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Beef production in the Atlantic Provinces

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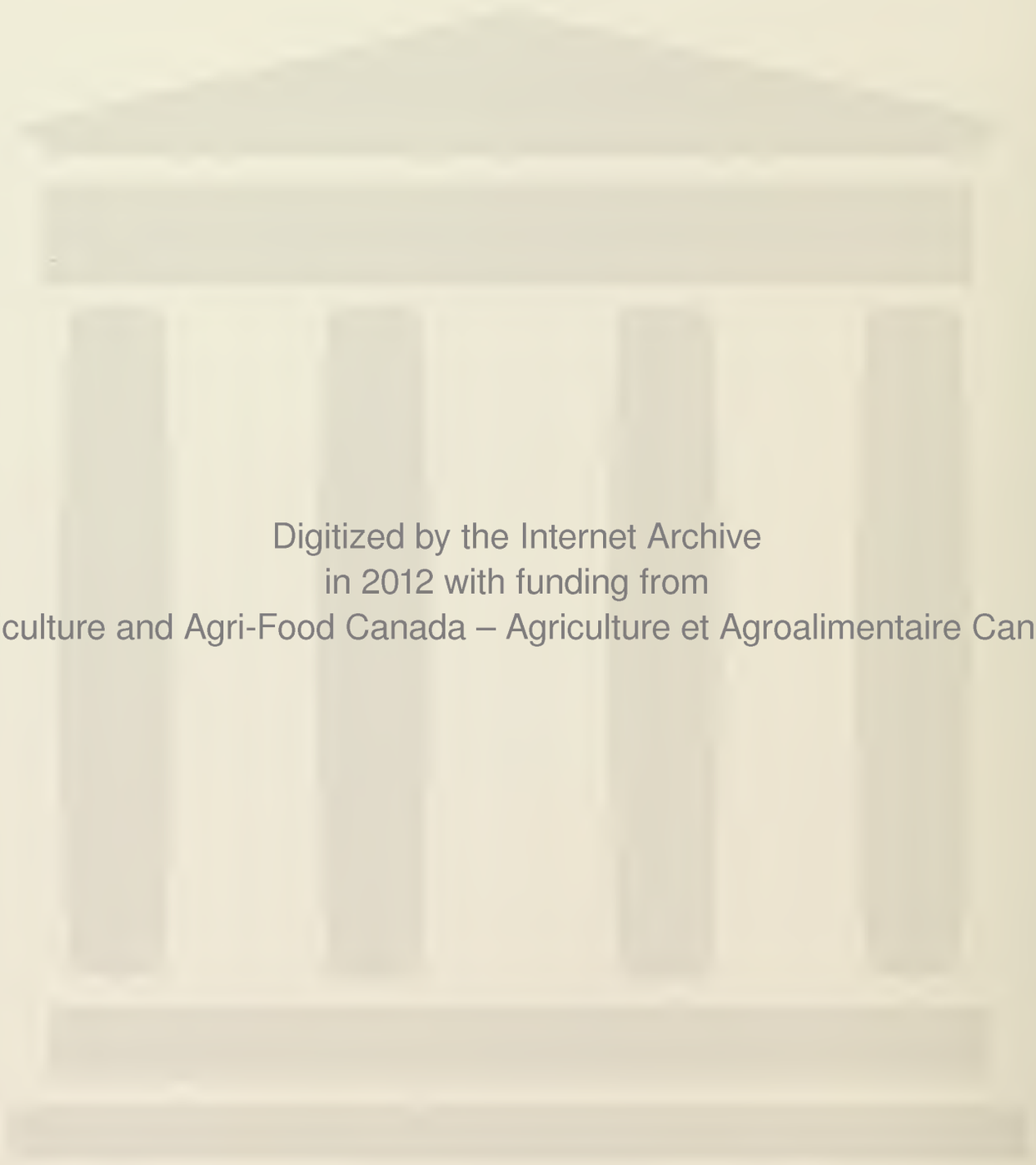

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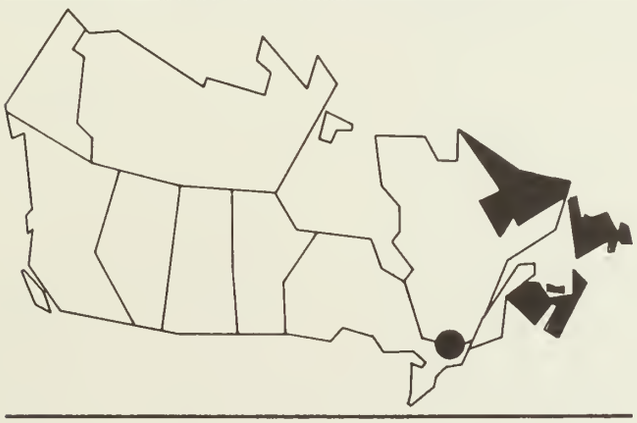

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CONTENTS

Foreword

This publication summarizes some of the management practices recommended for profitable beef production. It includes information on cow-calf enterprises and on finishing feeder cattle for slaughter.

Feeding and management programs for beef production can take many forms and must be modified for each operation to make the most of all natural advantages. It is hoped that the general recommendations given here will help each operator make such decisions for his enterprise. Detailed advice and specific recommendations can be obtained from extension specialists with the provincial departments of agriculture and from research stations and Production and Marketing Branch personnel of the Canada Department of Agriculture.

Beef production in the Atlantic Provinces

Beef production has long been part of the agricultural industry in the Atlantic Provinces. Most beef operations are small scale and carried on as a part of the general farm operation or as a supplement to off-farm employment. There is a growing trend towards the establishment of larger operations, particularly where byproducts from other enterprises are available.

The Atlantic Provinces possess many natural advantages for beef production. Land is relatively cheap in many areas; the climate is relatively mild, so that elaborate shelter is not required for beef cattle; and the normally adequate rainfall is well distributed through the year, resulting in good crops of forage and pasture. Harvesting forage by traditional hay-making methods, although still common, is risky because of the weather and there is a trend towards barn-drying hay and making silage. Corn silage is increasing rapidly in areas suited to its production.

Dairy cow numbers have declined rapidly during the last 30 years. As a result, many former dairy farms are left with buildings, machinery, land, feed and, often, underutilized labor which can readily be diverted to the production of beef.

More beef is consumed in Eastern Canada than is produced in the area. Packing plants already established can process more beef than they now receive from local suppliers. The amount of beef produced as a byproduct of the dairy industry is declining. This means that markets exist close at hand for an expanded beef industry, which would also create more jobs on farms and in related supply services such as trucking and meat processing.

Each year much potential livestock feed is wasted, for example, straw, cull potatoes, waste from fruit and vegetable processing plants, and spent grains from distilleries and breweries. Properly supplemented, these products can compose the main part of beef cattle rations. The potential for increased beef production can be illustrated by considering cull potatoes. It is estimated that 135 000 000 kg of cull potatoes are produced each year in New Brunswick and Prince Edward Island alone, and potato processing plants contribute 70 000 000 kg or more of processing waste. This is sufficient to supply the high-energy feeds needed to winter 50 000 fattening steers.

The Atlantic Provinces have the resources to support a much larger beef industry; we have advantages over other areas of Canada in cost of land, mild climate and ample, well-distributed rainfall; and we have a market close at hand. In spite of these advantages, the beef industry is not expanding rapidly in many areas. It is difficult to produce budgets that show high returns on capital invested, labor and management from beef production, based on average herd performance. The same is true for other beef-producing areas in Canada. However, beef production often represents the only feasible use for existing resources of land, buildings, machinery and family labor. The possibility of long-term appreciation in land values is another factor not usually considered in evaluating the returns on a beef enterprise.

The beef industry has not been subject to the violent fluctuation in supply and prices found in some other segments of the livestock industry. This facilitates long-range planning. The producer who follows good husbandry practices and is quick to adopt new developments, so that he achieves above-average performance, can expect a reasonable economic return.

Figure 1. Marshlands around the Bay of Fundy are an example of the Atlantic Provinces' productive grasslands.

Cow-calf programs

Cow-calf production falls into several different categories. The three major ones are:

Breeding stock production

In the production of breeding stock, the operator maintains a purebred foundation herd and often has calves born throughout the year. As a rule, the calves are weaned at 6 months and fed through to 18 months of age for sale as bulls and bred heifers. There will be a continuing demand for this type of operation as the number of beef cattle in the area continues to increase.

Feeder Production

This is the most common form of commercial herd based on grade or crossbred cows. The breeding season is usually restricted to a 2- or 3-month period so that all calves are about the same age. Spring calving is most common. The calves vary in weight from 300 kg down to 150 kg at weaning, depending on calving date and feeding level. The value of the calf, depends on its weight; therefore, to maximize the return per cow, you must try for maximum weight per calf. The advantages and disadvantages of calving at different times of the year are discussed in a later section.

Stocker production

The production of stockers is quite similar to the production of feeder calves except that the calves are kept over the winter and sold in the spring when they weigh about 300 kg. It is important that calves being overwintered are fed sufficient feed to keep them gaining 0.4 to 0.7 kg per day.

Goals for a cow-calf enterprise

The overall goal for beef cow herds should be the production of the greatest possible number of calves, with the heaviest possible weaning weights, for the least possible cost.

To do this, you should have economical facilities, and equipment that is adequate for a cow herd. Also, you should use the best cropping practices to produce economical pasture and roughage. Beef cow herds should make efficient use of any available inexpensive roughages. In the Atlantic Provinces, this would probably be hay and silage with pasture as the summer feeding program. For most efficient feeding you should aim to meet the minimum nutrient requirements and not overfeed the herd. Overfeeding raises costs and underfeeding lowers performance.

Some specific goals for a cow-calf operation are:

- Wean a 95% calf crop expressed as a percentage of cows overwintered.

Figure 2. A calf from every cow is the goal.

- Wean calves weighing at least 250 kg.
- Produce quality calves that will produce quality carcasses.

Effects of calf-crop percentage on returns per cow

The main determinant of profit for a cow-calf operation is the weight of calf that you have to sell for each cow maintained in the herd. Present operations are producing calves in the 200 kg range. Through proper management and new technology, average weaning weights can be increased to 260 kg. Table 1 illustrates the effect of calf-crop percentage and price levels on the average returns per cow. It illustrates quite clearly how an increased calf-crop percentage can increase these returns.

Care of breeding herd

To ensure that cows return to heat soon after calving and settle when bred, they must be well fed between calving and breeding. This is the time when the cows' nutrient requirements are at a peak. Spring-calving cows that start the winter in good condition can be fed so that they lose up to 10% of their weight between fall and calving, provided they are well fed after calving. Cows should be checked for pregnancy when the calves are weaned. It is not profitable to keep barren cows over winter.

Age to breed beef heifers

As a general rule, heifers first come into heat at about 1 year of age and will continue to come into heat approximately every 21 days until conception takes place. In the production of feeder cattle, it is desirable to have the entire cow herd calve within a short period. The age to breed heifers depends on their growth and development. Heifers calving at 2 years old should be well fed through gestation and lactation. When given proper care, they will remain regular breeders until 10 or 12 years old and in some cases even older. If heifers calving at 2 years old are not well fed during their first lactation, they may not return to heat until late in the breeding season. To be sure that heifers entering the herd become early calving cows, some breeders prefer to have their 2-year olds calve a month ahead of the main herd.

Breeding season and time of calving

The commercial producer must decide whether he is going to breed for fall, winter or spring calves.

It is important to plan for a uniform group of calves to sell or feed out to market. From a management standpoint, calves should be dropped within a 2- to 3-month period.

Commercial producers selling calves in the fall as feeders must plan for winter-born calves. Work carried out at the Nappan, N.S., Experimental Farm proved that early calves (January-February) will weigh 40 kg more than late (April-June) calves at weaning. Early calves will increase net returns for some extra expenditures in facilities, labor, and feed.

Early calves have less scour problems, benefit from spring milk increases and make better use of pastures. If facilities are available, early calving is profitable. Unless cows are completely confined, calving should be avoided in the

Table 1 The effect of calf-crop percentage on returns per cow

A Assuming an average weaning weight of 200 kg

Calf-crop %	kg calf weaned per cow in herd	Value of calf/cow in herd when calves sell for $/kg			
		$1.25	$1.50	$1.75	$2.00
100	200	250	300	350	400
95	190	238	285	332	380
90	180	225	270	305	360
85	170	212	255	298	340
80	160	200	240	280	320
75	150	188	225	262	300
70	140	175	210	245	280

B Assuming an average weaning weight of 260 kg

Calf-crop %	kg calf weaned per cow in herd	Value of calf/cow in herd when calves sell for $/kg			
		$1.25	$1.50	$1.75	$2.00
100	260	325	390	455	520
95	247	309	370	432	494
90	234	292	351	410	468
85	221	276	332	387	442
80	208	260	312	364	416
75	195	244	292	341	390
70	182	228	273	318	364

early spring when changeable weather and wet, muddy conditions cause added stress.

Spring calves offer the advantage of costing less to produce in terms of feed and labor costs. Cows are also bred on pasture when nutritional level and conception rates are usually high. The main disadvantage is a lighter calf in the fall, resulting in lower net profits if the calf is sold at this time.

In producing fall calves, cows are in better condition for calving. Calves are born in a season free of flies and heat. Labor is often more available during the winter and can be used to better advantage. Calves are sold at a more favorable time during the next spring when prices are higher. The big disadvantage to fall calving is the cost of extra winter feed for both cow and calf. Better facilities are required and fewer cows can be kept on a given feed supply.

Most beef producers who are selling feeder calves in the fall would be advised to follow a program of late winter calving.

Number of cows per bull

A bull should be at least 15 months old and well grown before being used, and then only on from 15 to 20 cows. For pasture breeding a bull should be at least 2 years old. If a younger bull must be used, he should be kept away from the herd, given special care and permitted to serve the cows as they appear in heat. When hand mating is practiced, a 2-year-old bull may be used on from 30 to 35 cows and a 3-year-old bull may be used on from 40 to 50 cows during the breeding season. If pasture mating is practiced, these numbers should be reduced by about one-third.

Problems sometimes occur when young bulls that have been on a high plane of nutrition for ROP testing are turned out on pasture with a group of cows. If possible, young bulls should be bought well before the breeding season and hardened up by reducing their daily grain intake and by giving them plenty of exercise. If this is not possible, young bulls should be fed supplementary grain during the breeding season.

Artificial insemination

Production-proven sires of all breeds are available to even the smallest herd through artificial insemination. Charges for A.I. service are reasonable and compare very favorably with the cost of keeping a bull, especially when quality of the bulls is considered.

One of the problems in using A.I. is the difficulty of detecting estrus (heat) in beef cows. This can be facilitated by running a late-castrated steer or a vasectomized bull with the herd and observing during early morning and late afternoon. Fitting the teaser animal with a chinball marker ensures easy identification of the animals in heat.

It is usually desirable to breed during the season when the cows are confined, to reduce the labor involved in catching the cows for service. This means that a higher level of winter feeding may be required to ensure that the cows show heat within 3 months of calving. Many breeders use A.I. for the first 6 weeks of the breeding season and then turn in a bull to breed any cows still not in calf.

Synchronization

Research is being done on synchronizing estrus so that all the cattle in a herd can be bred at one time with A.I. Injecting nonpregnant cows with prostaglandin to induce estrus is common in the dairy industry. The prostaglandin causes regression of the corpus luteum and the cow comes into heat 3 days later. To be effective, the cow must have a functional corpus luteum that only occurs during the last half of each estrus cycle. If all cows in the herd are to be synchronized, two injections are necessary 10 to 12 days apart. All cows that were cycling at the start of the injection program should come into heat about 3 days after the last injection. They can be inseminated individually when they show heat or all cows can be inseminated at 72 and 96 hours after the last injection.

About a 50% conception rate has been achieved at the Nappan Experimental Farm with well-fed cows using two injections and two timed inseminations. Poorer results were obtained with thin cows and with 2-year-old heifers nursing calves. This is likely because these groups were not cycling at the time they were injected. The perfection of synchronization techniques for beef cattle will let breeders use A.I. with greater ease and success.

