Coordinating Beef Cattle Management with the Range Forage Resource

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Highlight: *Seasonal changes in forage production and quality occur due to climatic factors, principally precipitation. Increased efficiency of livestock production could occur if livestock management were coordinated to the changes that occur in forage quality. Traditionally, calves are born in the spring in much of the western United States. Weaning then occurs sometime in late fall. Management practices of early weaning, supplementation on the range, time of calving, and length of the breeding period can be incorporated into a livestock system to take advantage of forage at its highest quality and therefore to maximize beef production from the existing forage resource.*

Box (1974) estimates the demand for red meat will increase in the future due to an increase in population. He further states that production of red meat will increase on rangelands. Red meat production on rangelands could be increased if better use were made of the range forage resource.

Traditionally, beef cattle management systems in the western United States have been similar regardless of geographic or ecological area. Generally, forage quality is the greatest in the spring in northern regions and following the season of greatest precipitation in the southern regions. Little attention has been paid to coordinating specific management practices with changes in forage quality. If this were done, efficiency of production in terms of pounds of beef produced per unit of rangeland could be maximized.

The Forage Resource and Livestock Production

Generally, seasonal forage quality is related to degree of plant maturity and precipitation patterns. Consequently, time of peak forage quality in the western United States is influenced by elevation, amount and pattern of precipitation, general topography, and the geographic area. Humphrey (1962) has divided the grazing regions of the western United States into three distinct units based on seasonal precipitation patterns. The Great Basin pattern lies between the Rocky Mountains and the Sierra Nevada and Cascade Mountains, and is characterized by primarily winter and spring precipitation with moisture deficient summers. The Southwestern pattern, including Arizona, southern Utah and Nevada, and parts of New Mexico, is biseasonal with winter precipitation followed by spring drought and summer precipitation followed by fall drought. The Plains pattern occurs in the area bounded on the west by the Rocky Mountains and on the east by the Appalachian Mountains. Precipitation in this area is greatest in the spring and summer and then tapers off in the fall and winter.

Great Basin Pattern

Common ecological units within the Great Basin pattern are the sagebrush-bunchgrass of the lower elevations and coniferous forest communities in the mountains. Skovlin (1967) studied the protein content of important range grasses in the Blue Mountains of Oregon. Skovlin reported a 4-year average of changes in protein content of four grass species from July to October. As the summer season progressed, protein content and hence forage quality declined.

By September, forage quality had declined so that continued growth of young livestock (unweaned calves or yearlings) could have been critically affected. Previous work by Skovlin (1962) showed that cow and calf gains decreased as the grazing season progressed (Fig. 1). Weights of cows and their calves taken at 2-week intervals from Aug. 17 to Oct. 24 revealed that the cows lost weight most of the study period. Calf gains per 2-week period decreased greatly between the third and fourth periods. The gains observed at the last weight day were a result of fall precipitation and a resulting forage "green-up." Cattle were removed from the range following the last weighing as this was the normal Forest Service practice. The gains made by cows during the last period did not make up for previous losses incurred. Calves showed only a slight net increase in weight.

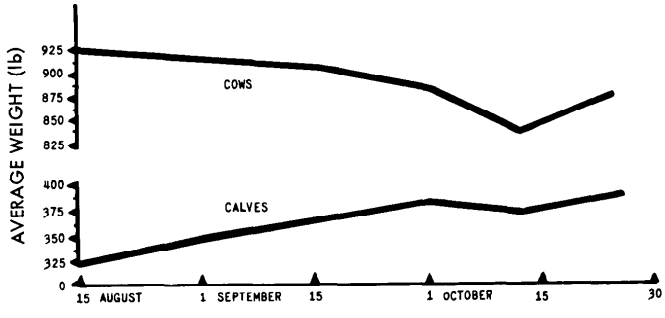

Fig. 1. *Weight trends of cows and calves grazing mountain range during fall months of 1961 (from Skovlin, 1962).*

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The Eastern Oregon Agricultural Research Center is jointly operated by the Oregon Agricultural Experiment Station and the Agricultural Research Service, U.S. Department of Agriculture, with locations at Burns and Union.

