Developing a Beef Herd Management System for Maximum Efficiency

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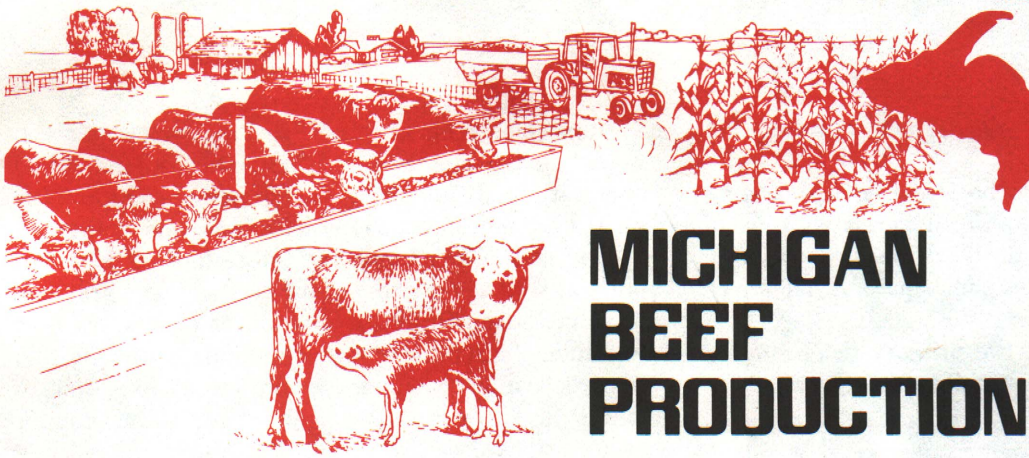

MICHIGAN BEEF PRODUCTION

Cooperative Extension Service ⊰⊱ Michigan State University

Developing a Beef Herd Management System for Maximum Efficiency

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WHY OWN BEEF COWS?

There are many reasons why people keep beef cows. In general, however, there are 3 basic types of operations.

1. A beef cow enterprise is added as a supplement to other farm enterprises. In this case the beef cows are kept to utilize land, labor, and crop residues that would otherwise be wasted. On some farms, the resource limiting the number of cows kept will be available forage; on other farms labor or capital may be the limiting factor.

2. A beef enterprise is to be the major source of income. Here enough beef cows are kept to provide enough income for nearly all of the family living expenses.

3. The owner works at an off-the-farm job full time. The beef cow enterprise in this case provides income that supplements the non-farm income. The beef cows can utilize otherwise wasted land and labor, and at the same time generate some income. In this situation, the number of beef cows kept are determined primarily by the labor available on a part-time basis, and not necessarily to fully utilize all of the feed that could be produced.

4. Same as No. 3, except the herd is kept primarily as a hobby and the income from the beef herd is not really needed. The family may or may not live on the farm.

ECONOMIC FACTORS

The beef cow enterprise in the United States has some unique properties that must be recognized when considering starting or expanding a beef herd. One characteristic is that payday for each brood cow comes only once each 12 months—at a maximum. Due to the approximate 9-month gestation period and subsequent lactation and estrus period, it is not possible to increase calving frequency and resultant paydays by techniques other than multiple births. The implication is that the cash inflow from a beef-cow enterprise is very periodic and infrequent.

A second characteristic is that the percentage return on total investments may not be competitive with other enterprises and investments. The wisdom of investing in a beef cow enterprise depends upon your anticipation of beef prices, the variable costs of production, and the alternative sources of employment for the required resources of land, labor and capital.

The majority of beef cows in the United States are maintained as supplemental sources of income. These beef enterprises can salvage the otherwise unused or underemployed resources of land and labor. In such a situation, the beef cow is not being relied upon for the sole source of income. Thus the infrequent payday may not be a major problem for most owners of beef cows, making it difficult for those who intend to have the income from a beef herd as the major source of income to compete. And if the resources used, except for capital, have no employment other than beef, the return on investment will be relatively higher than if the beef enterprise is charged for use of these resources. In a strict economic sense, for the beef cow enterprise to be economically profitable, the beef income must be greater than the sum of the direct operating expense and the value of one's own labor and capital. However, the farm operator may declare the beef enterprise to be

worthwhile if it covers the direct out-of-pocket expenses.