Embryo transfer

Embryo transfer is a breakthrough that will enable faster progress in genetic improvement. It has been used extensively to propagate the exotic breeds of beef cattle. The newer nonsurgical method is being used in many dairy operations on genetically superior cows.

Techniques have been described which make it possible to determine the sex of an embryo 13 to 17 days after conception. There is a tremendous amount of research being done on freezing embryos for later use. The successful application of these techniques may someday make it possible to order an embryo of any breed and sex desired, much as semen is ordered today. Meanwhile, the gradually lowering costs of embryo transfer are making it feasible for use with genetically superior purebred cows.

Crossbreeding

Knowledge of the potential benefits of crossbreeding has increased tremendously in recent years. Continuing study is showing greater economic returns than early work had promised.

In addition, buyers' attitudes towards crossbreds have changed. Feeders have learned that crossbreds do well in feedlots. Packers frequently find that carcasses from crossbreds are superior.

Crossbreeding is no miracle in itself. It won't make poor cattle good, though improved performance can be achieved. Basic improvement of the beef animal must come from the straightbred herds where accurate selection for given traits is more certain. *In short, crossbreeding emphasizes, rather than diminishes, the importance of purebred foundation stock.*

Crossbreeding promotes hybrid vigor; crossbred females are usually growthier and become better mothers than straightbred stock. Crossbreeds show improved concep-

Figure 3. Crossbreeding results in faster gaining calves.

tion, increased livability and, consequently, higher percentage calf crops.

Recent findings indicate that three-breed rotational crossbreeding programs can be managed with little maneuvering of breeding stock and still achieve the maximum benefits. For example, heifers from a cross between breeds A and B are bred to bulls from breed C. The heifers from this cross are bred to bulls from breed A, and the resulting heifers are bred to bulls from breed B. Then, bulls from breed C are used again and the cycle is repeated.

There are two drawbacks to the practice: first, two or more sires, each representing a different breed, must be available for at least part of each cycle; and second, color pattern, an important consideration with some buyers, is broken. Alternatively, crossbred replacement females can be purchased and all heifer, as well as steer, calves sold. This program can be applied in areas where dairy herds can be a source of beef-dairy crossbred heifers to maintain the breeding herd.

Recently, much interest has been focused on the European breeds of cattle (often referred to as exotic breeds) being introduced into Canada as sires of terminal cross calves, that is, those intended for slaughter. Calves from these breeds tend to be larger at birth and calving difficulties can be severe with young cows or small cows. However, because of the large mature size of the exotic breeds the calves grow rapidly and efficiently to market weights. The use of a beef-dairy crossbred cow as the dam of these rapidly growing calves is popular as she produces more milk than most of our traditional beef-breed cows.

Beef cattle performance testing

Breeding for rapid growth is the greatest challenge in the beef business. Proper selection and culling in a beef herd can only be accomplished where the breeder knows exactly what he is selecting for and has records indicating which animals are the best for these traits. The traits of economic value in beef cattle are fertility, rate of gain, mothering ability, efficiency of gain, carcass merit and longevity.

Breeding stock for use in commercial meat production can be selected from those ranking high in the population for the traits considered. Not all of the differences observed between individual animals will be passed on to their offspring. *Heritability* is the name given to the proportion

of *the differences measured between animals that is transmitted to the offspring*. The higher the heritability of a trait, the more effective selection will be for that trait.

Heritability estimates for some performance traits are given below:

Trait heritability	(%)
Calving interval	10
Birth weight	40
Weaning weight	30
Feedlot gain	45
Efficiency of gain	40
Final feedlot weight	60
Carcass traits: carcass grade	30
rib eye area	70
tenderness	60

Weaning weight, as an indication of mothering ability of the cow and growth ability of the calf, is an effective criterion for selection. Cows weaning heavy calves one year tend to wean heavy calves in succeeding years. The range encountered in weaning weights is shown by the following data for calves weighed on Record of Performance (ROP) in Canada in 1969/71.

	200-day weight (kg)		
	Top 1/3	All calves	Bottom 1/3
Males	255	221	187
Females	232	202	172

The difference of 68 kg between the top and bottom thirds of male calves can be translated into at least $125 extra profit, using current feeder prices. This example illustrates the potential for improvement by selecting herd sires and heifer replacements from the top third of a herd and culling calves in the bottom third.

Post-weaning growth rate of the calves is measured during a feeding period of 165 days on ROP. The range in average daily gains made on this feeding period in Canada in the 1969/70 test is shown here for steers (in kg).

Top 1/3	All calves	Bottom 1/3
1.15	0.90	0.64

The difference of 0.51 kg per day between the top third and the bottom third can be translated into 82 kg of beef during the 165-day feeding period. This represents an additional income of $148 or more for the top-gaining animal.

Efficiency of gain and growth rate are closely related. Rate of gain is a good indication of economy of gain.

Carcass merit is very important to our beef industry. It is highly heritable and rapid improvement can be made through proper selection.

Longevity is important, but is not highly heritable. Producing replacements is costly and the average age of a herd should be near the peak production age of 6 or 7 years.

Record of Performance programs

The Federal-Provincial Home Test Program is designed for home farm testing of cattle performance. The records obtained under the ROP program are used in culling poor-producing cows and selecting replacement bulls and heifers. Under this program calves are weighed at weaning and after a 165-day feeding period. Gains are indexed against those of other calves within the herd that were born within 90 days and managed alike. Records must be assessed in the light of management applied when comparing different herds.

The test stations compare rates of gain of bulls fed and managed the same during a 140-day test. The station test is designed for individual performance testing and progeny testing of beef bulls. Bulls are indexed for gaining ability following test completion.

Figure 4. The Beef Cattle ROP Test Station at Nappan, N.S., serves all the Atlantic Provinces.

Index is a word used to indicate how an animal rates compared with others of the same age, fed and managed the same. The index is expressed as a percentage. For example, an index of 100 means the animal is equal to the average of the group. An index of 115 means the animal is 15% better than the average of the group in which it was tested.

The main consideration in selecting cattle is how they rate in their management group, and this is what the index tells you. The important indexes are those for weaning weight, rate of gain and yearling weight.

The performance of each new herd sire used must be superior to the previous sire if real genetic improvement is to be made. Genetic improvement is slow, but permanent in nature and it tends to accumulate from year to year.

Records are absolutely essential if success is to be achieved in our beef breeding programs. Use of the Record of Performance programs available offers us the greatest avenue for improving rate of gain and feed efficiency.

A new Federal-Provincial Record of Performance for Beef Cattle program was introduced in October 1981. It is under the direction of an advisory committee consisting of representatives from all parts of the beef industry. It uses the latest computer technology, improved statistical methods, more accurate genetic evaluation and improved producer service, and is based on 25 years' experience with the original ROP program.

The new program is flexible and can be easily adopted to every type and size of farm and to every beef breed. Emphasis is on improving the cattle population for the traits of greatest economic importance. This is done by systematically evaluating genetic differences among animals—measuring the performance of an individual or its offspring against its contemporaries. Among the traits recorded and evaluated are: maternal and reproductive characteristics—calving percent, calving interval, gestation period, cow defects, calving ease and calf condition at birth; and growth traits up to 18 months—weights and average daily gains. In addition, other production information reported by the herd owner can be recorded, processed and used to more fully analyze herd performance and guide management decisions.

Three levels of testing are offered: Introductory Beef Improvement Program, Commercial Beef Improvement Program, and Seedstock Beef Improvement Program. The Introductory and Commercial programs require less recording but will supply useful information to commercial farmers and purebred breeders. The advanced seedstock level offers much more and is aimed at the serious-minded commercial producer and aggressive purebred breeder.

Remote data-entry terminals (one located in Moncton, N.B.) ensure accessibility and quick turnaround time. Historical data can be accumulated on the herd to monitor progress since the herd was first entered on the program.

The Introductory Beef Improvement Program requires only identification of calves and bulls used. By weighing calves at weaning, heavier calves can be selected for replacement. These will be from cows bred early in the breeding season or in their first heat cycle—a reproductive advantage. Selected replacement calves can be weighed at 12, 15 or 18 months and post-weaning gain calculated for final selection. The breeder chooses the traits to be measured, management summaries are produced on the data collected—by sex, bull battery, and pasture if desired.

The Commercial Beef Improvement Program requires identification of calves, cows and bull batteries (each of which may be an individual bull). Since both dam and calf birthdates are known, many traits can be measured: gestation length, calving interval, calving ease, birth weight, the heat cycle the cow was bred in, growth to weaning, weaning, yearling and post-yearling weights and average daily gains. Each breeder can record the traits that suit his needs. With this information reported to the terminal, the breeder can receive evaluations on every calf within the herd, lifetime cow production summaries and herd management summaries.

The Seedstock Beef Improvement Program requires identification of calves, cows and bulls. Calf birthdate must be known. This level provides accurate evaluations on a number of traits and, if needed, lineage performance certificates. Optional traits that can be reported are: expected calving dates, previous gestation length, previous calving dates, cow calving interval, calf age deviation from oldest calf (which is a measure of heat cycle the cow was bred in), and complete birth and weaning information. Also 12, 15, or 18 months information may be added, including weights, average daily gains and gain indices, adjusted hip heights at weaning and post-weaning periods, fat cover and scrotal circumferences. Estimated breeding values (EBV's), based on all available records on all relatives, will be calculated on all animals in the herd for a number of traits. EBV's are the strongest selection tool available. Lifetime cow production records with emphasis on reproductive traits are available. Complete evaluations on sires, dams and calves can be produced, as well as lineage performance certificates.

The Beef ROP program is a unique, nationally oriented program designed to help beef men develop the maximum efficiency of their beef cow herd.

Management of calves

One of a cattleman's main concerns is getting calves born alive. Cows, and especially first-calf heifers, need more care and attention at calving time than at any other time of the year; the herd should be confined during calving so they can be easily watched. Confining during the summer may simply mean keeping pregnant cows in a separate field near the buildings, where they can be easily watched.

As the cow nears calving she should be given a dry, clean place to ensure that the calf is given every chance for survival. The first sign of calving is the bagging-up of the udder which starts about a month before the calf is born. As the time approaches the vulva swells and becomes flabby, the ligaments relax about the tail head and the pin bones appear to fall away, enlarging the pelvic opening. A day or so before birth the cow's temperature drops 1 or 2 degrees below normal and she may become restless and moo a lot.

As labor pains begin, the cow will arch her back and cock her tail up and to one side. The straining gradually increases in intensity and in frequency until the calf is born. The period between the beginning of visible straining and the birth of the calf may be as short as 4 or 5 hours in cows or may last 15 or 18 hours with heifers. If the calf seems to be presented in the normal position and some progress is being made, let the birth proceed naturally. Great damage can be done to the cow and the calf if pulling is attempted too soon.

If there is an obvious problem of malpresentation (breech presentation, head turned back, twins coming together) and no progress is is being made, help must be given. Unless one is fairly experienced it is best to seek veterinary assistance, especially for first-calf heifers with large calves.

A few minutes after the calf is born, the mother normally gets up and starts to lick the calf. A half hour later, the calf is on its feet and getting its first feed of colostrum. If this does *not* happen, it should be assisted to get colostrum as this contains disease-fighting antibodies that the calf lacks. It also contains energy, vitamins and other nutrients essential to the calf and is a natural laxative necessary to start the first bowel movement.

The naval should be dipped with disinfectant as soon as possible after birth to prevent bacteria from using this route to enter the calf. The calf should also be tagged for identification.

One of the main complaints of buyers of feeder cattle has been the number of uncastrated males and calves that were not dehorned before being presented for sale. Castration and dehorning are simple jobs when done at the right time, and they increase the value of the calves by $50-60 for sale as feeders or for feeding at home.

Dehorning should be done as soon as the horn button can be easily located—usually within 2 weeks to a month of birth. Many people prefer to use an electric dehorner at this stage but caustic can also be used. Care must be exercised to ensure a complete kill of the horn or unsightly crooked stubs will develop. Somewhat older calves can be dehorned using a scoop or gouge dehorner. This dehorner causes a more severe wound and requires more care to ensure a good job. Older cattle can be dehorned with a guillotine-type dehorner. The use of this instrument often causes some setback in cattle and the wound must be watched carefully to ensure that infection does not occur.

Dehorned cattle usually settle down and feed more quietly, especially when strange cattle are mixed. Buyers of market cattle like dehorned lots as their carcasses are less likely to have bruises.

(For further information on dehorning see Publication No. 1: *Dehorning* available from N.S. Department of Agriculture, Truro, N.S.).

Most herdsmen prefer to *castrate* male calves when they are a few weeks old, which seems to cause the least setback to the calf. Others like to leave calves until they are several months old. It may take several days after birth for both testicles to descend from the body cavity. Therefore, it is desirable to wait a few days after birth when both testicles will usually be present in the scrotum. If one or both testicles are permanently retained in the body cavity, the calf will develop staggines but will not be fertile.

Two main methods of castration are used, the Burdizzo (bloodless castrator pinchers) and the knife.

The Burdizzo can be used any time of the year as it does not leave an open wound that can lead to infection or fly problems. However, it must be used carefully to avoid "misses". The pinchers have blunt jaws with a small lip on each side of the lower jaw (see Figure 5). This is to ensure that the cord to the testicle does not slip out. The jaws are closed on the cord to each testicle in turn; this crushes and severs the blood vessels and the testicle then dies and withers away.

The Burdizzo is usually used with the animal standing and the operator working from behind. The cord to a testicle is pushed against the outside wall of the scrotum and the point of the pinchers placed over the cord about 5-8 cm above the testicle. The jaws are tightened enough with one hand to hold the cord in place and then both hands are used to completely close the pinchers. Use the thumb and forefinger to press the cord immediately above the jaws to ensure that it is crushed. Some farmers will repeat the operation 1 cm above the original squeeze. The operation is then repeated on the cord to the other testicle. If possible, the two pinches should not be directly opposite each other to ensure that the blood supply to the skin in the lower scrotum is left intact.

Two errors that can occur in using the Burdizzo are failure to completely crush the cord (this is why some farmers like to pinch each side twice) and not pinching high enough above the testicle. If the tissues at the top of the testicle are left alive the animal will become staggy.

When a knife is used and the testicles removed, you can be sure there will not be any misses. However, it does cause an open wound that can become infected and, in warm weather, attract flies.

The testicles can be removed by slitting the side or by cutting away the bottom of the scrotum (see Figure 6). In either case, the testicle is slid out of the scrotum and freed from its support ligaments. The spermatic cord and blood vessels are next severed by scraping with the knife blade well above the testicle. As much of the spermatic cord as possible should be removed to ensure that the animal does not become staggy.

In some areas *preconditioned* calves are receiving bonus prices. Preconditioning means different things to different people but it usually includes at least the following: calves are weaned and accustomed to eating dry feed, free from internal (worms) and external (lice) parasites, vaccinated against blackleg, enterotoxemia, shipping fever and possibly IBR. Such calves are prepared for the stress of shipping and are ready to settle down and go to work in a feedlot. Cattle to be fed out at home will also benefit from being preconditioned before starting on heavy feeding.

