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Michigan State University

Cooperative Extension Service

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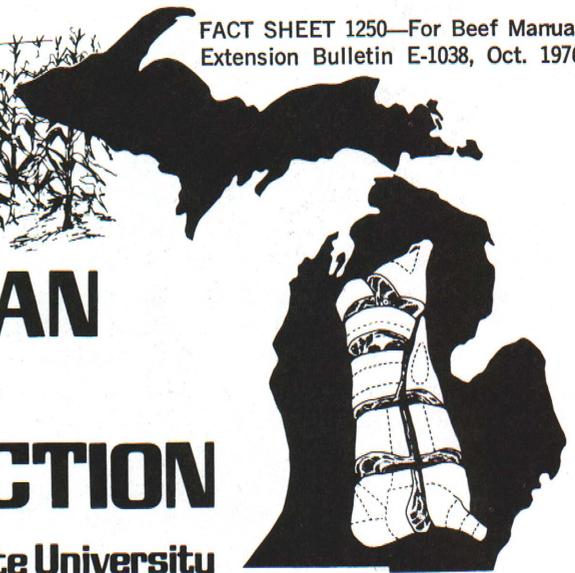
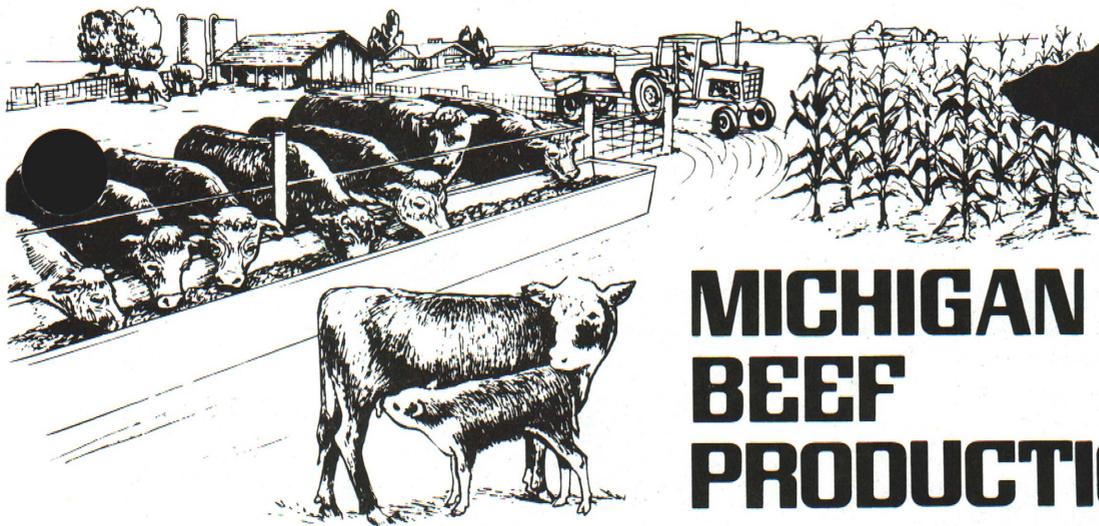
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MICHIGAN BEEF PRODUCTION

Cooperative Extension Service  Michigan State University

Guidelines for Producing Beef from Dairy Calves

D. G. Fox, Beef Specialist, Michigan State University and
R. G. Warner, Professor of Animal Nutrition, Cornell University

Over 200,000 dairy calves are born in Michigan each year that are males or females not needed for breeding replacements. Research and experience have shown that these calves can grow rapidly and efficiently on several types of rations and produce tender, flavorful beef, with a minimum of excess fat at 1,000-1,100 lb.

There are several keys to success in developing a profitable calf rearing and feeding operation.

1. Skill and close management are required in rearing the calves to weaning. A good disease control program is essential to keeping death losses at a tolerable level. A good goal is to have a maximum of 5 to 6% death loss. Achieving this goal requires a knowledge of sanitation, disease prevention and treatment procedures, as well as an understanding of proper rations and feeding practices for the young calf.

2. Proper rations and feeding systems must be developed for each operation to get the least cost performance from the available feed supply.