Thus the profitability of a beef cow enterprise may depend upon the definition of profit as related to what costs are being charged and the determined value of this charge. Table 1 summarizes some factors that affect profitability of a beef herd.

As suggested in Table 1, the primary determinants affecting profitability of a cow-calf enterprise are:

1. weaning percentage;
2. weaning weight of the calf crop;
3. feed costs to maintain the cow;
4. price received per pound of calf.

These areas suggest the important features that need to be emphasized in developing a sound management program. The number of calves weaned yearly as a percent of the mature breeding females kept in the herd must receive a great deal of emphasis in the management program. It is influenced primarily by proper nutrition of the breeding herd. When combined with the importance of yearly feed costs of the cow, it becomes obvious that the first part of planning is to develop a feed production and feeding program that will feed the cow herd properly for the least cost. The land area needed to produce the feed and the cost of that land, as well as the equipment required to produce that feed are also closely tied to the feeding program.

Weaning weights of the calves produced are also indirectly related to the feeding program. Having all the cows conceive as quickly as possible after calving results in the calves being born close together, giving them nearly the same opportunity for growth prior to weaning. Rapid rebreeding requires proper nutrition, particularly between the calving and breeding season.

Beyond proper feeding, however, producing heavy calves at weaning requires a sound breeding program. The herd bull must be carefully selected for rapid growth, as he is responsible for ½ of the genetic material in the calves. In addition, those cows weaning lightweight calves should be replaced by heifers that have greater potential as mother cows.

Proper marketing is the next step to developing a successful management system. There is little an individual operator can do about the general price level for cattle as it is influenced primarily by nationwide changes in disposable family income and total supply of beef and pork, as well as the demand for beef and feed grains in other countries. However, a producer must know how to obtain the top current price for his cattle. He also must determine whether the most profitable time to market his calves is at 6-8 months of age, as yearlings or as finished cattle.

This fact sheet will discuss the development of the management system by selecting the best alternatives in each of three major components of the total management plan, as follows:

1. **The feeding system.** To develop a good pasture and winter feed supply, one must consider the seasonal forage production, the demands by cattle for the forage, and the cost of increasing and shifting seasonally the forage production. These factors in turn will be related to equipment needs to produce, harvest and store the feed.

2. **The breeding plan.** The factors to select for and the best type of cattle will be discussed, considering the limitations in number of cattle, labor available and desires of the operator.

3. **The marketing plan.** The best time to market the calves will be related to maximum utilization of the available feed supply and labor and demand for various types of cattle in a given area.

These 3 factors will be discussed with respect to developing a general plan. Specific information on rations and production practices are given in other fact sheets.

THE FEEDING SYSTEM

The foundation underlying a least-cost feeding program is built on two factors: (1) matching the available feed supply with the cow's nutrient requirements. This

Table 1. Major Factors Affecting Profits of a Beef Enterprise

Item	U.S. Average	Most Efficient Herds	Differences Per 50 Cow Herd
Beef Herd to Weaning			
Weaning Percentage	75%	95%	4,000#
Weaning Weight	400#	600#	7,500#
Yearly Feed Costs/Cow	$100-$300	$100-$200	$2,500
Investment in Land, Buildings and Equipment	$2,500	$1,500	$50,000
Weaning to Slaughter			
Growth Rate (lbs./day)	2.2	2.5	33 days/calf
Feed Efficiency (lbs. feed/lb. gain)	7.5	7.0	6 tons feed
Yield Grade	3.0	2.5	600 lb. retail cuts