Creep feeding means the provision of extra feed, such as grain, for the calves in an enclosure which they can enter but the cows cannot. Whether or not it pays to creep-feed calves depends on several factors, such as time of calving, milk production of the dam, quality of pasture or forage available, and what you propose to do with the calves at

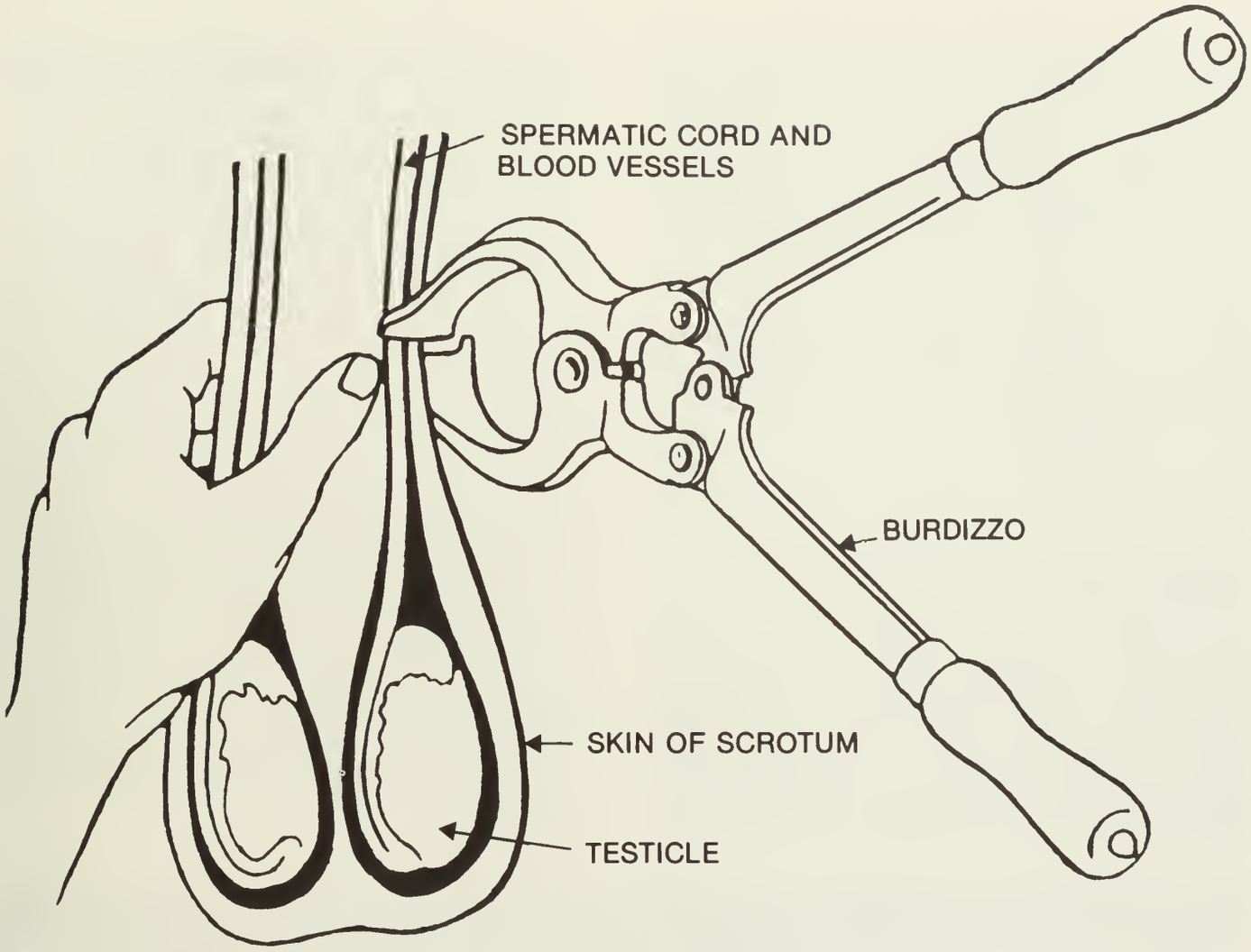


Figure 5. When using the burdizzo for castration, care is required not to pinch all the way across the scrotum.

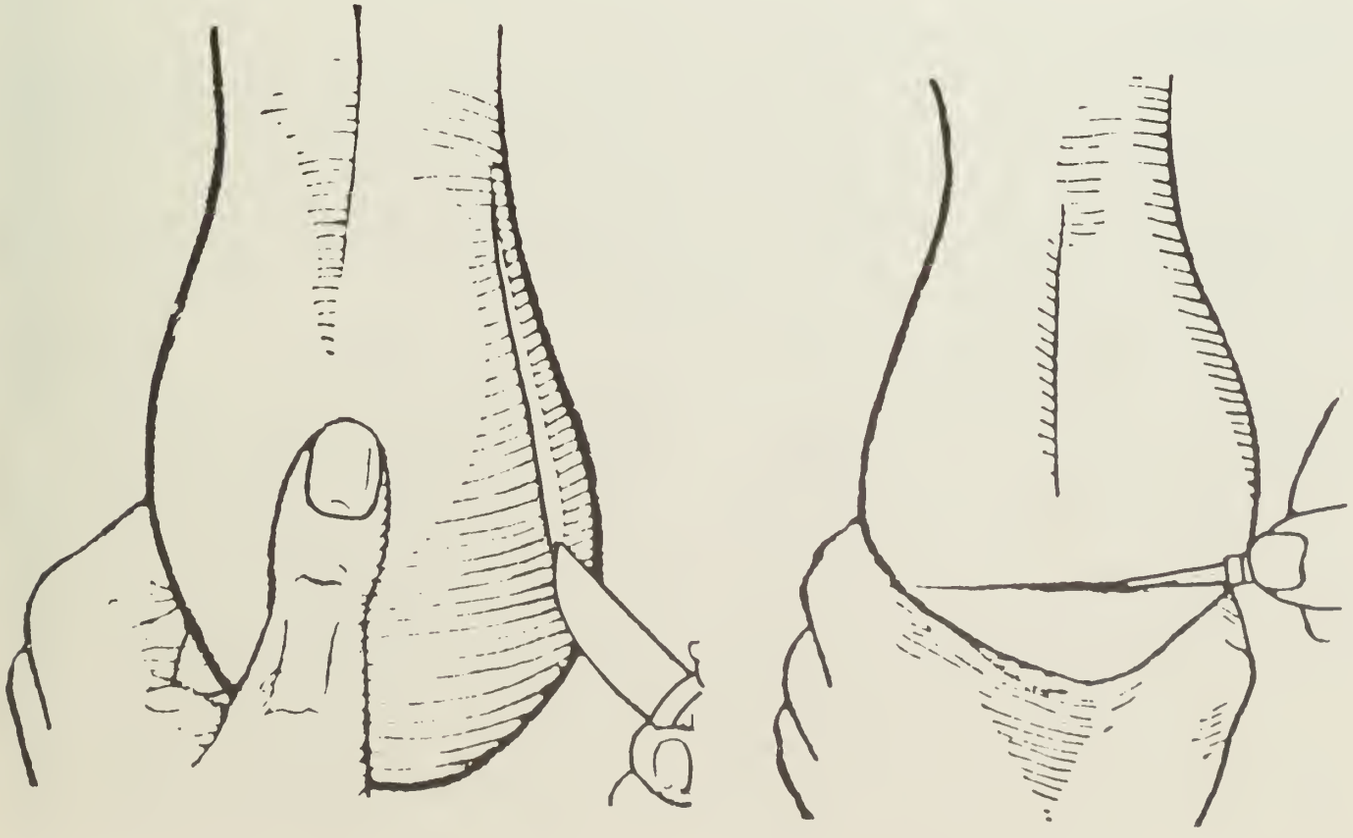


Figure 6. When a knife is used for castration the testicles can be removed through the side or through the bottom of the scrotum.

weaning. Often, it pays to creep feed fall- or winter-born calves during the barn feeding period, but not during spring and early summer when cows are milking well and there is ample high-quality pasture for both calves and cows. If provided with both, calves will eat the grain but reduce their intake of the cheaper source of nutrient—the pasture—and not gain much faster. However, when pasture herbage becomes scarce or low in quality in late summer, creep feeding often pays by increasing the weight gained by the calves.

Some feeders pay a premium for large, creep-fed calves as they go on feed quickly when placed in the feedlot, but others will discount such calves; you should know your market before deciding to creep feed.

The ration offered in the creep feed does not need to be complex. Whole oats or rolled barley alone or in combination are satisfactory, although calves usually learn to eat more quickly and eat more if linseed or soybean meal or molasses is added to improve palatability.

In experiments at the Nappan Experimental Farm, calves on well-fed, high-milking cows consumed very little creep feed until they were about 3 months old. Up to 6 months of age they consumed an average of 275 kg of creep feed and gained about 30 kg more weight than similar calves not creep fed. It took over 9 kg of creep feed to produce 1 kg of extra gain. Creep feeding under these conditions would just about break even for commercial calf production but would be desirable for purebred calves where sale depends upon size at weaning.

Early weaning may be advisable in some circumstances. Normally, spring-born calves are weaned at the end of the pasture season when the calves are about 200 days of age. Fall-born calves are often left with their dams until they are a bit older. If pasture is scarce, or if the forage available is too low in quality to let the cow produce milk for her calf without becoming too thin, it may pay to wean the calf. High-cost concentrates are used more efficiently if consumed directly by the calf rather than fed to the cow.

In experiments at Nappan, it took only 3.5 kg of feed dry matter to produce 1 kg of gain for calves weaned early at about 2 months of age. These calves were fed indoors on ad libitum creep feed and hay. Their weight gain from weaning to 200 days of age was the same as for the control calves weaned at 200 days (average weight at 200 days was 230 kg in the 1980 experiment). An added advantage of early weaning was a higher conception rate in the cows, especially for those that were thin at calving.

The successful rearing of early weaned calves requires generous grain feeding (about 450 kg/calf to 200 days of age). To be justified economically, there must be a considerable saving in the cost of feeding the cows. When enough good quality forage or pasture is available for the cows it will not likely pay to wean the calves and raise them on grain.

Figure 7. Creep-feeding calves will pay when pastures are in short supply (Photo Courtesy of American Cyanamid Company).

Calf management calendar

1. Before calving, vaccinate cow against *E. coli* scours.
2. Be sure the cow has a dry, clean place to calve.
3. Immediately after birth, dip the navel with a disinfectant.
4. Make sure the calf receives adequate colostrum within a few hours of birth. Keep some frozen from a high-milking, older cow to give to calves that are too weak to suck or if the dam does not have colostrum. First-calf heifers do not have as much colostrum as older cows, and it does not contain as many disease-fighting antibodies. Calves from first-calf heifers would benefit by receiving supplemental colostrum from an older cow.
5. Tag or tattoo the calf at birth and record for identification.
6. Give a vitamin E + selenium injection at 1 week of age if cows are not receiving supplemental selenium.
7. Dehorn at 2 weeks to 1 month of age.
8. Castrate between 2 weeks and 2 months of age.
9. One month after turning calves out to pasture, check for worms and repeat every 2 to 4 weeks.
10. One month to 2 weeks before weaning, vaccinate calves against clostridia disease (blackleg, enterotoxemia, etc.) and any other diseases endemic to your area (IBR, BVD, PI, etc.).

Feedlot programs

Feedlot operators have several sources of cattle available to them. Usually cattle are purchased through feeder sales, regular auction sales or by private arrangement. Many cow-calf operators in Eastern Canada feed their own calves to market weight.

Before buying cattle, each farmer must decide what kind of cattle he is going to feed. The type of cattle available may influence this decision, but feed supply, finishing program and experience are more important considerations.

Fall feeder sales generally offer the best selection of good beef calves and yearlings. Cattle can be purchased in lots that are uniform in breeding, quality and weight. A large number of feeders are bought privately. These are usually plainer cattle and may include dairy and dairy-beef animals. Regular livestock sales are held in many centers. At these sales a large number of dairy and dairy-beef-cross calves are sold. Many of these calves change hands several times before being marketed as finished beef.

Starting cattle on feed

The first 3 weeks after cattle arrive are critical in a feedlot program. Find out as much as possible about the condition of the cattle and the treatments received before they were shipped. This helps in deciding what additional treatment is necessary and what initial feed to offer. Keep the cattle isolated if possible during the first 3 weeks, and have adequate feed and watering facilities to quickly restore rumen fill and liquids lost during shipping. Also, keep stress to a minimum.

Calves should be fed hay for the first 10 days and gradually started on the ration to be fed. Yearlings can be started on corn silage and grains fairly quickly, but calves should be accustomed slowly to ration changes.

If high levels of grain or potatoes are to be fed, the adjustment period is much more critical. The grain ration should be gradually increased and roughage decreased over a 3- to 4-week period.

Cattle should be allowed to rest for the first 24 hours after arrival at the feedlot. It is better for cattle to regain fill before any necessary husbandry treatments such as castration, dehorning, worming, or vaccination are performed. However, they should be checked frequently for signs of sickness and treatment administered promptly when needed.

Systems for finishing cattle

The winter feeding program for finishing cattle depends on the age and type of cattle being fed. Generally, most economical gains are obtained in the Atlantic Provinces by using rations high in homegrown roughages, unless byproducts are available. This means that often cattle are not fed for high rates of gain and are marketed at slightly older ages than in areas where grain is cheaper. For example, in a trial conducted at the Nappan, N.S., Experimental Farm a number of years ago, the feed costs for steer calves fed a high-energy ration from weaning to market were one and one-half times higher than for calves fed to gain 0.4 kg per day during the winter and finished on pasture to the next summer. On the other hand, high interest rates favor shorter feeding periods and rapid turn over of cattle.

The feeding system worked out at the Nappan Farm and the Fredericton Research Station, for winter- or spring-born beef calves weaned in the fall, involves the feeding of only about 500 kg of grain to produce an A-1 or A-2 brand carcass at 18-24 months of age. The first winter, the calves are fed all the high quality forage they will eat and up to 2 kg of rolled grain plus minerals and vitamins. They gain 0.7-0.9 kg per day, depending on the quality of the forage. They are turned to pasture the following summer and some are ready for slaughter by the end of the summer at about 18 months of age. The remainder are put back on high quality silage and 2 kg of rolled barley per day. They gain 1 kg per day on this program and are slaughtered when they reach the desired weight. Under this program feed costs per kg of gain during the barn-feeding periods are low. Hormone implants are used to improve performance as outlined on page 19.

The exact feeding program to follow will depend upon the frame type of the cattle being fed. Fine-boned cattle that reach physiological maturity at light weights are better suited to a high-forage feeding program. Large-framed cattle that mature at heavy weights will need more grain to reach a satisfactory degree of finish (fatness) at weights desired by most packing plants. Dairy crossbreeds and crosses from the so-called exotic breeds (Charolais, Simmental, Chianina, etc.) require more grain to reach the same finish than do the traditional English beef breeds (Hereford, Angus, Shorthorn), but there is a considerable

variation within each breed. A new system of grading feeder cattle according to frame size and fatness has been developed to help decide what feeding program to follow for a given batch of cattle.

In the new system, frame size is divided into three categories: large, medium and small, which indicate the expected slaughter weight when the cattle will reach the degree of fatness required for A1 or A2 grades.

Large-frame cattle are those expected to reach A-1 to A-2 grades on an average ration at 550 kg for steers and 450 kg for heifers. Medium-frame cattle will need 450 to 550 kg for steers and 390 to 450 kg for heifers. Small-frame cattle will finish at less than 450 kg for steers and 390 kg for heifers.

The fatness, or fleshing, category has only two levels: lean or fleshy. Lean cattle do not show any obvious sign of fat cover and will usually have been fed mainly a high roughage ration. Fleshy cattle will show some obvious signs of fat cover and will have been fed a higher energy ration.

The six new grades can be summarized as follows:

Fleshing level	Frame size		
	Large	Medium	Small
Lean	Large lean	Medium lean	Small lean
Fleshy	Large fleshy	Medium fleshy	Small fleshy

There is a seventh grade for inferior, off-type or unthrifty animals that is divided according to sex and weight.

Off-type steers	Off-type heifers
over 270 kg	over 225 kg
under 270 kg	under 225 kg

About 10 to 20% of all healthy beef cattle will fall into the large-frame class, 70% into medium and 10 to 20% into the small grade.

Feeder cattle may be purchased as calves, yearlings, or 2-year-olds. Buying *calves* is considered a good way to reduce your risks. Since they are bought at light weights, usually 180-200 kg, they are more efficient in feed conversion than yearlings or 2-year-olds, and a higher proportion of the final product is produced in the feedlot rather than being purchased. The initial purchase price is usually lower than for heavier animals even though the price per pound may be higher.

The main disadvantage to feeding calves is their slow turnover; the capital invested in the stock is tied up for a longer time.