The research is a contribution of the Oregon Agricultural Experiment Station as Technical Paper Number 4120.

Manuscript received January 2, 1976.

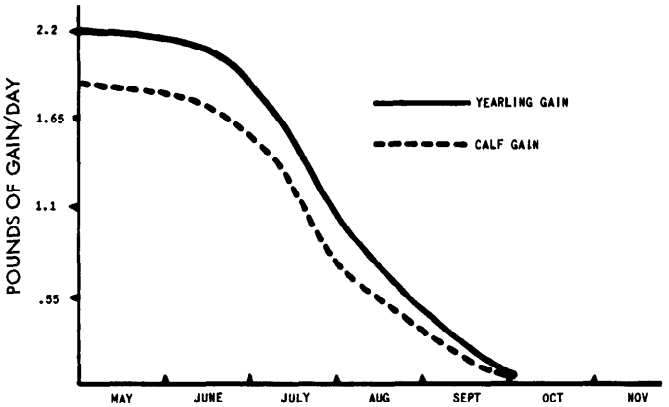

Fig. 2. *Average daily gain of yearling steers and suckling calves during time on sagebrush-bunchgrass range (from Raleigh, 1960).*

Forage quality decreases even more rapidly in the sagebrush-bunchgrass areas. Raleigh (1970) reported nitrogen levels and percent digestible dry matter in the diets of range cattle during the grazing season on a sagebrush-bunchgrass range in southeastern Oregon. By July the forage had deteriorated to a point that performance of yearling cattle and suckling calves was decreasing rapidly (Fig. 2).

Southwestern Pattern

Precipitation, as well as moderate temperatures of the Southwestern pattern, allows two annual peaks in forage quality. When winter rains occur, some grass species may initiate growth as early as January (Cable and Shumway, 1966). Browse species normally initiate growth and reproduction in the spring. The second growing season occurs with the summer rains in July, August, and September. Grasses normally reach maturity and set seed during this period. Two annual peaks in forage quality can occur in this region if precipitation occurs during both winter and summer (Fig. 3). Cattle weight changes reported by Ward (1975) and diet quality changes (Cable and Shumway, 1966) follow similar patterns (Fig. 4). Cow weight gains were less in the spring because the cows had just calved and begun to lactate.

Plains Pattern

The area included in the Plains pattern is one of the major cow-calf areas of the United States. The majority of the precipitation occurs during the spring and summer when the plants are actively growing. Vavra et al. (1973) reported little change in protein content of the diet of yearling cattle from June through August. Cattle grazing light and heavy intensity pastures consumed a diet consisting of 12.5% and 12.7% crude protein, respectively, in June. During August the crude protein content had dropped only slightly to 10.5% and 11.5% on the heavy and light grazed pastures. Scales et al. (1971) reported similar findings on similar ranges, but also collected samples in September and November and found crude protein in the diets of cattle dropped to 6.7% and 6.2%, respectively. Vavra (1972) also reported that cattle diets contained 6.8% crude protein on heavy use pastures and 6.3% crude protein on light use pastures in January. Klipple and Costello (1960) reported 10-year averages of yearling heifer gains on shortgrass range and found that monthly weight gains decreased as the grazing season (May to October) progressed.

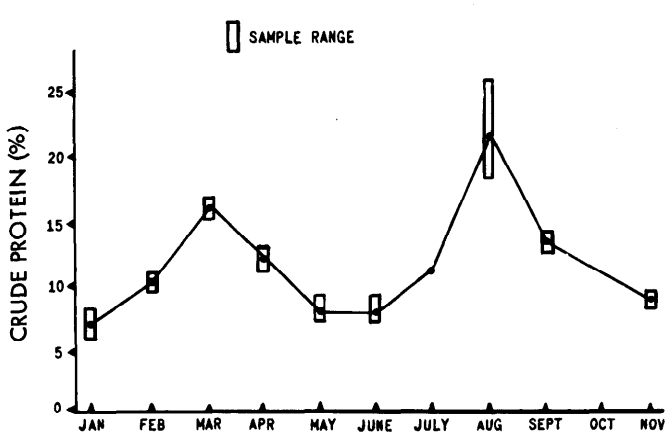

Fig. 3. *Changes in crude protein of rumen fistula samples and averages of monthly determinations collected from a southwestern range (from Cable and Shumway, 1966).*