involves having the best quality feeds available when the cow's nutrient requirements are at a peak during early lactation and rebreeding; and then utilizing feeds that have little alternative use such as the poorest quality hay or crop residues when the cow is just being maintained. (2) Minimizing the use of harvested feeds and maximum use of otherwise wasted feeds. This suggests maximum use of pasture and crop residues that have limited alternative uses, to minimize equipment, fuel, labor and housing costs. This is of particular importance in the North because of the long winter feeding period and relatively short growing season. In most areas, there are two major situations that determine the approach to selecting the best feed production system:

a. Where more land is available than can be fully utilized, the factors limiting the number of cattle that can be kept are the labor or capital available and/or desires of the operator.

b. Where land is limited, the goal is to most profitably utilize the land available.

These determine the extent of pasture and hay and improvement and breeding plan that is best.

The basic decisions that must be made in either situation are:

1. How much should I improve my pastures?
2. What do I use for supplemental feeding in the winter?
3. Does it matter if I cut my hay once, twice or three times?
4. How much machinery can I justify?

Unlimited Land

The conclusions that can be reached from most of our calculations under these conditions are as follows:

1. Even though land is unlimited it pays to improve pasture, and any money invested in agronomic practices should be invested first in reseeding and fertilizing practices. The main reason for this is when pastures are unimproved, there is a flush of growth early in the spring but the amount and quality of feed from the native grass declines rapidly in late summer and early fall at a time when the cow is still lactating, and supplemental feeding must begin earlier.

3. The least-cost plan for producing winter feed is usually to make one or two cuttings from unimproved native grass and/or maximize use of crop residues. The reason for this is unimproved native hay can be harvested at the peak of growth and at that point it contains enough nutrients for wintering beef cows that calve in the spring, with no cost inputs other than harvesting costs. Corn silage has not been profitable as a winter feed where land is unlimited.

Limited Land

1. In nearly every case, maximizing production by reseeding to the most productive pasture and hay crops and fertilizing and liming results in maximum profit when maximum return per acre of land is the goal. Returns depend on the price of beef; for example, beef production may be maximized but not dollar returns. More cows are supported and the feed production is better matched to the cows' requirements at various times of the year when the most productive forages are developed.

2. It is usually more profitable to improve the pastures than to improve the hay. The factors involved are an increased carrying capacity and a longer grazing season.

3. The use of corn silage support more cows per acre, but is often not as profitable as the best hay production system unless 12 tons or more of silage per acre could be consistently produced in combination with using the best pasture system.

Thus, even with current production costs at an all time high, it still pays to maximize pasture and hay production under these conditions.

Fall Calving vs. Spring Calving

If calves are to be sold at 7-8 months of age, fall calving is feasible if maximum use is to be made of the land and high yielding corn silage is used in combination with the best pasture system. A higher price can normally be obtained for the calves in the spring than in the fall because there are fewer of them in the spring. Another reason for fall calves might be labor availability. Otherwise fall calving does not appear to be feasible in the North under most conditions because high quality supplemental feeds must be used in the winter in order to support a lactating cow, whose nutrient requirements are nearly twice that of a dry, gestating cow.

In a spring calving system, pasture production is at a peak when the cow's nutrient requirements are at a peak, and is usually adequate to meet her requirements without supplemental feeding.

Where high milking cows are used and the calves are not weaned and sold until 10 months of age or the calves are fed to yearling or slaughter weights, however, fall calving may be feasible.

Machinery, Building and Equipment Costs

For a small beef herd (less than 40-50 cows) calculations made by the authors suggest that as long as used equipment can be purchased and can be used to harvest the small tonnages of hay needed for the winter feed supply, it will usually be the most economical way to obtain the feed needed for the winter feeding period, even for herds with as few as 10 cows. Table 2 gives a

Table 2. Size and Kind of Package, Capacity, and Costs for Several Kinds of Hay Making Equipment.

