

# Producing Forage Finished Beef in Manitoba

*Prepared by the Manitoba Forage Council,  
with support from Greencover Canada, MRAC and  
Manitoba Agriculture, Food & Rural Initiatives.*

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ADVANCING CANADIAN AGRICULTURE AND AGRI-FOOD



Manitoba Agriculture, Food and Rural Initiatives

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## References:

- 1) Manitoba Forage Council Website: [www.mbforagecouncil.mb.ca](http://www.mbforagecouncil.mb.ca)
- 2) Forage Beef Website: [www.foragebeef.ca](http://www.foragebeef.ca)
- 3) Eat Wild by Jo Robinson: [www.eatwild.com](http://www.eatwild.com)
- 4) Grassfed to Finish by Allan Nation
- 5) Grass-Fed Cattle by Julius Ruechel
- 6) Beef Today, March, 1998. Can grass-fed beef compete? By Raylene Nickel.  
<http://attra.ncat.org/attra-pub/beefmark.html#part2>

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# Producing Forage Finished Beef

Finishing beef cattle on forage was a common practice prior to World War II. However, after the war, technological advances and land clearing practices resulted in the production of surplus grain on farms. The excess product was readily incorporated into livestock operations and has been in practice ever since. Today's method of finishing beef on forage now includes new herd and forage management strategies to produce an excellent end product.

“Forage finished beef” is meat that has been produced by feeding beef cattle a diet of high quality forage from start to finish. Grain is not utilized at all during this process. The end product is high quality meat that can be equivalent to grain finished beef. The meat has a fat and marbling level consistent with grain fed beef, however, unlike grain fed beef it contains a high level of omega-3 and conjugated linoleic acid (CLA), two components reputed to have significant health benefits.

Both feedlot and forage finished beef require careful management. Livestock finished in a feedlot environment are managed to ensure optimal health, marbling qualities and weight gain and forage finished beef is produced by managing the forage production and grazing. A forage finished system also requires a strong focus on genetics, forage quality and animal health to achieve a consistent weight gain throughout the animal's 18 – 20 month life span.

At this time, forage finished beef is still considered a niche market. However, health issues resulting from North America's aging population and growing obesity rate are stimulating consumers to choose healthy products. This presents an excellent opportunity for Manitoba forage and livestock producers to create and promote a product rich in omega-3 and conjugated linoleic acid.

CLA's have been shown to have positive health benefits including the suppression of cancerous tumors and the ability to moderate body weight, body composition, glucose metabolism and the immune system. Clinical trials have also demonstrated the heart health benefits of omega-3 and are regularly promoted in eggs and margarine in today's market.

Environmental benefits are another factor spurring interest in forage finished beef. Forage finished animals in Manitoba have the potential to spend the majority of their life on pasture rather than a feedlot. Raising and finishing cattle on pasture distributes the manure over a larger land base reducing manure clean-up costs and the risk of runoff from areas of concentration. Grazing techniques such as swath and bale grazing are now being incorporated into farm operations to extend the grazing season.

Producers interested in marketing forage finished animals must adhere to the regulations for the “Natural Beef” market. This protocol prohibits the use of implants, antibiotics or feed products of a non-forage nature. A sample of an existing protocol is provided in Chapter 4.

This booklet shows some practices that can be employed to produce forage finished beef on your farm as well as some suggestions for marketing the end product.

**“Forage finished beef” is meat that has been produced by feeding cattle high quality forage from start to finish.**

## 2. Cattle Nutritional Phases

There are three distinct nutritional phases in the life of the animal and the feed requirements are different for each.

### Phase 1: Cow/calf

High quality forage is critical to animal performance. If high quality forage is **not** available, the calves can be left on the cow until late winter/early spring. The small amount of milk the calf receives helps it maintain a consistent rate of gain, however, the calf may now need to be pastured and over wintered a second time to achieve a proper finish. This may have an impact on profitability. Calves born in May or June should be weaned at approximately 450 lbs. in mid-late fall and should be fed high quality forage over the winter.

### Phase 2: Feeder

This is the growing phase, usually after the calf has been weaned, where the animal develops muscle and bone structure. It is very important to ensure the availability of high quality forage (high in protein and energy) for the weaned calf. The diet should provide a rate of gain of 1.5 to 2 lbs. per day. When cattle reach 65% of their mature weight they begin to develop intra-muscular cells where marbling (intra-muscular fat) will be deposited. Consistent weight gain is critical at this stage and compensatory gains are not recommended for a forage finished operation.

Calves are weaned in late fall and fed stored forage (alfalfa/grass) with a relative feed value (RFV) of 130 – 150. Target weight gains should be 1.5 to 2.0 lbs. per day for a spring weight of 750 - 800 lbs. Supplementing the animals in spring with high quality hay at pasture turn out reduces any weight loss in the transition to the high quality but usually low dry matter pasture.

***You will not be able to fatten beef on cow/calf quality pasture – they need high quality forage***

### Phase 3: Finishing

This is the phase where the fat and marbling occurs in the animal. This is usually when the animal nears maturity which is why smaller, early maturing cattle are often utilized in forage finishing systems. To facilitate this process, a proper ratio of energy to protein is required in the forage. It is recommended that the ratio between crude protein (CP) and total digestible nutrients (TDN) in any feed be as close to 0.2 to maximize feed utilization and maintain weight gain. High energy forages with a lower protein level are essential in this phase. Protein levels above 18% are detrimental to the finishing process as the animal is now using energy to remove the surplus protein rather than to lay down fat.

It is very difficult to utilize mature forages in the finishing stage because of the lower energy level. First growth forages and some high energy annual forage are the preferred choice. Animal gains must be in excess of 1.8 lbs. per day for at least 60 days prior to slaughter for sufficient fat deposit (marbling) to occur. Check your pasture quality on a regular basis.

Forage quality must be monitored consistently. The pasture (what the animals are eating) should be tested every three weeks during the growing season (May, June, July, August), monthly when on pasture during the non-growing season (September, October, November), and monthly during the non-grazing period. The use of a nutritionist to help plan the feeding program is highly recommended so that you achieve your performance goals.

A forage finished animal can achieve the desired finish by grazing high quality vegetative pasture in spring and into the early summer. Good grazing management using a rest recovery system will maintain high quality forage during the grazing season provided there is sufficient moisture and good growing conditions (temperatures below 30 degrees C). However, they should be moved from the perennial pasture if the quality drops (when grasses reach boot stage or early seed) to higher quality forages which may include annuals. Annual forages such as vegetative (immature) corn, Italian ryegrass or forage soybeans, are some of the high energy forages that can be used.

## 3. Key Elements of a Forage Finished Beef System

Producing excellent quality forage finished beef requires the incorporation of these following elements in the operation.

### **i) High Quality Forage Production and Management**

- \* Manage the forage to produce an average daily gain of 1.5 to 2.0 lbs. per day from birth to finish weight.

### **ii) Animal Genetics**

- \* Select offspring from cows that have a mature weight of 1,000 to 1,100 lbs. (medium frame). Generally steers will finish 100 lbs. heavier than their maternal dam and heifers will finish 100 lbs. lighter. Target a finished weight of approximately 900 – 1,100 lbs. depending on the breed and frame size. This means – weigh your cow herd!

### **iii) Slaughter Age**

- \* Plan to market animals between 18-20 months of age at a finished (mature) weight of 1,000 to 1,200 lbs. Consistent meat quality may be more difficult to achieve in animals over 24 months of age.

### **iv) Animal Management**

There are several factors that affect the meat flavour and tenderness so you must:

- \* Achieve consistent weight gain as any weight loss periods during the animal's life will result in tough beef.
- \* Use low stress handling systems and techniques during growth and slaughter to ensure excellent meat quality.
- \* Use ultrasound technology at weaning and prior to marketing to select animals with the required degree of marbling and finish.
- \* If selling direct to consumer, use a 14-day dry aging system, and cool slower than traditional beef.