Yearlings are preferred by many feedlot operators. They usually weigh in the range of 225 to 350 kg and their feed conversion is good, although not as high as for calves. Because fewer kg of beef are put on in the feedlot with yearlings, the purchase price per kg must be closer to the selling price than for calves, when a negative margin can often be absorbed. Healthy yearlings in low condition due to inadequate feeding will make highly efficient gains when provided with adequate feed. This type of feeder is in demand each spring for placing on pastures.

Dairy and dairy-crossbred steers are often available. These steers gain weight more rapidly than many purebred beef steers and with equal or better feed efficiency. They do not usually dress out as well as beef steers or reach as high a carcass grade, so that the selling price per kg is less. The difference in selling price must be reflected in the buying price, if you hope to make a profit on feeding dairy steers. To be marketed at 400 to 500 kg, Holstein steers must be fed high-energy rations from weaning. If they are fed high-roughage rations, they do not usually carry enough finish to bring good prices until they reach 620 to 700 kg liveweight. Many markets do not want steers this large. Before deciding to feed dairy-type steers, look into the available markets and determine the size and degree of finish that is likely to give you optimum returns, considering feed costs.

Heifers do not gain quite as fast as steers and require more feed per unit of gain if fed to the same weight as steers. Heifers coming into heat cause stress—and sometimes injury and reduced gains—in group-fed cattle, especially if steers and heifers are mixed in the group. The feed additive MGA will prevent heifers from showing heat and is recommended for use if large numbers of heifers are being fed. Heifers should be sold at liveweights of 45 to 70 kg less than comparable steers to yield carcasses of equal finish. If they are fed to greater weights, feed efficiency falls as they tend to lay on excess fat. Many experiments have shown that heifers and steers of equal finish or fat content have equal dressing percentage and the carcasses have equal retail value per kg. Buyers usually pay less for heifers than for steers because some are overfat and some are pregnant. If you are sure your heifers do not have these faults, consider selling them according to rail grade and carcass weight.

Cows and older steers are sometimes purchased to use extra pasture or homegrown feed. Healthy but thin animals make rapid gains on adequate feed and return a reasonable profit, especially if the grade is improved. The problem with buying such animals is one of distinguishing between the thin, healthy animals and those suffering from disease or internal parasites.

Preparing cattle for market

In deciding on the type of cattle to feed, producers must consider the market available. Cattle must be fed to produce a desirable carcass and then marketed to take advantage of current prices and trends.

Many markets are available to producers in Eastern Canada, for example, through auction sales, drovers, packing plants, local butchers and directly to consumers. Factors to consider in deciding on a market are market price, transportation cost, selling cost, shrinkage, services, and weighing conditions.

Selling by rail grade at a negotiated price is one way of ensuring that you receive full market value for your cattle. The grade is established by officers of Agriculture Canada. In the future, no doubt, standard procedures will be established for dressing and weighing cattle on a rail-grade basis.

Regardless of the market chosen, animals should be shipped in as attractive condition as possible. Uniform groups are more attractive to buyers. Cattle should be handled gently to avoid bruising and injury.

Shrinkage refers to the loss in weight between feedlot and market scales. Cattle lose weight largely because of excretions and to a lesser degree from tissue moisture loss. The longer the trip the greater the shrinkage. The greatest loss is in the first few miles or first 2 or 3 hours of shipment and can be 4 or 5 % of body weight. Cattle should not be held more than 24 hours without feed and water.

Dressing percentage refers to the ratio of carcass weight to liveweight. It varies depending on weights used to calculate it, that is, warm or cold carcass weight, initial weight at the feedlot or shrunk weight at the plant. Based on warm carcass and shrunk liveweight, dressing percentage varies from 50% for thin cattle to 60% or more for fat cattle. Several factors influence dressing percentage in cattle, including the amount of fill, type of animal, degree of finish and sex.

Feeding

For general information on feeding beef cattle and for information on common feeds, refer to Publication No. 400.50. Feeding Guide for the Atlantic Provinces, *available from Agricultural Department Offices.*

To make the most efficient use of the available feeds, samples of the roughages, homegrown grains and byproduct feeds should be tested at your provincial feed testing laboratory. Contact your agricultural representative or provincial department of agriculture headquarters for information on how to take the samples and submit them for analysis. Mechanical samplers may be borrowed from most agricultural offices. It is important that the sample be representative of the feed available, if the tests are to be useful.

Many beef operations are maintained to use waste or byproduct feeds available on the farm or in the area. Brief descriptions and suggestions on the use of some of these common feeds follow.

Straw

Straw that has been stored without too much weather damage and free from mold can be used for feeding dry, pregnant beef cows. A daily ration of 5-6 kg of straw, 2 kg of rolled barley or other grain, and 0.25 kg of a 50% protein supplement containing vitamins A and D and minerals will maintain a cow through the winter. If some hay is fed, the amount of grain can be reduced. Straw should not be fed in large amounts to young stock or fattening cattle, as it is too low in digestible energy. It is also deficient in vitamins and protein and these must be supplied in other parts of the ration. The straw from grain fields that were seeded out often contains some clover and grasses, which improve the nutritive value. If such straw is fed in excess of appetite, the cattle will sort out and eat the best part and the remainder can be used for bedding. Grinding straw through a hammer mill will result in higher daily intake and is recommended if the equipment exists on the farm. Feeding high levels of straw without adequate supplementation can cause impaction of the rumen.

Potatoes

Cull potatoes and potato processing plant wastes are available in some areas in large quantities. They are an excellent energy source for cattle and are highly palatable once cattle are induced to start eating them. Many animals will consume over 10% of their body weight per day of fresh potato material. Potatoes are deficient in digestible protein, calcium, magnesium and some vitamins. Young cattle can be readily fattened on high levels of potatoes. They should be fed at least 1 kg per day of roughage (hay or straw) and 0.5 kg per day of a commercial feedlot supplement containing 50% crude protein plus minerals, vitamins and other additives. If potatoes make up the remainder of the ration, additional protein will be needed and can be supplied by 0.25 to 0.4 kg of soybean meal or similar plant-protein supplement. A mineral mixture of equal parts of limestone, dicalcium phosphate and trace mineral salt should be provided in a box.

Cattle must not be fed high levels of sunburned (green) potatoes or potato sprouts as these contain a toxic material which can poison the animals. It is not necessary to cook potatoes for cattle. Some people prefer to pulp potatoes before feeding to prevent choking but many feed whole potatoes and report very little trouble unless the potatoes become frozen. As with any high energy feed, it is important that the amounts of potatoes fed per day be increased gradually to prevent digestive upset. Potatoes can be stored for extended periods, such as over the summer, by ensiling with a dry forage such as hay. A mixture of 4 parts potatoes to 1 part hay, by weight, is optimum for upright silos. The potatoes can be pulped by the silo blower, if free from stones.

Apple pomace

Apple pomace, a highly palatable byproduct from the production of apple juice, contains mainly the peel, core, and seeds of apples. Dried pomace is similar to lightweight oats in food value, except that it is lower in digestible protein (less than 2%). In some areas, spray residues contaminate the pomace and it is necessary to restrict the amount fed, or to feed it for only short periods of time, to prevent pesticide residues appearing in the carcass. Check with your supplier before feeding pomace. There have been reports of reproductive problems when apple pomace is fed to breeding females along with a supplement containing urea.

Processing waste

Processing waste from the canning and freezing of other vegetables and fruit is often available in quantity at the plants. This material can be ensiled and fed to cattle during the winter. The composition and feeding value of the material varies with the crop and the part of the plant being discarded. If possible, obtain a sample for testing at your provincial feed testing lab before planning your feeding program. Check with the supplier regarding

Figure 8. Cull potatoes are an excellent energy feed for cattle (Photo Courtesy of Agricultural Press Ltd.).

possible pesticide residues before feeding processing waste. Pea vines left on the field after harvesting of the peas for freezing make a high quality hay or silage.

Wet brewers' and distillers' grains

Wet brewers' and distillers' grains vary in value depending on the grain used in the process and the amount of water in the slurry. In general, these grains are higher in protein (27 to 28% of the dry matter) and lower in energy than the original grain. The cost of hauling the wet material usually limits the area in which these grains can be fed. They can be fed in any amount to beef cattle and will usually supply all the supplementary protein needed in the ration.

Forages

While byproduct feeds, when available, may provide the cheapest source of nutrients for beef cattle, forages are the backbone of most beef feeding programs in Eastern Canada. Pasture production is discussed beginning on page 21. Other bulletins give information on growing forage crops (*Field Crop Guide*, Atlantic Provinces Publication No. 100), harvesting forages (*Forage Handling Systems for Grass and Legumes*, Atlantic Provinces Publication P79-6M) and storing hay (*Forced Air Drying for High Quality Hay*, Atlantic Provinces Publication P79-3M).

As grasses and legumes mature they become less digestible and animals will eat less of them each day. If forages are harvested while still actively growing, the feed quality will be high but yield will be low. Many experiments have proven that the optimum yield of digestible nutrients is obtained when the grasses are just headed out and the legumes are in bud. If harvest is delayed beyond these stages, losses in digestibility are greater than benefits from the increased dry matter yield.

The most common method of harvesting forages is to make *hay*. Early in the season it requires three consecutive fine days to dry hay sufficiently so it will store without heating. Using hay conditioners at mowing (crimpers, crushers) and a forced-air drying system in the mow can reduce the drying time to 2 days; this increases the chances of getting hay dry without rain damage.

The advantages of making hay into *traditional rectangular* bales are that equipment is readily available and relatively inexpensive and the bales are suitable for barn drying with forced air. The disadvantages include a high labor requirement and the difficulty of drying hay in a humid climate.

Large round bales are increasing in popularity on larger farms because they greatly reduce the labor needed. The hay must be drier than for small rectangular bales as round bales are not conducive to barn drying with forced air and, because of the greater mass of hay, heat can build up rapidly if the hay is baled while damp.

Considerable losses can occur when large round bales are stored outside during a winter climate with frequent freezing and thawing. As much as a third of the bale can be encased in ice under these conditions. Also, unless appropriately designed feeders are used, the animals can destroy much hay by trampling it.

The advantages of these bales are that they are quick and easy to make. The disadvantages include higher cost for equipment, more power needed, the necessity to be extra careful to get hay dry before baling and greater storage losses when bales are left out.

Ensiling is the best way to preserve forages under the moist climatic conditions encountered in the Atlantic Provinces in late June, when these crops should be harvested. Silage can be successfully stored in stacks, horizontal silos or upright silos. It takes more attention and care to make silage into a stack, than to put it in a horizontal silo with tight walls or into a vertical silo. Fermentation losses are usually higher in a stack than in a silo because more air penetrates and leads to spoilage. The key to successful ensiling, regardless of type of silo, is to keep out air.

Animals will eat more dry matter per day from a wilted silage than from a wetter, direct-cut silage made from the same crop at the same time. However, drier silages are more difficult to pack and seal so that air does not enter and cause spoilage. A compromise is required and the ideal dry matter varies with the silo structure. The optimum dry matter content for stacks is about 25 to 30%, for horizontal silos with walls 30 to 35%, for vertical silos 35 to 40% and for sealed oxygen-limiting silos 45 to 50%.

Considerable experience is required to judge accurately the moisture content of cut forage, but it is important for ensuring successful preservation in the silo. Also, in planning your feeding program, it is important to know the dry matter content of the silage; 100 kg of 25% dry matter silage has only half the nutrients of 100 kg of 50% dry matter silage.

The advantages of preserving forage as silage include less dependence on the weather (therefore, greater likelihood of being able to harvest the crop at the optimum time), availability of high capacity systems, and easy mechanization of both harvesting and feeding. The disadvantages are high power requirements, capital expenses for equipment and silos, and high labor requirement during harvesting.

Silage and hay produced from the same crop at the same time are similar in feeding value. Ensiling does not improve digestibility of an overly-mature crop or improve intake of a stemmy or weedy crop. In planning a feeding program, hay crop silage and hay can be used interchangeably as long as adjustments are made for the higher moisture content in the silages.

Implants and feed additives

Two types of ear implants are approved for use in beef cattle intended for slaughter in Canada. Both are placed in the ear between the skin and cartilage (see Figure 9).

One type contains natural hormones under the trade names Synovex S and Synovex H. Synovex S is designed for steers weighing 270 to 450 kg and contains the hormones progesterone and estradial benzoate. Synovex H is for heifers and contains testasterone propionate and estradial benzoate. Neither implant is to be used within 70 days of slaughter.

Synovex implants increase the rate of gain of fattening cattle by 10 to 15% and improve feed efficiency by 8 to 15%. The manufacturer's recommendations must be followed to ensure maximum benefit from implanting. The implants must be placed in the mid portion of the ear for best results (see Figure 10). Full response to hormone

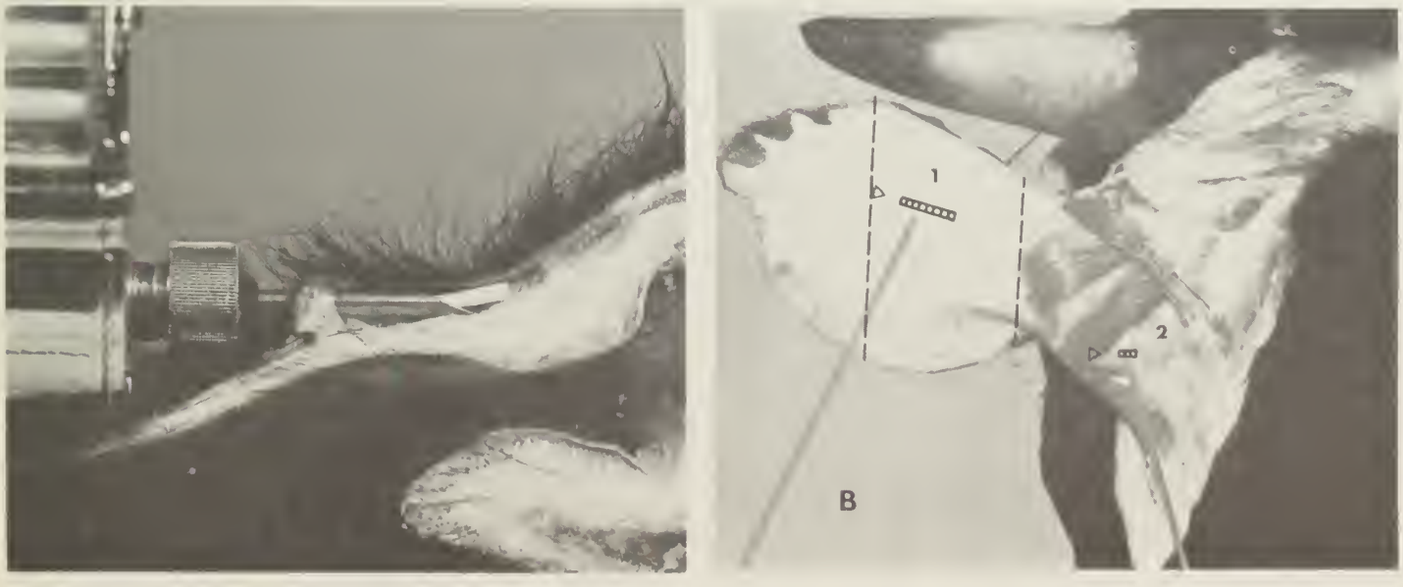


Figure 9. A — Cross-section through an ear showing position of implant pellets just under the skin (Photo courtesy of Brae Laboratories). B — An ear with skin removed to show recommended location of (1) Synovex and (2) Ralgro implants (Photo courtesy of *Cattlemen's Magazine*).

Figure 10. Synovex implants should be placed in the mid portion of the ear (Photo courtesy of Syntex Canada Inc.).

Figure 11. Ralgro implants should be placed near the base of the ear (Photo courtesy of Brae Laboratories).

preparations can only be expected in healthy, parasite-free cattle that are fed a balanced ration in adequate amounts.