Equipment	Mfg. rated package size	Capacity[1]			Estimated investment	Annual fixed cost[2]	Operating cost per ton[3]
		Size and kind of package	Package/ hr.	Tons/ hr.			
Vermeer 403F Round baler	up to 650 lb.	500 lb. round bale	30	7.5	$ 6,400	$1,280	$2.56
Hesston 5540 Round baler	up to 1,100 lb.	1,000 lb. round bale	16	8.0	$ 9,200	$1,840	$3.20
Vermeer 605F Round baler	up to 2,000 lb.	1,500 lb. round bale	12	9.0	$ 8,000	$1,600	$2.53
Hesston StakHand 30B	up to 3 ton	2.5 ton stack	4	10.0	$17,000	$3,400	$1.92
Hesston StakHand 10	up to 1.5 ton	1 ton stack	5	5.0	$ 8,700	$1,740	$3.84
Conventional baler and wagons—used[4]					$ 3,000	$ 600	$5.00

1 *Based on about 2 ton per acre hay.*
2 *Using 20% annually of original cost to cover depreciation, interest, repairs, taxes, insurance and housing.*
3 *Operating costs were charged at $19.20 per hour for tractor and labor; twine at $.40 per round bale.*
4 *Estimated by the authors.*

comparison of operating and overhead costs for various hay systems, based on estimates made by the authors. Although all actual costs are now higher, the relationships are still appropriate.

These comparisons show that at the lower tonnages needed for small herds, the used equipment is the most economical. At higher tonnages, the large round balers become more competitive, especially if used conventional equipment is not adequate to make greater quantities of hay.

Another alternative is to have a neighbor custom harvest the hay or share equipment with another operator. For those who have excess feed, a neighbor with haying equipment might be given ½ or more of the hay crop for making enough to meet your needs.

Shelter requirements for beef cows are minimal, and unnecessary investment in buildings for protection should be avoided. In most areas of the country beef cows are kept outside nearly all of the year, and many never see a barn, even in the northern half of the U.S. Beef cattle are better adapted to live in cold rather than hot temperatures due to the heat produced from the fermentation of feeds in the rumen and insulation from their heavy hides and thick hair coats.

DEVELOPING A BREEDING SYSTEM

There are several factors that must be considered in developing a breeding plan.

The effects of size of cow. Table 3 shows the results of a study in Ohio in which the weaning weights and energetic efficiency with three mature sizes of cows were compared over a 4-year period. The total energy requirements of the beef cow and her calf to weaning and slaughter weights were determined.

Table 3. Effect of cow size on calf weaning weights and efficiency.

	Cow Weight, lb.		
	874	1022	1210
Weaning weight of calf, lb.	405	433	464
Lb. TDN Required/lb. weaning wt. (cow and calf)	9.4	9.5	9.6
Lb. TDN/lb. edible portion from calf at low choice	16.9	17.4	17.3

As indicated in this table, a herd of bigger type cows can be expected to wean more lb. of calf, assuming the calf crop percentage is as high and the methods used to select bulls and replacement heifers are the same.

When land is limiting and profits are to be maximized from a fixed land area, choosing the size of cow that will be the most profitable is not an obvious decision. The factors that must be considered are the size of cow that will wean the most lb. of calf from the feed fed, the size that will produce the most lb. of edible beef from the feed fed, and the overhead costs per lb. of weaning weight or lb. of edible beef. The Ohio studies indicate that although smaller cows tend to wean more lb. of calf per unit of body weight, the differences between sizes of cow in energy required per lb. of calf or edible beef produced are negligible. Having fewer large cows rather than more smaller cows would reduce certain per head costs such as handling and labor, equipment and slaughter costs per lb. of beef. When all factors are considered, however, there appears to be no great advantage to any one size of cattle in maximizing the

returns from the feed fed unless it is related to one of the following factors.