### **v) Grazing Management**

- \* Use high quality pasture species and manage the regrowth using a rest recovery system to maintain high quality forage.
- \* Manage the stocking rate & stock density to maximize animal performance for growing animals (e.g. leader follower groups of feeders & finishing animals and cow/calf pairs).
- \* Use high energy annuals in the grazing system to supplement any lower quality perennial forage production.
- \* Use extended grazing technology; have animals harvest their own forage to reduce production costs.



## vi) Harvesting & Storing Quality Forage

- \* Harvest surplus high quality forages from pasture for later use.
- \* For high quality stored forage, harvest at the early bud or boot stage and use a silage or dry hay system to preserve quality.
- \* Store in a system to retain feed quality.
- \* Feed test to determine the suitability of the feed for dry cows (RFV 100), feeders (RFV 130-150), finishing (RFV 150+).

## vii) Winter Forage Feeding

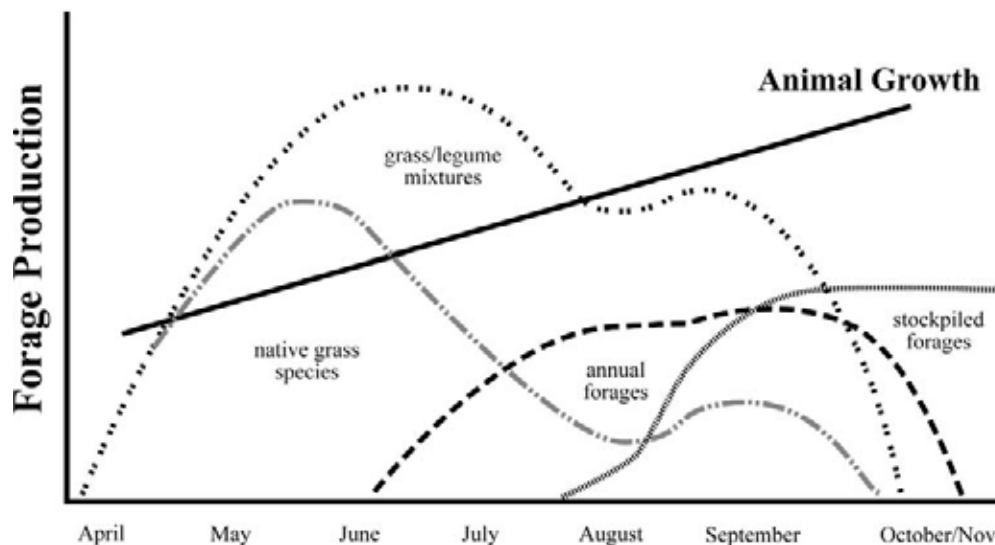
- \* Early planning is required to develop plans for extended fall feeding systems requirements.
- \* Seed annuals at the appropriate time to extend the grazing season.
- \* Plan grazing systems to retain specific areas for extended grazing (stockpile in early August for fall grazing).
- \* Feed test all forages prior to grazing to determine the nutritional value for the stage of animal growth.
- \* Utilize lower value forages such as crop residue for dry cows.

*The following pages provide further detail on the key elements required to develop an excellent product.*

## i) High Quality Forage Production and Management

One way to maintain a consistent weight gain is to develop a forage chain that includes a combination of high quality forages for grazing or storing. The goal is to achieve an average daily gain of 1.5 to 2.0 lbs. from birth to market (18 to 20 months) from high quality forage.

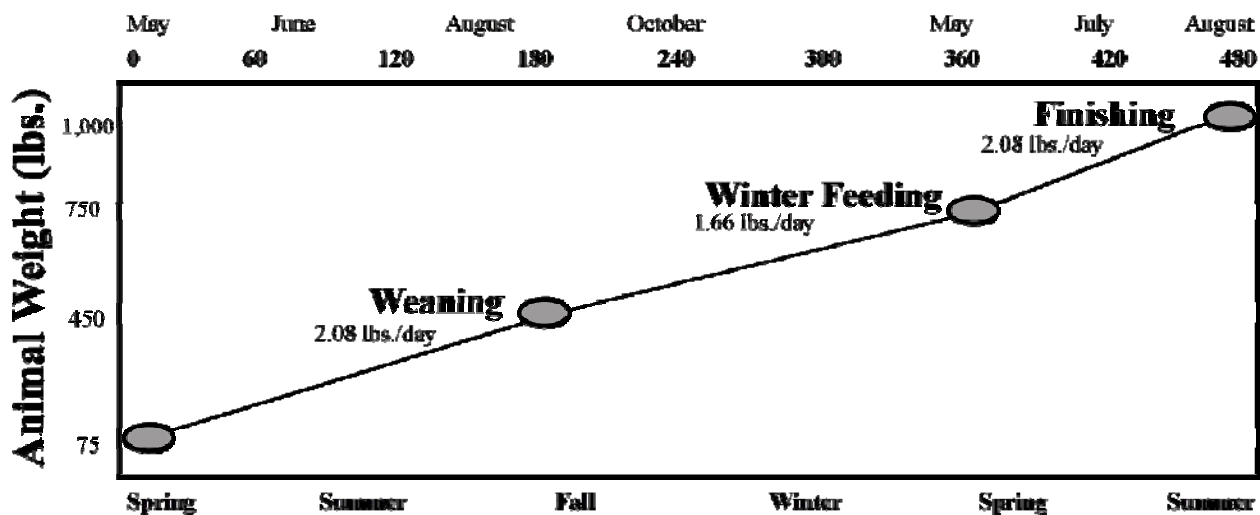
### Seasonal Distribution of Pasture Options



In Manitoba, early spring forage growth is high quality. Since most native species do not have the same sustained production and quality as many seeded species, a complementary system involving a combination of the two is frequently used. Using annual forages and stockpiled perennials extends the Manitoba grazing season.

## *Forage and Pasture Management Schedule*

### **Forage Chain Options - Birth to Finish**



### **Pastures**

Periods	Management	Weights
Spring	Calf born in May-June	Birth weight—75 lbs.
Summer	Cow/calf on good quality pasture – seeded grass/legume or native pasture if quality is high	
Fall	Calf weaned on pasture	Fall weight—450 lbs.
Winter	Use of high quality forage – RFV 125-150 to provide gains of 1.50 to 2.00 lbs. per day	Spring weight—750-800 lbs.
Spring-early Summer	Alfalfa/grass pastures – very high quality – 50% legume	
Summer	Finishing forages such as grazing corn or other annuals	Finish weight—1,000 lbs.



Pasture management is an integral part of your system. The following suggestions pertain to the seeding and management of your perennial and native pastures as well as annual forages such as soybeans, corn and Italian rye grass.

## **A) Perennial Pastures**

### **Grass/legume pastures**

- \* In the finishing period, 70% of the animal's weight gain will come from the alfalfa. Animals will often select the alfalfa in the morning and grass in the afternoon as the carbohydrates (sugars) in the grasses are the highest at that time.
- \* Alfalfa should be 30% to 50% of the pasture with high quality grasses such as meadow brome, orchard or tall fescue making the balance. Pastures with a low alfalfa percentage should not be used in the finishing phase, but they can be used in the cow/calf phase. The pasture should be renovated when the alfalfa percentage drops to 25% or less.
- \* Grass and legumes accumulate carbohydrates (sugars) during photosynthesis, therefore, carbohydrate levels are the highest at mid-late afternoon. At night, the cycle reverses and the plants begin consuming a portion of the energy stored that day (called respiration). Alfalfa will have the highest concentration of nutrients, most importantly protein, in the morning. Grasses will have the highest concentration of carbohydrates in the mid-late afternoon.
- \* Reduce bloat by grazing alfalfa after the bud stage and as this is when the alfalfa is in the slower growing phase (dark green leaves).
- \* Move animals to a new paddock in the afternoon after the dew has evaporated.
- \* Swathing the alfalfa and having the animals graze the swath reduces the incidence of bloat because the animals are forced to consume the entire plant and cannot selectively graze the leaves.
- \* The rest period for an alfalfa/grass pasture should be approximately 30 days depending on the rate of regrowth. Alfalfa regrowth is initiated when as little as one third of the plant is grazed off. There should be sufficient time for the plant to recover after grazing.
- \* During the fast growth periods (June), the pasture has a quicker recovery time, therefore a shorter resting period is required. When pasture growth is slow (July-August), the pasture needs a longer rest period. So, "Fast Growth – Short Rest Period: Slow Growth – Longer Rest Period" is the guideline.

