Cutting Ranching Costs: Optimizing Forage Protein Value

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In today's economic climate, an often talked about principle is cost-cutting. How do we get more out of what we have?

Nowhere is this more important than in the Ranching business. The profit formula {Profit = Price (Total Production)-Costs} requires us to examine all aspects of our operation. Which of these elements-price, production, and costs can you most easily influence?

Price is usually dictated by market conditions which is not easily influenced. Many people believe that production and cost can be influenced. Improving herd genetics and feeding to increase the amount of beef or lamb are two methods to increase production. But, how often is the cost per pound of beef or lamb weaned considered? Many times efforts on the cost side of the formula are limited to not replacing that worn out baler, tractor or pickup; or being resourceful in the reuse of old wire, nuts, bolts, and tools. Cost cutting measures such as these are important, but at the same time, one of the largest costs-feed-is not necessarily receiving the same attention.

Grass, forbs, and shrubs are the ranchers' real crop. Livestock are the harvesting and marketing tool of that crop. If grass, forbs, and shrubs are harvested effectively to provide more of the nutrients that our livestock need to be productive, then feed and feeding costs can be cut.

These feed and feeding costs consist of farming (equipment and fossil fuels), planting hay or forage crops, irrigating (sometimes using high cost irrigation equipment, and electricity or fossil fuels). Harvesting (equipment and fossil fuels), feeding, and the use of supplements such as salt, phosphorus, magnesium, and protein are also costs.

How should costs such as these be cut? There are many methods, but let's focus on optimizing the forage value of the crop by harvesting at different times of the year, thus providing more of the nutrients to livestock at a lower cost. We can compare this idea to harvesting a hay crop. Hay is harvested at a point to optimize production and protein content. The same idea applies to other forage crops, but expensive machinery and high cost fossil fuels aren't required. Livestock, the marketing mechanism, is the harvester.

Forage Value and Nutrients

In order to be practical, forage value must be discussed in general terms. Plants may be classified as having "good", "fair", or "poor" forage value. Forage values are based on three components: palatability, nutritive content, and dependability as a forage supply (deeper rooted, taller growing grasses, for example, tend to provide more reliability than shorter growing grasses, especially during drought periods).

Range livestock need six different kinds of nutrients in order to produce well:

1) Proteins—build and repair muscles and are a component of bodily fluids;

2) Carbohydrates—provide heat and energy;

3) Fats—provide heat and energy;

4)Vitamins—regulate bodily functions;

5) Minerals—phosphorus, calcium, iodine, sodium, chlorine, and others- needed for building bones and regulating bodily functions; and

6) Water—transports wastes and dissolved foods out of and around the body.

Thus, "good", "fair", and "poor" terms are given to a plant based on how well the plant furnishes these nutrients on a year round basis.

This classification may tell us that one plant is generally rated higher than another overall using this scale, but it doesn't necessarily tell us the specific time when a plant provides more of the nutrients livestock need. Unnecessary dollars may be spent to provide these nutrients.

Seasonal Trends of Nutrients

Let's examine how much of the important nutrients range plants provide at different times of the year, and let's cate-

Fourwing Saltbush is a palatable shrub containing about 13% protein during the winter. High protein shrubs growing on saline sites can be very valuable.

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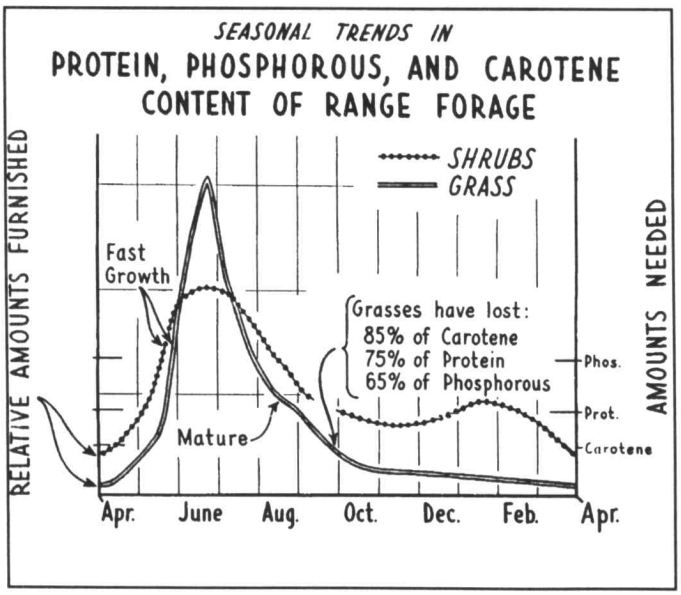