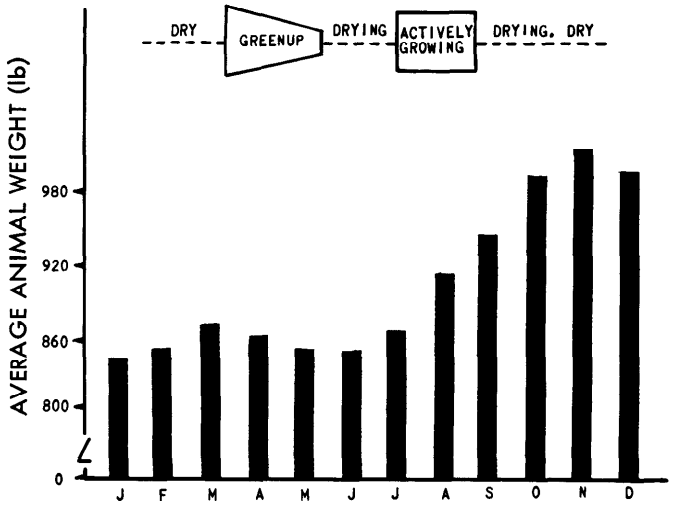

Fig. 4. *Average monthly weights of cows in relation to forage growth and calving cycles on a southwestern range (from Ward, 1975).*

It becomes evident, then, from the previous discussion, that the forage resource is an everchanging commodity. In any given range community young growth is high in quality and then as the plant matures, quality decreases. Also, animal response (daily weight gain) is definitely related to changes in forage quality; as forage quality decreases animal response decreases. Therefore, maximizing livestock production means coordinating it to the forage resource so that the most efficient use is made of the short periods when forages are at their highest quality.

Maximizing Livestock Production through Management

In the western United States most of the calves are produced between Jan. 1 and May 1, either by plan or circumstance. Cow-calf pairs graze native ranges together until sometime in the late fall or early winter when the calves are weaned. This conventional system of range livestock production is based more on tradition than on a planned program designed to produce maximum pounds of beef from the calf crop. Early weaning, range supplements, time of calving, length of breeding season, and manipulation of grazing management can be incorporated into a livestock system to maximize beef production from the range cattle operation.

Calf and yearling daily gains decline and even cease toward the end of the growing season regardless of region. The suckling calf is probably at the most efficient growth period in its life, but

traditionally it is left on range in late summer and fall when forage quality is such that it may not even provide for maintenance. Most beef breeds have little potential for milk production after 150 to 200 days of lactation regardless of forage quality or quantity, so the calf can expect little milk.

Yearling cattle, like the suckling calf, gain little during late summer and early fall. Ratliff et al. (1972) reported that on a northern California range yearling heifers made 81% of their total gain prior to Aug. 1 during 3 years of a 5-year study. During the other 2 years 73% of the gain was put on prior to Aug. 1. The grazing season ran from June 1 to Sept. 30.

Early Weaning

One alternative to allowing calves to stagnate on dwindling range quality is to wean them sooner than usual and put them on a high quality forage or a feeding program. In the northern regions of the west where native meadows or alfalfa hay fields are a part of most cow-calf operations, calves can be allowed to graze the aftermath following the last cutting of hay. Irrigation following haying and prior to grazing improves forage quality and quantity. In a study conducted by Wallace and Raleigh (1961) on sagebrush-bunchgrass range in southeastern Oregon, calves were weaned at 177 and 214 days of age (Table 1). Calves that were weaned at 177 days of age were fed a post-weaning ration of meadow hay *ad libitum*, 2 pounds of barley and 1 pound of cottonseed meal per head per day. Late-weaned calves remained with their dams on range until Oct. 18, when they were weaned. Post-weaning management was the same as for the other group. During the period of Sept. 15 to Oct. 26 the early-weaned calves were on feed and the normal-weaned group were suckling their dams 33 days and on feed 8 days. Average daily gains were over twice as high for the early-weaned calves during this period. This suggests an advantage in maintaining a constant growth rate in calves under existing conditions.

