Feeding and Management of Cattle With a Limited Feed Supply

SPECIAL REPORT 223 OCTOBER 1966

Agricultural Experiment Station • Oregon State University • Corvallis
in cooperation with the
United States Department of Agriculture

AUTHORS: R. J. Raleigh is Associate Professor of Animal Nutrition, Oregon State University and W. A. Sawyer is Superintendent of the Squaw Butte Experiment Station.

Squaw Butte Experiment Station, Burns, Oregon is jointly operated and financed by the Oregon Agricultural Experiment Station and the Crops Research Division, Agricultural Research Service, United States Department of Agriculture.

FEEDING AND MANAGEMENT OF CATTLE WITH A LIMITED FEED SUPPLY

R. J. Raleigh and W. A. Sawyer
Squaw Butte Experiment Station, Burns, Oregon

Many of Oregon's cattlemen are finding themselves short of both range feed and winter feed supplies due to the drouth. Livestock operators in most of the western range states face the same situation. This means the purchase of expensive hay or hay replacements and the possibility of reducing livestock numbers need to be considered. The purpose of this report is to provide guidelines or factors the rancher needs to consider in making the decisions that he must make to see him through this period at minimum cost and without a loss of long-time production.

The factors considered here will be: (1) nutrient requirement of the animal for sustained production; (2) replacement value of certain grains for hays of different quality; (3) additional requirements of minerals, vitamins, and so forth during a stress feeding period; and (4) criteria for culling animals if this becomes essential that will result in upgrading the production of those retained and minimize the reduction in long-term production.

The condition in which cattle come off summer range to go into the winter will affect the amount of winter feed required. In general, we can expect that cattle will come off summer range this year in poorer condition than usual. From the standpoint of food nutrients, probably the most economical level of nutrition is to maintain a mature animal at a constant thrifty condition. Any additional gain of weight or condition will result in an increased requirement of feed. Data from the Squaw Butte Station and others shows that if a mature producing animal in thrifty condition puts on weight (or condition) in the winter period, it will lose this in the summer and vice versa, providing adequate feed is available. For example, if a mature cow gains 150 pounds during the winter period, she will lose this during the summer while nursing her calf; if she loses 150 pounds during the winter she will gain this back during the summer, usually at the expense of some weaning weight of her calf. If the feed supply is such that she loses weight in one period and cannot gain it back during the next period, the result is lower production and/or reproduction failures.

I. Nutrient Requirement for Winter

This discussion on nutrient requirements will consider the animal coming off the range in what we might call a usual, or thrifty, condition and at levels somewhat below and above this. Each operator will need to appraise his particular situation.

Nutrient requirements of beef cattle for specific levels of production are published by the National Research Council 1/. Some of the data in Table 1 are an extrapolation of data from this publication. The rest are data obtained from the Squaw Butte Station. This table is made up to show the amount of each type of hay needed to meet the requirement of the animal. You will note the greater variation in the amounts of low, average, and high quality meadow hay than in alfalfas of the same classification. This is due to lower levels of protein in the meadow hay than in the alfalfa. In general, protein is our first limiting factor in meadow hay while energy of meadow hay compares favorably with that of alfalfa. Usually alfalfa more than meets the protein requirement before meeting the energy requirement. Table 1 shows the amount of hay needed to meet both the protein and energy requirement. It is obvious that 400 to 500 pound weaner calves will not be able to consume the 14 to 26 pounds of meadow hay listed in Table 1 to meet their protein requirement. The last column in Table 1 shows the maximum amount of roughage animals of different classes are able to consume. This will vary with the paunch capacity of the animal as well as the bulkiness of the roughage.

II. Replacement Value of Certain Grains for Hay

Several factors go into determining the comparative value of grains and roughages. As shown in the previous section, the value of a roughage varies with the class of animal receiving it and the level or type of production. A roughage has more value, energy-wise, for maintenance purposes than for production purposes such as meat, milk, or wool. For this reason it is impossible to give exact replacement values of grain and roughage. The commonly used measure to determine the value of a feed is TDN (total digestible nutrients). Recent research has shown that net energy is a more accurate measure of assessing the energy value of feedstuffs.

Net energy is the portion of energy of a feed used directly either for maintenance only or for maintenance plus production, while TDN includes the net energy and the energy expended in the process of digestion. This heat loss of digestion is higher in the high fiber feeds than it is in low fiber feeds. This is the reason we have a greater spread between TDN and net energy in high fiber feeds than in concentrates. However, this heat is useful in keeping the body warm when temperatures are below the critical level. Table 2 shows the digestible protein and comparative TDN and net energy values of some common feedstuffs.

Net energy is further broken down into that used for maintenance and that used for production. The higher fiber feeds, such as roughages, have a higher net energy value in relation to grains for maintenance purposes than they do for production. For example, alfalfa hay with a net energy of 0.54 therms per pound for maintenance has only 0.24 therms for production over maintenance, while barley has 0.85 therms of net energy for maintenance and 0.50 therms for production. Similar relationships are found for other grains and roughages.