Fig. 1. *(Cooperative Extension Service, Bulletin 1028, Montana State University, Dec. 1977)*

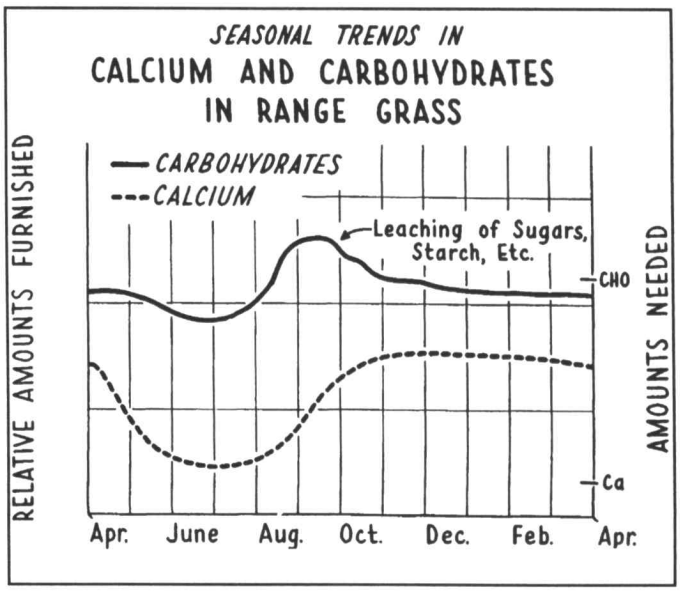


Fig. 2. *(Cooperative Extension Service, Bulletin 1028, Montana State University, Dec. 1977)*

gorize these nutrients into two categories. One nutrient category will include phosphorus, carotene, and protein. These nutrients are most likely to be deficient in range forage, especially in fall and winter and in dry years. Phosphorus, carotene and protein are more plentiful during fast growth periods, and carotene (which is converted to vitamin A and stored in the liver) is nearly nonexistent in plants by the first of November.

Although protein will generally be the focus of attention in this paper, phosphorus carotene, and protein are more plentiful during fast growth periods, and likely to be deficient in forages in the Northern Great Plains. These deficiencies, however, are overcome by mineral supplements containing both phosphorus and Vitamin A.

Figure 1 shows the seasonal trends for these nutrients in both shrubs and grasses, compared to the amount of these nutrients needed by livestock.

The second category of nutrients include carbohydrates which furnish heat and energy, and calcium, which is for bone building. Figure 2 shows that both of these nutrients change in amount in range grasses at about the same time throughout the year.Generally speaking, calcium is not deficient in range grass, and since lush spring grass growth is approximately 70% water, it can be likened to a high nutrient concentrate providing all the nutrients in category one. However, unless some old grass is present with the new growth, we may find livestock short on energy. As long as the old grass is present with the new grass in the spring, livestock generally do well.

Plants are most nutritious when they are green and growing most rapidly. Plants can be classified into two types: cool and warm season (see Table 1). Cool season plants grow most rapidly in April, May, and June. Warm season plants grow most rapidly in June, July, and August.

