

AGRI-FACTS

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Winter Feeding Programs for Beef Cows and Calves

Before making management decisions about feeding beef cattle and calves, producers need to answer the following questions:

- How much feed is available on the farm?
- What is the quality of the feed?
- What is the cost of purchasing feed and supplements?
- Do the cows need to gain weight during the winter?
- Are the calves going into a feedlot or back onto grass?
- What is the required weight gain from the calves?
- How will interest rates and overhead costs affect break-evens?

Plan a winter feeding program well in advance. Use the tools available to sample feed, and obtain feed test results. A balanced ration minimizes costs and improves animal performance.

Winter feeding programs for growing calves

There are basically two different types of winter feeding programs for calves.

Backgrounding rations “hold back” calves or limit weight gains to 1.25 to 1.5 pounds per day. This type of ration is appropriate for calves going back on grass or to “grow out” animals before being placed on full feed. Calves should be fed to develop a good frame to take advantage of the more economical compensatory gain. Buyers discount over-conditioned or “fleshy” calves.

Full feed rations are designed to obtain high rates of gain. This program should only be used when the calves remain

in a feedlot-type program until slaughter. Many producers now aim for a daily gain of 2.25 to 2.75 pounds for medium (500 to 800) weight calves, with gains increasing as the animal gets closer to finished weight. Large frame, well-grown calves have the ability to gain weight rapidly and still obtain acceptable grades at slaughter.

Determine costs before feeding

Know your target market before your feeding program starts. Animals not meeting the intended “target market” will be discounted.

Home-grown feed costs should be priced at fair market value.

The largest variable cost of production is feed. Shop around to reduce the costs of purchased hay, grains, supplements, minerals and vitamins. Ask for tenders from various suppliers for purchased

products. Specify volumes required and nutrient profiles for each product. Locking in a purchase price reduces your exposure to cost risk.

Are your assumptions for feed costs realistic? If your feed and yardage cost estimates are incorrect, the break-even costs are affected.

Opportunities to reduce feed costs

If alternative feedstuffs are available (by-products of the milling and brewing industries or screening-type products), consider their use to reduce feed costs. By-product feeds may not be acceptable as a complete replacement for traditional feeds, but can be included as a portion of the ration.

Establish the value of the by-product feed by comparing the nutrient content of the by-product feed against traditional feeds on a dry matter basis. Develop sample rations to establish acceptable feeding levels of the by-product feed(s)

The largest variable cost of production is feed

and traditional feeds required to meet the nutritional needs of the animal.

Damaged crops salvaged from drought or hail situations can be used in a feeding program. Cereal crops, canola or hay can all be used, but there are limitations on the total amount, depending on quality. High nitrate levels or high sulfur content in canola salvage crops must be taken into consideration when developing the ration. Testing the feed is highly recommended.

Producers should take care when considering the use of a “cure all” product in the ration. If a product appears too good to be true, it usually is. Obtain advice from a qualified nutritionist to verify promotional claims.

Some costs are constant regardless of rate of gain. Interest rates, overhead costs and utilities are there for the entire feeding period. These costs all affect the final break-even price.

Feeding losses and feeding efficiencies

The rations in this document provide recommendations for the amount of feed the animal should consume to meet individual requirements. There is no adjustment for feed wastage, inclusion of spoiled feed that is rejected by the animals or feeds that have higher than “normal” moisture content. Increasing feeding rates to compensate for waste or spoilage increases total feed costs.

What to feed and how much

Growing calves have some of the highest nutrient requirements of any animal on the farm. Use the best quality forage available as the base for the calf ration. In most cases, some grain should be included in the ration to increase the energy concentration of the diet. A protein supplement may be necessary if inadequate protein is available in the ration. If possible, feed the poorer or medium quality forages to mature pregnant cows.

Vitamin A, D and E

Vitamins should be included daily in the calf grain mix or silage and force fed if possible. If vitamins are injected, follow label information for use. Calves should receive 30,000 to 40,000 IU (International Units) of vitamin A per day, 3,000 to 4,000 IU per day of vitamin D and 200 to 300 IU per day of vitamin E.

The lower amount is recommended for light calves and for modest weight gains. Use the higher level when rapid weight gains are expected, especially for heavy calves.

Provided that the total amount of vitamin A meets the daily requirements, it can be fed daily, weekly, monthly or injected once every two or three months. It is difficult to find an injectable vitamin E product with sufficient concentration to meet a 2 to 3 month requirement.

Feeding supplemental vitamin E in the grain or silage as part of the daily ration is another option.