**Fast growth = Short rest period;  
Slow growth = Long rest period**

***Use a pasture stick to estimate the height to start and stop grazing.***

### **Native Pastures**

- \* Very high quality forage may be available in an unimproved or native pasture if it is in the vegetative stage (e.g. the first growth and regrowth stages). However, regrowth is usually slower for seeded or tame forages. Also, the total yield of native pastures is usually lower than seeded pastures. Complementary grazing systems use native and tame forages and graze at each forage's optimum stage.
- \* Unimproved pastures are usually more suited to the cow/calf phase and not the feeder or finishing phase due to the lower quality and dry matter yield.
- \* Monitor the forage nutritional level of the pasture to determine the suitability of the feed for your livestock.

## **B) Annual Forages**

- \* Annual forage as a grazed crop is often used to supplement lower quality perennial pastures and provide higher energy forage during the finishing phase.
- \* Do not graze annual cereals too early as it creates protein/energy imbalances due to the high moisture content of the forage.
- \* Delay the entry of animals on annual pastures - wait until growth is 6 to 8 inches high.
- \* Both cool season and warm season annuals can be incorporated into your grazing operation.

### **Cool Season Annuals**

- \* *Oats, barley, fall rye, winter triticale, annual ryegrasses (Italian types) and brassicas can be used in Manitoba.*
- \* Seed the forage so it will be at the ideal grazing height (usually 6 to 8 inches) when needed.
- \* A combination of a spring cereal such as barley or oats and a winter cereal such as fall rye or winter triticale can be seeded in the spring. The spring cereal may be grazed first or harvested as stored forage; the winter cereal may be grazed in mid-late summer.
- \* Another option is to have the finishing animals graze the annual cereal and have the regrowth or winter annuals fall-swath grazed or grazed by the cow/calf herd.
- \* Italian ryegrass selections are some of the highest energy grasses available (best balance of protein and energy) and can result in excellent gains for weaned calves in the fall or for finishing animals on pasture. These need to be seeded early with adequate moisture and fertility and are more suited to the higher moisture areas of Manitoba.
- \* Other high-energy crops include brassicas such as: forage turnips, forage rape and kale. These are generally used for fall grazing for either weaned calves or cow/calf units. Assess the nitrate level in these feeds after frost and alter your grazing management. Some research and experience suggests that brassica crops may negatively affect the meat flavour if used for finishing animals so they should not be used three weeks prior to processing.

### **Warm Season Annuals**

- \* *Green leaf corn* has potential for grazing in Manitoba, particularly as a finishing crop for market animals. Animal gains during the finishing period of 2.0 to 2.8 lbs. per day are possible for medium frame British beef breeds.
- \* Open pollinated varieties are more drought tolerant and digestible than hybrids, however, high producing hybrid silage varieties are suitable if grazed early.
- \* Use higher seeding rates than used for grain or silage crops to reduce the stalk size and improve palatability.
- \* The objective is to graze the leafy portion of the crop rather than the mature plant. Since corn matures very quickly and can easily become too mature for the livestock, it is best to plant on three different dates (15 days apart) to extend the grazing period.
- \* Strip-graze when the plant is approximately 4 ft. tall and before tasselling (flowering). Let the finishing cattle graze the leaves (approximately 50% of the plant), and leave the stalks for the following cow herd to clean up.
- \* Use a high stock density when grazing corn. Stockers weighing 750 lbs. will consume 25 lbs. of dry matter per day. Estimate the amount of dry matter in the field and calculate the number of head required to consume a one to two day crop. Moving animals on a daily basis is preferable to longer grazing periods, however, two-day moves are often used. Go to <http://www.gov.mb.ca/agriculture/crops/forages/bjc01s02.html> to see how to determine your dry matter.
- \* Corn grazing should be the final finishing feed. Animals should not be returned to a lower energy crop such as perennial pasture as this will result in weight loss and reduced meat quality. Plan your feed allowances carefully.

- \* Sorghums and the sorghum/sudan grass hybrids are also a good alternative for Manitoba, particularly if low moisture conditions occur.

### ***Forage Soybeans***

- \* *Forage soybeans* are another option for grazing. They are not as high in energy as corn, therefore the animal gains expected are slightly less – from 1.8 to 2.3 lbs. per day. This legume plant is more drought tolerant than many other crops and has the potential for mid-summer finishing. If planted during the first week in May it can be first grazed in 45 to 50 days. Grazing regrowth is possible after a 35-day recovery period – depending on moisture and heat.
- \* The seeding rate for grazing soybeans is 20 to 25% higher than for grain production. Use narrow rows.
- \* Begin grazing when the plant is 20 to 40 inches high. Regrowth is from auxiliary buds, therefore, heavy grazing should be avoided if regrowth is desired. Animals will select the leaves but will also remove the pods and stems.
- \* Soybeans can be used in mid-summer when most cool season forages have reduced growth due to heat.
- \* Soybeans complement a corn grazing system very well – you can graze corn one day and soybeans the next.

## **ii) Animal Genetics**

Good forage converting genetics are essential – fast maturing animals that will marble on high quality forage is the goal. Not all animals in your current herd will be suitable for forage finishing so it may take some time to develop the genetics to meet this market.

- \* Select medium frame animals that have the genetic potential for early maturity and early finishing. For example, heifers should be cycling at 10 months.
- \* Smaller animals provide smaller meat cuts and are often preferred for direct marketing. A 1,000 lb. cow can wean 50% of its body weight compared to a 1500 lb. cow that weans 41% of its body weight. Smaller cows generally have a 10% greater reproductive efficiency, cost less to produce and produce more beef per acre than the larger cow.
- \* British breeds such as Hereford, Angus, Shorthorn, Gelbvieh or Red Devon are often used to obtain a predictable animal with the desired meat and growth characteristics. This is often much easier to do with a straight (line) bred animal than a cross bred one; however cross-breeding will result in the expression of hybrid vigor.
- \* If you are using cross breeding to maximize growth rates, market all the cross-bred calves and develop a separate breeding program for your herd replacements. This way you can retain a more predictable herd.
- \* Hereford x Angus cross (Black Baldies) have been a popular cross for many forage finishing programs.
- \* Select calves from highly fertile cows with mature weights of 1,000 – 1,100 lbs. The steers from these cows will mature at 100 lbs. heavier than the dam and the heifers 100 lbs. lighter than the dam.
- \* Heifers are usually the preferred animal for graziers just starting forage finishing as they mature and finish at a lighter weight than the steers.
- \* When selecting herd replacements look for cows and bulls with big rumps, a body depth longer than the legs, strong muscling of the upper legs, and a wide mouth and large nostrils



*“Lack of  
planning  
is  
planning  
to  
fail!”*

to facilitate forage intake. Cattle with a long body length are often rejected as they tend to be high maintenance.

