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Fattening Montana Cattle

By

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Status of Cattle Fattening

Cattle fattening in Montana is becoming an important and rather specialized enterprise in several areas. Numbers of cattle on feed have more than tripled the estimated 25,000 head fed out 10 years ago. The steady and growing demand for fed beef in the Pacific Coast states provides a good outlet for light-weight slaughter cattle grading Good to Choice. Quotations on Choice grade slaughter cattle on Montana markets are essentially the same as those West Coast markets minus transportation costs. At the same time, however, West Coast markets have been fully equal to midwestern markets on this same grade of light-weight killers.

More recently, the huge annual barley production in Montana has provided a cheap source of energy for fattening.

The demand for fed beef in Montana is also of growing importance. Packers within the state now slaughter an estimated 90,000 head annually with a preference for Good to Choice quality. A large retail food chain operating within the state and featuring U. S. Choice-grade beef obtains a most substantial part of its annual requirements from Montana packers.

Livestock fattening is still concentrated in the irrigated valleys, usually in the sugar beet growing areas. There is a growing interest in the dry land areas closer to the big supply of barley. Fattening in the irrigated areas is a necessity in order to utilize certain crop residues and maintain soil fertility. In the dry land areas feeding is justified for the higher return from surplus feed grains with the added possibility of profit from the enterprise itself.

Montana cattle feeders face the economic disadvantage of being far from the principal
centers of consumption. They do, however, have the offsetting advantages of cheap, high quality fattening feeds and fresh, healthy cattle.

Fattening cattle, however, is and will continue to be secondary to wintering breeding livestock. This is not necessarily a conflicting situation. In areas of limited hay production, feed will always be committed to breeding herds, even in periods of temporary surplus. Only where feed surpluses occur annually can cattle fattening succeed or even be advised.

Cattle fattening trials have been conducted by the Montana Agricultural Experiment Station since 1900. Information presented in this bulletin is therefore based on findings during this long period of research plus the recommendations of the National Research Council on the nutrient requirements of beef cattle.

Choice quality yearling steers suitable for a long feed.

Selection of Feeder Cattle

Age. In order to meet the established preference by meat retailers for Good to Choice grade carcasses weighing 500 to 600 pounds, fat cattle must fall into the 900 to 1,100-pound live-weight bracket. This in turn calls for young, high quality feeder cattle. There are some exceptions depending on
market probabilities, feeds and cattle available, costs and personal desires of the feeder.

Calves will make more efficient gains than older cattle but will require a longer period to finish. For example, calves will put on 100 pounds of gain for about 850 pounds of total feed while yearlings will need about 1000 pounds of feed to make the same amount of gain. Two-year-olds are the extreme, requiring over 1100 pounds of feed for 100 pounds of gain. They will, however, make greater total daily gains.

Sex. Heifers usually make slower gains than steers but will finish in a shorter period. Cows, if not too old, can make rapid gains on low-cost feeds but seldom bring high prices. Pregnancy and recurring heat periods can cause trouble and some financial loss in feeding cows and yearling heifers. Heifer calves, however, are no problem and can be fed together with steer calves. They will fatten quicker than steers but at lighter weights. When fat they will sell for nearly the same price as the steers.

Pregnant heifers can be successfully aborted early in the feeding period by injection with a drug intended for this purpose. A veterinarian is needed to perform this service.

Grade. Feeding cattle to the highest grade of which they are capable will usually result in the greatest return on the investment. Knowledge of both feeder and slaughter grades is therefore essential to a successful cattle fattening enterprise. The corresponding U.S. D.A. grades for feeder and slaughter cattle are listed below as well as shown on pages 6 and 7.

While the widest market demand is for slaughter cattle in the Good to Choice grades, feeding the lower grades can also be profitable if they are bought, fed and sold according to their values and capabilities. Feeding high quality cattle just to a “warmed-up” condition can sometimes be a losing proposition. In general, the higher the quality the cattle the longer the feeding period must be to reach the most desirable slaughter grade. For choice feeders this means about 250 days on calves and 150 days on yearlings. Lower quality yearling feeders will rarely pay for more than a 120-day feed.

<table>
<thead>
<tr>
<th>Feeder Grade</th>
<th>Slaughter Grade Possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fancy</td>
<td>Choice to Prime</td>
</tr>
<tr>
<td>Choice</td>
<td>Choice to Prime</td>
</tr>
<tr>
<td>Good</td>
<td>Good to Choice</td>
</tr>
<tr>
<td>Medium</td>
<td>Standard to Good</td>
</tr>
<tr>
<td>Common</td>
<td>Utility to Standard</td>
</tr>
<tr>
<td>Inferior</td>
<td>Cutter to Utility</td>
</tr>
</tbody>
</table>
Although color markings, heads and other points of eye appeal may have much to do with the price of feeder cattle, these factors do not necessarily affect beef-making ability. In selecting feeder cattle consider healthy animals with a good spring of rib, wide, straight backs and deep, wide hind quarters. With 75 per cent of the carcass value of a steer coming from the rib, loin, rump and round cuts, these areas deserve first attention in selecting feeder cattle.