1. Where land and the feed supply are unlimited and the number of cows that can be cared for is limited, the herd should probably be made up of big cows and bulls rather than small cattle in order to wean as many lb. of calf as possible from the number of cows kept, assuming that big cows wean as high a percent of calves as small cows. There is likely little difference in fertility between large and small cows within a breed. However, some breeds that are large tend to be less fertile. For example, some exotic breeds require more feed during the critical breeding period to keep fertility high. Furthermore, calving difficulty in some of the large breeds may tend to increase calf mortality and lower the weaning percentage.

2. The size of calf desired at slaughter time may vary, depending on the market. The carcass in greatest demand at present is less than 2 years of age at slaughter, has a small (low choice) degree of marbling, ¼" to ½" of outside fat, and has a yield grade (cutability) of 2.9 or better.

Small size cattle reach this composition at lighter weights than large size cattle and if a small carcass is desired because of a home freezer trade, etc., then it may be most profitable to utilize smaller size cattle. See fact sheet 4300 for a more detailed discussion of this subject.

3. One type of cattle may be more efficient than another on certain feeding programs. Some studies suggest that small, early-maturing types may work better overall on high forage feeding programs than large types. However, this subject has not been studied well enough to draw definite conclusions on which size of cattle should be used in different feeding programs.

4. If crossbreeding is feasible, crossing medium-sized cows selected for fertility and ease of calving with sires of large mature size selected for growth rate and muscling is likely to be the most efficient.

Regardless of cow size used, developing a herd for a high calving percentage, rapid early growth, feed efficiency and carcass merit is much more important than cow size.

Adaptability to the environment. There are differences among cattle in their ability to adapt to various environments. Cattle with Brahman breeding have a greater heat and insect tolerance. The British breeds have considerable cold tolerance due to their heavy hides and hair coat. The Angus, Hereford, and Shorthorn breeds are also noted for their ability to breed and reproduce where feed is limited such as in our western range country. Beef x dairy cross cows will produce more milk for a longer time and will wean more lb. of calf where feed is abundant. However, they must be fed a higher level of nutrition to conceive early after calving.

Thus, it is important to select for the breed and type of cattle that will perform best in your environment.

Crossbreeding. There are several reasons for crossbreeding; they are as follows:

1. Crossing unrelated breeds results in hybrid vigor in the crossbred cow mainly for fertility and for increased growth rate in the crossbred calf.
2. Crossing breeds that are complementary can result in combining the advantages of each into the offspring.
3. Using moderate-sized cow breeds bred to larger bull breeds selected for rapid growth results in keeping the maintenance costs of the cow relatively constant while increasing the growth potential in the calf. Table 4 illustrates how hybrid vigor can increase production per cow.

Table 4. Advantages for crossbreeding.

Dam	Sire	Change in weaning wt.	Change in % calf crop
Full Blood	2nd Breed	4.7%	4.3%
½ Breed A & ½ Breed B	Breed C	5.0%	4.7%
Total		9.7%	9.0%

Table 5. Effect of crossbreeding on performance in a 50-cow herd.

Dam	Sire	% Calf crop	Weaning wt.	Lb. Calf weaned
Hereford	Hereford	80	400	16,000
Hereford	Angus	84.3	419	17,660
Hereford x Angus	Shorthorn	89.0	440	19,580
Hereford x Angus	Charolais	89.0	460	20,470

Table 5 shows that pounds of calf weaned per 50-cow herd could essentially be increased by 4470 lb. by crossbreeding. Therefore, where crossbreeding will work, it can increase profits in a beef herd, and it should probably be a part of the breeding program for many commercial breeders. However, there are several problems in utilizing the most efficient crossbreeding plan in a small herd.