- \* Avoid nervous, high maintenance, hard-to-finish animals as their temperament will result in tough, poor tasting meat.
- \* Individual animal records are essential for animal selection.
- \* Heat stress is less in animals with a light, glossy hair coat that reflects sunlight (white, yellow, or light brown). Good winter hair is essential for warmth but must be shed early.
- \* Thick, loose hides repel flies and are more resistant to heat than thin skin breeds. These breeds have the thickest hides: Red Devon (8.15mm), Hereford (6.77 mm), Friesen (6.08 mm), Angus (5.75 mm). Short thick hair is also more resistant to flies.

### **iii) Slaughter Age**

- \* In Manitoba, with access to high quality forage and sound animal genetics, it is possible to finish and market animals between 18-20 months of age at a finished weight of 1,000 to 1,100 lbs.
- \* Animal weight gains must be continuous throughout the life of the animal – slower gains may result in animals being fed over a second winter.
- \* It is generally observed that animals over 24 months of age have inconsistent meat quality, however, they can still produce good eating meat.

### **iv) Animal Management Tips**

- \* Calving in May or early June reduces the over-wintering cost of the cow.
- \* Spaying heifers shortens the finishing period and results in a calmer animal that fattens easier.
- \* Weigh animals every 30 to 60 days to determine performance - those gaining less than 1.5 lbs. per day should be dropped from the program.
- \* Breed in August or September to avoid having the cow pregnant during the hot summer period and for later spring calving.
- \* Fall calving animals will also do well under this system.
- \* Weaning can be early if high quality forage is available. Later weaning is often used if the cow has sufficient milking ability. The extra high protein from the milk is an excellent supplement if lower quality forage is used for wintering the calf. Compensatory gain on the spring pasture can make up for some weight gain losses during the wintering period, however, it is important to keep the weight gain consistent until slaughter.
- \* A low stress handling system is required to keep the animals docile and is essential in the development of quality meat. Curved handling chutes, pasture corrals with catch pens, crowding fences and gentle moving techniques should be used.
- \* Winter feeding systems that utilize wind fences, adequate bedding or fresh snow and quality watering systems reduce energy loss and increase feed efficiency.

### **v) Grazing Management**

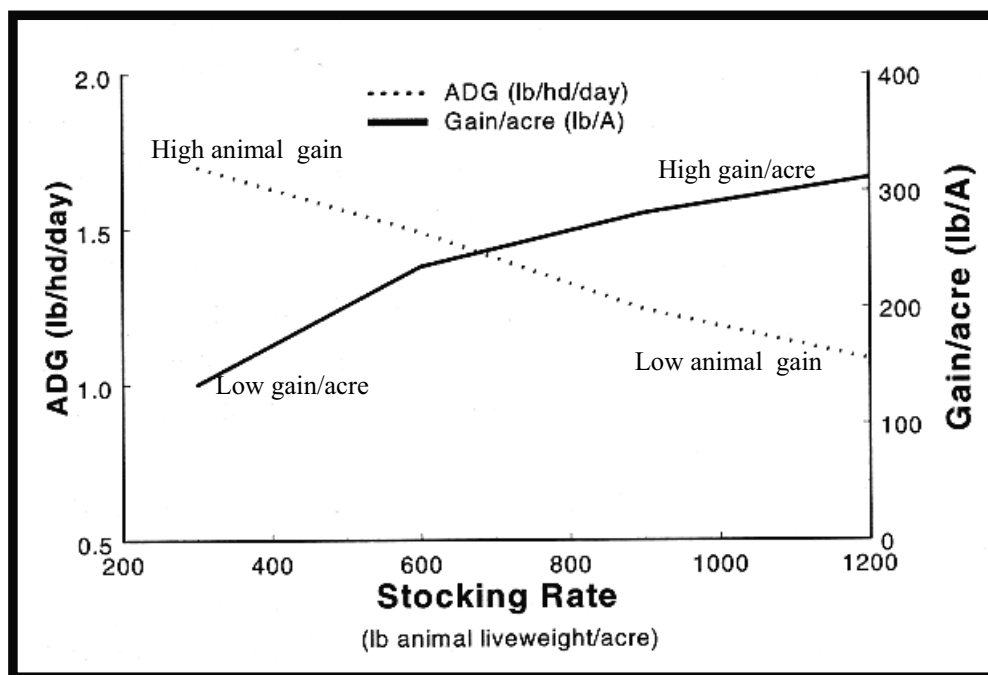
- \* Sketch or have an aerial photo taken of your existing forage operation. Include all types of forage, (tame and native pastures) and any cultivated areas that can be seeded to annual forages. Take photos of key areas with a permanent landmark in the picture so you can monitor the progress of your grasslands in future years (have a boulder or tree in your picture).
- \* Examine each paddock and note the forage species, weed types and any grazing or production limitations such as hilltops, saline land, sloughs, permanent roads, etc. Pasture assessment tools are available at your local Manitoba Agriculture, Food & Rural Initiatives office.

## ***Develop a Plan***

- \* There is no “right” number of paddocks, however, higher numbers offer greater control of the grazing system.
- \* Many grazing systems consist of 8-10 permanent paddocks with the use of temporary fencing to further subdivide these paddocks.
- \* Develop the paddocks according to soil types, and the type of forage species (tame, native or annual).
- \* Paddock size (acres) can vary in size, however, by adjusting the number of grazing days and the animal numbers (stock density) you can control grazing of the animals according to forage availability and quality.
- \* It is often said “a cow eats with five mouths,” meaning that she tramples more than she consumes. Some graziers use strip grazing to ration out the forage to the grazing animals and minimize trampling.
- \* Water location is critical for high performance. Place water sites within 800 ft. of the herd to encourage individual drinking. If the water is further away, the animals tend to travel as a herd. This results in greater animal stress, lower water intake and higher concentrations of manure around the site. Piped water systems are quite affordable and provide flexibility.

## ***Determine your Stocking Rate***

- \* Determine the stocking rate (animal units for the season) based upon the forage estimates available.
- \* Stocking rates are usually determined from experience but you can also estimate it using the Pasture Planner Booklet available on the MFC website, ([www.mbforagecouncil.mb.ca](http://www.mbforagecouncil.mb.ca)) under the Grazing Clubs button.
- \* Avoid overstocking - particularly for finishing animals. The greater the stocking rate, the lower the individual animal gain.
- \* Plan for the worst year – too much grass is not a problem but if you run short, you will have to de-stock. Be prepared!



## ***Stock Density***

- \* Proper stock density (animal units for the grazing period per acre) will ensure good animal performance. Lower density (preferred for forage finishing) results in excellent animal performance as the animals have access to the best forage for the finishing period. However, higher stock density provides greater returns per acre as the stock eat all available forage.

## ***Use a “Leader-Follower System”***

- \* The most productive animals (closest to being finished) should always have the first chance at the best forage. Let them graze, “cream the grass,” for a maximum of 3 days and then move them to a new paddock. The objective is to take no more than 50% of the forage and leave the rest for the cow herd to clean up. Leader groups must be able to consume 2.5% to 3% of their body weight without stress or competition from others.
- \* Consider harvesting any surplus forage for winter-feeding to maintain the quality of pasture regrowth if a “Leader-Follower System” is not available to cleanup the lower quality forage, or if a paddock ahead in the rotation has become too advanced.

## ***Develop your “Grass Eye”!***

- \* Knowing how and when to move animals from one paddock to another comes from experience. Graziers call this process developing your “Grass Eye.”
- \* The more paddocks you have, the more control you have of the grazing animal.
- \* Assess the pastures daily (on foot or by ATV) to make decisions.
- \* Use fast moves (every 1-3 days) during the fast growth periods and slower moves (every 5-7 days) during the slower regrowth periods.