Gain-Certified Feeders. Gaining ability has been determined to be highly heritable in beef cattle. Research at the

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Feeder Steers — U.S. Grades
USDA Agricultural Marketing Service, Livestock Division
Slaughter Steers — U.S. Grades
USDA Agricultural Marketing Service, Livestock Division
U. S. Range Livestock Experiment Station at Miles City has shown that bulls with a high gaining record themselves on feed-test will in turn pass this characteristic on to their steer progeny. This rate of heritability has been estimated at 60 per cent. In brief, a bull which gained 0.5 lbs. per day more on a standard 140-day index feed test or 70 pounds more than another bull will add a gaining potential of 21 pounds to each of his steer progeny over the steers from the other bull. Since the bull contributes exactly one-half the inheritance to his calves this possibility is figured as follows:

\[
70 \times 60\% = 21 \text{ lbs.}
\]

Even greater gaining ability can be expected from feeder calves out of cows also sired by high indexed bulls.

Feeder calves and yearlings sired by bulls with a known high-gaining index are now being produced by some Montana cattlemen. The Montana Beef Performance Association, organized in 1956, provides a service to purebred-breeder members by certifying the gain-index of bulls and to commercial producers by certifying the production and quality of feeder calves sired by Individual Performance Record or gain-indexed bulls.

An example of the value of bred-in gaining ability in feeder steers is found in an Ohio Experiment Station trial in which steers sired by indexed
bulls at the U. S. Range Livestock Experiment Station were fed out in comparison with other steers of similar quality purchased on the open market, but of unknown gaining ability. At the end of the trial, the U. S. Range Station steers had made 10 per cent more gain with 9 per cent less feed.

Management

Starting Cattle on Feed

Upon arrival at the feedlot fresh cattle need time to rest and get acquainted with surroundings. Fresh water, clean bedding and good-quality grass hay are all that is needed for the first 5 days. Feeder cattle should not be turned directly onto pasture or fields when they arrive. The third or fourth day is soon enough and then only after having a good fill of hay. A few hours each day is enough at the start.

The appearance, texture and odor of the droppings will indicate how cattle are starting on feed. This principle will apply throughout the entire feeding period. The droppings will vary with different rations but in general a healthy fattening steer will form a jelly-like mound of droppings.

Dehorn cattle as soon as they are settled and adjusted. They will take less space at the feed bunk, handle and ship more easily with less risk of bruising each other. Dehorned cattle, whether fats or feeders, command higher market prices.

Handling. Once cattle are started on feed leave them in the feedlot and disturb as little as possible. Other cattle must not be cut in and out of the feedlot if the feeders are to make efficient and economical gains. Feeding the same time each day and by the same feeder will do much to make cattle comfortable and ready to take on feed.

Sorting. Unless a very uniform lot of cattle is purchased some sorting into separate lots is advisable as the feeding period progresses. Sort the big cattle from the small ones, and cut timid cattle by themselves until they become more aggressive for feed. Cattle of varied quality can be sorted and fed accordingly, both as to length and amount of feed. Feed yearling heifers separately from the steers. Sell individual cattle not doing well after 60 to 90 days, including chronic bloaters, rather than continue to put expensive feed into them.
Weighing. Feeders who have scales at their feedlots will find it an advantage to make monthly or 28-day weighings of their cattle. This will not only tell how much cattle are gaining but will allow the feeder to keep a close check on his feed-cost per pound of gain. Weighing the amount of feed given cattle is of equal importance in determining costs and efficiencies. Also, this periodic check will help the feeder to quickly spot anything wrong with his management or ration that may be slowing down gains. Accurate weight records on both cattle and feed are necessary to determine profit or loss.

Bedding. If cattle are to make satisfactory gains, especially in winter, they need a dry place to lay down out of the wind. Straw is the best bedding but does not need to be added daily. Small farm feedlots can be completely bedded as a means of also conserving all manure. Cattle in larger lots also need bedding but a straw mound maintained in one place is good enough. Weather will determine when and how much bedding needs to be added to keep the top litter dry.

A further advantage of bedding the feedlot is to avoid dockage or a discount in price at marketing time because of cattle wearing excessive amounts of mud and dung-balls.

Water. A dependable supply of fresh, clean water that can be warmed in freezing weather is a first essential in any cattle feeding operation. Various watering and heating devices, both commercial and home-made, will provide this if kept in good repair. Cattle that have to drink ice water will use body heat produced by costly feed just to warm the water. Furthermore, they won’t drink enough water. This can materially reduce gains and in turn raise costs.

Cattle on feed will take from 5 to 10 gallons of water daily depending on their size. A high water intake each day is necessary for economical and efficient gains.

Digestive Disturbances. These include bloat and scouring or going off-feed. The bloat problem is perhaps best handled by feeding a ration that is not conducive to bloat. Some individual cattle may bloat regardless. In emergencies, treat affected animals with mineral oil or deflate with a hose inserted into the paunch through the esophagus or gullet. Tapping with trocar is a last resort after which, if the animal lives, he is likely to be a poor doer. If persistent bloat is a problem with a number of cattle the whole ration had better be changed to a combination of feeds less conducive to bloat.
Calves makes more efficient use of feed than older cattle.

Although not likely to cause immediate death, scouring can be even more costly than bloat through loss of weight or lack of gain. A noted livestock authority said that one day's scouring in a feedlot of cattle can cost a week's gain. Remove individual cattle that are scouring from the lot at once and put on less laxative feeds. Feeding wild or grass hay and less concentrates will help bring the animal back to normal. The same practice will apply to an entire lot of steers off-feed and scouring. Early veterinary advice in a persistent scouring condition will prevent the possible spread of any infectious condition that may be causing the trouble.