1. Several bulls and breeding pastures are needed if you develop your own replacement heifers. For example, if most of a herd of 30 beef cows were to be Angus × Herefords, and they were to be bred to a Charolais bull, the following combinations would be needed each year, assuming a 15% culling rate, a 90% calf crop and ½ of the calves are heifers.
   a. 7 Angus cows × a Hereford bull to replace the cross bred cows as needed.

b. 2 Angus cows × an Angus bull to get replacements for the Angus cows.

c. 21 Angus × Hereford cows bred to a Charolais bull to get the 3 breed terminal cross combination.

2. If replacement crossbred heifers are purchased and they are higher priced than straightbreds, then part or all of the advantage of the crossbred dam is shared with the other breeder.

Using artificial insemination can help overcome some of these problems. However, it requires more management than many with small beef herds are able or willing to provide. As a result of these problems many who start crossbreeding end up with no plan at all and a less productive herd than if they had chosen a breed they like best and then selected within that breed for the most desirable traits. If carefully planned and managed, however, crossbreeding can greatly increase productivity.

General Breeding Plan. Details of breeding beef cattle will be given in other fact sheets. Several guides can be followed in developing the overall breeding plan, however:

1. Choose a breed you like and use breeds for crossing that complement each other (see fact sheet 5500). Table 6 gives suggested breed combinations and Table 7 outlines a simple, effective crossbreeding plan, based on a crossbreeding experiment at Michigan State University.

Table 6. Logical breed combinations to maximize dam and calf heterosis, and carcass quality.

Dam	Terminal sire to use (1,000 to 1,250 lb. at 365 days of age)
Angus	Hereford, Charolais, Chianina, Simmental, Maine-Anjou
Hereford	Angus, Simmental, Limousin, Maine-Anjou
Shorthorn	Hereford, Simmental, Limousin, Maine-Anjou
Angus x Hereford	Charolais, Simmental, Limousin, Shorthorn, Maine-Anjou, Chianina
Angus x Shorthorn	Hereford, Charolais, Simmental Limousin, Maine Anjou, Chianina
Shorthorn x Hereford	Angus, Simmental, Limousin, Maine-Anjou
Hereford x Charolais	Angus, Simmental, Maine-Anjou, Limousin
Angus x Charolais	Hereford, Simmental, Chianina, Maine-Anjou, Limousin
Holstein x Angus	Hereford, Simmental, Limousin, Charolais, Maine-Anjou
Holstein x Hereford	Angus, Simmental, Limousin, Charolais, Maine-Anjou

Table 7. Example of a simplified 3-breed crossing program in which 75% of the maximum possible hybrid vigor is obtained.

Assume you have a herd of Angus cows and are going to crossbreed. You want to use Hereford and Charolais with Angus in the cross.

Years	Bull to Use
1975 and 1976	Hereford bull A
1977 and 1978	Hereford bull B
1979 and 1980	Charolais bull A
1981 and 1982	Charolais bull B
1983 and 1984	Angus bull A
1985 and 1986	Angus bull B

Then start breed sequence over.

2. Identify all cows and their calves.
3. Select cows for the following:
   a. Calving ability—90% or more of the calves born within the first 60 days of the breeding season.
   b. Get cow weights with calf weaning weights to determine cow efficiency. Select for those cows that wean calves 45 to 50% or more of their weight.
   c. Take calf weights between 160 and 250 days of age, and correct them to 205 days of age.
   d. Keep replacement heifers that have the best records relative to the other heifers in the herd.

4. Buy good bulls. The bull is ½ of the calf crop. Over a period of 15 to 20 years, the bulls used in a herd account for 85-90% of the genetic improvement. Ask for performance information on the bull. See how he was fed. Look for a weaning weight of over 500 lbs. and a yearling weight of at least 900 lbs. and preferably 1000 lbs. or more. This may tend to result in selection for larger cow size, but will likely be more than offset by the increase in efficiency obtained.