Minerals

Many calf rations have additional mineral supplementation provided for “insurance” purposes when feed analysis results are not available. Whenever possible, the minerals should be mixed in with the grain or in the silage. Feeding minerals free-choice is the least preferred method.

If you are feeding a considerable amount of legume forage in the ration, a 1:1 mineral supplement (containing equal parts of calcium and phosphorus) can be used. A ration based on grass hay, greenfeed or cereal silage should be supplemented with a 2:1 mineral (containing two parts of calcium to one part of phosphorus).

When a ration consists of two-thirds or more of grain, adding 1 per cent ground limestone by weight to the ration is recommended to balance the calcium:phosphorus ratio. A Fortified Trace Mineral (FTM) salt with selenium should be available free-choice, or it can be added to the grain mix.

Implants

If the calves are implanted, average daily gains could be 8 to 10 per cent higher than the target gains. The protein and mineral requirements of these calves should be increased by about 10 per cent relative to the energy content of the ration. So calves being fed ration No. 3 or 4 (see sample rations) for either of the target gains should receive an additional 0.1 kg (0.22 lb) of 32 per cent protein supplement.

Ionophores

Products such as Rumensin® and Bovatec® are registered for use as ionophores in Canada. These products change the rumen microflora and the relative amounts of volatile fatty acids produced. Acetate, butyrate, lactate and formate levels are reduced, and the relative amount of propionate produced increases during the fermentation of feed.

Increases in propionic acid production in the rumen improve overall energy utilization by the animal. The efficiency of gain is improved or the ability of the animal to obtain a larger percentage of the energy available from a lower quality (high forage) ration is improved.

When feeding a high grain ration, the effect of the ionophore is to reduce feed intake and maintain average daily average gain. In a high forage ration where minimal or no grain is fed, the total feed intake remains the same, but the average daily gain is improved. Follow label directions when feeding an ionophore.

Ionophores can be used as a coccidiosis preventative, but not as a treatment.

When formulating rations, consider the following

- The first limiting nutrient in a ration is the one that determines overall growth or production of an animal. It is of little use to supply any additional nutrient to a ration until the deficiency in the first limiting nutrient is resolved. If the problem is not clear, get assistance to help solve the problem. In many cases, energy is the first limiting nutrient in a ration.
- Roughage quality affects the needs for supplemental energy and protein. Immature forages typically contain more energy and protein than over-mature forage. Timing of cutting has a larger effect on forage quality than variety.
- In cold weather, for every 5°C below -20°C, increase the grain by about 1 kg (2.2 lb) over and above the levels the animals normally receive.
- Hay or silage in poor condition (moldy, heat damaged or rained damaged prior to harvest) reduces quality. Any form of spoilage reduces energy and protein content in the feed. If the forage has heated and smells like tobacco or is brown to dark brown, an Acid Detergent Insoluble Nitrogen (ADIN) test is required to determine the amount of protein that is tied to the fibre and is not available to the animal. In some situations, extra protein may be needed to meet animal requirements. If feeding damaged feeds, seek help to balance the rations.
- Greenfeed and cereal silage are normally lower in protein than an alfalfa grass hay or silage. Most growing rations based on greenfeed or cereal silage require supplemental protein.
- High quality legume forages, if consumed at adequate levels, can supply adequate energy and protein in a growing ration to achieve gains in excess of 1.1 lb per day, without supplemental grain.
- Grass hay is usually lower in energy and protein than mixed legume grass hay. It is usually necessary to feed grain and a protein supplement with grass hay.
- Grains high in protein (wheat, peas, lentils, chick peas) will reduce the need for a protein supplement. These high protein grains are also high energy feed and will be digested rapidly. There are limits to the amount that can be fed.

Sample rations for calves gaining 1.5 lb per day

The following sample rations have been calculated using “average values” for Alberta feeds that are free of molds, dust, foreign materials and have no rain damage. The

rations below provide the minimum nutrient requirements to take steer calves from 440 lb to 660 lb at a rate of 1.5 lb per day. At the lower end of the weight range, intake will be approximately 2 pounds less (of dry matter) than listed, and at the upper end of the weight range, intake will be approximately 2 pounds more than indicated.

The sample rations provided below use average values for feeds and may not be representative of the feeds available or on site. For optimal results, sample and test all the different feeds used, and have custom rations developed for your situation. Most feed mills have the capabilities to develop and manufacture custom supplements or minerals to meet individual needs.

It is assumed that no growth implants or feed additives are being used. A fortified trace mineral salt with selenium and vitamins A, D and E must be provided. The grain should also be rolled or coarsely ground. A temperature of -15°C (at noon) is the expected daytime high for the feeding period.