Other Health Hints. In case of foot-rot, pink-eye, and other incidental ailments of feedlot cattle, secure the advice of a veterinarian and treat accordingly. To prevent a possible loss from blackleg, vaccinate all calves upon arrival even though they may have been vaccinated earlier in the year by the former owner.
Nutrition

Unless cattle receive a surplus of feed over that required for maintenance and growth they will not fatten. In fact, in the case of calves they will lose flesh in compensating for growth of the skeleton. The kinds and amounts of feed required in the feedlot constitute the nutritional problem. Steers must have a balanced ration or they will not fatten no matter how much they eat.

Concentrate - Roughage Ratio. Since fattening cattle need a surplus of energy feeds to make proper gains, the proportion of grains to hay or concentrate-roughage ratio is important. Starting cattle need only a 1:4 ratio but may finish at a ratio of 3:1 or 4:1. The first figure represents the grains or concentrates and the latter the hay or roughage.

Where chopped hay and grain are fed as a mixture, it is possible to keep the concentrate-roughage ratio exact and to vary it from time to time throughout the feeding period. A good rule after cattle are once started on feed is to limit the concentrate to about 2 pounds per day for each 100 pounds live weight plus hay free-choice. As the amount of concentrates fed increases with body weight, hay consumption will usually decline in proportion.

The amount of concentrates to roughage in a ration also will vary with the grade of feeder cattle and the length of feeding period intended. For greatest returns high quality feeder cattle must be fed a high concentrate ration in order to reach their most desirable slaughter grade. For greatest economy, however, feed lower grade cattle a higher proportion of roughage to concentrates because of their lower values per pound when finished. Usually half as much grain or only one pound of concentrates each day per 100 pounds live weight is sufficient.

Proteins. Proteins are needed for body maintenance, growth and development and are necessary to all animals. Young, rapidly growing animals such as calves have a higher requirement in proportion to their body weight than do older animals. Montana grown alfalfa hay and barley are quite high in protein and a supplement is not likely to be needed where these feeds make up an important part of the ration. An exception might be in the case of corn silage or wild hay being the main source of roughage. Rations containing 10 per cent or more in total protein content are sufficient for fattening cattle.

Since excess protein is not stored by animals but merely
converted to energy, the addition of a protein supplement to a ration that is otherwise adequate is poor economy. The extra feed is not wasted, however, but its value inside the animal becomes no greater than an equal amount of the cheapest energy feed already in the ration. Feeding excess protein is not harmful to livestock and the cost is of no concern when the excess is in home-grown feeds rather than in supplements.

**Carbohydrates and Fats.** These are energy feeds including starches, sugars, fats and oils which furnish the fuel for fattening. Home-grown grains such as barley, corn and oats are high in energy. Any fattening ration, with the proper amount of concentrates, will have adequate energy.

**Minerals.** While all animals need all the essential minerals, Montana cattle feeders only need be concerned with those that may be lacking in the usually available feeds. Common salt, of course, is needed by all livestock and should be supplied in the feedlot as elsewhere.

Calcium is abundant in all Montana-grown hay, especially alfalfa, therefore, the addition of this mineral to a cattle fattening ration is unnecessary. Too much calcium in a ration can cause nutritional complications. Grains are usually low in calcium so a combination of home-grown grain and alfalfa or wild hay will usually hold the calcium in the ration at a proper level.

Phosphorus is likely to be deficient in most hay unless grown on phosphate-rich soil. Fortunately, however, grains are consistently good sources of phosphorus regardless of the soil on which they were grown. Fattening cattle on full feed will rarely have a need for extra phosphorus unless they are getting a large proportion of beet tops or beet pulp in the ration. In such case, free access to a mixture of 1/3 each by weight of monosodium phosphate, steamed bonemeal and salt, or a commercial mineral mixture containing at least 10 per cent phosphorus is sufficient.

Because some feeder cattle may be suffering from phosphorus deficiency when they arrive at the feedlot, free access to a high-phosphorus mineral mixture as suggested in the paragraph above is advised. Deficient cattle may consume rather large amounts of mineral at the start but as they increase their grain intake their appetite for minerals will decline. Free access to a high-phosphorus mineral may also get cattle started on feed sooner than otherwise. Mineral mixtures used in the Corn Belt are not advised for Montana because they are
much too high in calcium with too little phosphorus.

There are adequate amounts of trace minerals, with the exception of iodine, in Montana-grown feeds so their addition to a feedlot ration is not necessary. Where a commercial protein supplement containing urea is fed, trace minerals may be beneficial. The feeding of trace-mineralized salt including iodine is not, however, harmful if the feeder so desires.

**Vitamins.** Vitamin A is usually the only one of concern in cattle fattening in Montana. Other vitamins are important but they are either plentiful in natural feeds or are synthesized by the animal. Vitamin A is best supplied in the feedlot through green leafy hay of the current year's production. This type of hay is usually very high in carotene which cattle convert to vitamin A. The amounts of hay usually fed in Montana rations is sufficient to meet this need.