Table 1. Effect of time of weaning on winter performance of weaned calves (from Wallace and Raleigh, 1961).

Measurement	Time of weaning	
	Early	Normal
Age of weaning (days)	177	214
Avg weight, Sept. 15 (lb)	370	380
Avg daily gain by periods (lb)		
Birth to Sept. 15	1.67	1.66
Sept. 15 to Oct. 26 (41 days)	0.84	0.41
Oct. 26 to Nov. 30 (35 days)	1.51	0.63
Nov. 30 to Feb. 15 (76 days)	1.01	1.16
Sept. 15 to Feb. 15 (152 days, total)	1.08	0.84
Avg weight, Feb. 15 (lb)	534	507

McArthur (1973) in a study in northeastern Oregon on forested rangelands studied the effects of early weaning on cow performance. Calves were weaned about 160, 185, and 215 days of age. Cows with calves at their side grazed a native flood-irrigated meadow from the beginning of the experiment when the first group of calves was weaned until the final weaning on Oct. 12. As a group of calves was weaned, the cows were turned out on native range. The calves were put on alfalfa hay meadows that had two cuttings removed and were irrigated prior to calf turnout. Cows that had their calves removed at 160 days of age did not graze the native meadow. Their calves did not respond as well as those calves weaned at 185 or 215 days (Table 2). Only calves weaned at 160 and 185 days of age underwent the stress of weaning during the study. Cows from the earlier weaned groups (160 and 185 days) went into the winter at heavier weights than those allowed to remain on the native meadow with their calves. These heavier cows could conceivably be wintered at less expense than the cows from the 215-day weaned group because this extra condition could then be lost through less feeding. It appears that for forage conditions in northeastern Oregon weaning calves at approximately 185 days of age is the best management practice.

Table 2. Cow and calf performance as a result of weaning management (from McArthur, 1973).

Measurement	Weaning age		
	160 days	185 days	215 days
August weight (lb/calf)	385	387	385
October weight (lb/calf)	443	462	444
Weight gain—August to October (lb/calf)	58	75	59
Avg daily gain (lb/calf)	1.01	1.32	1.04
Cow weight—Nov. 30 (lb)	1,219	1,184	1,102

Early-weaning of calves also has fringe benefits. When calves are weaned earlier in the fall before the onset of winter, they have less chance of contracting the respiratory disease syndrome often associated with weaning. Hedrick et al. (1968) observed that cows with calves would not utilize heavily timbered country or range far from watering areas. Dry cows, on the other hand, disperse well and cover the more inaccessible and remote areas of the range.

Length of Breeding Season

Maintaining a short breeding season is a management tool that can be used to achieve greater efficiency from the forage resource. In theory, if the cow has recovered physiologically from calving, is on an adequate plane of nutrition, and is free of disease and other stress, she should conceive with one exposure to a fertile bull. Advantages of the shorter breeding season are increased weaning weights, more uniform calves that bring higher prices or that can be put on a single management and feeding program at weaning, the ability to identify low producing cows, and the opportunities for achieving greater efficiency from feed resources through more intensive management. A breeding season of about 63 days (3 estrus cycles) provides the opportunity to confine the cow herd on small highly productive pastures for good cow nutrition as well as concentrating the cow herd for better exposure to the bull.

Calving Time

Calving should be timed so that the suckling calf can make the most advantage of high quality forage and also occur at a season of the year when severe weather will not be a problem. Normally calves are dropped in the spring when forage quality is highest. However, at this time the calf is usually more nutritionally dependent on the dam's milk than the forage. As the calf grows during the summer and begins to use more forage the quality of this forage is decreasing rapidly. Under most range conditions efficiency of forage utilization under these circumstances is quite low. Time of calving, then, should be adjusted so the calf is old enough to utilize forage when peak production and quality occur.