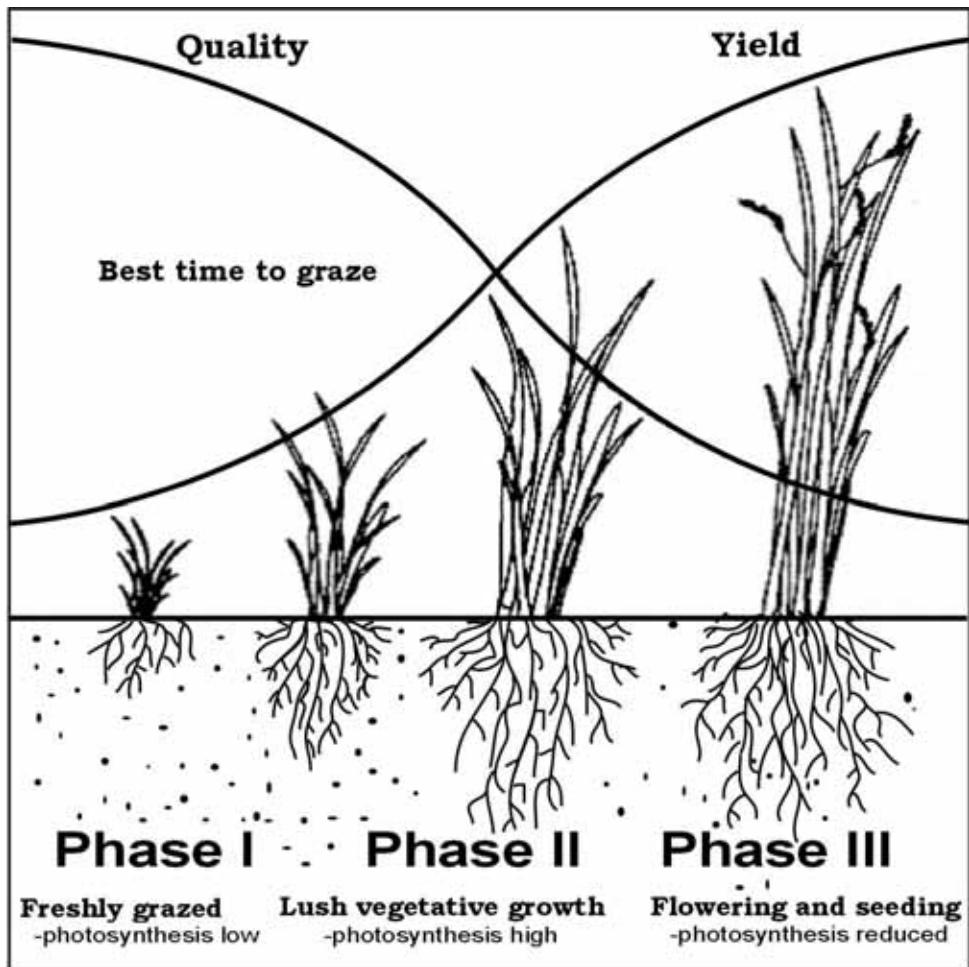


***Develop  
your  
“Grass Eye”***



## ***Rest is the key to pasture management!***

The forage must be rested prior to the next grazing. There are three phases of grass growth that must be kept in mind. Pastures should only be grazed in the vegetative stage, 6-10 inches in height at turn in.



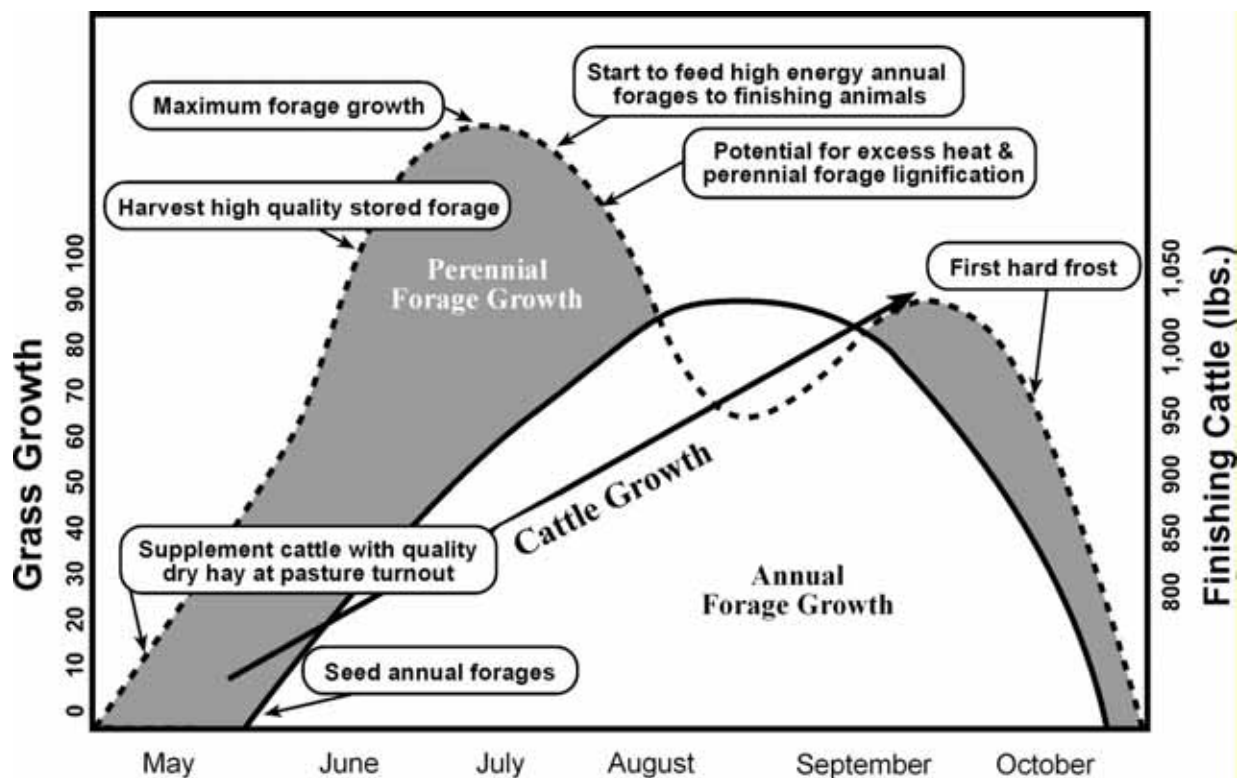
***The three phases of grass growth must always be kept in mind. Pastures should only be grazed in the vegetative stage, 6 to 10 inches in height at turn-in.***

## Fall grazing

- \* It is important to have high quality forage available in the late summer/early fall to obtain good animal gains for weaned calves. Also, the finishing animals who are depositing fat and intra-muscular marbling in their final finishing period require high energy feed. In Manitoba, Italian rye grasses and late seeded corn or its regrowth are suitable high energy annual forages if high quality perennial pasture is not available.
- \* Late summer/fall regrowth is usually very high in moisture and may result in poor gains. However, after the killing frost, the dry matter will increase and better gains will result. In fact, gains will often double during this period.
- \* Supplemental feeding of dry hay may be required.
- \* Avoid overgrazing as the plant is now dormant and will not regrow during this period. Overgrazing will affect next year's growth.