3. Cost control, proper budgeting and management of finances is a must. Capital requirements and cash flows should be developed before starting, in order to get properly financed. Many operations have failed because they did not develop a repayment schedule and did not determine the total amount of capital needed to carry them until the first cattle were sold.

4. The cattle ready for slaughter must be marketed rather than just sold. The producer must know where

he can best market what he produces in order to receive the maximum price.

This bulletin outlines guidelines that relate specifically to producing beef from dairy calves. Those items that relate to all types of beef cattle are discussed in detail in other fact sheets in the Michigan Beef Production Manual, and references to these fact sheets will be given where appropriate.

Management Procedures from Birth to Weaning

1. *Purchase only healthy, strong calves.* If possible, purchase only calves that have had colostrum for the first 1 to 2 days after birth. This is the first milk produced after calving, and it contains antibodies that protect the calf against most of the diseases present in its environment until it can develop its own. All too often, however, the dairyman ships the calf to market as soon as it can stand, and doesn't bother to feed colostrum, even though this milk cannot be sold. Often calves that have a dry navel may likely have been fed colostrum milk as the dairyman probably kept them for a day or two. In any event, buy only calves that appear bright and strong. The larger calves are usually the most desirable. There is a blood globulin test that can be run by your local veterinarian that shows whether or not the calf has had colostrum.

2. *Transport the calf home in a closed, draft-free clean truck or trailer.*

3. *Have facilities that provide a good environment for the calves.*

A. *Have good ventilation.* Proper ventilation is necessary to prevent respiratory problems. Check the air at the calf's nose—that's where it counts. A general guide is to have a fan(s) that will move 7 to 10 cubic ft. per calf per minute (CFM) in winter and 60 cubic ft. per calf per minute in summer. Direct inlet air downward along walls, making sure drafts are not created. Use care in selecting ventilation systems—some work better than others. One system is to have one fan running at a low rate all of the time (7-10 CFM/calf) and a larger fan (70 CFM/calf) that is started by a thermostat when the temperature exceeds 60°. Ask successful operators in your area and your local extension agent to see which system has worked best in your area.

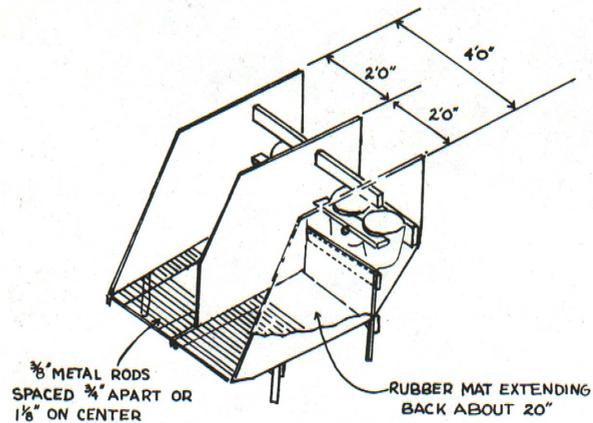
B. *Control the temperature and humidity.* We recommend that the temperature in the calf starting barn be kept between 55° and 65°. To do this, you will need the equivalent of 3" of expanded polystyrene in the ceiling and 2" in the walls and a heater that will provide 150 watts per calf. Healthy calves can stand cold temperatures. Since these calves are highly stressed and many get sick during the starting period and therefore chill easily, proper temperature control is important. The humidity should also be above 50%. Many wash the floor daily as a means of keeping the humidity up.

C. *Have well designed pens* that are comfortable and keep the calves clean, that allow for easy feeding, cleaning and disinfecting.

Portable elevated calf stalls facilitate treatment and feeding of calves and recordkeeping. Figure 1 shows the pen construction and dimensions. Wood slats or 3/8" metal rods can be used for the stall bottoms, using a 3/4" space between. Put removable knee pads in the front 12" to 18" of the stall. The same material used for cow mats can be used. Make provision for 2 pails in front of the calves. The individual pen system appears to work best because it facilitates close individual observation and treatment, record keeping and controlling individual intake to avoid overeating.