If you know what plants are present in certain fields and when these plants are green and growing most rapidly, you can take advantage of their higher nutrient content. For example, fields that have high amounts of warm season plants such as little bluestem may be utilized in the summer to take more advantage of the high nutrient value of category one nutrients. Little bluestem is classified as a "good" to "fair" forage plant. It has a "good" value if it is used during the growing season, but only has a "fair" value if it is allowed to cure and become coarse and stemmy. Little bluestem contains approximately 16% protein when immature, but by mid bloom drops to only about 7% protein (National Research Council 1971).

Fields that have high amounts of cool season grasses such as bluebunch wheatgrass, should be grazed in the spring or early summer. Livestock do very well utilizing bluebunch wheatgrass during this time because the grass is green and growing. Bluebunch wheatgrass contains nearly 20% protein when immature and approximately 11% protein at mid-bloom (National Research Council 1971).

Table 1. Forage values and season of growth of some common native range plants.

	Good	Fair	Poor	Cool Season	Warm Season
Green Needlegrass	X			X	
Bluebunch Wheatgrass	X			X	
Rough Fescue	X			X	
Silver Bluestem	X			X	
Little Bluestem	X to	X			X
Nuttals Saltbush	X			X	
Red Threeawn			X		X
Winterfat	X				X
Greasewood		X		X	
Silver Sage		X			X
Big Sage			X		X
Fringed Sagewort		X			X

Table 2. Protein content of grasses and shrubs in eastern Montana

	Grasses	Shrubs
	%	%
Spring	10-16	12-23
Summer	6-12	8-18
Fall	3-7	7-15
Winter	2-6	7-13

(Adapted form Van Dyne, et. al., 1965)

grasses are cured out. Shrubs as a group provide more of the category one nutrients than do grasses during a large part of the year.

Protein Supply and Demand of Cattle

Growing conditions also affect forage value in two ways. Growing conditions that are harsh for plants lower palatability and digestibility, while favorable growing conditions cause plants to be higher in category one nutrients. The following table summarizes the protein content of grasses and shrubs over a period of several years by season in eastern Montana. This table reflects changing growing conditions and nutrient content, and since protein is one of the best indicators of palatability, it also reflects palatability fluctuations.

An 1,100 pound cow with average milking ability nursing a calf needs approximately two pounds of protein a day and 26 pounds of dry matter a day for the first four months postpartum and from 1.4 to 1.6 pounds of protein a day and 24 to 25 pounds dry matter a day after that (National Research Council 1984). This information is used to determine which plants provide livestock nutritional needs at various times of the year.

We can see that grasses provide the approximately two pounds of protein per day needed in the spring by a nursing cow. This same cow needs approximately 1.4 pounds of protein per day during the summer. Grasses meet this demand also. However, during the fall and winter months, grasses begin to fall short of providing the 1.4 pounds of protein per day that the cow needs in the fall and the 1.6 pounds per day of protein she needs in the winter.

Along the Rocky Mountain front in west central Montana and north into Canada, rough fescue is a high protein grass that is excellent winter forage.

Table 3. Protein intake for cattle.*

	Daily Dry Matter Intake	Approximate Daily Amount of Protein Needed	Protein Provided Grasses	Protein Provided Shrubs
	Lbs.	Lbs.	Lbs.	Lbs.
Spring	26	2	2.6-4.2	3.1-6
Summer	24	1.4	1.4-2.9	1.9-4.3
Fall	24	1.4	0.7-1.7	1.7-3.6
Winter	25	1.6	0.5-1.5	1.8-3.3

*Based on the approximate dry matter intake of either grasses or shrubs for an 1,100 pound March-calved cow.)
(Adapted from National Research Council, 1984 and Van Dyne, et. al., 1965.)

Certain grasses cure out at higher levels of protein and nutrients than do others. Native grasses, such as green needlegrass and rough fescue, and introduced grasses such as Russian wildrye and orchardgrass cure out and average 4 to 5% protein (Dubbs, 1966) to provide approximately 1.2 pounds of protein daily, very near the 1.4-1.6 pounds needed during the fall and winter.