**Feed test your pasture and harvested/stored forage to develop your forage profile.**

## Matching the Cattle Year to the Grass Growth Cycle



# Cattle Management Activities

Growth Period	Management Activities
<b>March - April</b>	<ul style="list-style-type: none"> <li>• Wean calves if on cows over winter</li> </ul>
<b>May - June</b>	<ul style="list-style-type: none"> <li>• Calving season</li> <li>• Start selecting butcher animals – process them through the summer</li> <li>• Rejects sent to auction</li> </ul>
<b>Mid-July</b>	<ul style="list-style-type: none"> <li>• Yearling heifers sorted</li> <li>• Culls to steer groups for meat sales</li> <li>• Replacements vaccinated and placed in cow herd</li> <li>• Bulls: semen tested &amp; vaccinated prior to breeding season</li> </ul>
<b>August - September</b>	<ul style="list-style-type: none"> <li>• Reject steers &amp; heifers sold to auction at 800 – 1,000 lbs.</li> </ul>
<b>September - October</b>	<ul style="list-style-type: none"> <li>• Grass-finished animals who reach the finish weight are processed off pasture until grass quality drops</li> <li>• Those not suited to slaughter held over winter or sent to auction</li> <li>• Current year calves weaned or left with cows over winter</li> </ul>
<b>November - December</b>	<ul style="list-style-type: none"> <li>• Calves castrated, dehorned, tagged, vaccinated</li> <li>• Meat animals kept separate – limited “chemical” treatments allowed</li> </ul>
<b>December - April</b>	<ul style="list-style-type: none"> <li>• Feed sample all stored feed</li> <li>• Check rations to ensure animal performance</li> </ul>

***Reference: Adapted from Grass fed Beef, Julius Ruechel pg. 296***



### ***Several tools can be used to help monitor forage quality and animal performance:***

- \* The Manitoba Pasture Stick helps estimate the dry matter available prior to grazing and the residue after grazing (available from the Manitoba Forage Council).
- \* Visual appraisal of the manure of the grazing animal can also be used to monitor forage quality. Loose manure indicates good forage quality; hard manure is poor quality.
- \* Use pasture record books to record daily procedures. This pocket sized record book is a handy way of monitoring your pastures and for future planning. They are available at your local MAFRI office.
- \* Grazing animals will return a high percentage of plant nutrients back to the soil as urine and manure (60%-80%). Grazing management and the location of water sites are a major factor in determining where these nutrients are deposited.
- \* Legumes will increase soil nitrogen levels (pasture mixtures should have at least a 30% legume content so only the other major nutrients phosphate and potassium may be deficient).
- \* Use soil tests and the plant color to assess the health of the soil and the plant. Soil tests are necessary to provide a base line as to what additional nutrients may be required as commercial fertilizer or livestock manure.

### **Consider fertilizer options if necessary:**

**A) Commercial fertilizer** – Avoid high applications of nitrogen fertilizers for finishing forage as it produces a high protein level in the forage (above 15%) and excess protein levels in the animal. When this happens, the animal must convert the excess protein level into urea and excrete it - a process that uses up valuable energy required for weight gain and finishing. Using legumes in the pasture mixture is the preferred method for improving soil nitrogen levels and feed quality.

**B) Hog and cattle manure** are options for a fertility source. Do not add excess manure as excess nitrogen can increase grass growth at the expense of the legumes. High phosphate levels can also accumulate over time in the soil. Monitor the soil fertility level and test the manure before applying to ensure a proper balance of nutrients.

## **Maintaining Forage Quality at Critical Times of the Year**

### ***During spring turn-out***

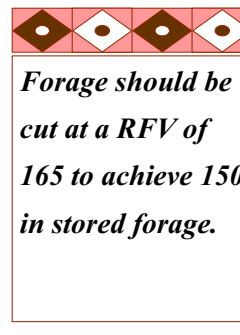
- \* To reduce animal weight loss during the change over from winter feeding rations to lush spring pasture (high moisture), consider supplementing the grazing animals with high quality alfalfa hay (high dry matter). This will increase the dry matter of their total intake until they become accustomed to the new more lush feed.

### ***During the mid-summer slump***

- \* Temperatures above 30°C in mid-summer reduces the digestibility of the pasture forage so you may have to supplement with high energy forage, especially if you are finishing the cattle.
- \* Lack of moisture causes most perennial pastures to become dormant and have reduced feed quality.
- \* The use of legumes in the pasture mixture (30%-50%) will supplement the digestibility of the pasture forage.
- \* Be prepared to provide supplemental feeding of high quality stored forage, (e.g. 1<sup>st</sup> cut alfalfa), during this grazing period if perennial pasture quality drops.

## vi) Harvesting & Storing Quality Forage

- \* Forage grown for storage should be harvested at the optimum stage of maturity to ensure maximum yield and quality for the later season cuts (late bud or early bloom stage, or before mid-June). Second and third cuts should also be taken at the late bud to early bloom stage. Use a PEAQ stick to estimate quality in the field.
- \* Manage the dry down process by using a wide swath at cutting to maximize the sun's solar energy. Use swath turners to speed up the drying process.
- \* Forages cut in the afternoon are higher in soluble carbohydrates than hay harvested earlier in the day, however, the trade off is that there is less time to wilt the forage down to a safe storage level for dry hay. Cutting in the afternoon is preferred for silage to capture maximum plant energy levels.



## Silage Harvesting

### ***Chopped silage***

- \* This is perhaps the lowest cost system for harvesting and storing high quality forage. The major limitation is that large amounts of forage must be harvested at one time and sealed in a bunker or silage pile immediately. The equipment investment is significant for this system.

### ***Baled high moisture forage***

- \* Although more costly than chopped silage, baled silage (high moisture hay), adds more versatility to a grazing system.
- \* Small amounts can be harvested quickly at the highest quality.
- \* A high quality UV-resistant plastic with good stretch qualities must be used. Most systems require at least 6 wraps for an air-tight system. Eight wraps are also frequently used.
- \* Bales must be tight and even in size to allow for good wrapping.
- \* They can be self fed with an electric wire system or fed in standard round bale feeders.
- \* Freezing may be a problem if moisture is too high so feeding in the spring or fall may be the only option.



### ***Direct cut vacuum silage***

- \* This system is very popular in Europe. Silage is direct cut with a chopper and blown into a silage wagon. The silage is then formed into a pile and covered with plastic with little or no packing.
- \* Hoses are imbedded into the pile and the air is vacuumed out to hasten fermentation and reduce spoilage.
- \* Stacks are usually four to six feet high and are sealed with plastic. Since there is no wilting, the forage maintains a level of omega-3 & CLA similar to grazed pastures.
- \* This silage would freeze with Manitoba's winters so it must be fed during the fall or spring period.
- \* Silage piles sealed with plastic must be protected from animals by effective electric fencing and from birds by adding an extra layer of old plastic.



## vii) Winter Forage Feeding

- \* Consider developing a forage profile for your herd - particularly the finishing animals. Take feed samples every 3-4 weeks from the pastures (what the animals are actually eating), or monthly from stockpiled forage or stored forage. Do this over a three-year period to develop a forage profile that can be used by your nutritionist to develop the required ration for the target gains. Do not handle the feed samples with your bare hands as this contaminates the feed sample.
- \* Use a qualified nutritionist to make sure a proper ration is being used to achieve the target gains. Feed quality, environmental conditions and the type of animal (cow/calf, feeder etc.) must be considered.
- \* Feed testing is crucial to determine if the forage has the quality necessary for the required gain. Forage that has a Relative Feed Value (RFV) of 130 – 150 has been shown to provide a weight gain in excess of 2.0 lbs. per day in feeder animals over-wintered in Manitoba. It may be more economical to purchase high quality hay with an RFV of 130-150 than to try to grow it yourself – especially if weather conditions are not ideal. Many of the Manitoba hay marketers will provide a hay RFV feed analysis to prospective buyers.
- \* Relative Feed Quality (RFQ) is a new index that provides a more accurate estimate of feed quality and subsequent weight gains than RFV. Ask your feed testing lab or hay marketer about it.
- \* CLA content in forage is reduced during the wilting process, however, the use of legumes in the forage mixture (up to 30% more than pure grass), increases the CLA content in the fatty tissue of the animal. According to a recent research project at Agriculture and Agri-Food Canada Brandon Research Centre, supplementing a finishing ration with sunflower seeds increases the CLA content of the fat tissue (Dr. Shannon Scott, 2006).
- \* Manitoba has the potential to produce very high quality stored forage; a result of our soil and climate. This high quality forage can provide excellent gains on weaned calves over the winter without the use of grain.