See your local extension agent for detailed plans of facilities for calf rearing. Figure 2 shows layout for adapting a typical stanchion barn for raising calves.

4. *Practice a strict sanitation program.* Many find management easiest when they practice an all-in, all-out system where all pens are filled with calves as rapidly as possible. This allows pens to be disinfected and rested between groups, and gives the operator a rest between critical periods. Some have two sets of floors and/or pens. They then exchange these between groups after disinfecting, leaving every other group outside. It is a good idea to have the pens in pairs so they can be moved around more easily. The pen



(Cross Section)

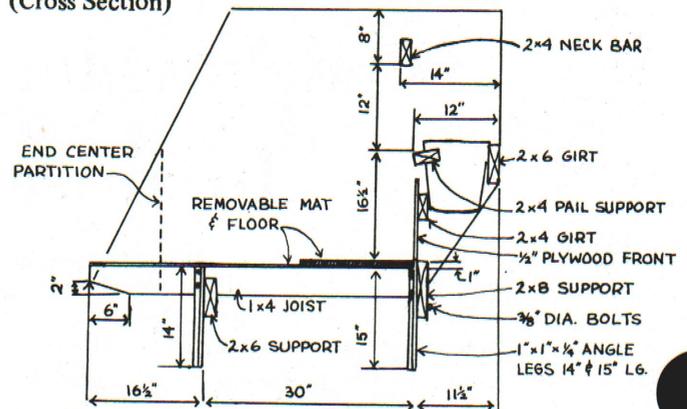


Figure 1. Construction of Calf Pens

floors and pail area are where disease organisms will be concentrated. The following sanitation procedures provide some guidelines in preventing an overwhelming disease buildup.

A. Take calves out of pens by 6 to 8 weeks of age.

B. Wash down the entire calf barn with water plus detergent with a high pressure hose. Then dry out building by running fans.

C. Then wash facilities with a disinfectant, and dry again.

D. Then leave facility empty 7 to 10 days before starting another group of calves. If you have had a disease outbreak in the last group of calves, wait until four weeks before starting again. Some routinely leave the calf barn empty during July and August to let it dry out and break the disease cycle.

In addition to the above procedures, the calf pails should be rinsed daily with a detergent and then many rinse them with dairy disinfectant. It is a good idea to assign individual pails to reduce the possibilities of spreading disease.

It is desirable not to have over 50 to 70 head per

housing unit for maximum disease control and ease of filling and emptying.

5. *Develop and follow disease prevention and treatment procedures that work best for you.* In spite of strict sanitation programs, some calves will get sick even if they have had colostrum milk, due to the stress of handling, shipment and exposure to other diseases in the sale barn, in transportation vehicles and in the new environment. *Do not use antibiotics or other drugs* as a crutch or substitute for strict sanitation and good management, however. Sickness occurs when the body's normal defenses are overwhelmed by the disease organisms, and treatment beyond that point is an uphill battle at best, regardless of what drugs are used.

The best bet is to prevent sickness and the buildup of disease organisms by strict sanitation and a good environment and then treat at the first signs of sickness and only if needed. *You should work with a local veterinarian with experience with calves.* He can be most helpful in designing a disease control and treatment program that is most successful in your area. Do not wait until a disease outbreak occurs to work out procedures with him.

Scours are the most common killers of young calves, and the most common causes of acute scours are *E. Coli* and *Salmonella*. Both cause severe diarrhea, gaunt appearance, rough hair coat and dehydration. The basic principles for treating scours are to control the bacteria with antibiotics and other medication, reduce the intake of solids to reduce the source of nutrients for bacteria in the gut and maintain fluid intake by feeding electrolytes to help retain fluids in the body. The following approach to treating scours has worked reasonably well for many operators:

1. At the first sign of scours, cut milk replacer solids in half and keep the amount of water the same. Give recommended scours medications and antibiotics (neomycin is usually given, and furacin derivatives are often helpful). Don't put off treatment. The earlier you detect and treat them, the higher the chances for recovery.

2. If the scours persist for 2 or 3 days or get worse, take away all milk replacer and feed only an electrolyte solution for 1 or 2 days (see table, page 4). Some calves will drink it better if fed from a nipple pail or bottle.