Some operations in the southwestern United States already take advantage of shifts in calving time (Lane, 1975). Peak forage quality and production occur during July, August, and

September (Fig. 3). Calving begins about Jan. 1. Breeding begins about Apr. 1, when forage is still in fair condition from the spring green-up. Under this system calves are large enough to better utilize the high quality forage that occurs in the summer. Efficiency may be increased further if the calving time could be started in December. Breeding would occur during the peak of spring forage production (Fig. 4). The mild winters in the Southwest should not cause a problem with winter calving.

In more northern climates where severe winters commonly occur, fall calving can increase efficiency of forage use. Sagebrush-bunchgrass ranges reach their peak in forage quality early. A spring-born calf has little chance to take advantage of good quality feed. Severe winter climate is not conducive to winter calving. However, calving in October and November, prior to the occurrence of severe weather offers an alternative. Calves are born when the cows are congregated on hay meadows where problems and diseases can be treated easily, fall weather is generally favorable (little precipitation), feeding of the cow and calf can be controlled, and breeding is done when the cow herd is still concentrated. Calves are old enough at "turn-out" time in the subsequent spring so that they can make the most use of the high quality forage. Cows on range with larger calves at their side should do a better job of forage utilization by ranging farther from bed ground, loafing areas, and waterholes.

Supplements on Range

As indicated, range forage is high in nutrient quality in the early part of the growing season and as the season progresses quality reduces to a point where the forage may provide for little more than animal maintenance, if that. When forage is adequate for maintenance then a pound or more of grain supplement may provide a very efficient return. Supplementation beyond this point where high levels of production are expected may be economically marginal.

This type of intensive management may not fit the general pattern of range beef cattle management and does not refer to the supplementation for maintenance of mature animals practiced in the plains or southwest. On the other hand, more intensive management can be practiced on high yielding reseeded clear-cuts on forest range or seedings (crested wheatgrass, etc.) on sagebrush range.

In developing a supplementation program we need to estimate or determine the amount of nutrients the grazing animal gets from the forage and then determine the amount of supplement needed to maintain a practical rate of gain. Raleigh (1960) developed a supplementation program for yearling steers on sagebrush-bunchgrass range. Normally, yearling steers on range gain 2.0 to 2.5 pounds per head per day during May and June and decline thereafter (Fig. 2). Supplements were provided with less than a pound required at certain times and gradually increasing to about 3 pounds as the season advanced and forage quality declined. Levels of over 3 pounds of daily supplement resulted in a decline in forage intake and a decrease in efficiency of the supplement. During this 120-day period an additional 100 pounds of gain was put on each steer with an average of 2 pounds of supplement per head per day or about 200 pounds of total supplement.

While the above program may not fit all areas, the general principles should apply. It does indicate the potential for increasing production for those livestock producers who have the facilities and the desire to intensify their management.

Summary

The range forage resource in the western United States has been shown to be a highly variable commodity. Traditional systems of livestock management do not maximize red meat production because they do not make efficient use of the forage resource. Early weaning is an effective means of improving weaning weights of calves. A defined breeding season allows the rancher to intensify management of the cow herd so that percent calf crop can be maximized. Once the seasonal changes in forage quality are identified, the rancher can manipulate calving time (within environmental restrictions) so the suckling calf can make the most of the period of peak forage quality. Supplementing weaned calves or yearlings on the range can increase their seasonal average daily gain with only a small grain input. Manipulations in grazing management are sometimes necessary when incorporating some of these management practices. However, the changes may further increase the return from each specific management objective incorporated. For example, using crested wheatgrass pastures in the spring not only concentrates animals for better breeding but also defers the use of native range. The rancher, then, should evaluate his total forage resource and incorporate management that best utilizes that resource to maximize red meat production. He may use some of those discussed or develop specific programs that fit his situation.

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