Substituting Grain for Hay in Winter Rations for Beef Cows

Cooperative Extension South Dakota State University

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Substituting grain for hay in winter rations for beef cows

Cooperative Extension Service
South Dakota State University
U.S. Department of Agriculture
Substituting grain for hay in winter rations for beef cows

David Whittington and Joe Minyard
Extension beef specialists

Rations composed largely of roughages are traditionally considered to be most economical for wintering beef cows. However, substituting grain for roughage may be economically feasible, depending upon availability and the price relationships between grains and roughages. Drought tends to shift the economics toward grain, as more energy can be transported per ton of feed in this form compared to hay.

Substituting a high energy feed (grain) for a low energy feed (hay) becomes economical when cattle can be wintered to achieve the same level of production but at a lower cost. Since grain usually costs more per pound than hay, a smaller amount of grain must be fed to economically substitute for hay in such rations. This will require some system of restricted feeding.

Wintering objectives

Pregnant cows should be wintered in a way that keeps them healthy, vigorous, and able to support normal growth and development of the fetus. They should normally be fed to maintain their weight or perhaps lose a little depending on initial weight and condition going into the winter.

In wintering breeding stock, a basic question should be, "How can I provide an adequate ration at the least possible cost?" To answer this question you need to know:
1. The animal’s daily nutritive requirements.
2. The nutritive value of common feeds.
3. The substitution value of available feeds in relation to nutritive properties and cost.

Nutritive requirements

Meeting the nutrient requirements of the pregnant cow is the basic underlying objective of any type of a wintering program.

This can be done in a number of ways; therefore, economics will normally dictate the feed combinations that should be considered. However, another concern is that the nutrient availability matches the nutrient need of the cow during the various phases of pregnancy and lactation. Refer to Fact Sheet 78, "Calculating Beef Cattle Rations," to determine the relative nutrient needs of your cow herd. It is available at your county Extension office.

Substituting grain for hay

Table 1 shows the energy value of various grains compared to prairie, sorghum-sudan, alfalfa, and mixed hay. From this table you can determine the approximate feeding value of any of the grains in relation to hay.

For example, on the basis of TDN, corn grain is worth 1.9 times as much as average quality prairie hay, or one pound of corn will replace 1.9 lb of prairie hay in the wintering ration of beef cows.

Table 2 shows the price that could be paid for various grains in relation to the price of mixed hay (50% prairie hay and 50% alfalfa hay), based on the energy value of each feed.

For example, if good quality mixed hay costs $80/ton delivered, you could afford to pay up to $6.80/cwt for corn grain or $6.00/cwt for oats delivered in a ready-to-feed form. If grain can be bought for less than the value indicated in Table 2, the substitution of grain for part of the roughage in the winter ration of beef cows would be economical.

Table 1. Energy value of various grains compared to prairie, sorghum-sudan, alfalfa, and mixed hay.*

<table>
<thead>
<tr>
<th>Grain</th>
<th>Prairie hay (47% TDN)</th>
<th>Sorghum-sudan (56% TDN)</th>
<th>Alfalfa hay (60% TDN)</th>
<th>Mixed hay* (53% TDN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>90</td>
<td>1.9</td>
<td>1.6</td>
<td>1.5</td>
</tr>
<tr>
<td>Barley</td>
<td>84</td>
<td>1.8</td>
<td>1.5</td>
<td>1.4</td>
</tr>
<tr>
<td>Oats</td>
<td>77</td>
<td>1.6</td>
<td>1.4</td>
<td>1.3</td>
</tr>
<tr>
<td>Sorghum, milo 83</td>
<td>1.8</td>
<td>1.5</td>
<td>1.4</td>
<td>1.4</td>
</tr>
<tr>
<td>Wheat</td>
<td>88</td>
<td>1.9</td>
<td>1.6</td>
<td>1.5</td>
</tr>
<tr>
<td>Ear corn</td>
<td>83</td>
<td>1.8</td>
<td>1.5</td>
<td>1.4</td>
</tr>
</tbody>
</table>