Hay held in the stack over a year may have lost most of its vitamin A value. If it is necessary to feed such hay, send a sample to the Chemistry Department at Montana State College for analysis. If it is low in carotene it will be advisable to feed one pound of dehydrated alfalfa per head daily or a good vitamin A supplement.

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Big, heavy cattle make large daily gains but the outlet for this kind of beef is rather limited.
Vitamins in the B-complex group are supplied through action of the micro-organisms in the rumen or paunch of cattle so their addition to the ration is unnecessary. Also, vitamin D is supplied through direct sunshine or through sun-cured hay. With cattle outdoors most of the time in Montana, a vitamin D deficiency is unlikely.

Feed Grains

Comparison between feed grains in a fattening ration is first a matter of nutritive value, second relative cost, and third the physical effect on the animals. The common feed grains used in Montana are herewith discussed accordingly.

Barley. This grain is the most widely used feed in cattle fattening in the West. It is economical, quite palatable and produces carcasses with satisfactory finish and quality. In terms of energy or fattening value, barley carries about 90 per cent of the value of No. 2 yellow corn. Because it is much lower in price, barley is a decidedly cheaper fattening feed in Montana than corn. Montana-grown barley also has a protein content of 10 per cent or higher.

Because barley is likely to be a bloat hazard when fed with alfalfa hay the addition of another feed to the ration is advised. Dried molasses beet pulp is a bloat preventative when mixed with barley in quantities of 25 to 50 per cent by weight. Although not proven by research, corn silage, wild hay or grass hay appear to have value in preventing bloat. Limited observations indicate wheat mixed feed may have a similar value.

Steam rolling, dry rolling or coarse grinding is preferred to finely ground barley for cattle feeding.

Corn. Most of the corn now raised in Montana is fed in the form of silage with little being fed as grain. Some feeders, however, prefer corn but most of this is shipped in from the Corn Belt and is therefore rather high-priced compared to barley.

Corn has no equal as a fattening feed, being very palatable and can be fed alone without much risk of digestive upsets. Corn-and-cob meal is suitable for the entire feeding period for calves but is a little too bulky for the final finishing of older cattle. Mixing cracked wheat with the meal in 50-50 proportions corrects this fault and uses the wheat very satisfactorily.

Grind corn for feeding cattle unless they are followed by pigs.

Oats. Oats serve an important purpose as a starting grain to get cattle on feed, especially calves. They are not recommended as the only grain for fattening purposes, because of
Medium grade steers suitable for a short feed on a high roughage ration.

their bulk. Oats mixed with other small grain such as barley or wheat will tend to offset certain digestive disturbances associated with heavy grain feeding. Oats may be crushed or rolled — never finely ground, when mixed with other grains. There is no advantage in grinding oats for starting weaned calves on feed.

Wheat. Although wheat has almost equal fattening value with corn it is rarely fed to fattening cattle because of the price differential. Mixing other grains with wheat gives better results than feeding wheat alone. Wheat should be rolled or coarsely ground for cattle feeding.

Wheat Mixed Feed. This by-product of flour milling is also known as “mill-run” or “mill feed”. It carries less crude fiber than bran but is more digestible. It is a somewhat bulkier feed than oats but with a higher protein content of nearly 16 per cent. Wheat mixed feed is also very high in phosphorus, averaging over one per cent.

Roughages

All ruminants require a certain amount of coarse, rough feed to maintain normal digestive functions. The daily amount of roughage fed in a
fattening ration will be determined by several factors, including the type of ration chosen, cost, kind of roughage, degree of finish desired and age and sex of the cattle. For maximum gain and finish the roughage part of the ration must be limited. This was previously discussed under “Concentrate-Roughage Ratio”.

Any mature, weathered hay or straw is not advised in a cattle fattening ration because of usually having too little protein and carotene for vitamin A as well as too much crude fiber. Such roughage is better fed to stock cattle rather than in fattening rations.

Grinding or chopping hay will not change feeding value in the least although it may save some waste. Chopping poor quality hay will cause cattle to eat what they might otherwise refuse but it will lower rather than raise the fattening value of the ration. Chopping good hay is not harmful and has the advantage of saving labor where a mixed grain-hay ration is fed with mechanical equipment.

Alfalfa. Besides being the main source of roughage in Montana cattle fattening rations, alfalfa hay is also an important and dependable source of protein. Alfalfa hay also is

Good quality alfalfa hay is a cheap source of protein and carotene for vitamin A.
probably the cheapest source of protein for Montana feeders. The green leaves and fine stems of alfalfa hay are usually the only source of carotene for vitamin A in the ration.

The higher the quality in alfalfa hay as shown by green color, leafiness and fine stems, the higher its value in the feedlot. Whether the hay is first, second or third cutting is of much less importance than the quality.

Native Hay. Montana’s native hays are widely known for their high feeding value. These include western wheatgrass or “bluejoint” as well as the native mixed hays of the mountain valleys. These hays are so varied in species, compositions, and nutritive values that only general comment is possible.

The advantages of good native hay include less bulk and a tendency to reduce bloat in combination with rations including barley.

Native hays are lower in protein than alfalfa and therefore may require a protein supplement, especially if fed to calves. The necessity for a protein supplement will not be so great with yearlings or older cattle. Hay containing 30 per cent or more legumes will usually have enough protein for fattening cattle.