3. After 1 or 2 days on electrolytes, gradually re-

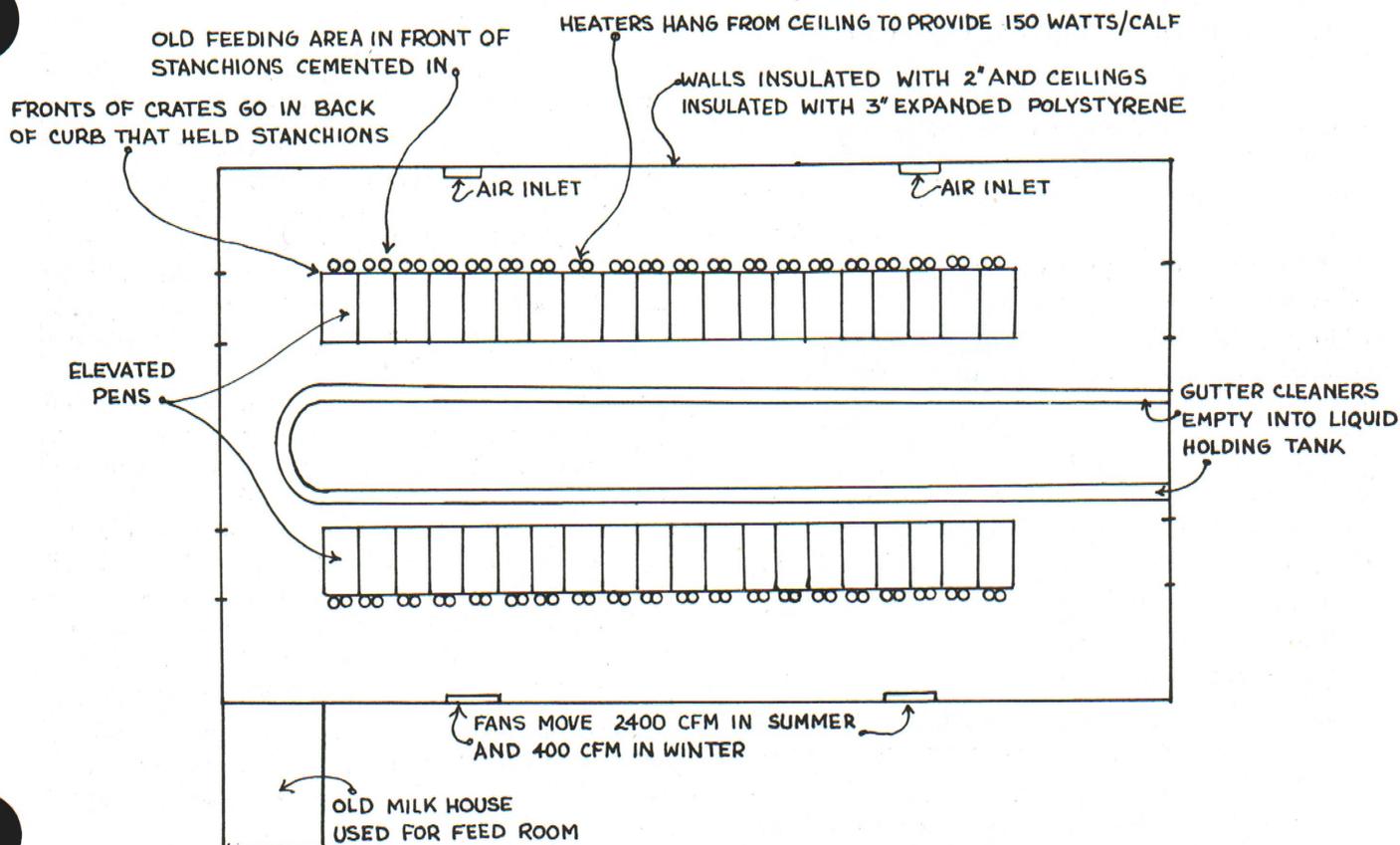


Figure 2. Old Dairy Barn Converted for Calf Rearing

turn the calf to this regular feeding except mix the milk or milk replacer with the electrolyte solution instead of with water for 2 to 3 days.