Generally the best source for protein in the fall and winter is shrubs. Shrubs contain from 7-15% protein in the fall and provide 1.7 pounds to 3.6 pounds of the protein needed by livestock. Shrubs hold their protein content relatively well through the winter. The daily protein requirements are being met even by the lower quality species and under less favorable growing conditions as evidenced by the low end numbers for shrub protein intake during the fall and winter seasons.

Palatability Can Cut Feeding Costs

Palatability is a major consideration towards cutting feeding costs for cattle. By allowing livestock to feed on shrubs during the fall and winter months feeding costs can be cut.

Big sagebrush browse, for example, contains approxi-

Table 4. Protein intake for sheep*

	Daily Dry Matter Intake	Approximate Daily Amount of Protein Needed	Protein Provided Grasses	Protein Provided Shrubs
	Lbs.	Lbs.	Lbs.	Lbs.
Spring	5	0.6	0.5-0.8	0.6-1.15
Summer	4	0.4	.24-.48	.32-.72
Fall	3	0.27	.09-.21	.21-.45
Winter	2.5	0.4	.05-.15	.18-.33

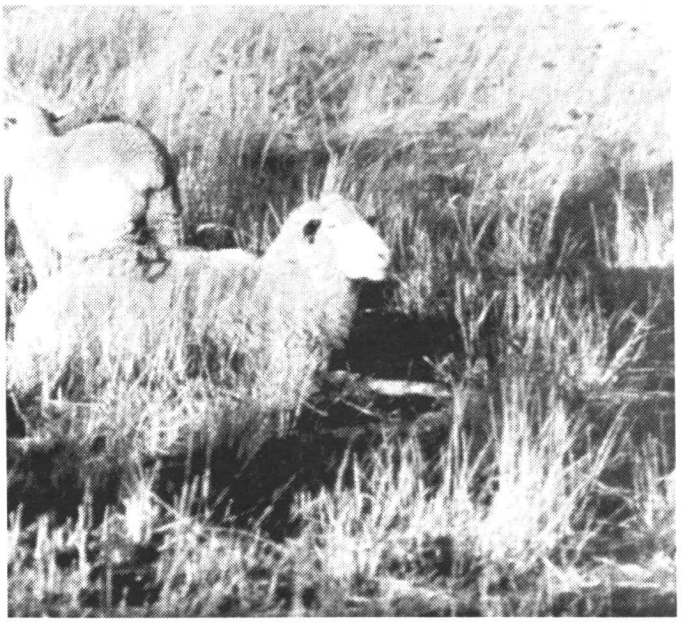
*Based on the approximate dry matter intake of either grasses or shrubs for a 132 pound March-lambed ewe.
(Adapted from National Research council, 1985 and Van Dyne, et al., 1965.)

mately 9% protein during the fall and winter. This is more than adequate to meet the 1,100 pound cow's requirements during these months even if only two-thirds of her daily dry matter intake is sagebrush. However, we know that cattle do not find big sagebrush palatable. Livestock performance may suffer unless we provide a protein supplement. Our attention must be focused on a few of the more palatable shrubs.

Winterfat, nuttal saltbush, and fourwing saltbush are all shrubs that are very palatable and provide about 11% protein during the fall and winter (National Research Council 1971). Silver sage and greasewood are slightly less palatable, but more palatable than big sagebrush. They also provide 11% protein during the fall and winter (National Research Council 1971). The use of silver sagebrush and greasewood can be timed for grazing in the fall and winter months in areas where these shrubs exist.

Greasewood browse can contain nearly 22% protein, so it is very potent (National Research Council 1971). It can, however, be poisonous to livestock. This occurs only if livestock eat large amounts in short periods of time. If range is managed so that livestock have ample opportunity to graze grasses, along with greasewood in the same area, this shouldn't be a problem. Greasewood increases in toxicity as the growing seasons advances. Timing grazing for fall and winter will take advantage of its nutrient content at a time when toxicity is lower.

