CHARACTERISTICS AND CHALLENGES OF SUSTAINABLE BEEF PRODUCTION IN THE WESTERN U.S.

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Introduction

Beef cattle producers in the western U.S. are faced with never-ending dilemmas of maintaining economic viability during times of low market values and, more recently, increased public criticism of beef product quality and industry compatibility with the environment. Unlike other meat animal industries such as swine and poultry, the beef industry in the western United States is very dynamic, ever adapting to changing arid environments and subsequent effects on forage quality, quantity, and associated relationships to beef cattle nutritional requirements. As a result, the western beef cattle industry is very extensive, with optimal production being a function of the resources each ranching unit has available, and how successfully the manager can match the type of cow and/or production expectations to the available resources. Successful beef producers are not necessarily the ones who wean the heaviest calves, obtain 95 percent conception, or provide the most optimal winter nutrition. Instead, the successful producers are the ones who demonstrate economic viability despite the economic and public pressures that can and will continue to plague the industry.

Rangeland Forage Resources

The western United States has several unique geographic features that shape and influence the beef cattle industry. First, much of the land area fits the general classification of "rangeland"; that is, land not suitable for tillage, due to arid environments, shallow/rocky soils, high elevations, and short growing seasons. From arid rangelands in the Northern Great Basin (cold desert) to arid rangelands in Southern New Mexico, ranchers are faced with limited forage resources and challenging nutritional calendars. Arid/high elevation rangelands also are characterized by dynamic, highly variable climates that change drastically from season to season and year to year. For example, the crude protein (CP) content of diets selected by cattle in the Northern Great Basin differs dramatically across seasons and years (Figure 1). The extremes in CP content are, in turn, related to wide ranges of crop year precipitation averaging 158, 246, 231,

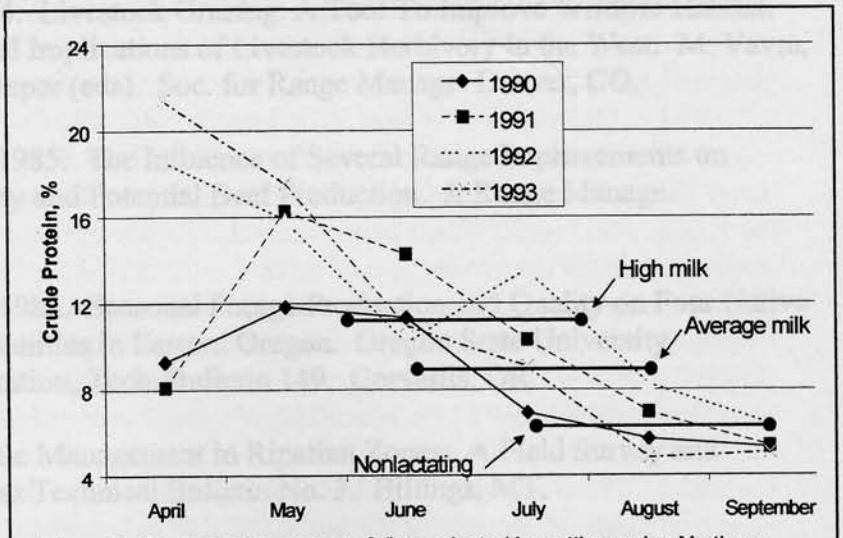

Figure 1. Crude protein content of diets selected by cattle grazing Northern Great Basin native rangelands. Crude protein requirements (NRC, 1984) are indicated for a high milking (20 lb/day), average milking (10 lb/day) and nonlactating gestating beef cow (1,100 lb).

and 524 mm for 1990, 1991, 1992, and 1993, respectively (40-yr average = 277 mm). The extreme fluctuations of precipitation also significantly affect forage available, with 1990 to 1992 averaging 240 kg/ha, whereas 1993 forage availability was 580 kg/ha. Thus, the Beef Manager has to adapt to wide ranges of forage quality and quantity.

