Practices Utilized in a Cow-Calf Grazing Operation in South Texas.

Item	Traditional	Alternative
Grazing Management:		
Land	Ownership	Lease
System	Continuous grazing (No movement of animals)	Rotational grazing (Timely movement of animals)
Stocking rate	Overstocked	Properly stocked
Forage reserve	Hay	Stockpiled forage
Practices	Fertilization/Aeration	No Fertilization/Aeration
Cattle Genetics:		
Breeds	Black Angus- and Brahman-based	Red Angus x Senepol x Tuli crossbreds
Body type	Moderate to heavy	Small to moderate
Muscle score	Moderate to heavy	Light to moderate
Milking level	Moderate to high	Low to moderate
Cattle Management:		
Time of breeding	May-June	July-August
Time of calving	March-April	May-June
Time of weaning	6-7 months of age	First good fall rain
Supplementation	Grain- or sugar-based	Natural protein source to supply nitrogen to microbes to enhance fiber digestion
Marketing:	Auctions	Niche markets
	Transport calves	Buyers purchase from ranch

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