THE MARKETING SYSTEM

If Winter Feed is Limited and Expensive

If your winter feed is in short supply and expensive to buy, there is little alternative except to sell weaned calves in the fall as feeders. However, if butcher cows are relatively high-priced compared to feeder calves, it may prove worthwhile to cull a higher percentage of cows in the fall, and to winter more calves that could be sold as short yearlings the following spring. If calves are relatively high-priced in the fall and the outlook for

spring feeder prices is not favorable, they should be marketed as feeders in the fall, regardless of the winter feed supply.

If Winter Feed is Plentiful and Inexpensive

If you have surplus hay or winter grazing, if grain is not too expensive, and if the price outlook for the following spring is favorable, it may pay you to carry over part or all of your calf crop. If they are to be sold as feeders the following spring, the amount of grain fed should be limited so the calves do not become overly fat. Feeding too much grain increases the cost of winter gains and could result in a price discount in the spring if they are too fat. On the other hand, feeding low quality roughages with no grain or protein supplement reduces gain to an unprofitable level. Ideally, calves should gain somewhere between 1.0 and 2.0 lbs. per day during the winter months, depending upon breed, type, housing, climate, feed costs, etc. (See Fact Sheet 1201, "Rations for Growing and Finishing Beef.")

If Summer Pasture is Plentiful

If you elected to carry calves over the winter, if spring prices turn downward, if summer pasture is plentiful, and if the fall price outlook appears favorable, it may pay you to graze your yearlings over the summer and sell them as feeders in the fall, when they are 15-18 months old. An unforeseen summer drouth, however, could prove to be disastrous to this marketing system. As a slight hedge against this situation, marginally productive females that lost their calves in the spring should be culled prior to the grazing season. Yearlings on summer pasture may gain from 0.5 to 2.0 lbs. per day, depending upon stocking rate, quality of the forage and length of the grazing season. An average of 1.0 to 1.5 lbs. per day is fairly typical.

If Grain is Plentiful and Inexpensive

If your farm produces surplus grain and if grain prices are relatively low compared to the price outlook for fat cattle, it may pay you to feed-out your calf crop to slaughter weight and finish. Age at slaughter will range from 12 to 20 months, depending upon how fast you push them. This will be determined by the type of cattle and the percentage of grain in the diet. For example, a growthy, large-framed, 550-lb., 7-month-old steer calf could average 2.7 lb. gain per day for 8½ months on an 80% corn, 20% hay diet, resulting in a 1,250-lb. finished steer at 15½ months of age. On the other hand, a smaller-framed, 400-lb., 7-month-old steer calf fed a 35% corn, 65% hay ration for 12 months might gain an average of 1.65 lb. per day, resulting in a 1,000-lb. finished steer at 19 months of age. (See Fact Sheet 1201, "Rations for Growing and Finishing Beef.") There are various marketing alternatives for finished cattle: (1) local sale yards; (2) direct to a packer; (3) selling sides of beef for home freezers. Most small producers sell their finished steers at local sale yards, but near urban areas, the sale of freezer beef can be a profitable venture once a good reputation is established.

Selling Calves Direct to Cattle Feeders

Some top feeder calf producers can receive a premium for their high quality, fast-gaining calves by selling them directly to cattle feeders who are willing to pay for extra performance. This type of market outlet can be achieved only by establishing a good reputation over a period of years.

Selling Club Calves

A few extremely top quality commercial herds can realize extra income by selling their best steer calves to 4-H and FFA members as show prospects. However, this is a very limited and specialized market.

Selling Breeding Stock

Purebred herd owners, of course, are in the business of selling breeding stock. However, some top commercial herds can also sell a few heifers as seedstock to other commercial herds. One must beware of cutting too deeply into his own replacements; if this occurs over a long period of time, the productivity of the herd will decline.

Keeping Replacement Heifers

Unless you purchase all of your replacement females, a portion of the heifer crop must be retained as herd replacements for cows that are culled for various reasons. Normal culling rate ranges from 12 to 20% of the cow herd per year. The average rate would be about 16% per year, which would necessitate retaining 30 to 40% of the heifer calves as potential herd replacements.

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