The second type of implant contains the antibiotic Zeranol and is sold under the trade name Ralgro. Ralgro must not be implanted less than 65 days before slaughter. It can be used on calves as young as 1 day old, and improvement in rate of gain and feed efficiency is similar to that with Synovex. For best results, the implants must be placed near the base of the ear (see Figure 11).

Neither type of implant is recommended for use on cattle intended for breeding as they may reduce fertility, especially in bulls.

Few practices are as consistent in response as ear implanting. The actual implanting is not difficult, as long as the animal's head can be restrained, and takes only a few seconds. The extra weight gains and improved efficiency of feed conversion will return the cost of the implants many times over. Other types of implants are being tested and, no doubt, some will soon be licensed for use in Canada.

Monensin is another feed additive approved for cattle intended for slaughter. It is sold under the trade name Rumensin. It is added at 11 ppm to the diet for the first 28 days then increased to 33 ppm for the remainder of the time the animals are on feed. There is no requirement to withdraw it from the feed before slaughter.

Monensin causes changes in the fermentation pattern in the rumen, reducing methane production and increasing the propionic acid produced there by bacteria. The net result is an increase of 10 to 12% in the efficiency of feed converted to weight gain. Daily weight gains are not usually increased when high concentrate rations are fed but the animals continue to gain at the same rate while eating less feed. With cattle on high-roughage rations or pasture there is often an increase in rate of gain as well. Monensin is toxic to horses, so care must be taken not to feed rations that contain it to horses.

MGA (melengestrol acetate) prevents heifers from coming into heat when it is fed at the approved rate of 0.4 mg per head per day. It gives about the same improvement in rates of gain and feed efficiency as implanting (8 to 15%) and costs about 1 cent per animal per day. It does not improve the rates of gain of steers or spayed heifers. Feeding MGA must be discontinued 48 hours before slaughter; and it should not be discontinued much before 48 hours, or the heifers will start coming into heat and much of the advantage of using MGA will be lost.

Antibiotics fed at low levels (about 60 mg per day) to fattening cattle improve rates of gain and feed efficiency under some conditions. The response to low-level antibiotic feeding is not consistent and can only be recommended with certainty where chronic disease conditions are likely to exist.

A higher level of a mixture of chlortetracycline and sulfamethazine (Aureo S700) has been approved for feeding to cattle for the first 4 weeks after entering a feedlot. It is designed to help maintain weight gains and feed efficiency in cattle during periods of stress due to weaning, shipping or handling. Cattle cannot be slaughtered for food for at least 21 days after the last treatment with this preparation. Extensive research indicates that the use of this product is advisable for cattle shipped a considerable distance or going through a sale barn before arriving at a feedlot.

Pasture for beef cattle

Pasture can provide the most economical source of feed for beef cattle and should be considered as a major source of nutrients for beef production in this region. Proper fertilization and grazing management techniques can in-

Figure 12. Pasture can provide an economical source of feed for beef cattle.

crease the productivity of many of our pastures several fold.

Pasture for beef cows

For a breeding herd, pasture should be the main source of nutrients. Winter feeding programs now emphasize a restricted level of feeding for spring-calving brood cows, just enough to ensure healthy calves and to maintain reproductive efficiency. This minimizes the requirements for winter feeding of costly stored forages, but makes it essential that ample pasture is available during the grazing season, so that cows can recover winter weight losses and attain a gaining condition during the breeding season. Ample early pasture also stimulates milk flow to support growth of nursing calves.

Pasture area required per cow depends on type of pasture sward, fertility and grazing management. With good pasture one cow with calf requires about 0.3-0.4 ha of pasture but this increases under less-favorable conditions. Shade as well as an ample supply of clean water should be available in pasture areas. A mineral mixture supplying salt, calcium, phosphorus, cobalt and iodine should be available to grazing animals at all times, especially before and during the breeding season.

Pasture can provide ample feed to support good growth in replacement heifers. The heifers should be on good pasture and in a gaining condition during the breeding season. Minerals plus a supply of clean water and shade should be available, as for breeding cows.

Fattening market animals on pasture

Beef animals on pasture may not attain the degree of finish and grade that feedlot cattle will, but the lower feed costs will offset the lower prices obtained. The gains obtained on pasture vary considerably depending on the age and condition of the animals going onto pasture, the type of pasture, fertility, and grazing management. Grain feeding on pasture will improve the quality and yield of beef and will increase the carrying capacity of the pasture.

Several systems of pasture grazing may be followed:

Pasture only – This system, with no grain feeding, will not produce well-finished beef but under good fertility and grazing management should produce up to 0.9 kg of gain per day throughout the pasture season. Older animals in poor condition will give the greatest response in actual gains and improvement in condition on pasture. Partly finished animals on pasture only tend to lose condition and should receive some grain.

Pasture with limited grain during the latter part of the grazing season – Grazing animals may put on half or more of the season's gain during the first 2 months of grazing. This is because many pastures tend to drop in productivity during the hot, dryer midsummer. Feeding a limited amount of grain from midsummer to the end of the grazing season maintains growth rates, produces more and better beef, and increases the carrying capacity of the pastures. Grain feeding rates vary, but up to 0.75% of body weight may be fed per day, depending on pasture condition and type of animals being fed.

Pasture plus high level grain feeding throughout the pasture season – This system is used most often with animals that are partly fattened at the start of the pasture season. It ensures that cattle will be ready for market at an early date. Cattle taken off pasture under this system will adapt to grain feeding and will gain rapidly in the feedlot if additional finishing is required.

Zero grazing refers to the practice of cutting fresh grass and hauling it to the cattle daily. It increases the carrying capacity of a pasture and is most often used where land costs are high and the farm is equipped with feedlot facilities. A variation of zero grazing is to store all forage as silage and feed cattle year-round in the feedlot rather than turn them out to pasture.

Minerals and salt should be available free choice for market animals on pasture. A suitable mineral mixture for pastured animals is two parts of dicalcium phosphate plus one part trace-mineral salt. This mixture should be placed in covered feed boxes adjacent to the water supply.

Pasture management

To produce good weight gains on pasture and maintain productivity throughout the pasture season, adequate amounts of fertilizer, plus good pasture-grazing management are required. In addition, pastures seeded out to forages adapted to pasture grazing are usually more productive than permanent pastures, especially under drier midsummer conditions. (See federal and provincial field crop recommendation bulletins for pasture establishment and fertilization recommendations.)

Pasture management involves rotational or other forms of grazing management that allow a recovery period following each grazing cycle. Ten to 15 cm of herbage on pastures will provide excellent quality forage. Early in the season some herbage may have to be removed as hay or silage to cope with the rapid spring growth and to maintain palatability.

Many permanent or old pasture swards have a predominately white clover-bluegrass sward. With adequate moisture this sward can be very productive, but under dry, midsummer conditions it becomes dormant and quite unproductive. There are available now a number of forage varieties developed especially for pasture which are more productive under these conditions, i.e. annual ryegrass.

Supplementary pasture

Annual crops for supplementary pasture can be important in a pasture program for beef. These crops are planted to provide additional pasture during mid- to late-season when regular pastures drop off in productivity. Among the crops used for supplementary pasture are annual ryegrass, oats, millet, rape, kale and winter rye. These crops, either grazed or used for green chop, enable a beef producer to maintain growth in market animals throughout the entire grazing season or to extend the grazing season.

For additional information on pasture production and grazing management, see *Pasture Production and Utilization in the Atlantic Provinces*, Atlantic Provincial Publication 135.

Figure 13. Cereal grains make an excellent supplementary pasture for midsummer grazing.

Disease control in beef cattle

Infertility

Heavy financial loss may result from failure of cows to reproduce regularly. Causes of infertility include:

- Infectious diseases, such as leptospirosis, vibriosis and infectious pustular vulvovaginitis.
- Breeding cows too soon after calving.
- Poor quality semen.

Control is based on:

- Purchase of additions to the herd from other herds not experiencing infertility problems.
- Regular veterinary examinations of cows about 1 month after calving and about 2 months after breeding.
- Fertility check on herd sires, if previous fertility record is unknown or questionable.
- Vaccination against infectious diseases, as prescribed by your veterinarian.

Abortion

The most suitable materials for laboratory tests to determine cause of abortion are the aborted fetus and a piece of the afterbirth. If it is not possible to take these to the lab the same day, they should be kept in a cool place where dogs, cats, rodents and birds cannot get at them.

A cow that aborts should be isolated from the remainder of the herd. The place where she aborted should be cleaned and disinfected, with disposal of the soiled bedding by burning.

Calving problems

First-calf heifers, and sometimes older cows, may require assistance at calving time. It is usually wise, however, to let labor progress 1 to 2 hours, to allow for maximum opening of the birth canal. (Some heifers may show uneasiness and slight labor for a day before really getting down to business).

The calf's nose and front feet should appear at about the same time. If this does not seem to be happening, and if assistance appears to be needed, the cow's hind quarters and the operator's arms should be washed with a mild antiseptic solution. If you cannot properly position the calf for delivery, get veterinary help.

The navel of a newborn calf should be disinfected with 2% tincture of iodine or with 'pinkeye and wound spray' to help prevent joint-ill. Also, it is important that the calf soon gets its mother's first milk (colostrum), which contains antibodies against infection.

Calf scours

Diarrhea (scours) is the most common disease of young animals. This is a major area of research and we have learned a great deal about this disease in recent years. However, there are still areas in which little information is available.

This discussion will be general, and restricted to animals 2 weeks of age or less.

Dietetic or nutritional scours do occur, but diarrhea due to infectious agents represents the major problem to producers. The infectious agents, usually bacteria (certain *E.*

coli) and viruses (usually Rotavirus and Coronavirus), reside in the large bowel of the dam and contaminate the environment via feces. The organisms are then ingested by the newborn and pass to the small intestine where they cause injury resulting in diarrhea.

The following are important in the prevention of diarrhea:

1. The dam must be in good condition so that the fetus develops properly and sufficient colostrum is produced.
2. Problems are greatest with heifers having their first calf. They have little colostrum and mismothering often occurs.
3. During the past 2 years, vaccines have become available to protect calves against the common infectious agents causing diarrhea, *E. coli* and the two enteric viruses mentioned above. With both products, the dam is vaccinated (usually twice) during gestation. She produces antibodies that are passed on to the calf via colostrum. These products appear to be very helpful, when properly used. The critical point is that the calf must receive colostrum. Discuss these vaccines with your veterinarian.
4. Have the young born in a clean, dry environment. It is ideal if calves can be born outdoors or where animals are not normally housed so it is free of fecal contamination, the source of organisms causing diarrhea.
5. Be sure the newborn receive colostrum as early as possible. It is not well absorbed from the intestine more than 6 hours after birth and not at all after 24 hours.
6. Prevent overcrowding. This stress interrupts nursing and sleeping, the main occupations of the newborn.

If an outbreak of diarrhea does occur, consult your veterinarian. The following points are important in treatment of this problem:

1. If possible, discontinue feeding milk.
2. The common infectious agents causing diarrhea also cause death by dehydration. This is reversed by giving electrolytes (solutions of the salts found in blood) orally or, in severe cases, intravenously.
3. Use antibiotics with care and use preparations to coat and protect the intestine.
4. If the problem persists, submit a sick, untreated animal to the laboratory to assist with diagnosis of the specific problem.

White muscle disease

Inability to stand and get around properly, distress in breathing and sudden death due to heart failure are common signs of white muscle disease. The cause is deterioration of the skeletal and heart muscles from deficiencies of vitamin E and the mineral selenium.

Young calves may be given vitamin E and selenium by syringe and needle on the second or third day following birth. On farms where white muscle disease is a serious problem, the injection may be repeated a week later and again when turning the calves to pasture.

All feeds grown in the Maritimes are low in selenium content, therefore it is good insurance to feed supplemental selenium to beef cows. Because high levels of selenium are toxic, supplemental selenium can only be fed as follows:

1. In grain rations for all classes of beef cattle and sheep, at a level not to exceed 0.1 mg supplemental selenium per kg.
2. In feed for limit feeding at a level not to exceed an intake of 1 mg supplemental selenium per head per day in beef cattle and 0.25 mg in sheep.
3. In loose trace-mineralized salt at a level not to exceed 25 mg supplemental selenium per kg.
4. In free-choice mineral feed for beef cattle on range at a level not to exceed 10 mg supplemental selenium per kg.

The diets must be adequately supplemented with vitamin E (20 I.U. per kg of grain ration) and the animals should receive only one source of supplemental selenium (either the grain ration or supplement premix).

Pinkeye

Early symptoms of pinkeye include swelling and redness of the eyes and a moderate to heavy discharge of tears and pus. Later a white film may cover the surface of the eye. The disease is most common in early summer.

Affected animals should be isolated from the remainder of the herd, preferably in a shaded place and away from flies.

Many ointments, powders and sprays are available for treatment of pinkeye. Sprays are probably most popular. As these are under considerable pressure, the can of spray should not be held closer to the eye than about 15 cm to avoid further damage to the diseased eye.

Blackleg

A dead, bloated carcass found in the pasture is often the first indication of blackleg in a herd. Cattle between 4 and 30 months are more susceptible than others to the germ of blackleg, which may live for many years in soil.

Vaccination with *Clostridium chauvei-septicus-perfringens* bacterin is highly effective in preventing blackleg and related disease. For maximum protection, the vaccination should be done at least 10 days before turning the herd to pasture in the spring.

Lameness

Long toes on cows and bulls cause undue strain on the tendons at the back of the legs. This, and the tendency of long toes to crack, often produces lameness, which interferes with grazing and with breeding.

Swelling between the toes and above the hoofs, which later breaks and discharges foul-smelling pus, is appropriately called foot rot. The germ of foot rot thrives in swamps and muck. Cuts and bruises make the feet vulnerable to infection.

Control is based on:

- Routine hoof trimming in late winter or early spring—a set of slings makes this job easier.
- Draining or fencing off swamps.
- Keeping pastures, lanes and yards clean and free of stones, wire, broken glass and other refuse.
- Including organic iodine in the salt-mineral mixture if foot rot is a problem.

External parasites

Horn flies and face flies annoy cattle on pasture and thus interfere with weight gains. Face flies also help to spread pinkeye. Control of these pests at pasture is made easier by the use of rubbing devices or dust bags that automatically apply insecticide to the cattle when they put their heads into the salt-mineral box or when they rub against the devices. Other controls include periodic spraying, an oral insecticide in the feed that prevents development of the fly larva in the manure, and the newest method, ear tags containing insecticide. These tags are simple to use and are claimed to give protection for a whole summer.

Warble flies cause economic loss because they make the cattle lose weight by galloping over the pasture during fly season. The warble grubs also damage carcasses and hides in the spring. Organophosphate preparations applied to the backs of cattle in the fall provide very effective control. These products are poisonous and product label directions should be carefully followed.

The fall treatment for warble fly may be repeated later in the winter for control of lice. Cattle that are not treated in the fall should not be given these treatments after December 1. Instead, derris powder may be used in the spring to kill the warble larva when they reach the backs of the cattle. Various nonsystemic dusts and sprays are available to control lice on cattle that were not treated with the systemic insecticides in the fall. With all insecticides, carefully read the label on the package before use.

Internal parasites

Coccidiosis may be suspected when calves are affected with severe scouring and straining. Frequently clots of blood are passed. This disease is more common when calves are closely confined in wet, overcrowded pens or when they drink from mud puddles. Microscopic examination of feces from affected calves shows the egg-shaped parasites. This condition also may cause a syndrome characterized by nervous signs.

Control is based on:

- Isolation and treatment of affected calves with sulfa drugs; blood transfusion if necessary.
- Clean, dry pens.
- Avoidance of overcrowding.

Stomach and intestinal worms may be suspected when cattle, especially grazing calves and yearlings, scour and become unthrifty, thin and weak. The worms spend part of their life cycle on the ground and cattle become infected while grazing. The climate of the Atlantic Provinces is moist and cool, conditions these parasites like. Pastures may become heavily contaminated in a period of 2 or 3 weeks with any of a dozen or so species of parasite eggs and larvae.