In very cold weather, feed intake will increase compared to the values stated. The average daily gain of the calves in the very cold weather may be somewhat less than the target unless more grain is supplied in the ration.

- **Ration No. 1**
5.5 kg (12.1 lb) good quality alfalfa hay
1.6 kg (3.5 lb) barley grain
- **Ration No. 2**
5 kg (11 lb) alfalfa-brome hay (50:50)
2 kg (4.4 lb) barley grain
- **Ration No. 3**
5 kg (11 lb) oats greenfeed
1.8 kg (4.0 lb) barley grain
0.45 kg (1.0 lb) 32% protein supplement
- **Ration No. 4**
11.4 kg (25.0 lb) barley silage (63% moisture)
1.8 kg (4.0 lb) barley grain
0.45 kg (1.0 lb) 32% protein supplement

A 1:1 mineral may also be provided free-choice for Rations 1 and 2, and a 2:1 mineral provided free-choice for Rations 3 and 4, although both calcium and phosphorus requirements are being met when calculated using average values for Alberta feeds in these rations.

Sample rations for calves gaining 2.5 lb per day

The following sample rations have been calculated using “average values” for Alberta feeds as above and the minimum nutrient requirements to take steer calves from 500 pounds to 800 pounds at a rate of gain of 2.5 pounds

per day. It is assumed that no growth implants or feed additives are used. A trace mineral salt with selenium and vitamins A, D and E must be provided. A temperature of -15°C (at noon) is the expected normal temperature for the feeding period.

At the lower end of the weight range, intake will be approximately 2 pounds less (of dry matter) than listed, and at the upper end of the weight range, intake will be approximately 2 pounds more than indicated.

- **Ration No. 1**
3.6 kg (8.0 lb) good quality alfalfa hay
4.7 kg (10.5 lb) barley grain
- **Ration No. 2**
3.2 kg (7 lb) alfalfa-brome hay (50:50)
5.2 kg (11.5 lb) barley grain
- **Ration No. 3**
3.2 kg (7.0 lb) oats greenfeed
4.9 kg (10.75 lb) barley grain
0.45 kg (1.0 lb) 32% protein supplement
45 grams (1.5 ounces) of ground limestone
- **Ration No. 4**
6.8 kg (15 lb) cereal silage (65% moisture)
5.0 kg (11 lb) barley grain
0.45 kg (1.0 lb) 32% protein supplement
45 grams (1.5 ounces) of ground limestone

Finishing calf rations

Vitamin E provided to finishing steers and heifers influences the color of the meat after the animal is slaughtered. Currently, there are no incentives or premiums paid for animals fed additional vitamin E prior to slaughter.

Winter feeding programs for cows

Cow body condition influences feeding requirements

Cow body condition in late fall or early winter has a major impact on the total amount and quality of feed required. Cows in thin condition in the fall must gain weight throughout the winter to be able to deliver a live healthy calf, provide adequate amounts of milk, become pregnant and produce a calf the following year.

To improve cow body condition prior to calving requires a ration of high quality forage combined with some grain. The total amount of feed required to overwinter a thin cow is significantly higher than for an animal in good condition.

Divide the herd into different feeding groups

Whenever rations contain low quality hay, greenfeed or straw, or if the amount of feed offered is closely controlled, divide the herd into separate feeding groups. Nutritional requirements for bred heifers, first and second-calf heifers, thin cows, old cows and cows in good condition are all different. In these situations, feed testing and providing a balanced ration to meet each group's needs becomes more important.

Younger mature cows in good condition require the least amount of care to get them through the winter. A maintenance ration will meet their requirements.

Heifers or first and second-calf cows require a higher quality ration. These animals are still growing and do not have the intake capacity of mature animals. These younger animals often have difficulty competing with the mature cows for time at the feed bunk or feeder. If extra feed is provided, the older cows typically consume too much feed and become too fat. Most heifer rations contain a better quality hay or more supplemental grain than a ration for mature cows.

Thin or old cows and timid cows do not compete well for feed against more aggressive mature cows. These cows are no different than the heifers or first-calf cows and require a higher quality ration to get through the winter.

If cows cannot be divided into three groups, combine the heifers and the old, thin cows in one group. The extra effort put into the feeding program is often rewarded in improved reproductive performance next breeding season.

Using low quality forages or feeds for wintering cow rations

Cows in good body condition can be fed poorer quality hay or a straw-grain ration for most of the gestation period. This program could provide significant savings over the winter feeding period.

Mixing straw with medium to good quality hay, grain and in some situations, a protein supplement to provide a balanced ration is possible.