Because of the dynamic nature of arid/high elevation rangelands in terms of forage quality, forage availability, and environmental extremes (snow cover, precipitation, temperature, etc.), cattle body weight and condition changes during winter grazing supplementation studies show similar ranges in variation. DelCurto and coworkers (1991) found similar patterns of cow weight and body condition change when supplemented graded levels of alfalfa to beef cattle winter grazing sagebrush steppe rangelands (Figure 2). However, the magnitude of response was dramatically different between consecutive years due to observed changes in forage quality, forage availability, and environmental stress imposed on the grazing cattle. Likewise, other researchers in the western U.S. have indicated variable results with supplementing free-ranging beef cattle consuming stockpiled forage due to dramatic changes in forage resources and (or) environmental conditions. While these examples do not describe adequately all the considerations needed for supplementing grazing livestock, they do point out some of the complexities in achieving optimal response to supplementation strategies. In addition, these examples suggest that further research is needed to describe the interaction of environment, forage quality/quantity, and livestock nutrient demands so that optimal use of the forage resources, minimal use of supplements, and acceptable levels of beef cattle production can be obtained.

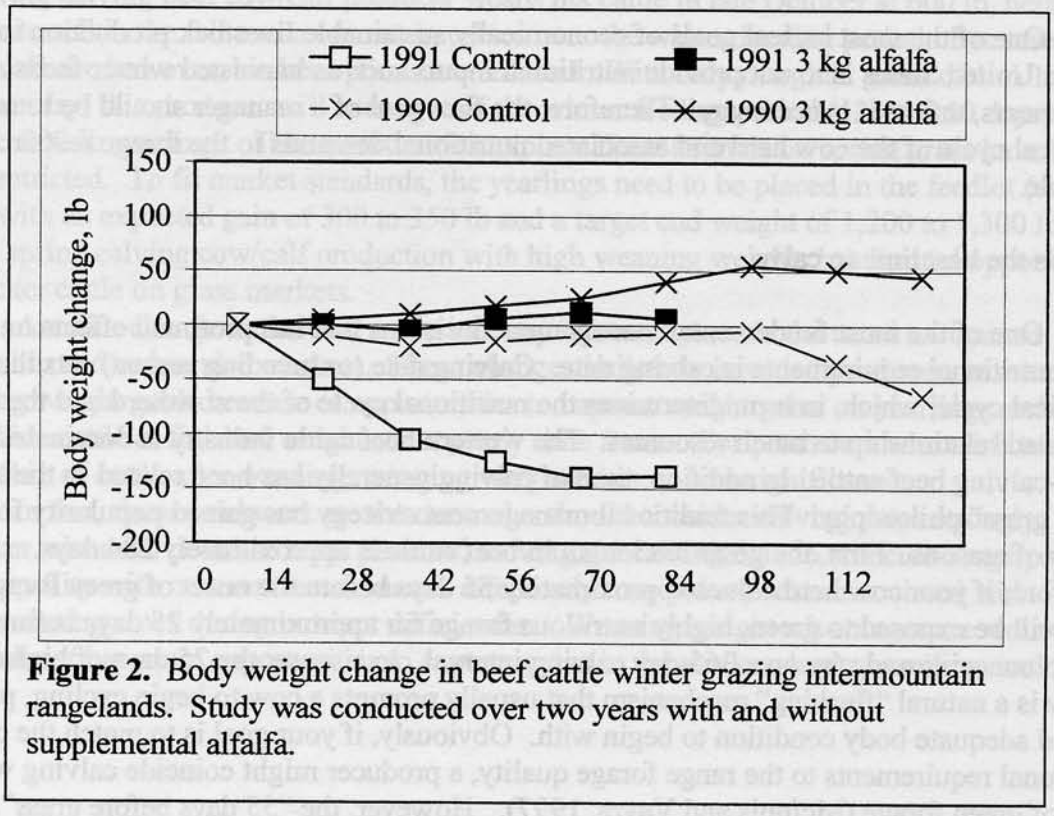

Figure 2. Body weight change in beef cattle winter grazing intermountain rangelands. Study was conducted over two years with and without supplemental alfalfa.