4. Get the help of your veterinarian in severe cases of scours. He can have the organism causing the scours identified so a specific treatment can be prescribed.

Although calf scours is the most common killer of young calves, there are several other calfhood diseases which must be guarded against. One of these is pneumonia. This is an inflammation of the lungs that may be caused by a variety of bacteria or viruses. A calf with pneumonia usually coughs, has rapid respiration and a fever.

Some calves may have sub-acute pneumonia, never showing any sign of a runny nose or coughing, but after a few weeks will suddenly die. Often calves with sub-acute pneumonia do not eat as much as normal and are slow growers. So it is wise to have the veterinarian check questionable cases with a stethoscope to see if he can detect any lung congestion. Overcrowding, drafts, poor ventilation, and poor sanitation are conditions which are apt to cause pneumonia. When treating with antibiotics, continue to give them for at least 3 days after the calf appears to be back to normal. This helps prevent a recurrence of the disease.

RECOMMENDED ELECTROLYTE MIXTURES.

Formula No. 1

Electrolyte solution that can be mixed with ingredients found around the farm.

Dextrose or cerelose (White corn syrup)	8 Tbs.
Salt	2 tsp.
Baking soda or sodium bicarbonate	1 tsp.
Warm water	to 1 gal.

It is fed at the rate of 1 lb. per 10 lbs. of body weight. So a 90 lb. calf might receive 2½ lbs. of electrolyte solution 4 times a day.

Formula No. 2

Electrolyte mix which can be made up by the druggist.

- Prepare a PREMIX:

Salt (NaCl)	4 oz.
Potassium chloride (KCl)	5 oz.
Sodium bicarbonate (NaHCO ₃)	5.5 oz.
Potassium monobasic phosphate	4.5 oz.
- Add 1 oz. of the above mixture plus ½ lb. of dextrose to 1 gal. warm water. Feed 2-3 qts. of this solution 4 times daily.

Formula No. 2 is probably better because it contains more salts. Gator-Ade is a soft drink which contains electrolytes, and this may be given at a rate of 1 quart per feeding in a nipple pail to scouring calves — but it is expensive.

Here are some other diseases to watch for besides scours and pneumonia:

Disease	Signs	Prevention
IBR (Infectious Bovine rhinotracheitis)	Redness around nostrils high fever, coughing, diarrhea.	Vaccinate
BVD (Bovine virus diarrhea)	Generally older calves, diarrhea, redness in lips and mouth. High mortality.	Vaccinate
Pink eye	Watery eye discharge. Eye inflammation.	Reduce dust and control flies. Isolate infected calves in darkened areas. Treat with antibiotics.
Navel-ill	Local infection of the stump of the umbilical cord. Infection may extend to the joints.	Sanitation, dip navel in iodine at birth.
Stomach and Intestinal Worms	Rough hair coat, potbellied, unthrifty appearance, retarded growth.	Avoid over crowding, don't feed hay and grain on the ground, rotate pastures.
Lice	Itching on back and neck. Hairless patches. Appearance of adult lice.	Routine dusting, or use a pour on lice control insecticide.

In summary, several points should be remembered for successful control of disease:

(a) Early detection, diagnosis and treatment of disease is critically important in obtaining recovery and preventing mass outbreaks. A temperature change usually occurs 12 to 14 hours before symptoms appear (such as drooping of the ears, nose not moist and cool) and is the best aid in early detection of oncoming sickness. Therefore, many operators will take temperatures of all calves for the first 7-10 days. A good practice is to begin treatment at the first sign of sickness and continue for two days after temperature is back to below 103.5°F. If over 8-10% have elevated temperatures, all calves can be treated for 5-7 days to prevent a mass outbreak, then discontinue and treat individual cases. A general guideline is to give 10 cc per day of combiotic plus up to 150 mg. of broad spectrum antibiotic in the milk replacer. If elevated temperatures persist, then 2 cc tylosin per day can be given instead until temperatures return to normal.

(b) A continuous and strict sanitation program is critical in controlling disease buildup as you must consider all calves as having been exposed to disease when you get them.