The carotene content for vitamin A will be sufficient if the native hay is cut before maturity and cured with good green color. Native hay cured on the stem is a poor source of carotene.

Mixed Tame Hay. These roughages include different percentages of timothy, various clovers, redtop, bluegrass, bromegrass, orchard grass, crested wheatgrass and alfalfa. Well-grown and properly harvested, these mixtures are usually more palatable and of higher feeding value than pure species. The protein and vitamin A value of mixed hays will vary directly with the percentage of legumes they contain and the stage of maturity when cut.

Silages. Silages are basically roughages which have been cut before maturity and preserved without curing by ensiling. This process breaks down much of the crude fiber making it more digestible. Some of the starches have also been converted to sugar. Silages, however, have a high water content and in terms of dry matter have about one-third the feeding value of cured hay. Large quantities of silage are therefore not advised in cattle fattening rations. For most efficient use silages should be used as a substitute for part of the dry roughage at the rate of 3 to 1. Older cattle can utilize larger amounts of silage than can calves.
Corn silage is highly palatable and fits very well in the ration on the farm where corn is grown. It also appears to prevent digestive upsets associated with rations including barley and alfalfa hay.

Alfalfa or grass hay silage is proportionately higher in protein content than corn silage and should have the other advantages of corn silage if properly preserved in the silo. Corn silage, however, has a higher energy value than hay silage.

Beet top silage has a higher value than cured beet tops on a dry matter basis. Siloing is perhaps the best way of preserving the feeding value of this crop residue. The value of sugar beet tops in a fattening ration is discussed under "Sugar Beet By-Products".

Sugar Beet By-Products

Sugar beet producing areas have long been the center of Montana fattening operations. The by-products of producing and processing sugar beets are useful livestock feeds with but little other value. Feedlot manure is also needed to maintain beet yields. Sugar beet by-products are uniformly low in protein and phosphorus but when fed in proper proportions with other fattening feeds these deficiencies are corrected.

Beet Tops. Three methods of feeding beet tops are (1) graze in the field, (2) feed dry-cured in the lot, or (3) ensile. Grazing tops in the field requires no labor or preparation but entails the loss of nutrients in direct proportion to their exposure to weather. Beet crowns can also cause serious trouble by choking. Beet tops alone are not a balanced ration. If fed alone they lose much of their complementary value to other feeds. Because of the high water content and laxative effect, cattle grazing beet tops will do better if also fed some good quality hay.

Curing or ensiling beet tops are preferred methods for preserving their nutritive value. For example, the results of 27 feeding trials at four experiment stations show that well-cured tops from one ton of beets has a replacement value in a fattening ration of 46 pounds of corn plus 150 pounds of alfalfa hay.

Dried Molasses Beet Pulp. This by-product might also be classed as a commercial feed as its use is not restricted to those who grow sugar beets. It occupies a special position in Montana cattle fattening rations because of the tendency to reduce bloat in rations containing barley and alfalfa hay. Trials at the Montana Agricultural Experiment Station at Bozeman and at the U. S. Range Livestock Experiment Station at Miles City, showed that a 50-50 barley-dried pulp
mixture by weight was effective in bloat prevention. The minimum percentage of dried beet pulp for bloat control has not been fully established although other Montana experiments show that 25 to 30 percent pulp in the concentrate mixture is effective in keeping down bloat.

In terms of fattening value, dried molasses beet pulp is fully equal to barley when fed in equal amounts in the ration. When dried molasses beet pulp and barley are equal in price a 50-50 mixture is indicated. When dried pulp is higher in price than barley, reduce the amount of pulp proportionately.

**Wet Beet Pulp.** Although most sugar refiners in the state now dry their pulp to give a wider distribution to feeding areas, some wet pulp is still fed close to the factories. Wet pulp has essentially the same value as dried pulp except it contains little over 10 per cent dry matter. Because of high water content, wet pulp is a better feed for older cattle than calves.

**Beet Molasses.** The use of beet molasses depends largely on cost as this feed does not provide anything not already supplied by other Montana feeds. Molasses add palatability to lower grade roughages but the use of such feeds is hardly advisable in a fattening operation. Molasses is definitely laxative and must be fed with caution. One-half pound per steer per day is considered the maximum for starting this feed. The top limit is 2½ to 4 pounds for yearling steers and 3 to 6 pounds for two-year olds.

**Protein Supplements**

As previously shown, most Montana cattle fattening feeds can be combined into rations which are fully adequate in protein. The use of protein supplements should therefore be limited to those rations including either corn silage or non-legume hay as the only roughages or where the feeder desires to use a feed additive which is only available in the form of a commercial protein supplement. The value of these additives is discussed under "Feed Additives".

**Natural and Synthetic Protein Supplements.** The natural sources include soybean oil meal, cottonseed meal or cake, and linseed oil meal. Commercial protein supplements sold under various trade names are usually composed of varying amounts of these natural sources of protein. The amount of protein shown on the feed tag is total or crude protein as determined by chemical analysis. Digestible protein is the
amount that can be utilized by animals and has been determined by repeated feeding tests. Information on digestible protein is available only on natural feeds in their original form and can be obtained from various feeding texts and publications.