Winter Feed Needs

Perhaps the greatest challenge to western beef producers relates to the need for supplemental inputs. Seasonal deficiencies of nutrients (protein/energy) are high in arid and high elevation rangelands. Producers dependent on rangelands forage resources have to develop strategies to maximize the use of the forage resources and minimize supplemental inputs while maintaining acceptable levels of beef cattle production. Likewise, high elevation and high latitude beef cattle operations are likely to have significant periods of snow accumulations, which necessitates feeding harvested forages. In the Pacific Northwest and Intermountain West, many producers feed 1,500 to 3,000 kg of hay to their mature cows during the winter feeding period. The success of producers in these regions may depend on their ability to find an economical alternative to winter-feeding of hays, such as stock-piled forages and crop residues. However, like dormant range forages, stock-piled forage and crop residues are low-quality roughages that require nutritional inputs for optimal use.

What follows is a general discussion of potential management strategies that may offer economic advantages to western range livestock producers. Many scenarios or strategies may not be appropriate for your environment or production goals. Instead, most of the following information should be considered potential management alternatives that **may** offer economic advantages by decreasing input costs per cow.

Management to Reduce Nutritional Inputs and Costs

One of the most logical goals of economically sustainable livestock production in the western United States is to not provide nutritional inputs such as harvested winter feeds and supplements, unless it is necessary. Therefore, the first goal of a manager should be to match the biological cycle of the cow herd and associated nutritional demands to the forage resources available.

When is the best time to calve

One of the most fundamental management decisions that has profound effects on beef cattle nutritional requirements is calving date. Calving date (or breeding season) sets the biological cycle, which, in turn, determines the nutritional cycle of the cow herd and the associated relationship to ranch resources. The western beef cattle industry is dominated by spring-calving beef cattle. In addition, time of calving generally has been related to the "55 days before grass" philosophy. This traditional management strategy has gained popularity for a variety of reasons. First, the gestation length in beef cattle is approximately 284 days. Therefore, if your cow herd calves approximately 55 days before the onset of green forage, the cows will be exposed to green, highly nutritious forage for approximately 25 days before they need to conceive and stay on a 365-day calving interval. In a sense, the 25 days of high forage quality is a natural "flushing" mechanism that usually prompts a cow to begin cycling, provided she had adequate body condition to begin with. Obviously, if your goal is to match the cows' nutritional requirements to the range forage quality, a producer might coincide calving with the onset of green forage (McInnis and Vavra, 1997). However, the "55 days before grass" philosophy has another advantage: the calf. A typical beef calf does not become a functioning ruminant until approximately 90 to 120 days of age. This event usually takes place when the

cow has passed its peak lactation period (day 70 to 90). As a result, calf performance depends, to a greater degree, on the forage quality available to the calf. Thus, a calf born March 1 will be effectively utilizing forage available in June. In contrast, a calf born May 1 will not be effectively utilizing forage resources until August. Because of the vast difference in calf nutrition from day 90 to weaning, the earlier born calf will have weaning weight advantages that greatly outweigh the 60-day difference in age. Obviously, if higher weaning weights are a measure of economic importance (you market calves in the fall), then the "55 days before grass" philosophy may be the best approach.

Are Weaning Weights Really Important

The beef cattle industry in the United States has seen dramatic changes in production efficiencies over the last 30 years. In particular, weaning weights have increased from approximately 400 lb in 1967 to greater than 600 lb in 1997. The increase in weaning weights is related to increased use of continental breeds, greater selection on growth traits, and general improvements in management efficiency. If your goal is to market your spring calves in the fall, then this change in production efficiency has improved your economic potential.