(c) The greatest carrier of disease is the operator — keep yourself clean, particularly after treating sick

calves and then working with healthy calves.

(d) Facilities must be disinfected and rested between groups.

(e) There is no substitute for buying healthy, colostrum-fed calves.

6. *Develop a good feeding program for the pre-weaning period to get calves weaned as soon as possible.* Proper feeding should be geared to avoid digestive upsets, to provide needed energy, protein, minerals and vitamins and to get them weaned and on dry feed as soon as possible.

A. Milk Replacer. Milk is nature's best food for the calf, as its dry matter is high in energy, natural protein, calcium and other minerals. Milk replacer is used rather than milk because of convenience and cost. Here are a few guidelines to follow when feeding a milk replacer:

(1) Don't use the cheapest product on the market because it will usually contain low quality milk or cereal products which make it less digestible and may cause scours. Use an all-milk product milk replacer containing about 24% protein, 20%-25% fat, 25,000 I.U. of Vitamin A and 5,000 I.U. of Vitamin D per lb. and 250 grams of neomycin per ton.

(2) If you suspect a problem with your milk replacer, switch to milk and see if it improves. If it does, then you might try a higher quality milk replacer.

(3) Mix and feed milk replacer according to the manufacturer's recommendations. A general guide is as follows (amounts are for each feeding, 2 times daily):

Day	Dry Milk Replacer	Water (Lukewarm)
1 to 3	Colostrum and herd milk	
4 and 5	.3 lb.	2.5 lb.
6 and 7	.4 lb.	3.0 lb.
8 until weaning	.5 lb.	3.5 lb.

Weigh ingredients carefully and make changes gradually. Be sure the calf drinks. You may need to help it for the first day or two.

Many are feeding pickled colostrum. Using this can practically eliminate the cost of feeding milk or milk replacer. For a large operation, this could mean a savings of hundreds of dollars. Pickled colostrum, however, requires careful management. Here is a recommended method of handling pickled colostrum, using 3 plastic barrels:

(1) **To Start**—dump the fresh colostrum into the first barrel over a 2 or 3 day period, making sure to stir it every day. Then start feeding it out—stirring it well before each feeding.

(2) Fill the other barrels. Keep rotating them so you are feeding from one, storing in the second, and filling the third.

(3) Make sure to stir them all each day. Cover the barrels with cheese cloth or screening to keep out flies. Don't put a tight cover on, or it will spoil.

There have been studies where up to 4 lbs. of cold pickled colostrum were given per feeding. Many dairy-men, however, report success when feeding about 1½ to 2 lbs. of pickled colostrum diluted with an equal amount of warm water per feeding. You may find that your colostrum supply may not be enough to provide for the calves at all times of the year, so you will have to feed whole milk or milk replacer occasionally.

B. Calf Starter and Hay: Calf starter and hay should be offered to the calf from the first week on and kept fresh. Calf starters should contain about 16 to 20% protein and 6 to 8% crude fiber. The hay should be of good quality and not fed to the extent that it limits grain consumption. If no hay is fed, the starter should be a coarse mixture containing 8 to 10% crude fiber. A successful calf starter ration developed at Cornell is given in Table 1. Cool water should be available free choice from the time the calf is started on milk or milk replacer. A small amount of water should be provided at first so that the calf doesn't drink too much.

Table 1. Starter Ration — From Start to 8 Weeks.

Ingredient	Amount (%)	Lb./Ton
Corn and Cob Meal (16%)	20	400
Crushed Oats (4%)	25	530
Beet Pulp	16	320
Brewers Grains	10	200
Soybean Meal (50%)	18	360
Molasses	7	140
Salt	1	20
Dicalcium Phosphate	1	20
Trace Minerals	.5	10
		2000

4 million I.U. Vitamin A

1 million I.U. Vitamin D

30 grams antibiotic

Chemical Analysis (as fed)

Protein, %	18.80
Calcium, %	.53
Phosphorus, %	.55
% Crude Fiber	9.1

C. Weaning: A good rule of thumb is to wean the calf when it consumes 1 to 1½ lbs. of grain per day on a regular basis (previous 4 days). The consumption of calf starter will increase even more after weaning.