*Mixed hay is equal to 50% prairie and 50% alfalfa hay.
Table 2. Comparative value of hay* and grain for wintering cows

<table>
<thead>
<tr>
<th>Hay</th>
<th>Value of grain per cwt</th>
</tr>
</thead>
<tbody>
<tr>
<td>$/ton Corn Barley Oats Sorghum Wheat Ear corn</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>$2.55</td>
</tr>
<tr>
<td>40</td>
<td>3.40</td>
</tr>
<tr>
<td>50</td>
<td>4.25</td>
</tr>
<tr>
<td>60</td>
<td>5.10</td>
</tr>
<tr>
<td>70</td>
<td>5.95</td>
</tr>
<tr>
<td>80</td>
<td>6.80</td>
</tr>
<tr>
<td>90</td>
<td>7.65</td>
</tr>
<tr>
<td>100</td>
<td>8.50</td>
</tr>
</tbody>
</table>

*Hay is mixed hay, equal to 50% prairie and 50% alfalfa hay.

The hundredweight value of the various grains in relation to the price of prairie hay, sorghum-sudan, or alfalfa hay can be calculated from the relative energy values shown in Table 1. Multiply the price per ton of the hay by the relative energy value of the grain and then divide by 20 to convert to a hundredweight basis. For example, if prairie hay costs $50/ton, the amount you could afford to pay for corn would be $50 \times \frac{1.9}{20} = $4.75/cwt.

Protein not considered

The comparative value of the various grains as shown in Tables 1 and 2 is based on estimated TDN values alone. Differences in protein content of feeds have not been considered.

When making substitutions, the higher protein grains (barley, oats, and wheat) would be worth slightly more than is indicated in Table 2, because less protein supplement would be needed, particularly if these grains are fed to younger stock requiring more protein in the diet.

Feeding problems

In view of possible feeding and management problems associated with limit-feeding a high concentrate ration, it would be advisable to substitute grain for only part of the hay or other roughage.

A minimum of \( \frac{1}{2} \) lb of hay per 100 lb of body weight is suggested when this amount can be fed without greatly increasing the winter feed cost. That is, feed cows at least 5 to 6 lb of hay per day.

During extremely cold weather or in pastures with little winter protection, this minimum allowance of hay may be increased to \( \frac{3}{4} \) lb hay per 100 lb of body weight (8 to 9 lb per day).

Because of possible digestive problems, it is suggested that wheat make up not more than one half to two thirds of the grain fed. Wheat can be mixed with oats, barley, or ground ear corn.

Unless the price of the grain dictates otherwise, the use of grains with "built-in roughage" such as barley, oats, and ear corn is advisable. These grains will likely perform most satisfactorily over a longer period of time and be less likely to cause feeding problems.

Substitution guide

To estimate total winter feed needs, the approximate amount of the various grains required to replace a ton of prairie hay, sorghum-sudan, alfalfa, or mixed hay is shown in Table 3.

How to feed grain

How you feed grain during the winter makes a difference. You have the alternative of using bunks or having the grain pelleted so you can feed on the ground. The choice should depend on labor, facilities, cost of bunks, and cost of pelleting.

A little pencil work will determine the most economical method. Should the choice be to feed in bunks, all the grains can be fed whole except milo, which should be cracked or rolled.

Feed so each animal has an equal opportunity to eat. Sorting the herd into nutritional groups will aid in limit-feeding grain. Timid, mature cows can bewintered with heifers so they can get

Table 3. The amount of various grains required to replace one ton of prairie hay, sorghum-sudan, alfalfa, or mixed hay*