1/ This publication, Number 1137, can be obtained for $1.50 from the National Academy of Sciences, National Research Council, 2101 Constitution Avenue, Washington, D. C. 20418

Table 1. Dry matter intake, protein and energy requirement of cattle for different levels of production and different roughage sources.

Body weight	Daily weight change	Digest. protein	TDN	Digest. energy	Daily feed required 1/						Maximum roughage intake 2/
					Alfalfa			Meadow hay			
					Low	Avg.	High	Low	Avg.	High	
lb.	lb.	lb.	lb.	Kcal	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Wintering mature pregnant cows											
900-1,200	0.5	0.9	11.0	18,000	22	21	20	30	22	18	30+
	0.0	0.8	9.0	17,000	18	18	17	26	20	16	30+
	-0.5	0.8	8.0	16,000	16	15	15	26	20	16	30+
Wintering pregnant heifers											
700-900	1.0	0.9	10.0	20,000	21	21	21	25	22	20	20
Wintering weaner calves											
400	1.0	0.7	5.3	10,500	12	11	11	23	15	14	10
	0.5	0.7	4.3	8,500	9	9	9	23	15	14	10
500	1.0	0.8	6.3	12,600	13	12	12	26	20	16	12
	0.5	0.8	5.1	10,250	11	10	10	26	20	16	12

1/ These figures represent the amount of each type hay required to meet both the energy and protein requirement. In all cases where alfalfa is used, the protein requirement is met with less hay than listed, but the amounts shown are needed to meet the energy requirement. The reverse is true of meadow hay, not because it is higher in energy or TDN but because it is lower in digestible protein.

2/ These figures are derived from both measurements and estimates and will vary depending on the bulkiness of the roughage and the paunch capacity of the animal.

Table 2. Digestible protein, total digestible nutrients, and net energy of certain feedstuffs

Feedstuff	Net energy	TDN	Digestible protein
	therm/lb.	%	%
Barley grain	0.70	78	8.4
Oat grain	0.65	65	8.8
Meadow hay 1/, good	0.38	52	4.9
Meadow hay, mature	0.22	37	1.6
Alfalfa, good	0.41	51	11.2
Alfalfa, stemmy	0.34	50	8.1
Barley straw	0.22	32	0.7

1/ Good meadow hay is hay that has been cut before July 20; hay cut after that time classed as mature meadow hay.

This means that a ton of hay has more value in relation to barley if used for maintenance in wintering pregnant mature cows than if used for wintering replacement heifers or calves where some measure of gain should be a goal. Table 3 is designed to show the comparative values or replacement values of grain and hay.

We have discussed energy rather than protein to this point because in short feed years we are concerned mainly with maintenance, and energy or total feed is our first concern. However, protein needs to be considered also. Data in Tables 1 and 2 show that good meadow hay will provide adequate protein for maintenance if fed in amounts to meet the daily energy requirement, whereas mature meadow hay or barley straw will not meet the protein needs of an animal under any conditions. If roughage is of poor quality, protein is very likely the first nutrient that needs to be supplied. When good alfalfa is used, the protein requirement is met before the energy requirement.

A more critical look is necessary in short feed years than in normal years when considering the use of urea-grain or urea-molasses mixtures as sources of protein extenders. It is important in cost-cutting but even more important to see that nutrients are in balance. A lot more good can be obtained from urea products, both nutritionally and economically, if they are fed in a well-balanced ration. To get the most out of urea, adequate available energy is especially important.

III. Minerals, Vitamins, Water, and Management During Stress Feeding

Low quality of feed is often encountered when trying to stretch feed supplies during drouth years. The main minerals to be concerned with are phosphorus, calcium, and salt. It is important that these be supplied in a form readily available to the animal. Steamed bonemeal, dicalcium phosphate, or tricalcium phosphate or tripolyphosphate mixed half and half with coarse ground iodized salt will meet the mineral requirement. Extra salt should be available also. Feeding iodized salt is recommended. Since more feed than

usual may be shipped in from other areas, there may be a mineral imbalance and feeding iodized salt is an inexpensive solution. The need for feeding trace minerals in eastern Oregon when animals are fed for maintenance is questionable. However, when urea has been used as a protein extender, beneficial effects of trace minerals have been reported. If alfalfa hay is being used as part of the ration, there should be no need for additional trace minerals. Supplementing should continue in areas known to be deficient in copper or other minerals.

Table 3. Comparative value of some roughages to barley 1/

Feedstuff	Net energy		TDN		Digestible protein	
	lbs.	ratio	lbs.	ratio	lbs.	ratio
Barley grain	2,000		2,000		2,000	
Oat grain	2,150	(1.07)	2,400	(1.20)	1,910	(0.96)
Meadow hay 2/, good	3,684	(1.84)	2,961	(1.48)	3,428	(1.70)
Meadow hay, mature	6,363	(3.18)	4,162	(2.08)	10,500	(5.25)
Alfalfa, good	3,417	(1.71)	3,020	(1.51)	1,500	(0.75)
Alfalfa, stemmy	4,118	(1.06)	3,080	(1.54)	2,074	(1.00)
Barley straw	6,363	(3.18)	3,667	(1.83)	24,000	(12.00)

1/ Unbracketed numbers represent pounds of each roughage that will provide the same amount of nutrients as a ton of barley. Numbers in parentheses are the ratio of the particular roughage to barley and can be used to evaluate costs. For example, if good meadow hay is selling at $30 per ton, then 1.84 x 30 = $55.20; this is the top price one should pay for a ton of barley to provide this same amount of energy.