Bluebunch wheatgrass, Montana's state grass provides excellent spring forage. It contains approximately 20% protein when immature.



Sheep, which require a relatively higher protein diet than cattle, select forbs and shorter grasses. Forbs can contain as much as 25% protein content, often when grasses are cured out.

Protein Supply and Demand of Sheep

Sheep frequently have a much higher need for protein than do cattle. This may explain why sheep have a diet that consists of a much larger percentage of shrubs and forbs than do cattle. Many forbs have a high protein content, and they are green and actively growing at various times of the summer. As earlier stated, this is when plants contain the highest amounts of category one nutrients.

For example, western yarrow and arrowleaf balsam root contain nearly 17% and 30% protein, respectively, when immature, and 13% and 10% when mature (National Research Council 1971). These forbs are an excellent source of protein that sheep select. Cattle have been known to graze considerable amounts of forbs also, but it appears that sheep have a greater need for this protein source.

Big sagebrush and black sagebrush, shrubs which are not very palatable or desirable to cattle, are utilized frequently by sheep, again most likely reflecting their need for a higher protein diet.

In addition, sheep producers often say that sheep don;t like the tall, course grass, but rather the fine short grasses. They are most likely observing a sheep's larger demand for protein. A 132 pound March lambed ewe has about a five pound daily dry matter intake in the spring and needs about 0.6 pounds of protein per day during this season. Grasses may or may not provide these needs depending on growing conditions, growth stage, and types of grasses. Sheep are then forced to utilize shrubs and forbs to meet demands.

During the summer, grasses may or may not meet sheep

Near Big TImber, Montana, cool season grasses dominate.

quacy of the diet in meeting the seasonal sheep protein needs is important.

Winter is a season during which a 132 pound March-lambed ewe in the Northern Great Plains may not be able to meet her protein demand of .4 pounds per day. When temperatures get very cold, a sheep's dry matter intake drops, making supplements during these periods necessary in spite of the availability of shrubs. The same can be said of cattle, also, but to a much lesser extent due to a cow's larger size. An overreaction often takes place as more money than necessary is spent to provide these nutrients even though these very cold spells last a relatively short period.

Many times beneficial shrubs are not recognized for their seasonal nutritional value. The result may be that we graze these areas in the late spring or summer when the grasses are already providing the nutrients our livestock need. We may then be wintering in an area without these types of shrubs and feeding high quality alfalfa hay or other feed supplements to provide these nutrients at a much higher cost. The result may be the same. The calves or lambs or culls that we market may be the same weight or even heavier, having been fed costly supplements instead of utilizing proper grazing management planning. The question remains- How much did it cost or what was my profit?

Timing Calving, Lambing, and Marketing

It is important to understand that grasses generally provide all the nutrients that are needed by livestock in the late spring and summer. We will assume that there is plenty of old grass for energy to go with the new grass during this time. Thus, knowing what types and amounts of shrubs and high quality grasses that are available (or could be made available through seeding) can make a significant difference in the amount of supplement that is required to maintain herd productivity during the majority of the year (fall, winter, and early spring). This potentially could translate into lower costs and higher profits.

The greatest amounts of nutrients are freely available during the late spring and summer months, and a mother cow or ewe has her greatest demand for nutrients and energy the three to four months following calving or lambing. During this time, she's nursing her calf, recovering from the stress of giving birth, and for cattle, being bred. This accounts for the high nutritional requirements. We meet those needs through supplements such as high quality, high cost alfalfa hay. However, the possibility does exist to calve or lamb later in the spring and market earlier in the fall to capture more of the nutrients available at much lower cost (less feeding).

Understandably, calf weights may be slightly lower. However, if the cost of wintering that cow or ewe is cut, then the profit margin may be improved. Whether considering timing grazing more effectively in accordance with the shrubs and grasses that are available or changing the calving and marketing dates, each rancher needs to assess his or her goals and resources to make wise decisions. These decisions can work to cut costs and improve profits.

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