<table>
<thead>
<tr>
<th>Grain needed to replace a ton of:</th>
<th>Prairie hay</th>
<th>Sorghum-sudan hay</th>
<th>Alfalfa hay</th>
<th>Mixed hay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn, lb</td>
<td>1052</td>
<td>1250</td>
<td>1333</td>
<td>1176</td>
</tr>
<tr>
<td>Barley, lb</td>
<td>1111</td>
<td>1333</td>
<td>1428</td>
<td>1250</td>
</tr>
<tr>
<td>Oats, lb</td>
<td>1250</td>
<td>1428</td>
<td>1538</td>
<td>1333</td>
</tr>
<tr>
<td>Sorghum, lb</td>
<td>1111</td>
<td>1333</td>
<td>1428</td>
<td>1250</td>
</tr>
<tr>
<td>Wheat, lb</td>
<td>1052</td>
<td>1250</td>
<td>1333</td>
<td>1176</td>
</tr>
<tr>
<td>Ear corn, lb</td>
<td>1111</td>
<td>1333</td>
<td>1428</td>
<td>1250</td>
</tr>
</tbody>
</table>

*Mixed hay is equal to 50% prairie and 50% alfalfa hay.
their daily allotment of feed. Some producers may wish to try a salt-grain mixture, self-fed. Such a system of feeding grain to breeding stock should be attempted with great caution and with special care to insure the desired intake.

Remember that the proportion of salt to grain required to control grain consumption varies according to (1) daily grain consumption desired, (2) age and weight of the animal, (3) fineness of the salt grind, (4) salinity of the water, (5) severity of weather, (6) quality and quantity of hay fed, and (7) length of the feeding period.

If this method is used, some trial and error is necessary to determine the proper ratio of salt to grain (and this will probably change during the winter). You might start by mixing one part salt to four or five parts of grain, changing the proportion of salt as needed to control intake.

**Warning:** Forced salt consumption increases water intake. **Be sure that clean, ice-free water is available at all times.**

Don't forget vitamin A and minerals

There is a good possibility that beef cows may become deficient in vitamin A before spring if their roughage is made up of winter range or old hay, or if grains make up a substantial part of the diet.

Pregnant beef cows need 25,000 to 30,000 I.U. of vitamin A per day before calving and 40,000 I.U. per day during lactation.

Vitamin A may be included in the protein or energy supplement. A practical way to supplement vitamin A is to include it in the mineral mixture. This method works well if mineral and highly stable vitamin A are mixed weekly.

Mineral consumption will vary, thus more vitamin A than is actually needed should be mixed with the mineral. Start with 1 million I.U. of Vitamin A per pound of salt before calving and 2.5 million I.U. per pound after calving.

Subcutaneous injections of vitamin A will bring liver stores up to normal. However, it is advisable to include vitamin A in the mineral or in the feed to insure adequate amounts for livestock consuming poor quality hay or high amounts of grain.

When beef cows are maintained on a limited feed of a high concentrate ration, the minerals most likely to be deficient are salt, phosphorus, and calcium.

Dry pregnant beef cows need 15-25 grams each of calcium and phosphorus per head daily, the higher level being required in late pregnancy.

In general, supplemental phosphorus will likely be needed with high roughage rations and supplemental calcium will likely be needed with high grain rations. Both may be needed with a limited feed of a high grain ration.

Salt should be provided free-choice to beef cows at all times. Salt should be iodized or trace mineral salt. The latter will provide adequate levels of all needed trace minerals.

Supplemental calcium and phosphorus should be supplied in the protein supplement or free-choice offering of a simple mineral mixture containing trace mineral salt and a source of calcium and phosphorus. Steamed bone meal, dicalcium phosphate, and defluorinated rock phosphate are acceptable sources of both calcium and phosphorus for beef cattle.

Some suggestions on substituting grain for hay

1. It is generally best to replace only part rather than all of the roughage. Feed at least one half pound of hay per 100 lb of body weight (5-6 lb). In extremely cold weather or with minimum winter protection, increase these minimum values by 50% (8-9 lb).

2. The animals should receive a balanced ration. It should provide adequate amounts of vitamins and minerals as well as protein and energy.

3. Be sure you are equipped to feed grain. Each animal needs an equal opportunity to eat.

4. Figure feed, equipment, and labor costs carefully. Be sure there is a cost advantage to the specific program you choose.

5. If wheat is used, it should make up not more than one half to two thirds of the grain portion of the ration. Mix wheat with oats, barley, or ground ear corn.

6. If practical, use those grains with "built-in roughage" such as barley, oats, or ear corn.