2/ Good meadow hay is hay harvested before maturity, usually before July 20, and having a crude protein content of not less than 7.0% while everything cut after that time is classed as mature meadow hay. Naturally there will be variation in quality within each of these periods but at about this date we experience a marked decline in total protein as well as digestibility of both protein and energy.

Vitamin A supplements could be beneficial to the animals in drouth years. With such early drying and curing of range feed, the liver vitamin A stores would be expected to be low. If a low quality roughage (especially a late-cut one) is used, additional vitamin A is needed. In cases where straw is fed as the main roughage source, vitamin A should definitely be supplemented. Here again, if good green grass hay or alfalfa hay makes up a reasonable portion of the roughage, the value of additional vitamin A is questionable. If vitamin A is provided to range cattle during the winter, it should supply about 10,000 I.U. per head daily. This can be given by injection at about two-month intervals or mixed in the daily feed or salt supply. Salt intake will vary depending on the salt content of the feed, however, mature cattle usually consume about

2 pounds of salt per head per month. The value of other vitamins in ruminant feeding is questionable. This is especially true when feeding for maintenance or low levels of production. However, this is not to be construed as meaning that cattle fed for maintenance do not need a balanced ration; their requirements are less, but a good nutritional balance is just as important here as when feeding for high production.

Water may be our most important feed constituent, although it is often taken for granted. Adequate clean water should be available at all times if we are to get the most out of our feed. Water is particularly important to control intake of a supplement when salt is used. A certain amount of the energy of feed is used to maintain body heat. Fresh well water requires less feed energy to maintain body temperature than water obtained by cutting a hole through the ice. It may be economical in some cases to provide heated water to help maintain body heat.

Attention to management may provide the most economical means of wintering cattle on limited feed. Cattle separated by class (i.e., heifers, mature cows, yearlings) will make more efficient use of feed. This is even more important when the amount of feed is limited so that each animal gets its share. Also, it may be practical to separate cattle by condition so the ones in thin condition can be fed a little extra.

Supplements can be fed in several forms such as blocks, pellets, or liquids, self-fed loose with salt as a control or hand fed daily. As long as they contain the nutrients needed and intake can be controlled any method of feeding is satisfactory. Economics is the primary factor in determining the form and method of feeding. Under any system, adequate feed bunks or feeders should be available. If loose grain is hand fed, it should be fed in troughs rather than on the ground to eliminate waste. At least two feet of trough length per cow should be provided. Probably the most satisfactory and economical troughs are low flat troughs without legs. Initial cost and upkeep of these troughs is considerably lower than for those built on legs, and they do not get much more dirt in them and are easier to turn over to clean. Feeding in this manner requires more labor, but the costs of feed preparation and extra salt or other materials that might be used to regulate intake are eliminated. This feeding method also offers an excellent opportunity to observe the cattle daily for sickness or other irregularities so they may be treated before they become serious.

IV. Culling Criteria

The first concern of the livestockman is to get through drouth periods without adversely affecting long-time production. This means keeping his breeding stock and his replacement program intact. Under normal conditions, cows in the borderline area of production may be viewed somewhat leniently, but in a time of short feed a more critical look should be taken and many of the lower producing animals should be culled. The same is true of older cows. Pregnancy testing is a good method to employ in helping to eliminate older cows that will not produce a calf next year. These older cows are often bigger and actually take more feed to winter than younger or middle age cows;

records show that cows start to decline in production after reaching 9 or 10 years of age. Cows that have had serious illnesses and recovered may be more susceptible to disease under stress conditions, so they should be considered for culling. If a big reduction of breeding animals is necessary, all animals should be pregnancy tested. This should be considered along with the above factors for determining which to cull. We can expect a lower conception rate from our range cattle in drouth years than in normal years.

Replacement heifers should be selected with the usual criteria, but numbers to select may need to be considered depending on feed supply. These heifers need more feed and better nutrition than the mature herd if they are to produce, and it would be better to keep less replacements and feed them properly than to try to keep more on poorer feed. In fact, replacement heifers which cannot be fed to gain on a normal rate of growth probably should not be kept, as they will lose at least one year of production during their lifetime. Mature cows under stress conditions are more likely to produce than young heifers.

Calves and yearlings -- other than those kept for replacement -- should not be kept if feed supply is low. If animals of this type are kept, they must be fed to gain at least at their normal rate of growth. If not, a lot of feed is being used that is needed elsewhere and it is getting no return. It take 10 pounds of good meadow hay per day to maintain a 400-pound calf; twice this amount will more than maintain a mature pregnant cow during this same time. It is not economical to just maintain a 400-pound calf during the winter in times of abundant feed and certainly not during times of short feed.