The nutritional quality of straw can vary greatly. Pea and lentil straw generally contain more protein than a cereal (oat, barley or wheat) straw. Unfortunately, energy levels in pea straw are lower than cereal straws, limiting the use in rations. Testing is necessary to establish the quality of any straw.

The voluntary consumption of straw is directly related to the fibre component in the straw. Cows have a higher voluntary intake of barley and oat straw over wheat straw, but intake of all cereal straws will be lower than for pea or lentil straw. Canola straw is a feed that is gaining popularity for use as part of a pregnant cow ration.

Cows are able to consume a limited amount of straw per day without adversely affecting total feed intake. A cow should not be expected to consume straw at rates higher than 1.25 to 1.5 per cent of body weight per day. When feeding straw at higher levels, the daily feeding of additional grain and a protein supplement are required. Mineral, trace minerals and vitamin supplementation programs are different from that of a traditional mixed hay ration.

If the total amount of feed provided to the animals is not increased in winter, the only additional feed available is bedding straw. Straw is a high fibre, low protein, low energy feed that is difficult to digest. Processing straw and poor quality forages using a hammer mill or tub grinder improves total intake, but increases the potential for impaction. When temperatures drop to the -20°C to -25°C range, a higher voluntary intake of straw reduces the overall energy and protein concentration in the diet, causing impaction.

When feeding low quality feeds, watch carefully for sudden drops in temperature

In cold weather, the animals' energy requirements increase, the amount of feed consumed increases, and feed passage (through the cattles' digestive system) is more rapid than in warm conditions. Use a grain to add energy to the ration.

Feeding an additional 1 to 2 pounds of grain per head per day for every 10°C drop in temperature below -20°C improves energy levels in the diet to meet higher energy requirements. An additional 0.5 to 1.0 pounds of protein supplement may also be needed depending on the voluntary increase in straw consumption. The protein level in the ration should be maintained or kept at a constant percentage when colder temperatures occur.

Minerals and salts

Most winter feeding programs for cows require supplemental minerals, vitamins and salt. A fortified trace mineralized salt with selenium (non-medicated) should be available on a free-choice basis.

If the rations are mainly a legume or mixed legume-grass hay, the ration should be supplemented with a mineral supplement containing equal parts of calcium and phosphorus. Cattle find some mineral formulations less desirable and typically do not consume them well. Mixing the salt and minerals together or purchasing a product that has pre-mixed the salt and minerals improves overall voluntary intake.

When rations are mainly a greenfeed, cereal silage or a straw-grain mixture, the ration should be supplemented with a mineral containing two parts of calcium and one part of phosphorus. In many situations, the addition of

2 to 3 ounces of limestone per head per day may also be required to improve and balance the calcium:phosphorus ratio.

Post-calving requirements for supplemental minerals increases by 25 to 40 per cent depending on the amount of milk the cow is able to produce and the type of ration being fed. After calving, a mineral supplement containing equal parts of calcium and phosphorus is normally the most suitable if a legume hay or legume-grass hay ration is provided. If a grain is being fed at this time, the mineral should be mixed with the grain because cows will not usually consume a sufficient amount of mineral free-choice.

Vitamins

Vitamins A, D and E are essential fat soluble vitamins. Animals require vitamins to metabolize and utilize nutrients as well as to initiate and control metabolic processes.

Actively growing young plants provide vitamins A, D and E when consumed by ruminants. As the forage matures, vitamin levels first increase, then decrease and eventually drop to zero (Table 1).

Table 1. Vitamin levels change as forages mature

Vitamin	Alfalfa stage of active growth			
	Early vegetative	Early bloom	Mid bloom	Late bloom
	IU/kg			
Vitamin A	80,000	56,000	46,000	26,000
Vitamin D	0	0	2,000	11,000
Vitamin E	0	0	1,000	11,000

National Research Council, Nutrient Requirements of Cattle, Update 2000, page 194-195

After forages are harvested, any remaining vitamin precursors oxidize and are not available to the animal. To be safe, supply 100 per cent of the vitamin requirements to the cattle during the entire winter feeding program.

Beef cows require 40,000 IU to 60,000 IU of vitamin A daily prior to calving. After calving, the requirements increase to 60,000 to 70,000 IU of vitamin A daily. As milk production increases, the vitamin A requirement increases as well.

Vitamin D requirements are 10 per cent of the vitamin A level. Most vitamin products and supplements typically supply the vitamin A and D in appropriate ratios.

Vitamin E is required for proper immune system function and reproduction, and it helps maintain efficient animal growth. Feed 200 to 300 IU/day pre-calving and 300 to 500 IU/day post-calving to beef cows and first-calf heifers.