Lungworms resemble short white threads. Their life cycle is somewhat similar to that of stomach and intestinal worms. Adult lungworms live in the air passages of the lungs of cattle. Affected cattle become unthrifty and cough a great deal. In heavy infection the animal may suffocate because lung air passages are plugged with worms.

Control of stomach and intestinal worms and lungworms is based on:

- Prepasture treatment of cattle with levamisole, thiabendazole, dictycide, or other drug prescribed by a veterinarian to remove the species of parasites present in the herd.
- Treatments at other times of the year, if necessary and as prescribed for the particular parasite problem.
- Drainage of pastures and yards (worm parasites need moisture to survive and infect cattle).
- Regular removal of manure from feedlots; and spreading of manure on crop land, not on pasture land.

ITEME

ITEME is the shortened name for Infectious Thromboembolic Meningoencephalitis, a disease occurring from time to time in early winter in feedlot cattle, and less often at other seasons and in other cattle.

First evidence that ITEME is present may be when a dead animal is found in the feedlot. Affected animals may also be found lying down, unable to get up, stupid, and perhaps blind in one or both eyes. Others may be able to stand, but are weak and staggery, and may show lameness with swollen joints. Affected cattle often show rapid, shallow breathing. Typically, about 2% of cattle in a feedlot are affected by an outbreak of ITEME.

Affected cattle will usually recover if treated with antibiotics before they become unable to stand. The disease is rapidly fatal if treatment is not given when signs are first noticed.

Vaccines have been developed. Although their effectiveness is not proven, vaccination against ITEME may in future provide useful protection.

Urinary calculi (bladder stones)

Unsuccessful efforts of a steer to urinate, kicking at its belly, stiffness in moving about and switching its tail are the usual signs of urinary calculi. In extreme cases the bladder may rupture, with the steer dying in a coma 2 or 3 days later.

A veterinarian should be called for surgical relief of the urinary obstruction before the bladder ruptures. Prevention consists of providing adequate vitamin A and, in some cases, carefully increasing the salt content of the ration to encourage greater water consumption.

Warts

The unsightly appearance of warts around the head, neck and back of young cattle may interfere with their sale. Usually warts disappear by the time heifers have their first calves.

Commercial wart vaccines are available, but vaccines prepared from wart tissues of affected animals will probably give better results in the herd. Vaccination does not give 100% immunity to warts. Other control measures include removing sharp objects (nails, etc.) from walls, feed racks and gates. Also, tattooing equipment and other instruments should be kept clean and disinfected to avoid spreading wart infection through the herd.

Ringworm

A variety of fungicides are available for treating ringworm on cattle. These include tincture of iodine, tinevet, captan and others. Used crankcase oil has been claimed to be effective, but cattle may get lead poisoning if they lick or chew rubbing devices soaked with this oil. Since ringworm is caused by different species of fungi it is often necessary to try more than one remedy to obtain a cure.

Barns should be thoroughly cleaned and disinfected in the spring to remove spores of ringworm fungus along with other disease germs.

Virus diarrhea

Loss of appetite, fever for 2 or 3 days followed by scouring, and the appearance of crusty lesions on the muzzle are the usual signs of virus diarrhea. Cattle 6 to 24 months old are more susceptible. Occasionally a cow may abort. Lameness may develop in a few cases.

Vaccines are available and, ideally, vaccination should be done 3 weeks before cattle are put in a feedlot.

Diagnosis of this condition by your veterinarian is essential, as it can be confused with about 14 other diseases. Diseased animals may be treated to prevent or reduce secondary bacterial infection.

Shipping fever

The term "shipping fever" has been used for many years to denote respiratory disease in cattle and other animals during or following shipping and other conditions of stress.

Dullness, loss of appetite, fever, discharges from the eyes and nose, and coughing are prominent signs.

Sulfa drugs and antibiotics are the usual drugs employed in treatment. These are often added to the herd's drinking water for ease of treating many animals.

New additions to the herd should be kept in isolation for 2 weeks. Cattle that come down with shipping fever should be further isolated. Cool barns (10-12°C) are less likely to stress cattle or predispose them to shipping fever.

Infectious bovine rhinotracheitis (IBR)

Close contact makes this respiratory disease more severe in feedlot cattle than in others.

The symptoms of IBR are somewhat similar to those of shipping fever. In addition, fat animals lose weight rapidly and, in a few cattle, the nose becomes red and crusted (the disease is sometimes called rednose). Abortion is fairly common some weeks after an outbreak of disease in the herd, or after vaccination. Cows 6 to 8 months pregnant usually abort and often retain the afterbirth.

The ideal program of prevention would be *preconditioning* — vaccinating cattle against IBR, shipping fever, virus diarrhea, etc., 3 weeks before they are shipped to feedlots. Also, well in advance of being introduced to strange, crowded quarters the cattle should receive other necessary treatments such as castrating, dehorning or implanting.

Because of the risk of causing abortions, IBR vaccination should only be employed in areas or situations where this disease has appeared or is thought very likely to occur. The form of vaccine that is administered as a spray in the nose is less likely to cause abortions than is the injectable form.

Digestive problems

Prevention and control of digestive problems, such as indigestion, bloat, choke and hardware disease, involves several do's and don'ts of herd management:

- Avoid sudden changes in feed.
- Avoid overfeeding with starchy feeds, which ferment easily.
- Give a full feed of dry roughage to which the cattle are accustomed before putting them on lush pasture.
- Do not attempt passing a fork handle, or other such objects down the throat of a bloated or choking animal. Consult your veterinarian and keep an emergency supply of bloat remedy on hand.
- If cattle are accidentally overfed, withhold drinking water, move the affected cattle about frequently and call your veterinarian. He will be able to select animals for treatment and assist you in selecting animals for emergency slaughter.
- The administration by mouth of specially designed magnets gives effective prevention of hardware disease in cattle. Also, pieces of wire, nails and other metal should be kept out of the feed.

Beef cattle housing

Beef cattle production, whether it involves feeder or cow-calf operation, requires careful planning. Planning of housing, equipment, and feed stores is essential for the efficient use of labor and equipment to ensure a successful enterprise.

Temperature extremes are not serious hazards to a beef operation in Atlantic Canada. However, the provision of adequate protection for the animals from wind, rain and snow, with additional protection for young calves, is essential for a successful operation. Muddy conditions in uncovered areas such as feedlots should be prevented.

Adequate shelter for the least possible investment per cow is essential. For example, consider converting unused buildings to loose housing or building inexpensive pole frame structures. Well-drained woodlot sites provide adequate shelter in many areas. Early steps in planning require decisions on the number and kind of animals and the approximate feeding program to be followed. It will be necessary to calculate the space needed, including feed storage and processing, and to sketch possible layouts. Plan the manure-handling system, as well as traffic routes for animals, cleaning equipment and supply vehicles. Try to pick a site that will allow future expansion.

Some of the more common housing systems are outlined here. Additional suggestions and detailed building plans are available from the Canadian Farm Building Plan Service at your nearest agricultural extension office.

Figure 14. Existing buildings can often be adapted for beef cattle with little cash outlay.

Figure 15. A hard-surfaced alley is essential along feed bunks.

Cow-calf facilities

Open-front building with bedded resting area and paved feeding area – The cattle are confined in yards, with a covered shelter to provide protection from wind and precipitation. This shelter usually has an open front facing south. The land must slope away from the front so that water runs off.

Provision must be made for: draft-free maternity pens for use in severe weather; areas for calf creep feeding; separate areas for feeding and resting; frost-free water; and cattle handling and treatment facilities.

A well-compacted, graded gravel floor is required in the bedded area. Enough sawdust, shavings or chopped straw must be available to maintain a good bed.

The feeding area must be provided with adequate manure storage adjacent to, but outside, the yard. Paving of the entire yard is desirable, and is essential unless a minimum of 40 m^2 of yard and 3 m^2 of bedded area is available per cow. Feeding bunk space required per animal is 20 cm for animals being fed free choice and 60 cm for animals whose feed intake is restricted.

Sheltered woodlot with shelter for young calves and for cows during calving time – The cattle are located on a site with ample dry, well-drained resting, feeding and exercise areas well protected from the wind, snow and rain by a dense softwood growth.

The site should be adjacent to fields or open areas with a southern exposure and protected from the prevailing winds, as cattle will prefer to remain in these areas on sunny days. A 3.5 m wide paved area along the face of all feed bunks is required so that a clean area may be maintained by periodic scraping.

A well-bedded, covered shelter is required for the calves, especially during the early spring when weather changes may be sudden and severe and ground conditions are often wet.

Feeder cattle facilities

Open feedlots with covered bedded area – The cattle are confined in lots with covered shelter, which may be an open-front building to provide protection. The building must be located where adequate grade can be provided to carry water away, and the open front must face south.

The feeding area may be a covered fence-line feed bunk designed for feeding chopped material by self-unloading forage wagon, or a covered feed bunk equipped with a conveyor allowing animals to feed from both sides.

A windbreak fence must be provided with wind pockets located at each end of the building to control wind and drifting snow. A paved yard is essential, for scraping and piling manure. Space requirements are 2 m^2 of bedded area and 20 cm of feeding space per animal, if they are to have feed available at all times.

Modified environment – Cattle are confined within a building in which the natural ventilation is usually sufficient to maintain a constant winter outside-to-inside temperature difference instead of a constant inside temperature.

A feeding area of 3.5 m minimum width is required along the feeders. For satisfactory manure-pack operation a fence is required to separate feeding and manure-pack areas. A fence and gate arrangement also assists in cattle sorting. Feeding can be from a central passageway with self-unloading wagon or a mechanical feeder over a feed bunk 1-1.5 m wide. The saving on space using the mechanical feeder will pay for the feeder. One and a half square metres of bedded area and 20 cm of feeding space is required per animal (see Figure 18).

Adequate ventilation is achieved by the provision of continuous, controlled, air intakes along the sides and a continuous ridge outlet. The ventilating force is wind combined with the chimney effect caused by the density

Figure 16. Beef cows can be overwintered with only a softwood grove for shelter in many areas of Eastern Canada.

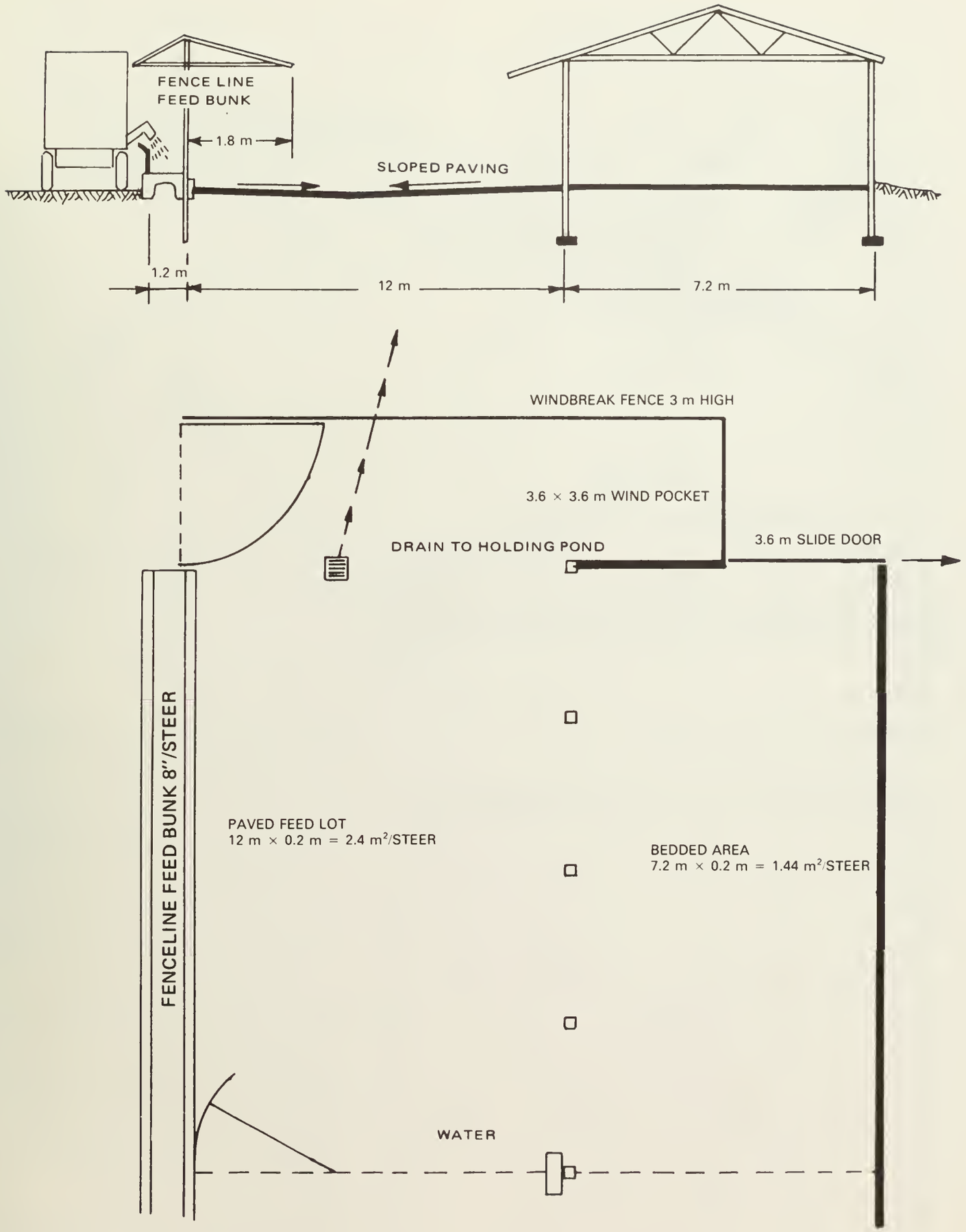
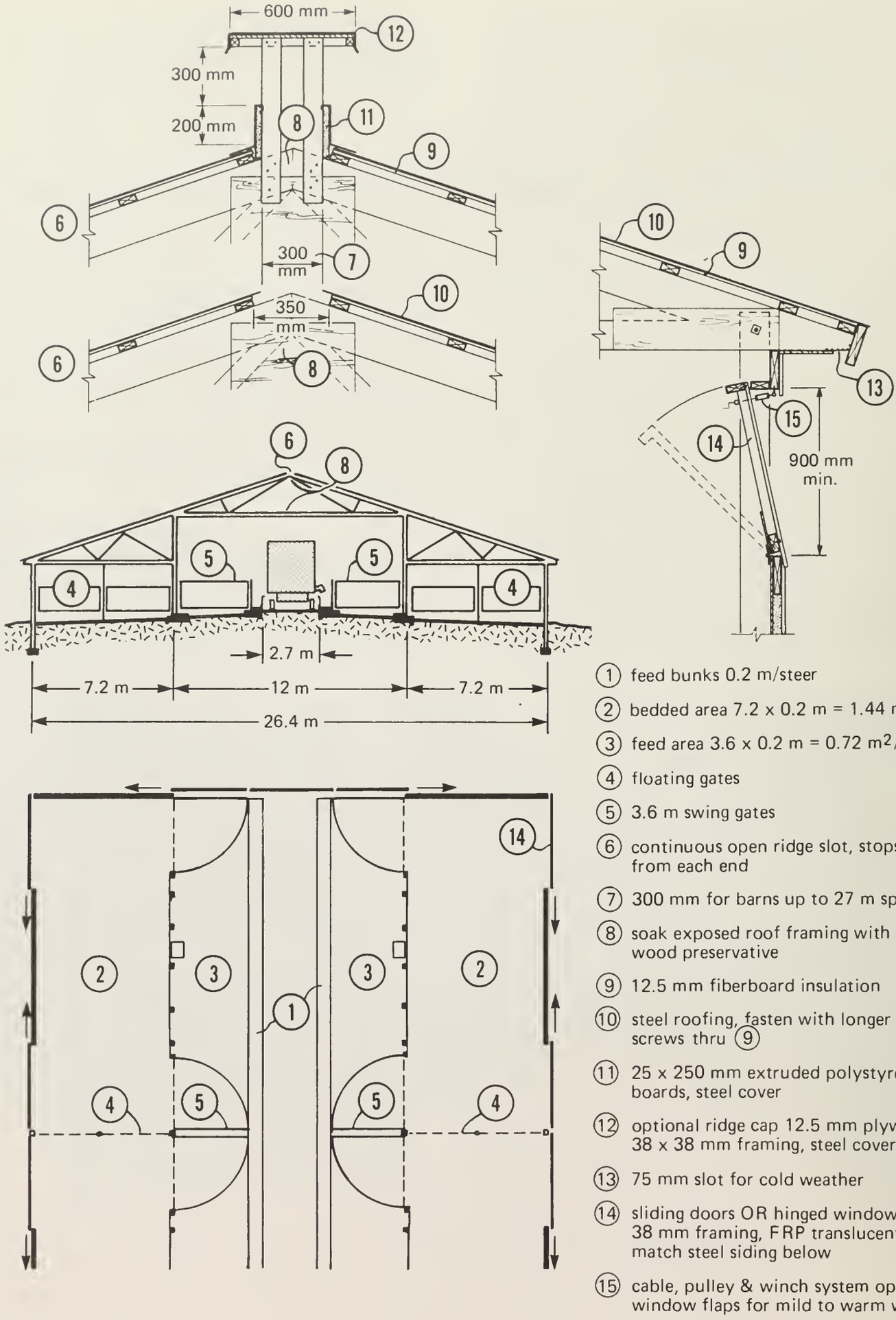


Figure 17. Open feedlot with covered bedded area.