However, the increase in weaning weights is an improvement in production efficiency that has some indirect problems. First, the target slaughter weight of market cattle has not changed dramatically during this time period. As a result, the opportunities to put on post-weaning weight have become more limited with the heavier weaning weight cattle. For example, if a spring calving beef cow/calf producer weans his cattle in late October at 600 lb, he/she may choose to sell in the fall market or retain calves over the winter feeding period. Because of the bigger calves, however, his/her options are reduced. With only marginal gains of 1 to 1.5 lb per head per day, this producer will come out of the winter feeding period (120 to 150 days) with 700- to 800-lb yearlings. The opportunities to place these animals on spring grass have become very restricted. To fit market standards, the yearlings need to be placed in the feedlot (avg. 90 days) with an expected gain of 300 to 350 lb and a target end weight of 1,200 to 1,300 lb. As a result, spring calving cow/calf production with high weaning weights has limited opportunities as stocker cattle on grass markets.

Another change in the beef cattle industry in recent years is the trend to retained ownership and/or branded markets. These changes indirectly have led producers to reevaluate weaning weight goals because of opportunities to capture weight gains on yearlings and the need to provide cattle at finished weights on a yearly time frame. For producers who wish to retain ownership of cattle after weaning, weaning weight takes on less significance.

In fact, these producers are the ones who should consider calving dates strongly. If a producer wishes to decrease costs per cow, moving the calving date to coincide range/pasture forage quality with cow nutrient demands effectively may reduce costs associated with supplementing cows during nutrient deficiencies. Weaning weight advantages are reduced, but the producer has more opportunities to capture gains in the stocker, backgrounding, and finishing phases.

Preparing the Cow Herd for the Winter Period

Because the winter period represents a time of high feed costs for beef cow-calf production, management strategies should emphasize decreasing the needed inputs. Getting your cow-herd in good fleshy condition going into the winter period should be a year-round management goal. Obviously, this involves monitoring your range and/or pasture forage conditions with particular attention to the quantity and quality of late summer and early fall forage (Figure 2). Forage resources in the Pacific Northwest are influenced strongly by the Mediterranean climate and, as a result, cool season forages. With the majority of precipitation coming in winter months and summers being relatively dry, forage quality and quantity may be limited and, at the very least, highly variable during the late summer and fall period. Therefore, a manager should monitor body condition and calf performance in late summer. When cows start losing body condition and/or calf performance begins to decline, the producer should consider nutritional or management strategies to optimize cow condition going into the winter period. A cow in good condition (5 or better) going into the winter period will be easier to feed and can lose some body condition without adversely effecting subsequent calving and rebreeding potential.

Early Weaning as a Management Tool

Traditionally, beef producers in the Great Basin region have weaned calves at approximately 7 months of age, which usually coincides to late October or November for spring calving herds. However, gains of calves and cows are often poor by late August, particularly during years of poor forage quality/quantity. By removing these calves early, they can be put on better feed with the cows remaining on range. Dry cows do well on range forage during the fall, and without suckling calf, will come into winter in better condition. Improved body condition, in turn, translates into a cow that is easier to maintain during the winter period and that has a higher chance of breeding back on a 365-day calving interval.

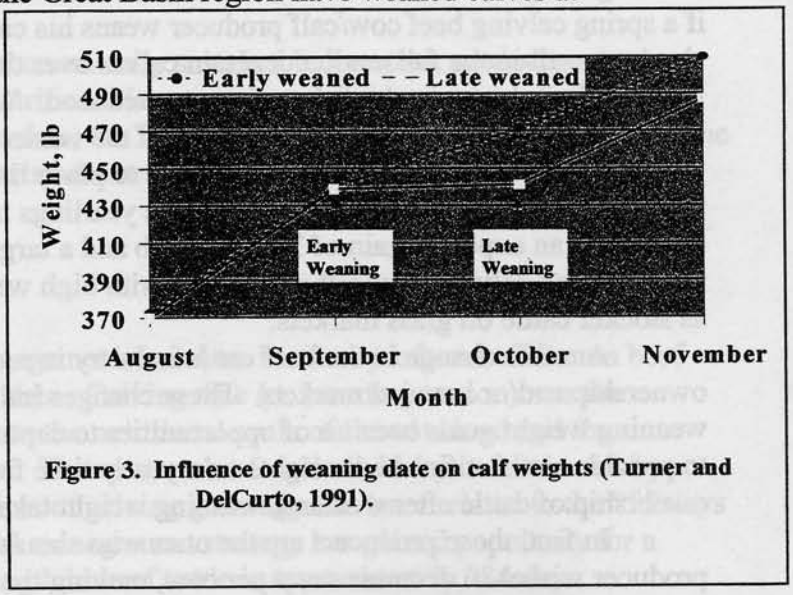

Figure 3. Influence of weaning date on calf weights (Turner and DelCurto, 1991).