*The following recent research trials indicate that gains in excess of 2.0 lbs. per day are possible with good quality forage*

**Trial #1** was conducted at the University of Manitoba's Glenlea Research Station in 1997. The round baled silage was chopped and fed (with very limited waste), to animals in small pens. The high dry matter of the forage indicates that minimal fermentation occurred so this forage could be better described as high moisture hay rather than a silage product.

All-silage Diets Using Round Baled Silage Chopped Prior to Feeding				
Trial	Forage Quality (Relative Feed Value*)	Dry Matter %	Gain (lb/day)	Feed per unit of gain
# 1	RFV 100	58.3	2.0	8.5
	RFV 125	65.9	2.8	6.8
	RFV 130+	70.4	3.6	5.4
# 2	RFV 100	63.1	1.7	8.3
	RFV 125	56.0	2.2	7.9
	RFV 130	68.0	2.3	7.7
	RFV 150+	72.3	2.2	8.5



**Trial #2:** This trial involved round baled silage fed as round bales in traditional round bale feeders on a farm near Beausejour, Manitoba.

All-Silage Diets Using Round Bale Silage in Round Bale Feeders				
Feed Quality (RFV)	Steer initial weights (lbs.)	Final Weights (lbs.)	Gain (lbs./day)	Feed per unit of gain
RFV 101	669	757	0.88	18.2
RFV 125	667	870	2.13	11.6
RFV 127	666	941	2.74	10.5
RFV 142	668	885	2.17	11.1

This Manitoba winter feeding trial by Dr. Kim Ominski, University of Manitoba has shown that hay with a RFV of 127 produced an excellent average daily gain of 2.74 lbs. The weaned beef calves were fed high moisture, plastic wrapped baled forage for a 100 day period (January to April 2000) on a farm near Beausejour, MB.

### Extended Forage Feeding Systems

The most economic feeding system is to have the animal harvest its own feed either as a grazed product during the growing season, or as a conserved forage product in the non-growing season. Some of the more popular options being used in Manitoba are:

- \* **Bale grazing** – Bale grazing reduces the labour costs associated with daily winter feeding. Bales are spaced about 30 to 40 feet apart and spread throughout a permanent pasture in the late fall period. Lightweight, moveable round bale feeders may be used to minimize waste, however many graziers find that if the quality of the forage is high, there is minimal waste. Another option is to control the feeding with the use of an electric wire. Animal days per acre should be monitored and recorded to determine how much manure is being deposited on the land. Excess nutrient loads can become an environmental concern so it is suggested that a new bale grazing site be used every year.
- \* **Swath grazing** – This popular winter feeding system can involve either annual or perennial forages. The forage is swathed early in fall and an electric fencing system is used to strip graze the feed on daily or a two-day system. Less feed wastage and lower feeding costs have been shown in western Canada. Costs per day are often quoted as 50% of the cost of a feedlot system.
- \* **Chopped silage** can also be efficiently fed from a stack with the use of an electric wire. Stacks can also be made at the feeding location for use later in the winter. Chopped silage can also be provided every second day to supplement forages that are lower quality. The silage can be fed on the ground under an electric wire which restricts trampling by animals.

## 4. Production Protocol

\* A production protocol is frequently used by those in the value chain to ensure that the quality of the product meets market specifications. The following example cites some of regulations currently being used.

- Each animal has an affidavit that includes: individual animal identification (microchip, animal tag), birth date, weaning date, record of sire and dam, breed, movement history, veterinary interventions, and ultrasound data.
- Diet: 100% forage fed; may be any combination of grass, legumes from pasture (growing season), or stored forage (non-growing season). Animal must remain on mother's milk for a minimum of 60 days.
- No growth hormones or antibiotics, no animal by-products to be fed.
- No cereal grain supplementation, including corn silage or other high starch feeds.
- Cattle treated in a humane way according to Canadian standards.
- Animal health treatment may include vaccinations but no sub-therapeutic (feed grade) antibiotics are allowed. Antibiotics for therapeutic purposes are permissible but the withdrawal period is twice as long as the label requires (drop sick animals from program).
- Animals in good health at delivery.
- Animals must have an ultra-sound at least once before harvest to determine back fat thickness, rib-eye area and shape, percent intramuscular fat and tenderness.
- Farm must be inspected twice during the production period with the producer certifying the management practices being used.

### Production Protocol Example

*Live animal specifications, Tall Grass Beef, a U. S. marketer of grass fed beef [www.tallgrassbeef.com](http://www.tallgrassbeef.com)*

- Steers and heifers: maximum of 30 months of age with carcass weight between 500-900 lbs.
- Fat cover verified by ultrasound a minimum of 0.25 inches at a maximum of 50 days prior to harvest.
- Actual rib eye area must be a minimum of 10.00 sq. inches.
- Minimum % intramuscular fat must be 3.5%.
- Rib eye shape score must equal or exceed 0.50.
- Tenderness score of 25 or less.

# 5. Influencing Meat Quality

Producers can control many factors that influence the eating quality of the meat. To ensure a quality product, one must also work closely with their abattoir, especially if he/she is selling the meat directly to the consumer.

## ***Producer factors that can be controlled:***

- \* Animals must be on high quality forage and **gaining weight** (1.8 lbs./day or greater) prior to slaughter to obtain a degree of marbling and tenderness in the meat.
- \* Forage-fed beef slaughtered in early to mid-summer has the highest potential for optimum meat quality as the animal has grazed the highest-energy spring forage and has likely had excellent weight gains.
- \* Stress factors such as rough animal handling negatively impact the quality of meat. Reduce stress by working the animals in small groups, shipping them with their herd mates, and familiarizing them with trailers prior to shipping. Select calm breeds and animals that fatten easily.
- \* Stress prior to slaughter results in higher cortisol levels and reduced muscle glycogen. This causes a higher pH level (5.8-6.9) and a lack of proper maturing. As a result, lactic acid (pH 5.3-5.7) does not develop as it should and a “dark cutter” is the result. A nice red colour meat will have a pH of 5.4.
- \* Animals should be processed at 16-22 months of age. Older animals up to 30 months of age will provide acceptable meat, however, they will not be as tender.
- \* Animals harvested under the age of 24 months will have less variability in their meat quality.
- \* The flavour of meat is usually related to the fat content. Meat, with an acceptable fat content will stay moist during the cooking process, and depending on the feed source may have the health benefits of the omega-3 and CLA's.
- \* The flavour of the meat is also related to the feed. Forage finished beef is usually considered “stronger” than grain finished beef.
- \* Tenderness is often considered 50% genetic and 50% stress & diet. The rib eye cut is the best indicator of tenderness.
- \* Ultrasound technology is available to provide an indication of meat tenderness in the live animal and is often a requirement in forage finished beef production protocol. This technology may also be able to identify tough eating animals at weaning.

## ***Abattoir factors that can be controlled:***

- \* Improper meat processing can turn well fed, flavorful beef into poor tasting meat.
- \* Chilling the carcass too quickly causes the muscle fibers to shrink and results in tough meat. Abattoirs have their coolers set to chill grain finished animals which have a thicker carcass fat layer than forage finished carcasses. As a result, forage finished beef can be chilled too quickly. Work with your processor to slow down the drop in post mortem temperature to achieve the best meat quality.
- \* If too few animals are in the cooler the carcass temperature will drop more quickly – often too fast. Frequent door opening affects the chilling curve, pH curve and maturation process.

- \* Home freezers do not freeze the meat quick enough. This results in the formation of large ice crystals in the muscle cells, cell destruction, a loss of juice in the meat, and possibly an off flavour.
- \* After slaughter, animals should be dry aged a minimum of 14 days to improve tenderness.
- \* Some meat cutters work the carcasses when they are warm and then chill the cuts. This will still result in tough meat.
- \* Spoiled meat or off flavour is produced by excessive maturation and a slow temperature drop curve at the abattoir. If meat maturation is too long (too slow a chill process), the oxidation of antioxidants will increase the “metallic, grassy or game flavor.” Additionally, the longer the thaw process prior to cooking, the greater the “game flavour.” Frozen meat has a stronger taste than chilled meat, however, this can be minimized if the production process is properly managed.

