Limit Fed Energy Rations

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The potential of drought prompts many producers to plan alternatives for feed as roughage resources become ever more limited. Roughage is an important component for feeding ruminants however as prices rise the potential to reduce feeding costs through the use of cereal grains becomes ever more viable.

Research from Illinois and Kansas using limit fed grain rations indicated that cow performance can be equal to or superior to traditional free choice hay and silage rations. This work prompted a similar research project in the fall of 2002 (drought year) at the University of Alberta, Kinsella Ranch that evaluated the cost effectiveness of limit fed corn rations as an alternative to a full fed roughage-feeding program. The Alberta research confirmed what previous researchers had found and that limit fed – high energy rations are a viable alternative to full fed roughage rations.

Energy Value of Corn vs. Hay

In 2002, cereal grains and roughages were both in short supply, however, corn was available from the United States and was the energy source of choice. In 2002 research, corn was valued at $168 per ton delivered or $0.084 / lb, then assuming a 88% dry matter (DM) content, the value of corn was $.095 / lb. of dry matter. According to the National Research Council (NRC), corn is approximately 90% total digestible nutrients (TDN), 10% crude protein and contains 1.02 megacalories (Mcal) of net energy for maintenance (NE_m) / lb. of DM. Consequently, each Mcal of NE_m was worth $0.094.

Availability of grass hay was limited and in terms of nutrient content was lower in TDN than corn. A medium quality, grass hay for example had the following nutrient content: 89% DM, 9% crude protein (DM basis), 57% TDN (DM basis) and 0.60 Mcal/lb. Ne_m (DM basis). If the medium quality hay is priced at $150 per ton ($0.075 per lb.), the value of the hay is $0.084 per lb. of DM; each Mcal of NE_m will cost $0.14 per lb of DM.

It is evident that the hay is a more expensive energy source than corn, given these prices and nutrient values. Expressed in another way, in order for the hay to be priced the same as the corn on an energy basis, it would have needed to be priced at $112 per ton.

So How Much Concentrate Can You Feed to a Beef Cow?

Feeding diets high in concentrates to breeding females will require greater skill and discipline on the part of the manager. Acidosis, bloat, founder, etc. are always a risk. These risks can be minimized by the following management practices:

- When starting a new ration using, gradually increase the amount of grain fed over a 2-week step-up period. When, removing cattle from this diet allow for a gradual access to pasture so that the rumen has time to adjust.
- Provide plenty of feeding space to accommodate uniform consumption (at least 30 inches per cow).
- Split feeding of the grain is another alternative to reduce digestive upset
- Whole or coarsely processed grain is safer to feed compared to finely processed grain*.
- ***Note: with a minimum 0.5% of body wieght roughage source – corn was able to be fed whole without processing with little or no economic loss compared to processed corn.***
- Feeding an ionophore, such as Bovatec© or Rumensin© will help prevent acidosis and bloat.
- Feeding at the same time every day will reduce the risk of digestive upset.
- Long stemmed hay should be fed at a minimum dry matter level of 0.5% of body weight; however 0.75% of body weight is easier to manage.

Feeding less hay reduces the cost, but increases

the need for greater management intensity. Using 0.5% of body weight, a 1,200 lb. cow would need 6 lbs DM of the low quality grass hay described above, or 6.75 pounds on an as-fed basis. As the cattle and the manager adjust to the program, the amount of hay fed could be gradually reduced. Do not exceed the energy in ration above 1% of body weight (i.e. 1,200 lb cow -12 lbs on an as fed basis).

Remember that the idea is to supply a ration in a very small package that is highly concentrated in energy. Consequently, the total pounds consumed per day will be less than what the cattle are accustomed to. The cattle may act hungry for the first few days. Resist the temptation to feed more because they act hungry. Otherwise the advantages of decreased cost and/or decreased hay utilization will be negated. If straw is available, it could be fed to alleviate the issue.

An ideal feeding situation would be one where grain, hay and supplement could be placed in the bunk ahead of time. At the appropriate time of day, the cattle would be given access to the feed by simply opening the lot gate. Obviously, large square and round bales that can be fed in flakes or rolled out lend themselves better to a limit feeding system. Hay intake and even distribution among cows will be more difficult to control if fed in feeders.

Table 1 provides examples of a limit fed ration for a 1200-pound cow with average milk production and in average body condition. Corn (9% CP) is lower in crude protein (CP) than barley (12% CP), so a protein supplement was added to balance the protein requirements. A protein supplement may be required with lower amounts of barley grain. These diets require added limestone as a source of calcium to offset the high phosphorus content of corn and barley. Salt and Vitamin A should also be provided in the feed or a free choice mineral supplement.

The nutrient profile of these diets would be similar to that of a commercial 14% complete feed. The protein supplement could be mixed with the energy source, fed at a different time of the day or top dressed over the energy source at feeding time.

Table 1. Limit fed grain rations for gestating and lactating cows (1200 lbs).