Figure 3 presents some early weaning data from the Eastern Oregon Agricultural Research Center herd (Turner and DelCurto, 1991). Early-weaned calves were removed from their dams on September 12 and put on meadow aftermath and regrowth plus supplemented with 2 pounds of barley and 1 pound of cottonseed meal. Late-weaned calves remained on range with their dams until October 12 and then were managed with the early-weaned calves. On November 12, all calves were fed meadow hay and received 2 pounds of barley and 1 pound of cottonseed meal throughout the winter.

Early-weaned calves out-gained late-weaned calves by 20 pounds from September 12 to October 12, despite going through the stress of weaning and adjusting to new feed. During the next time period, October 12 to November 12, the early-weaned calves out-gained late-weaned calves by an additional 31 pounds and were now 51 pounds heavier. Late-weaned calves compensated somewhat over the remainder of the winter, but were still 24 pounds lighter on April 12.

A number of factors need to be considered when deciding if early weaning is appropriate. First, forage quality must be limiting to the point that calf gain will be reduced and cows likely will lose body condition from late-August to the October or November weaning date. If forage quality and quantity is not limiting, then there is really no advantage to early weaning. The real advantage of early weaning is to improve the weight and body condition of the cows from late summer to the beginning of the winter feeding period. In addition, the producer must provide adequate forage/nutrition to the early-weaned calf. For producers who frequently have limited nutritional options during the late-summer and fall period, however, early weaning may provide an alternative that allows for more efficient management of mature cows' body condition relative to a dynamic arid rangeland environment.

Alternative Winter Nutritional Management Strategies

Beef cattle producers in the western U.S. and, more specifically, intermountain and Pacific Northwest, compete at an economic disadvantage relative to other regions in North America due to high winter feed costs. Many producers currently feed 1.5 to 2.5 tons of hay to their mature cows during the winter feeding period. This represents costs of $75 to $150 per cow per year and may be greater than 50 percent of the input costs per cow per year. Obviously, our ability to compete with other regions of North America may relate to how effectively we can reduce winter feed costs while still maintaining acceptable levels of beef cattle production.

Rake Bunch Hay

The Eastern Oregon Agricultural Research Center conducted approximately 10 years of research evaluating rake bunch hay as an alternative to traditional winter management. With this system, hay is cut, then raked into small piles (80 to 120 lb) with a bunch rake, and left in the field. The forage then is strip grazed, using New Zealand-type electric fences, throughout the winter. A general summary of 10 years of data demonstrated that cows wintered on rake bunch hay came out of the winter period in better condition than traditionally fed cows and did not require supplements or additional hay. Likewise, conception rates, calving interval, weaning weights, and attrition rates were equal between control and treatment groups. In addition, the costs of winter feeding rake bunch hay has been $30 to $40 less per head than the traditional feeding of harvested hay. For additional information relative to rake bunch hay feeding, please refer to Turner (1987) and Turner and DelCurto, 1991.

Winter Grazing

Another alternative to traditional winter-feeding may be the winter grazing of "stockpiled" forage. To use this alternative effectively, the producer must defer grazing of irrigated pasture or native range to the fall or winter months. The range forage base will be

dormant and, as a result, likely will need some level of supplementation depending on quality of selected diets, body condition status of mature cows, and stage of gestation. More thorough discussions of winter grazing (Brandyberry et al., 1994) are available.

Like rake-bunch hay, winter grazing may decrease winter feed cost by $20 to $30 per cow during mild to average years. To utilize winter grazing effectively in your management program, the producer must have access to the animals to accommodate supplementation programs. Water must be available throughout the fall or winter grazing period, although the cow can utilize snow effectively. In addition, the grazing area must be relatively free of snow accumulation during most years.