### **2007 Feeders on High Quality Pasture**



## 6. Cooking & Marketing

- \* Grass fed beef has the fat content of skinless chicken. It is low in unhealthy fat and is high in heart friendly essential fatty acids, Vitamin E and cancer fighting conjugated linoleic acid.
- \* Cooking lean meat too fast produces tough meat as it destroys the structure of the proteins. Lean meat must be cooked slowly – Don't overcook!
- \* Roasts usually cooked at 325° F/160° C should be cooked at 275° F/135° C.
- \* Forage finished beef continues to cook when removed from heat, therefore, it requires 30% less cooking time.
- \* Forage finished beef is low in fat it should be coated with a light oil, such as olive oil, to promote browning, enhance the flavour, and prevent drying and sticking.
- \* For some cuts, a **mechanical** meat tenderizer such as the Jaccard Meat Tenderizer can be used.
- \* Fire or heat must be consistent, but not hot enough to burn or scorch the meat.
- \* Fat should **not** be removed prior to cooking.
- \* Thaw the meat in a fridge, never use a microwave.
- \* If you market directly to customers, provide a cooking manual.



**Include cooking guidelines with your forage finished beef product to ensure an excellent eating experience.**

The first step in any business venture is to develop a business plan that identifies your goals and market opportunities. From there you must develop a marketing strategy to get you and your product into the public eye.

### *Here's some tools that can be used to promote your forage finished beef.*

- \* Create brochures to advertise your product and your production method. (There are several inexpensive desktop publishing programs available which make designing brochures quick and easy). Sell the story of your farm and family within it.
- \* Develop a website yourself or hire a professional. (Your internet provider often offers free storage space on the internet where you can develop and post your website for free). Check with your internet provider. Have your contact information listed and provide a toll free number if possible.
- \* Participate in Farmer Markets and hand out brochures and/or business cards so customers can call or refer you to other customers.
- \* Advertise in local and/or city newspapers or association newsletters.
- \* If you're not comfortable marketing you own beef, partner with someone who is. Check out [www.tallgrassbeef.com](http://www.tallgrassbeef.com) to see what they are doing.
- \* Organic producers are making great strides today, visit one and find out what they are doing.

# 7. Economics of Production

A five year study by Ralene Nickel, University of Missouri, 1998 showed that the cost of grass-finished cattle is 55% less than feedlot cattle. Here are some factors that impact on profitability and two charts that estimate the cost of a forage finished enterprise.

- \* Forage finishing can have lower capital input costs compared to feedlot operations. Hay can be purchased from neighbours who utilize forages in their rotational system, from high quality hay growers, or baled by custom operators. This may be less expensive than owning your own equipment.
- \* Feed costs are lower as the animal harvests its own feed.
- \* Marketing and transportation costs are reduced.

## ***Profitability***

Direct marketing of forage finished beef is not for everyone – many producers prefer to work within a value chain system where they produce the product and have others do the processing and marketing. However, if you do not have direct access to the consumer, you will be working for those who do. Direct sales can result in a higher net return. The following is one Manitoba example of the return possible with direct marketing. The following table indicates the additional return possible by direct marketing compared to the value of the animal if sold in the conventional method (on the rail). Marketing costs would have to be deducted from the net return. Try some calculations for your own farm to determine the profitability.

<b><i>An Example of Direct Marketing of a 600 lb carcass</i></b>			
	<b>Cost/lb</b>	<b>Total \$</b>	<b>Your Costs</b>
<b>Rail price as of November 2006</b>	\$1.40	\$840	
<b>Processing cost for 600 lb carcass</b>	\$0.21/lb	\$126	
<b>Cutting and wrapping</b>	\$0.40/lb	\$240	
Estimated Production Cost		<b>\$1,206</b>	
<b>* Assume retail cuts 420 lbs (70%)</b>			
<b>Estimated retail value (Nov'06)</b>	\$4.32/lb	<b>\$1,814</b>	
<b><i>Net return/head to other costs</i></b>		<b>\$608</b>	
<ul style="list-style-type: none"> <li>• Retail value is an average price for the various cuts such as; steaks, roasts and ground beef obtained from the carcass</li> </ul>			



## Estimated Cost of Production for a Forage Finished Beef Enterprise

<b>Phase 1 Cow/Calf Unit</b>	<b>Days</b>	<b>\$ per Day</b>	<b>Total \$ per Head</b>	<b>Reference</b>
Summer Grazing (cow/calf)	138	\$.69	\$95.22	WBDC*
Fall grazing & winter costs (cow unit)	227	\$1.02	\$231.54	WBDC
<b>Total</b>	<b>365</b>		<b>\$326.76</b>	
<b>Phase 2 Feeder – Winter period</b>	<b>Days</b>	<b>\$ per lb Gain</b>	<b>Total \$ per Head</b>	<b>Reference</b>
Sept 30 <sup>th</sup> (425 lbs.) – May 15 <sup>th</sup> (879 lbs.) (forage only)	227			
227 days @ 2.0 lbs. per day = 454 lbs.				
Feed conversion: 11.0 lbs. feed per lb. gain				
Feed cost: \$0.03/lb.		<b>\$0.33/lb gain</b>	<b>\$149.82</b>	University of Manitoba
<b>Phase 3 Finishing Period</b>	<b>Days</b>	<b>\$ per Day</b>	<b>Total \$ per Head</b>	<b>Reference</b>
(forage only)	56	\$0.50	\$28.00	MAFRI
Perennial pasture				
May 15 – July 10	36	\$0.98	\$70.56	WBDC
• ADG: 2.0 lbs./day				
Annual pasture (corn) – <b>Total</b>	<b>92</b>		<b>\$98.56</b>	
July 11 – Aug 15				
• ADG: 2.0 lbs./day				
<b>Final finish weight</b>	<b>Total Days</b>		<b>Total Costs</b>	
• 1,063 lbs. over 684 days.	<b>684</b>			
• Total cost per animal			<b>\$575.14</b>	
• Cost per lb. gain			<b>\$0.54</b>	

### Notes:

- \*1. Cow/Calf Units: References: Western Beef Development Centre (WBDC) from the 2005 Saskatchewan Cow/Calf Production Analysis. (Feed & Bedding costs only) (<http://www.wbdc.sk.ca/factsheets.html>)
2. Feeder – Winter Period: MFC Fact Sheet on Back Grounding with Manitoba Forages (<http://www.mbforagecouncil.mb.ca/projectstechnicalinfo/default.aspx>). Information is from trials at Beausejour using high quality forage-only rations. Forage cost obtained from MAFRI Feb'07 Alfalfa Hay Production costs estimates.
3. Finishing Period:
  - a. Pasture Cost from MAFRI 2007 Improved Pasture Cost of Production (<http://www.gov.mb.ca/agriculture/financial/farm/pdf/pasture.pdf>).
  - b. Corn grazing costs from WBDC on Backgrounding Calves on Swathed Corn (<http://www.wbdc.sk.ca/factsheets.html>)
  - c. Corn Animal Performance from USA production references: ([http://beef-mag.com/mag/beef\\_grain\\_stump/](http://beef-mag.com/mag/beef_grain_stump/)) and from Dr. Anibal Pordomingo (<http://www.mbforagecouncil.mb.ca/eventinfoproceedings/eventproceedings/grazingschoolproceedings/default.aspx>)

The costs included above are essentially feed costs only, as there is limited information from Manitoba experience that will provide a complete cost of production analysis of forage finished beef. This is information that needs to be completed.

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