Urea, a synthetic compound containing an equivalent of 2.62 per cent protein per pound, is sometimes added to commercial protein supplements as a means of increasing their protein value. Ruminants are able to utilize the nitrogen contained in urea providing not more than one-third the total protein is from a non-protein nitrogen source and is not more than 3 per cent of the total ration. Micro-organisms in the rumen synthesize protein from urea in combination with their own bodies. The purpose of urea is therefore to cheapen the cost of protein supplements within the safe limits as established for ruminants at not more than one-third the total protein. Urea in itself has no energy value.

Composition of Feeds

Knowledge of the nutrient content of feeds commonly grown or available in the area is of first importance to the cattle feeder. The use of a supplement where a deficiency exists will be a good investment but where home-grown feeds are adequate, extra use of supplements will only add expense.

Tables showing the average composition of many feeds may be found in certain textbooks and publications on file at county extension offices. They also may be purchased from the publishers if desired.

How to Balance Rations

Balancing a ration is a matter of trial and error by making adjustments between various amounts of feeds available until a balance of all necessary nutrients is reached. The amount of nutrients in each feed in the ration is determined by multiplying the percentages shown in the average composition tables by the pounds of that feed. Totals for each nutrient contributed by the several feeds in the ration are then compared with tables on daily nutrient requirements for the age and weight animals to be fed. A balanced ration must also include not only an adequate amount of feed but also feeds that are palatable.

It makes little difference to a steer from what feeds he gets his total nutrient requirements as long as the amount is adequate. For greatest economy, the ration balance must also take into account the cheapest source nutrients from available feeds. For example if barley is worth $2.00 cwt. with T.D.N. (total digestible nutrients) at 77.7%, 100 pounds of T.D.N. would cost $2.57
# Daily Nutrient Requirements of Beef Cattle

(Based Upon Air-Dry Feed Containing 90 Per Cent Dry Matter)

<table>
<thead>
<tr>
<th>Body wt. (lb.)</th>
<th>Av. feed daily per gain animal (lb.)</th>
<th>Digestible Total protein (lb.)</th>
<th>TDN (lb.)</th>
<th>DE (lbs. therms)</th>
<th>Ca (lb.)</th>
<th>P (lb.)</th>
<th>Carotene (mg.)</th>
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</thead>
<tbody>
<tr>
<td>Fattening calves finished as short yearlings</td>
<td></td>
<td></td>
<td></td>
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<td>10.9</td>
<td>22</td>
<td>0.044</td>
</tr>
<tr>
<td>800</td>
<td>2.2</td>
<td>20</td>
<td>2.0</td>
<td>1.5</td>
<td>13.6</td>
<td>27</td>
<td>0.044</td>
</tr>
<tr>
<td>1000</td>
<td>2.2</td>
<td>22</td>
<td>2.2</td>
<td>1.6</td>
<td>15.0</td>
<td>30</td>
<td>0.044</td>
</tr>
</tbody>
</table>

| Fattening yearling cattle |
| 600 | 2.4 | 18 | 1.8 | 1.4 | 11.7 | 23 | 0.045 | 0.040 | 10 |
| 800 | 2.8 | 22 | 2.2 | 1.6 | 14.3 | 29 | 0.044 | 0.044 | 14 |
| 1000 | 2.5 | 26 | 2.6 | 2.0 | 16.9 | 34 | 0.044 | 0.052 | 17 |
| 1100 | 2.3 | 27 | 2.7 | 2.0 | 17.6 | 36 | 0.043 | 0.054 | 19 |

(From Nutrient Requirements of Beef Cattle, Revised 1958, National Research Council with interpolations on calcium and phosphorus requirements).

(2.00 \times 100 = 2.57). If corn 77.7

is worth $2.50 cwt. and contains 80.1% T.D.N., 100 pounds of T.D.N. from corn would cost $3.12. In this price situation, barley has a decided advantage over corn. This same principle may also be applied in comparing total or digestible protein values of various feeds.

The following are examples of two completely balanced rations, using typical Montana fattening feeds, for an 800-pound fattening yearling steer.

<table>
<thead>
<tr>
<th>Daily Feed</th>
<th>Total Prot. (lb.)</th>
<th>Dig. Prot. (lb.)</th>
<th>TDN (lb.)</th>
<th>D.E.* (lbs. therms)</th>
<th>Ca (lb.)</th>
<th>Phos. (lb.)</th>
<th>Carotene (For Vit. A) (mg.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rolled barley</td>
<td>10</td>
<td>1.27</td>
<td>1.00</td>
<td>7.77</td>
<td>15.7</td>
<td>.006</td>
<td>.040</td>
</tr>
<tr>
<td>Dried Mol. beet pulp</td>
<td>5</td>
<td>.45</td>
<td>.80</td>
<td>3.61</td>
<td>7.3</td>
<td>.028</td>
<td>.004</td>
</tr>
<tr>
<td>Alfalfa hay</td>
<td>7</td>
<td>1.07</td>
<td>.76</td>
<td>3.54</td>
<td>7.1</td>
<td>.102</td>
<td>.016</td>
</tr>
<tr>
<td>TOTALS</td>
<td>22</td>
<td>2.79</td>
<td>2.06</td>
<td>14.92</td>
<td>30.1</td>
<td>.186</td>
<td>.060</td>
</tr>
<tr>
<td>Rolled barley</td>
<td>10</td>
<td>1.27</td>
<td>1.0</td>
<td>7.77</td>
<td>15.7</td>
<td>.006</td>
<td>.040</td>
</tr>
<tr>
<td>Rolled oats</td>
<td>4</td>
<td>.48</td>
<td>.37</td>
<td>2.80</td>
<td>5.6</td>
<td>.003</td>
<td>.013</td>
</tr>
<tr>
<td>Prairie hay</td>
<td>7</td>
<td>.42</td>
<td>.14</td>
<td>3.15</td>
<td>6.3</td>
<td>.028</td>
<td>.008</td>
</tr>
<tr>
<td>Soybean oil meal</td>
<td>1</td>
<td>.48</td>
<td>.36</td>
<td>.77</td>
<td>1.56</td>
<td>.008</td>
<td>—</td>
</tr>
<tr>
<td>TOTALS</td>
<td>22</td>
<td>2.60</td>
<td>1.87</td>
<td>14.49</td>
<td>29.16</td>
<td>.040</td>
<td>.067</td>
</tr>
<tr>
<td>Daily Requirements **</td>
<td>22</td>
<td>2.2</td>
<td>1.60</td>
<td>14.30</td>
<td>29.0</td>
<td>.044</td>
<td>.044</td>
</tr>
</tbody>
</table>