Indirect benefits of winter grazing relate to the increased management opportunities of traditional hay meadows for spring and early summer grazing. In addition, fall and winter grazing is an alternative use of native rangelands that may provide some significant advantages. First, grazing dormant forage presumably will have minimal impact on the plant as compared to traditional spring and summer grazing. Second, grazing, nonlactating-gestating cows will be better distributed over the grazing area, demonstrating greater distance traveled from water, better use of slopes, and more uniform use of the grazed area.

Grass Seed Residues

Another alternative to traditional winter management would be the use of grass seed residues produced as a bi-product of Oregon's grass seed industry. Currently, Oregon's grass seed industry produces over 1 million tons of crop residues. While only 50 percent of these residues appear to be a viable livestock feed resource, there are a number of reasons producers should consider these feeds as a winter alternative. First, many of these grass species are perennial forages (Kentucky bluegrass, tall fescue, perennial ryegrass, bentgrass, etc.) and, as a result, are substantially better than annual cereal grain straws. Second, burning, previously used as a tool to sanitize fields and remove residues, has been eliminated as the primary tool for grass seed producers. As a result, there is a critical need to find an effective use for these residues. Third, the Japanese export market has become "soft" in recent years, making delivery of grass seed residues to the eastern portions of Oregon more economically viable.

In most cases, grass seed residues should not be considered a complete feed for wintering mature beef cows. Instead, grass seed straws should be tested and supplements formulated to meet the cows' nutritional requirements while maximizing the use of the low-quality roughage. For more thorough reviews of grass seed residues and associated supplementation, refer to Chamberlain and DelCurto (1991) and Turner et al., 1995.

Currently, grass seed straw is being delivered to Eastern Oregon for approximately $40 to $50 per ton. The economic viability of this feed resource should not only be compared to costs associated with meadow hay production, but also other potential benefits. First, feeding grass straw frees up meadows for grazing and/or other uses. Second, grass seed residues represent a clean feed with limited weeds, with the exception of the seeds from the residue itself. In many cases, however, seeds from bluegrass, tall fescue, and perennial ryegrass germinating on disturbed winter feed grounds should not be considered a problem. Third, feeding residues on winter-feed grounds or traditional hay meadows represents an increase in nutrients added to the

site. Decreased fertilizer costs and improved organic matter of the soil may result from long-term feeding of grass seed residues.

Other Considerations

Research at the Eastern Oregon Agricultural Research Center has shown that ionophores, specifically rumensin, can improve winter beef cow performance or reduce winter feed needs (Turner et al., 1977; Turner et al., 1980). Cows fed a full diet of meadow hay plus 200 mg of monensin had daily gains of 0.2 pounds higher than cows fed meadow hay alone. In studies where cow weights were kept equal between control cows receiving meadow hay and cows receiving meadow hay plus monensin, hay savings of up to 13 percent were realized. This represents another management tool for improving cow condition or reducing feed requirements while maintaining cow condition through the winter feeding period.

There are several other potential tools or management strategies that may help reduce winter feed costs. Obviously, if you are using low-quality roughages such as stockpiled forage and crop residues, your supplementation strategy must emphasize minimizing supplement costs while maintaining acceptable beef cattle performance.

Summary

The ability of western beef cattle producers to compete effectively with other regions of North America may depend on management strategies that emphasize profit margins rather than weaning weights. The above information only "scratches the surface" of potential alternative management strategies that may offer economic advantages. Keep in mind, however, that western beef cattle producers and resources are dynamic, and incorporation of any of these strategies must fit your production philosophy, production goals, and holistic ranch management plan.

Many of the management strategies described in this paper, as well as future opportunities for beef production in the Pacific and intermountain west, necessarily will involve the use of supplementation to utilize low-quality feed resources. Producers will have to evaluate which supplements are most economically viable in their region, as well as which strategy best fits their needs, nutritional calendar, and management style.

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