Depending upon how well the calf develops, it may be 4 to 8 weeks of age when it is weaned. Lower the barn temperature gradually, over a period of several days to 38-40° if putting calves out into a cold barn at weaning.

6. It is best to do *castrating* and *dehorning* after critical 4 week period is over but before removing from individual pens. Consider vaccination for feedlot diseases, especially IBR, leptospirosis and blackleg, if a problem in your area, by 4 months of age.

7. *The calves can be grouped outside at 6-8 weeks.* Base on feed intake and health, especially in winter.

A. Group pens can be outside — calves start ruminating by 3-4 weeks, resulting in higher heat production from fermentation of feeds in the rumen.

(1) Provide access to shelter free from drafts and wind but well ventilated.

(2) The shelter should be well drained and dry.

(3) Space requirements per head:

Inside space — 10-15 sq. ft. to 300 lb.
15-20 sq. ft. to 500 lb.
20-25 sq. ft. to slaughter

Outside lot — 20-30 sq. ft. per head of surfaced lot

Management from Weaning to Slaughter

After the dairy calves reach 300 to 400 lb., they can be handled similar to calves that are weaned from beef cows by 7 months of age.

A. *Selecting the Feeding Program.* Selecting the most economical feeding system for a given operation depends on cost of production or purchase cost of energy and protein from grains or roughages, overhead costs and importance of turnover rates and marketing conditions for grains or cattle.

Most farming operations that produce their own feed can usually maximize over-all returns by harvesting at least part of the land as silage or hay and using a high- or all-silage feeding program or a 2-phase system that produces near a 2 lb. daily gain to 700 or 800 lb. on a high silage diet and then feeding a high concentrate diet to slaughter weights.

Where cattle are to be wintered and then returned to grass, the most economical winter daily gains may be between 1 and 1.5 lb. per day. If a cattle feeder produces large amounts of grain and it is the most profitable to market as much of it as possible through the smallest number of cattle possible due to limitations in labor, facilities or capital, then a continuous high concentrate ration from weaning to slaughter may be the most profitable for his total operation.

Other situations where this system may be the most feasible is where labor, roughage availability and handling is a problem, cost of silage harvesting and storage is high due to a low volume, or turnover rate is critically important.

When Holstein steers are about 12 months of age and are slaughtered at weights similar to British breed cattle (approximately 1000-1100 lb.) they will gain faster and as efficiently, and the carcass from dairy breed steers will contain less fat and a higher per cent of edible portion due to slaughtering at an earlier stage of growth. At this point the meat will be tender and will have a desirable flavor that is milder than typical feedlot cattle that are more mature and older (14-16 months) at slaughter.

If Holstein steers are fed until they weigh 1200-1300 lb., they will have carcass grades similar to 1000-1100 lb. British breed steers fed similar rations. Research shows that the proportion of steak and roast meat and meat quality in Holstein beef will be similar to that from British breeds when compared at these weights. However, they will be about 10% less efficient than British breeds when fed to the fatness of low choice grade.

B. *Feeding Holstein Bulls Compared to Holstein Steers.* Bulls gain about 10% faster than steers and require about 5% less feed per lb. of gain. Heifers mature earlier than steers, and steers mature earlier than bulls. Therefore at the same weight heifers are fatter than steers and steers are fatter than bulls. In addition, bulls appear to become more variable in tenderness as they get to be 16 months and older compared to steers and heifers. If slaughtered at younger ages, however, the meat from bulls can be quite comparable to steers at the same degree of finish. Thus, bulls should be fed a higher energy ration so they reach slaughter weight at a young age before the eating quality of their meat begins to decline. If they are to be utilized for processed meats, however, they are often worth more than steers at any age due to their greater proportion of lean meat.

C. *Guideline Feeding Programs.* Most feeding programs will be one of three types:

(1) *Continuous high or all concentrate* — In addition to the factors discussed previously, the advantages of this program are less volume of feed and manure to handle, less labor and equipment requirements (can use a self feeder as compared to daily bunk feeding with high roughage programs) and less time is required to reach slaughter weight and condition.