Ingredient	Gestation		Early Lactation	
	(lbs/day, as fed basis)		(lbs/day, as fed basis)	
	Corn	**Barley**	**Corn**	**Barley**
Grass hay[1]	6	6	10.5	11
Barley straw[2]	4	4	--	--
Barley grain	--	10.5	--	12
Corn grain	9.5	--	12	--
Beef supplement[1]	1	--	1.5	0.5
Limestone	0.2	0.2	0.1	0.1

[1] Grass Hay – 89 % dry matter, 10% crude protein (CP), 60% Total Digestible Nutrients; Beef supplement – 32% CP.

[2] Straw has been included in this ration to add a greater fiber component than hay alone. During drought conditions hay may have low fiber levels.

Factors like weather, stage of gestation, milk production and age of animal, as well as hay quality, price and grain source must be considered in each evaluation. Balancing your ration with your feed tests will help to get things more precise.

The rations in Table 2 used 2002 feed prices and were balanced for a 1200 lb cow in late gestation, with a body condition score of three. The grass hay utilized is of medium quality with 60% TDN. Even with a protein supplement, the cows may still loose body condition over a long period.

To make sure cows have enough body condition during a drought or pasture shortage wean early in the fall. If not additional energy supplementation may be required to maintain body condition, which would further increase the cost. Limit feeding corn in combination with fair quality alfalfa hay simplifies the program by eliminating the need for added protein and calcium.

Table 2. Comparison of grass hay ration and rations supplemented with limit fed corn[1].

	Limit-Fed rations		
Ingredient	Grass Hay (lbs/day, as-fed basis)	Corn & Grass Hay (lbs/day, as-fed basis)	Corn & Alfalfa (lbs/day, as-fed basis)
Grass Hay (9% CP)	24.0	6.5	--
Barley Straw (4.5% CP)	--	4.0	4.0
Alfalfa hay (18% CP)	--	--	5.0
Corn Grain (10% CP)	--	9.0	9.5
Beef Supplement (32% CP)	--	1.0	--
Limestone	--	0.2	--
Body condition score change in 100 days	No change	No change	No change
Cost, ($/cow/day)[2]	$1.80	$1.37	$1.25

[1] Formulated for a 1200 lb cow with body condition score of 5 during the last trimester of gestation.
[2] 2002 Feed prices: grass hay $150/ton, barley straw- $40/ton, alfalfa hay $180/ton; corn- $168/ton beef supplement - $250/ton.

In Table 3, fall 2006, feed prices were used in the rations. The cost for forages, cereal grain and corn are lower than prices in 2002/2003. The 2006 prices are slightly higher than 2005 prices due to projected feed grain shortages in the United States. Barley grain is valued at $118/tonne, and has 89% dry matter, 12% crude protein, 83% TDN or 0.92 Mcal/lb NE_m (DM basis). The value of the barley ($118/2204) is $0.054 per lb of DM. Each Mcal of NEm will cost $.059 (about 6 cents) per lb of dry matter. The energy in corn (1.02 NE_m Mcal/lb of DM) in these rations costs $0.69 per lb of DM. This winter feeding barley grain provides a cheaper energy source than corn even though it has slightly less energy. About an extra half pound of barley needs to be fed than corn. The rations were balanced so that the cows would maintain condition over 100 days.

Limit feeding barley grain and grass hay plus straw, resulted in a lower cost ration ($0.86/cow/day) than corn limit fed with grass hay plus straw ($1.00) in the above rations. Limit feeding alfalfa hay and barley grain increased cost to $0.88/cow/day which was still lower than limit feeding corn and grass, or alfalfa hay and corn ($1.00/cow/day). Limit feeding a cereal grain reduces the daily feed costs and provides enough energy for the cows to maintain their body condition over 100 day period.

Monitor the cows to make sure they are not losing body condition. If the weather turns cold (below -20 Celsius) the cows will require additional energy supplementation (barley or corn) to maintain their condition. The cereal grain or corn should be increased by 10 per cent for each 10 degrees Celsius below -20^{o} Celsius to increase the energy available.
Monitoring feed prices and checking your feed rations on semi-annual or annual basis can result in significant savings and improve your profit.

Table 3. Comparison of limit fed rations using 2007 feed prices for a 1200 lb cow in good condition. [1]

	Ration 1	Ration 2	Ration 3	Ration 4	Ration 5
Ingredient ($/tonne)	Grass hay $85	Grass $85; corn $152	Grass $85; barley $118	corn $152; alfalfa $110	barley $118; alfalfa $110
Grass hay (10% CP)	24	5	6.5	--	--
Barley Straw (5% CP) ($35/tonne)	--	4	4	4	4
Alfalfa Hay (18% CP)	--		--	5.5	5.5
Corn Grain (10% CP)	--	9.0	--	9.5	--
Barley grain (12% CP)	--	--	9.5	--	10
Beef Supplement (32%CP) (250/tonne)	--	0.5	--	--	--
Limestone $85/tonne	--	0.015	0.1	--	--
Cost ($/cow/day0	$0.94	$1.00	$0.86	$1.00	$0.88

[1] Rations are formulated for a 1,200 lb cow in good condition during mid-late gestation with no condition score change in 100 days.

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If you have questions or require further assistance on this topic, call the AgInfo-Center at 310-FARM (3276)