* Digestible Energy
** National Research Council, “Nutrient Requirements of Beef Cattle - Revised 1958”
Feed Additives

Most recent developments in fattening cattle nutrition have been the discovery and use of feed additives as a means of stimulating growth or gain. The additives are by no means a substitute for good feeding and management. Without proper supporting nutrition and care, the effect of a feed additive may be lost. The daily nutrient requirements for fattening cattle as recommended by the National Research Council and appearing on page 22 include amounts sufficient for the use of feed additives.

Antibiotics. The commonly used antibiotics are aureomycin, terramycin and bacitracin. Others are being developed but they have not been properly tested as yet. One of the values of feeding an antibiotic may be to reduce liver condemnations in cattle at the time of slaughter. Antibiotics may also reduce low-level infections in the animals' systems so they can make greater use of available feed. Recommended levels are now 70 milligrams per steer, usually fed in a concentrate form. At this level, feedlot steers can be expected to gain 7 to 10 per cent faster with about a 6 per cent saving in feed. Some feedlot tests have, however, given negative results.

The response of cattle to antibiotics may be related to the disease level in the herd. Pens of cattle in well-bedded, wind-protected pens may not show as much weight-gain response to antibiotics as cattle fed in large open pens which are not protected.

Hormones. Stilbestrol is the best known additive in this group and is now widely used in cattle fattening operations. It can be obtained in the form of a commercial feed supplement or as an implant. When fed, the standard recommended rate is 10 milligrams per head daily. Implants at the rate of 24 or 36 milligrams are equally effective. One implant per steer, given in the ear, is sufficient for a feeding period of 120 to 150 days.

In general, steers fed or implanted with stilbestrol will gain about 15 to 20 per cent faster with about 10 to 15 per cent less feed required per 100 pounds of gain than steers not receiving stilbestrol. Although cattle given stilbestrol may reach a certain market weight sooner than non-stilbestrol cattle, they will still need the same length of feeding period to reach the same degree of finish or market grade. At the end of the feeding period, stilbestrol-cattle are usually heavier.

Synovex is a synthetic male hormone also given as an ear
implant. Although not yet tested as extensively as stilbestrol, the weight-gain response is about the same.

Chemobiotics. The one substance so far known in this group is called Dynafac. It is made up to 20 per cent trimethylalkylammonium stearate and 80 per cent bone meal. Trials at the Montana Agricultural Experiment Station have, in general, shown favorable results in terms of weight-gain response. A chemobiotic is intended for reducing infections of the digestive tract only rather than having the systemic effect on animals attributed to antibiotics. It is also claimed that Dynafac reduces the incidence of bloat, however, further tests need to be made.

The following tables show the results of two cooperative trials conducted by the Montana Agricultural Experiment Station comparing the value of rations with stilbestrol fed or implanted and Dynafac on steers and heifers.

### Thyroid Depressors.
These substances which reduce the rate of metabolism have been tested in recent years but have not given satisfactory results.

Table 1. Dynafac, Stilbestrol and Synovex for fattening steers.  
May 3 to August 23, 1957 — 112 Days

<table>
<thead>
<tr>
<th>Treatment:</th>
<th>Average Daily Gain (Lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Control</td>
<td>2.33</td>
</tr>
<tr>
<td>DES (36 mg. implant)</td>
<td>2.59</td>
</tr>
<tr>
<td>DES (10 mg. daily)</td>
<td>2.63</td>
</tr>
<tr>
<td>Synovex</td>
<td>2.55</td>
</tr>
</tbody>
</table>

Avg. daily feed: 12 lbs. grain; 1 lb. 32% protein supplement.  
Initial weight: 595 lbs.; Wt. Gain: 282 to 320 lbs.  
No. steers per lot: 12 or 13

Table 2. Dynafac and Stilbestrol for fattening heifers

<table>
<thead>
<tr>
<th>Treatment:</th>
<th>Average Daily Gain (Lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>Control</td>
<td>1.74</td>
</tr>
<tr>
<td>DES (18 mg. implant)</td>
<td>1.89</td>
</tr>
<tr>
<td>DES (24 mg. implant)</td>
<td>2.10</td>
</tr>
<tr>
<td>DES (10 mg. daily)</td>
<td>2.18</td>
</tr>
</tbody>
</table>

Avg. daily feed: 12 lbs. grain; 1 lb. 32% protein supplement.  
Initial weight: 580 lbs.; Wt. Gain: 146 to 201 lbs.  
No. heifers per lot: 12 or 13

A new product known as Tapi-zole has been reported by Iowa State College to produce slightly faster gains on steers over a long feeding period with more fat covering over the loin.
and an increase in intramuscular fat. Further research is needed to prove the value of thyroid depressors in comparison to other feed additives.