(1) feed bunks 0.2 m/steer

(2) bedded area 7.2 x 0.2 m = 1.44 m^2/steer

(3) feed area 3.6 x 0.2 m = 0.72 m^2/steer

(4) floating gates

(5) 3.6 m swing gates

(6) continuous open ridge slot, stops 2.4 m from each end

(7) 300 mm for barns up to 27 m span

(8) soak exposed roof framing with penetrating wood preservative

(9) 12.5 mm fiberboard insulation

(10) steel roofing, fasten with longer nails or screws thru (9)

(11) 25 x 250 mm extruded polystyrene, or boards, steel cover

(12) optional ridge cap 12.5 mm plywood, 38 x 38 mm framing, steel cover

(13) 75 mm slot for cold weather

(14) sliding doors OR hinged window flaps, from 38 mm framing, FRP translucent siding to match steel siding below

(15) cable, pulley & winch system operates window flaps for mild to warm weather

Figure 18. Modified environment beef barn with solid manure system.

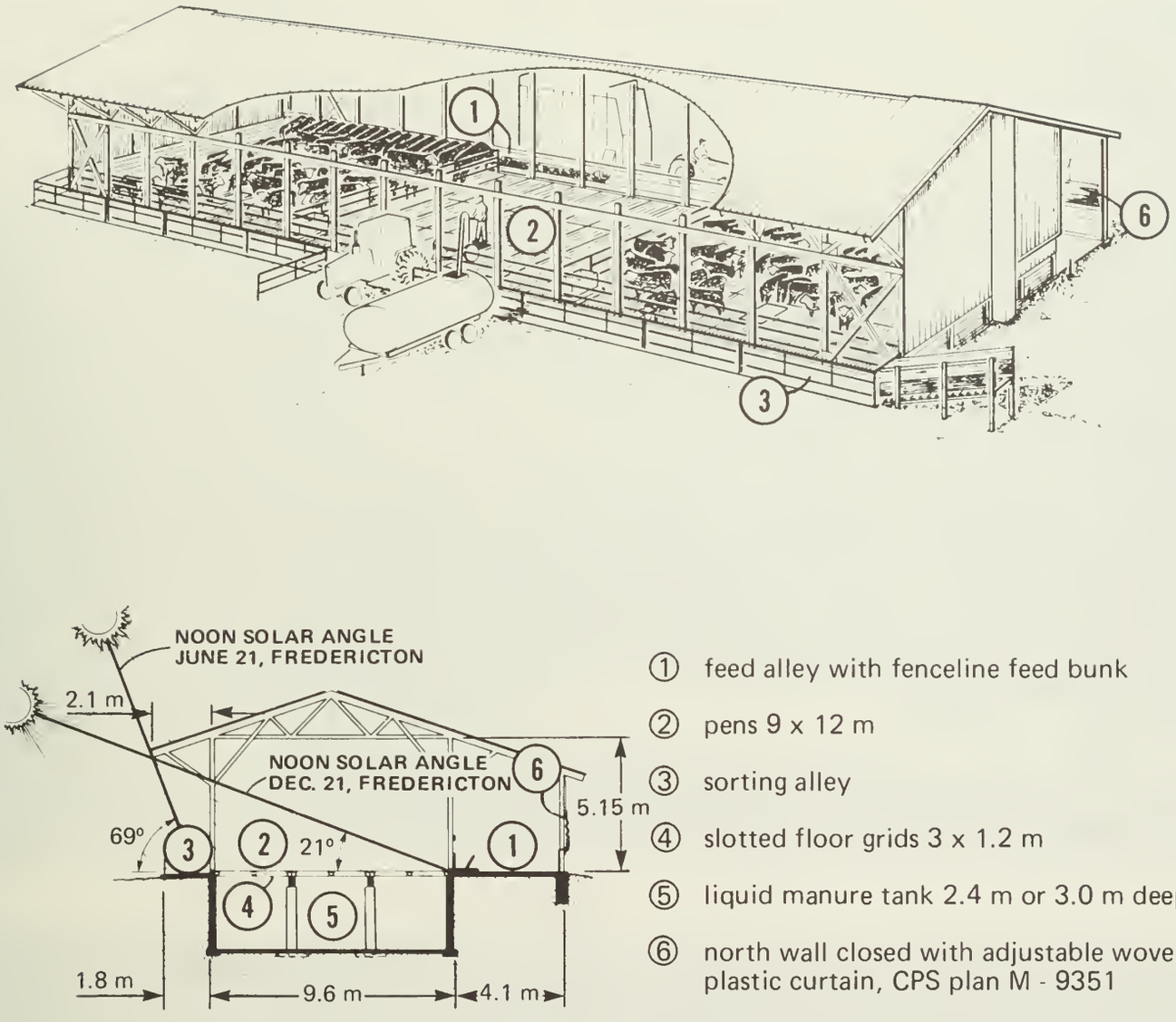


Figure 19. Open-front slotted floor beef barn, from Canada Plan Service, Plan M-1463.

difference between the slightly warmer air within the barn and the cold outside air. This system tends to maintain a constant outside to inside temperature difference.

There is no ceiling, but the use of 12.5 mm fiberboard insulation or plywood on the underside of the roof virtually eliminates condensation. If better insulation is needed, the spaces between the wood roof purlins can be partly filled with glass fiber insulation, sealed on the lower surface with polyethylene vapor barrier and covered underneath with a plywood ceiling.

Summer ventilation and cleaning of the bedded area are possible through large sliding doors in the long walls. Frequent cleaning of the feeding area is required. Manure can be piled outside on a paved slab with low retaining walls or on a sloping site, pushed off a ramp at the end of the barn to a paved slab with low retaining walls, or put directly into a spreader or truck.

Slotted floors – An alternative arrangement is to provide a slotted floor and a liquid manure handling system (see Figure 19).

Slotted floors, although high in cost, provide a manure handling system that requires the lowest labor costs and the best pollution control. The manure in this system is handled as a liquid, and adequate storage must be provided for a 6-month period. The tank must be designed for adequate manure agitation, which limits the distance from the pump to the farthest corner of the manure storage to 7.5 m.

A slotted pen area of 0.4 to 0.5 m^2 per 100 kg of animal weight is required. Feed bunk length required is about 0.2 m per animal.

Where bedding is available, the best system appears to be a modified environment with a manure pack and a separate feeding area cleaned regularly.

Feed storage systems

Both silage and hay feeding systems are popular in the Atlantic Provinces. However, a silage system is easier to mechanize than a hay system, since the chopped forage

Figure 20. Silage in horizontal silo can be compacted with a farm tractor.

Figure 21. Stacking silage requires little capital expense but spoilage can be high if stacks are not carefully sealed with plastic film.

Figure 22. A hard-surfaced yard improves sanitation and reduces space required per animal.

can be handled by a wider variety of transport vehicles and mechanical conveyors. The economics of tower and horizontal silos, therefore, becomes an important consideration in the design of the total beef system.

Costs of various silage storage systems must include an allowance for the feed value lost during the ensilage process and the storage period. Research indicates wide variations in dry matter loss, but the losses shown in the chart are typical with good management:

	Dry matter loss (%)	Silo cost/t capacity ($)
Oxygen-limiting silo	5	110-125
Conventional tower with plastic film	11	55-60
Horizontal silo, covered with plastic film		
No roof	15	13-15
Roof	14	30-35

Horizontal and verticle silos are competitive alternates with the horizontal silo, planned and constructed to facilitate self-feeding, having the economic advantage.

Space requirements

Too much space increases building costs, wastes bedding and manure, and involves unnecessary movement of cattle. The areas listed in Appendix Table 5 may be used as a guide to requirements.

Extra space is usually provided for manure and snow storage and greater animal freedom.

Traffic routes for vehicles and cattle require alleys at least 3.5 m wide. Roads between two parallel fence-line bunks should be at least 7 m wide and troughed in the center for drainage and to store plowed snow till it melts.

Beef cattle handling facilities

Proper beef cattle handling facilities are essential if management practices are to be carried out safely and efficiently. A well-planned corral will reduce the time and labor required to handle cattle and will allow management procedures to be followed at the correct time.

Location

It is important to choose a well-drained site, convenient to pasture, barn areas and roadways to facilitate year-round use. Sometimes, all or part of the handling equipment can be located inside a barn.

Materials

Only strong, durable materials should be used in the construction of pens and working or loading chutes. Plank or poles are both suitable for pen construction. Heavy round or square posts, treated with wood preservative, make good pen supports. The posts should be set below the level of frost penetration.

Arrangement

Animal handling equipment and pens should be arranged so that they can be used efficiently from both barn and pasture areas. Choose an arrangement that will allow handling tasks to be done as quickly and easily as possible. Equipment, such as loading chutes, is more durable if stationary; however, on some farms it may be desirable for this equipment to be portable.

Sharp objects

All pens, chutes, etc., should be free of sharp corners and objects that may injure animals.

Floors

Floors of crowding pens and chutes should be concrete. Yard areas that are in constant use should also be hard-surfaced. Hard-surfaced areas can be cleaned quickly and easily and cattle can be worked on them any time of the year. Muddy and dirty conditions in working areas make work harder and proper sanitation more difficult.

Holding pens

A holding pen is used to confine cattle before and after working. It must have direct access to other areas, such as the working alley. Sharp corners should be avoided. The entrance gate should be at the corner of the pen.

Crowding pen

This is the confined area into which animals are placed as a starting point for working. This pen must be directly accessible from the holding pen and to the chute.

Figure 23. A long, narrow working chute is essential for the proper handling of beef cattle.

Table 2 Recommended dimensions for beef cattle handling facilities

	Less than 270 kg	270-540 kg	Over 540 kg
Holding area (m^2/animal)			
– worked immediately	1.4	1.7	2.0
– held overnight	4.5	5.0	6.0
Working chute (vertical sides)			
– width (mm)	450	550	700
– desirable length (minimum) (m)	7.2	7.2	7.2
– recommended minimum height (mm)	1200	1350	1500
– depth of posts in ground (mm)	750	750	900
Corrals			
– recommended height (mm)	1500	1500	1800
– depth of posts in ground (mm)	900	900	1200
Loading chute			
– width (mm)	650	700	750–875
– length (minimum) (m)	3.6	3.6	3.6
– rise: run	1:4	1:4	1:4
– ramp height (mm) for:			
– gooseneck trailer	375		
– pickup truck	700		
– van-type truck	1000		
– tractor trailer	1200		
– double deck	2500		
Access alley width (m)	3.6	3.6	3.6

NOTE: Cow-calf operations should utilize dimensions for over 540 kg

Working chute

This is the alley or lane into which cattle are placed for treatment. It can lead to a squeeze chute or headgate. Width is important in planning the working chute. Cattle must not be allowed to turn around as this slows the working process; an inside width of 70 cm is wide enough for mature cows (see Table 2). The lower portion of the chute should be solid up to about 75 cm to prevent leg injuries. A pole can be inserted from one side to the other at different intervals to prevent animals from backing out. The length of the chute depends upon herd size; generally it should be at least 7.5 metres long. The average cow requires about 180 cm of space.

Headgates and squeeze chutes

Some type of headgate or squeeze chute is essential for the proper handling of cattle. This equipment should be located at the end of the working chute.

Headgates and squeeze chutes can be purchased or homemade. A walk-through gate is preferable, since cattle are handled easier and with less risk of injury.

A side entrance gate behind the squeeze chute will let the operator enter the chute easily to treat animals. It should be as wide as the chute to block the next cow in line.

Figure 24. An automatic headgate provides excellent restraint for health and management treatments.

Loading and unloading facilities

Every handling facility must include some means of loading or unloading cattle. These chutes can be portable or permanent. The loading chute should have access to the crowding pen or working chute and be accessible to an all-weather road.

An effective handling facility is developed by organizing the various pieces of equipment into a system. Figure 25 shows one such arrangement for a small beef herd.

Budgets

The three budgets prepared for this publication illustrate the phases and types of beef production: cow-calf, stocker calves and steer finishing. The budgets illustrate the size and kind of expenses normally encountered (Tables 3-5). Since many assumptions were made on the feeding and handling systems, it is unlikely that the derived costs will be similar to any particular beef operation.

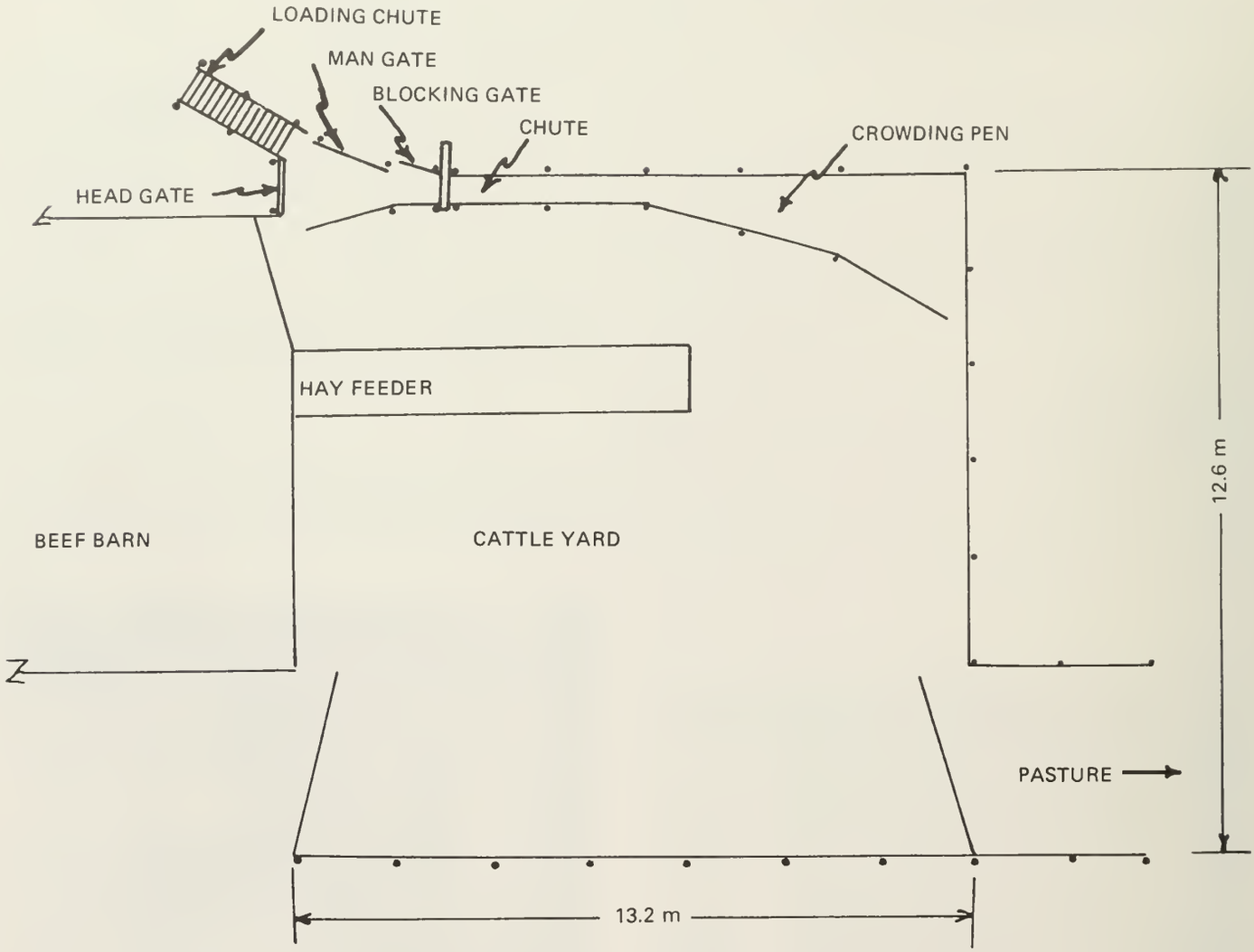


Figure 25. Corral plan for a small beef farm of 50-100 head. See also Canada Plan Service plan M-1831.