(2) *Two phase* — This program produces more beef per acre, and is of particular advantage when the cost of grain is high. In this program the calves are fed the equivalent of 40-50% concentrates (1% of body-

weight in grain and a full feed of hay or a full feed of corn silage plus enough protein supplement to balance the ration) to 650-800 lb., then 2-4 lb. hay or silage plus a full feed of grain plus enough protein supplement to balance the ration until a desirable slaughter weight is reached (1100-1300 lb.).

(3) *Continuous High Corn Silage*—In this program the first phase of the previous program is continued to slaughter weight. It produces the maximum lb. of beef per acre, but requires more time to reach slaughter weight.

Table 2 summarizes recommended rations and expected daily gains and feed requirements for each of these 3 programs. Several guidelines for using these programs are given at the bottom of Table 2.

More details on specific rations and selecting protein supplements can be found in fact sheets 1200, 1201, 1202 and 1204 A and B and information on facilities and equipment can be found in section 6000 of the beef reference manual.

Notes for Table 2

1. Average daily rations are based on hay, shelled corn and protein supplement at 10% moisture and corn silage at 70% moisture. Never let the cattle run out of feed after they are on full feed, especially on the all concentrate program.

2. Protein supplement used is the equivalent of a 40%. Use an all natural source of supplemental pro-

tein to stage 2, 1/3 of protein from urea to stage 3 and up to all protein from urea or urea treated silage after stage 2. Calcium level in the protein supplement needs to be 4-5%. The supplement needs to provide at least 20,000 I.U. of Vitamin A and 70 mg. aureomycin or terramycin per head daily. See fact sheet 1204 for more details on selecting the protein supplement.

3. Cattle are implanted every 100 days with Ralgro or Synovex S.

4. Providing 1-2 lb. of long hay or 5-10 lb. corn silage per head daily will help prevent liver abscesses and digestive upsets when on high or all concentrates.

5. 1/2 lb. shelled corn and 1/2 lb. legume hay can be used to replace 3 lb. corn silage and the equivalent of a .15 lb. of a 40% protein supplement.

6. Feed requirements are based on average expected dry matter intakes and net energy values of the various rations and net energy requirements for the actual weight gained. Nearly all of the weight loss occurring between the time when the cattle are removed from feed and when sale weights are obtained will be losses of undigested feed and water from the digestive tract (fill) if the sale weight is taken within 12 to 24 hrs. after the cattle are taken off feed. Therefore, the cost of 15 to 20 lb. of feed should be added to feed costs to adjust for shrink (see fact sheet 4301).

7. The feed requirements for each period can be calculated by multiplying the average daily consumption times the days required.

TABLE 2
RATIONS AND EXPECTED PERFORMANCE FOR 3 SYSTEMS
FOR FEEDING DAIRY BREED CALVES FROM WEANING TO 1000 LB.

Item	Stage 1 (140-450 lb.)			Stage 2 (450-700 lb.)			Stage 3 (700-1000 lb.)			Total		
	High Silage	2 Phase	All Concentrate	High Silage	2 Phase	All Concentrate	High Silage	2 Phase	All Concentrate	High Silage	2 Phase	All Concentrate
Legume Hay, lb./day	2	2	—	—	—	—	—	—	—	340	340	—
Corn Silage, lb./day*	F.C. (10)	F.C. (10)	—	F.C. (45)	F.C. (45)	—	F.C. (60)	—	—	15,125 lb.	7,325 lb.	—
Shelled Corn, lb./day	3	3	F.C. (7)	—	—	F.C. (14)	—	F.C. (19)	(F.C. (10))	510 lb.	2,220 lb.	4,000 lb.
Supplement, lb./day	1	1	2.0	1.5	1.5	1.5	1.0	1.0	1.0	490 lb.	450 lb.	485 lb.
Avg. Daily Gain, lb.	1.8	1.8	2.4	2.0	2.0	3.0	2.3	3.3	3.0	2.0	2.25	2.7
Days Required	170	170	130	125	125	85	130	90	100	425	385	315

*FC = Fed free choice. The expected consumption when fed free choice is given in parenthesis.

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