Sample rations for cows

The following sample rations have been calculated using “average values” for Alberta feeds and are designed to meet the needs of 1,300 lb mature pregnant (mid to late term) beef cow gaining 0.25 lb per day under normal winter conditions in Alberta. The weight gain for the cow is above what is required for normal development of the fetus, membranes and fluids during gestation.

Ration 1 is a typical ration used for a cow in good condition. The same type of ration is shown in Ration 1A, but is for a cow in poor body condition. The two rations provide a comparison and demonstrate the changes required to provide a higher quality ration needed to increase weight gain and improve body condition prior to calving.

These rations should contain adequate amounts of energy and protein, but will require mineral and vitamin supplementation. A feed analysis is recommended, so producers can formulate the ration to meet cow requirements. In very cold weather, additional feed would be needed for the cow to maintain body condition and to continue to gain weight.

- **Ration No. 1 (mature cow in good condition – score 3)**
9 kg (20 lb) grass hay
5 kg (11 lb) straw
45 grams (1.6 ounces) 2:1 mineral (19:9 or higher)
- **Ration No. 1 A (mature cow in poor condition – score 1.5)**
10 kg (22 pounds) grass hay
2.3 kg (5 pounds) oat or barley straw
1.8 kg (4 pounds) barley grain
- **Ration No. 2**
9 kg (19.8 lb) alfalfa-brome hay (50:50)
4.5 kg (10 pounds) oat or barley straw
10 grams of 2:1 mineral
- **Ration No. 3**
4.5 kg (10.0 lb) good quality barley or oat straw
9 kg (19.8 lb) good quality alfalfa
70 grams of 1:1 mineral

- **Ration No. 4**
8.6 kg (190 lb) good quality barley or oat straw
5.5 kg (12.0 lb) oats or barley grain
0.45 kg (1.0 lb) 32% protein supplement
- **Ration No. 5**
4 kg (8.8 lb) grass hay
5.4 kg (12.0 lb) good quality barley or oat straw
3.6 kg (8.0 lb) oats or barley grain
50 grams (1.75 ounces) of limestone
- **Ration No. 6**
14.0 kg (31.0 lb) good quality greenfeed
9 pounds straw
50 grams (1.75 ounces) of limestone
- **Ration No. 7**
25 kg (55 lb) barley silage (60% moisture)
2.3 kg (5 pounds) straw
50 grams (1.75 ounces) of limestone.

These rations do not make allowance for feed wastage.

Increase the amount of feed offered to compensate for the feed that is not consumed by animals.

Six weeks prior to calving the “pounds” of feed provided should be increased by about 15 per cent to reflect the animals’ increased requirements.

Feed intake after calving increases by about 10 per cent compared to a late pregnancy ration. A cow producing 10 kg (22 lb) of milk should receive 25 per cent more energy in the ration than what was in the pre-calving ration. Some of the forage or roughage must be removed from the ration and replaced with additional grain. **Straw should not be included in an after-calving ration.**

Evaluate the feeding program

The sample rations above are guidelines and should be treated as such. Changes in weather, feed quality, individual animal appetite or the animals’ ability to compete for feed influence nutrients required and obtained. Evaluate animals on a regular basis. Condition scoring the brood cows and periodic weighing of feeder cattle determines if cattle are performing as expected using these guidelines.

Substitutions for sample rations

Note: These substitutions are not exactly equivalent on an energy or protein basis (i.e. there may be slight overfeeding in some cases). Therefore, these substitutions should not be reversed (Table 2).

Table 2. Possible substitutions for sample rations	
Ration Component	Possible Substitute
From:	To:
4.5 kg (10 lb) barley grain	5.0 kg (11 lb) oats grain
5.0 kg (11 lb) alfalfa hay	3.0 kg (6.6 lb) barley grain plus 1.4 kg (3 lb) of a 32% protein supplement
5.0 kg (11 lb) alfalfa hay	4.0 kg (8.8 lb) grass hay plus 1.3 kg (2.9 lb) of a 32% protein supplement
5.0 kg (11 lb) grass hay	3.0 kg (6.6 lb) barley grain
1.0 kg (2.2 lb) of a 32% protein supplement	2.0 kg (4.4 lb) excellent quality alfalfa or 2.0 kg (4.4 lb) dehy alfalfa
1 kg (2.2 lb) cereal greenfeed	2.4 kg (5.3 lb) cereal silage

Reference: National Research Council. 2000. Nutrient Requirements of Beef Cattle. Seventh Revised Edition. National Academy Press. Washington. D. C.

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