Management tasks	Chute	Crowding pen	Sorting pen	Head gate	Squeeze	Stock or table	Scales	Loading ramp	Blocking gate	Cutting gate
Treatment	X	X		X	X				X	X
Dehorning	X	X		X					X	
Castrating	X	X		X					X	
Hoof trimming	X	X				X	X		X	
Spraying	X	X							X	
Operations				X	X	X				
Sorting	X	X	X						X	X
Identification	X	X		X					X	
Weighing	X	X	X				X		X	
Breeding – A.I.	X	X		X						
Loading	X	X	X					X		

The budgets include both operating (cash) costs and fixed (non-cash) costs. Because many beef enterprises use resources that would be idle if not in beef production, it is appropriate to exclude the costs associated with those resources. For example, a farm may have an idle barn and/or unused pasture. In this case, the associated expenses would be substantially reduced, reflecting only the maintenance costs. However, caution must be taken if this approach is used for planning (very seldom, if ever, can you get something for nothing).

Space is provided to enter figures for a particular farm. Local agricultural representatives and farm management specialists can provide assistance in establishing estimates.

Table 3 Cow-calf budget ($)

General assumptions: 72 cow enterprise
95% calf crop at weaning (68 calves)
20% cow cull rate
Birth date – March
Marketing date – October
Market weight per calf – 215 kg

		Ours		Yours	
		Total	Per cow	Total	Per cow
OPERATING COSTS					
Hay (150 tonnes @ $55/tonne)		8 250	114.58		
Grain (12 tonnes @ $190/tonne)		2 280	31.66		
Salt & minerals (655 kg @ $3.95/20 kg)		130	1.81		
Veterinary, drugs		720	10.00		
Taxes		200	2.77		
Insurance (bldg & herd)		820	11.38		
Bldg & fence repairs		1 600	22.22		
Utilities		600	8.33		
Bedding		1 100	15.27		
Miscellaneous		300	4.16		
Interest on operating capital (0.5 × 16 000 × 20%)[2]		1 600	22.22		
Marketing (5% of sales, approximate)		1 700	19.44		
Total operating costs		19 000	263.89		
FIXED COSTS					
Interest on investment					
Bldg & equip. (av. value)	17 600				
Pasture (30 ha @ $440/ha)	13 200				
Cattle	53 000				
Total investment @ 13%	$84 800	11 025	153.13		
Bull depreciation (2 bulls @ $100 each)		200	2.77		
Bldg & equip. depreciation	(32 000 – 3 200[3]) / 20	1 440	20.00		
Total fixed costs		12 665	175.90		
TOTAL COSTS		31 665	439.79		
Less: Culled cows sold (15 × 475 kg @ $1.10/kg)[1]		7 838	108.86		
COST OF PRODUCING CALVES		23 827	330.94		
BREAKEVEN PRICE/kg FOR CALVES SOLD[4]	23 827 / (53 × 215) = $2.09/kg				

[1] Based on May 1982 prices

[2] Assumes operating expenses are constant year round

[3] Straight line depreciation over 20 years

[4] Assumes 53 calves sold, 15 replacement heifers retained

Table 4 Stocker calves budget ($)

General assumptions: Fed for 190-day period
Average daily gain = 0.70 kg
Start at 205 kg
End at 340 kg
Total gain of 136 kg
Hay – 6.5 kg/day
Barley – 1.2 kg/day

	Ours (per steer)	Yours (per steer)
OPERATING COSTS		
Calf costs (204 kg @ 1.70/kg)[1]	346.80	
Hay (1 235 kg @ $55/tonne)	67.93	
Barley (228 kg @ $190/tonne)[2]	43.32	
Salt & minerals (6.8 kg @ $3.95/20 kg)	1.34	
Veterinary & drugs	4.00	
Bedding (10 bales @ $0.80/bale)	8.00	
Death loss (2% of purchase price $346.80)	7.00	
Interest on operating capital $20\% \times \frac{190}{365}$[3]	49.80	
Marketing cost (5% sales @ 1.75 kg × 340 kg)	28.75	
Total operating cost	556.94	
FIXED COSTS		
Yardage[4]	47.25	
TOTAL COSTS	605.69	
BREAKEVEN PRICE/kg $\frac{605.69}{340 \text{ kg}} = \$1.78/\text{kg}$		

[1] Based on market price, May, 1982
[2] Based on FOB price, Truro
[3] Interest on operating cost of $478.39 includes calf costs, feed, salt & minerals, vet & drugs and bedding
[4] Yardage:

Investment in building and machinery per animal ($1.85 m^2 \times \$68.00 = \$125.80$)	
Interest on investment ($125.80 × 13% × 0.5)	8.17
Depreciation ($125.80 × 5%)	6.29
Insurance ($125.80 × 3%)	3.77
Repairs ($125.80 × 3%)	3.77
Utilities	4.00
Labor ($5.00/h × 4 h labor/hd)	20.00
Taxes ($125.80 × 1%)	1.25
	47.25

Table 5 Steer finishing budget ($)

General assumptions: Steers fed for 135 days
Average daily gain = 1 kg
Start at 340 kg
End at 475 kg
Total gain 135 kg

	Ours (per steer)	Yours (per steer)
OPERATING COSTS		
Steer cost (340 kg @ $1.70/kg)[1]	578.00	
Corn silage (28 000 kg @ $20/tonne)	56.00	
Barley (500 kg @ $190 tonne)[2]	117.44	
Salt & minerals (20 kg)	3.95	
Veterinary & drugs	4.00	
Bedding (10 bales @ $0.80)	8.00	
Death loss (1% purchase price)	5.80	
Interest on operating costs $20\% \times \frac{135}{365}$[3]	57.20	
Marketing (3.5% sales @ 1.75/kg × 475 kg)	29.11	
Total operation cost	859.50	
FIXED COSTS		
Yardage[4]	35.85	
TOTAL COSTS	895.35	
BREAKEVEN PRICE/kg $\frac{895.35}{475\ kg}$ = $1.88/kg		

[1] Based on marketing price, May, 1982.
[2] Based on FOB price, Truro.
[3] Interest on operating cost includes steer cows, feed, salt & minerals, vet & drugs and bedding.
[4] Yardage:

Investment in building and machinery ($1.85 m^2 \times \$60.00 = \$110$)	7.15
Interest ($110 × 13% × 0.5)	5.50
Depreciation ($110 × 5%)	3.30
Insurance ($110 × 3%)	3.30
Repairs ($110 × 3%)	4.00
Utilities	11.50
Labor ($5.00 h × 2.3 h labor/hd)	1.10
Taxes ($110 × 1%)	35.85

Appendix 1

Normal temperatures, heat and gestation of beef animals

Normal rectal temperature range (°C)	Regularity of heat periods		Duration of heat periods (h)	Length of gestational period	
	Av. (days)	Variation (days)		Av. (days)	Variation (days)
36.5 to 39.5	21	16-24	8-30	282	274-291

Appendix 2

Gestation table for cows

The gestation period of cows is subject to considerable variation, and is likely to depend upon heredity, environment and breed. The generally accepted average of 282 days was used to calculate this table.

Service date	Approx. birth date	Service date	Approx. birth date	Service date	Approx. birth date
Jan. 1	Oct. 10	May 7	Feb. 13	Sept. 10	June 19
8	17	14	20	17	26
15	24	21	27	24	July 3
22	31	28	Mar. 6	Oct. 1	10
29	Nov. 7	June 4	13	8	17
Feb. 5	14	11	20	15	24
12	21	18	27	22	31
19	28	25	Apr. 3	29	Aug. 7
26	Dec. 5	July 2	10	Nov. 5	14
Mar. 5	12	9	17	12	21
12	19	16	24	19	28
19	26	23	May 1	26	Sept. 4
26	Jan. 2	30	8	Dec. 3	11
Apr. 2	9	Aug. 6	15	10	18
9	16	13	22	17	25
16	23	20	29	24	Oct. 2
23	30	27	June 5	31	9
30	Feb. 6	Sept. 3	12		

Appendix 3

Estimating weight of cattle from heart girth

Approximate weight of beef cattle of good grade

Heart girth (cm)	Weight (kg)	Heart girth (cm)	Weight (kg)	Heart girth (cm)	Weight (kg)	Heart girth (cm)	Weight (kg)
75	33	113	121	151	271	188	476
76	35	114	125	152	276	189	482
77	37	115	128	153	281	190	488
78	38	116	131	154	285	191	495
79	40	117	134	155	290	192	501
80	42	118	138	156	295	193	508
81	43	119	141	157	300	194	514
82	45	120	144	158	305	195	521
83	47	121	148	159	310	196	528
84	49	122	151	160	315	197	534
85	51	123	155	161	321	198	541

Appendix 3 (Cont'd)

Estimating weight of cattle from heart girth (Concl'd)

Approximate weight of beef cattle of good grade

Heart girth (cm)	Weight (kg)	Heart girth (cm)	Weight (kg)	Heart girth (cm)	Weight (kg)	Heart girth (cm)	Weight (kg)
86	53	124	158	162	326	199	548
87	55	125	162	163	331	200	555
88	57	126	166	164	336	201	561
89	59	127	169	165	342	202	568
90	61	128	173	166	347	203	575
91	63	129	177	167	352	204	582
92	65	130	181	168	358	205	589
93	67	131	185	169	363	206	596
94	70	132	189	170	369	207	603
95	72	133	192	171	374	208	611
96	74	134	196	172	380	209	618
97	77	135	201	173	386	210	625
98	79	136	205	174	391	211	632
99	82	137	209	175	397	212	640
100	84	138	213	176	403	213	647
101	87	139	217	177	409	214	654
102	90	140	221	178	415	215	662
103	92	141	226	179	421	216	669
104	95	142	230	180	426	217	677
105	98	143	234	181	432	218	684
106	101	144	239	182	439	219	692
107	103	145	243	183	445	220	700
108	106	146	248	184	451	221	707
109	109	147	252	185	457	222	715
110	112	148	257	186	463	223	723
111	115	149	262	187	469	224	731
112	118	150	266				

Although not absolute, this table is practical for the average livestock feeder or breeder where livestock scales are not available. The degree of error is usually less than 5%.

Appendix 4

Approximate yield of wholesale cuts of a beef carcass

Front quarter		Hind quarter	
Chuck	25%	Round	20%
Prime rib	11%	Rump	5%
		Sirloin butt	8%
		Short loin	10%
Plate, Brisket, Shank	15%		
		Shank, Flank	6%
	—		—
Total	51%	Total	49%

Appendix 4 (Cont'd)

Approximate yield of wholesale cuts of a beef carcass (Concl'd)

Front quarter	Hind quarter
Approximate yield of steaks in a choice beef carcass	
Porterhouse, T-bone, club steaks	8%
Sirloin steaks	7%
Round steaks	12%
Total	27%

Source: Beef Production in Nova Scotia

Appendix 5

Accommodation for beef cattle

Accommodation	Cows and bred heifers	Yearlings	225 kg calves
Feedlot (without shed) (m^2/animal)			
– hard surfaced	7.5	4	3.5
– soil	28	23	14
Feedlot (with shed) lot area (minimum)(m^2/animal)			
– hard-surfaced	4.5	2.3	2.3
– soil	28	25	25
Shed area (minimum)			
– floor area (m^2)	2.8	2.0	1.5
– clear height (m)	3	3	3
Slotted floors			
– space/animal (m^2)	2.8	2.0	1.5
– % of floor area slotted	100	100	100
Maternity pens (additional area)	1 pen/20 cows 3 m × 3 m	minimum (not slotted)	
Water			
– surface area (m^2)	0.1 /25 head	0.1 /25 head	0.1 /30 head
Bedding storage (except for slotted floors)	3.5 kg /head-day	2.5 kg /head-day	2.0 kg /head-day
Feed bunk length/head (cm)			
– simultaneous feeding	65	50	45
– full feeding			
– roughage	20	20	15
– mill feed	7.5	7.5	5
height at throat	45	45	45
max. reach (top of throat board to bottom inside corner)	85	75	60
Feed storage			
hay, without silage	11.5 kg/head-day (maintenance only)	6.8 kg/head-day (maintenance only)	5.5 kg/head-day (maintenance only)
	or		
silage, without hay	34 kg/head-day (maintenance only)	4½-5 kg/day per 100 kg live wt. (fattening)	16 /head-day (maintenance only)

Appendix 5 (Cont'd)

Accommodation for beef cattle (Concl'd)

Accommodation	Cows and bred heifers	Yearlings	225 kg calves
grain and concentrate	Cows: no grain Fattening 2-year olds; 1½-2 kg /day/100 kg liveweight	May substitute grain for hay at 1 kg grain/ 1½ kg hay	0.7-0.9 kg /head-day

Source: *Canadian Code for Farm Buildings* NRC 11065, 1970, Ottawa

Appendix 6

Construction costs

GENERAL ACCESSORIES – IN PLACE OF COSTS	
Flooring:	$/Unit
concrete slab 100 mm thick	15.00/m^2
15.5 mm plywood	7.00/m^2
Concrete slotted floor	60.00 – 70.00/m^2
Wall framing:	
Wood stud partition 38 × 89 @ 400 mm o.c.	12.00/m^2
Wood stud partition 38 × 140 @ 600 mm o.c.	12.00/m^2
Exterior wall covering:	
Galvanized metal siding – 28 Ga.	5.00/m^2
Insulation:	
89 mm rock wool RSI 1.7	2.50/m^2
152 mm rock wool RSI 3.5	3.60/m^2
25 mm rigid polystyrene (expanded)	2.00/m^2
50 mm rigid polystyrene (expanded)	4.00/m^2
25 mm rigid polystyrene (extruded)	3.50/m^2
50 mm rigid polystyrene (extruded)	7.00/m^2
Roof covering:	
Galvanized metal, 28 Ga.	4.50 – 4.80/m^2
Fencing:	
Feedlot fencing 1200 – 1500 mm high	14.00 – 20.00/m
Feedlot windbreak 2400 – 3000 mm high	27.00 – 40.00/m
Feed systems:	
Fenceline feed bunk	70.00 – 90.00/m
Double feed bunk with catwalk	100.00 – 140.00/m
Mechanical feeder	70.00 – 90.00/m
Corral	
Headgate	450.00
Materials for chute, pen, gates, etc.	1500.00
Labor	1000.00
HAY BARN	
One storey, 6 m high	50.00 – 70.00/m^2
LIQUID MANURE STORAGE (CONCRETE)	40.00 – 80.00/m^3

COST PER ANIMAL

Cow and 2-year-olds	Yearlings	225 kg calves
$300 – $600	$200 – $400	$200 – $400