**Tranquilizers.** Only limited tests have so far been made with tranquilizers which do show that cattle have gained about 8.5 per cent faster with an increase of 6 per cent in feed efficiency. More research is also needed here to determine the value of these products.

**Other Additives.** Research on feed additives is a continuing process. Current studies are under way at several experiment stations on new compounds such as enzymes and stilbestrol derivatives. Reports on results of these and other products yet to be developed will be available in due time from experiment station and extension sources as well as commercial manufacturers.

**Pelleted Rations**

One of the latest developments in cattle feeding is pelleting the concentrates and roughage together and feeding in that form. Limited research to date shows that while pelleting increases feed consumption which in turn increases the rate of gain, current pelleting costs have resulted in an increased cost of gain. The economic advantage to pelleting so far appears to be a saving in labor, storage and handling costs on feed. Feeding an all pelleted ration does, however, provide a rather exact control on the proportions of concentrates to roughage in the ration. Certain feeds can also be made more palatable by pelleting.

Pelleted rations versus loose feed were compared in a steer feeding trial at the Montana Agricultural Experiment Station in 1958. This trial sought to determine differences if any between (1) a loose ration fed free choice, (2) the same ration pelleted without any other roughage and (3) the pelleted ration with straw fed free-choice. Of the five lots of steers, each fed for 147 days, two lots receiving pellets also received certain feed additives. The composition of the rations were as follows:

Although not shown here, the steers on the loose ration graded higher in the carcass than the pellet-fed steers. The pellet, no-straw steers graded the lowest. Also, steers on pelleted rations had a greater incidence of hyperparakeratosis, a condition affecting the inside wall of the rumen or paunch and apparently due to improper rumen function. In this trial, Dynafac reduced the incidence of hyperparakeratosis while Dynafac plus a stilbestrol implant increased daily gains.
Ingredients %

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Loose-grain</th>
<th>Completely Pelleted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alfalfa Hay, ground</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>Barley</td>
<td>58.25</td>
<td>40</td>
</tr>
<tr>
<td>Wheat Mixed Feed</td>
<td>8.25</td>
<td>5</td>
</tr>
<tr>
<td>Beet Pulp, Dried Molasses</td>
<td>27.25</td>
<td>20</td>
</tr>
<tr>
<td>Sugapulp (80% Molasses)</td>
<td>6.25</td>
<td>0</td>
</tr>
<tr>
<td>Molasses</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

A brief summary of the trial is shown below.

<table>
<thead>
<tr>
<th>Lots</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Loose-grain alfalfa hay free-choice</td>
<td>Completely pelleted</td>
<td>Pelleted plus straw</td>
<td>Stilb. implant</td>
<td>Pelleted plus straw Stilb. Dynafac</td>
</tr>
<tr>
<td>Av. Daily Gain Lb.</td>
<td>2.53</td>
<td>2.41</td>
<td>2.68</td>
<td>2.78</td>
<td>3.01</td>
</tr>
<tr>
<td>Feed/cwt. Gain Lb.</td>
<td>787.0</td>
<td>769.9</td>
<td>764.0</td>
<td>799.5</td>
<td>765.9</td>
</tr>
<tr>
<td>Price of feed/cwt. $ Concentrate</td>
<td>2.08</td>
<td>2.26</td>
<td>2.26</td>
<td>2.29</td>
<td>2.29</td>
</tr>
<tr>
<td>Hay or Straw</td>
<td>0.83</td>
<td>——</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>Cost of feed/ cwt. gains-$</td>
<td>15.20</td>
<td>17.40</td>
<td>16.73</td>
<td>17.78</td>
<td>17.03</td>
</tr>
</tbody>
</table>

From this one trial, it can be concluded that until pellets can be prepared with coarser roughage the feeding of straw or other roughage free-choice with a pelleted ration is advisable to promote proper rumen function and in turn higher and more efficient gains.

**Daily Vs. Self-Feeding**

Since no experimental evidence is available on either method of feeding, the choice is largely one that livestock feeders should make for themselves according to their own situations. The advantages of each, based on simple observations, are as follows:

**Daily Feeding**
- Fresh feed before the cattle each day.
- Cattle off-feed are more easily detected at feeding time.
- Less waste.
- Controlled finishing date.

**Self-Feeding**
- Less labor required for feeding.
- Cattle never are hungry.
- Smaller feeding space required.
- Higher daily consumption and earlier finish.
A well planned farm feed lot than can be expanded.

Costs and Margins

Average margins or profits from feeding cattle are perhaps the narrowest of any operation in the beef production line from producer to consumer. Profits or losses may, however, fluctuate widely from year to year. For this reason successful cattle feeders cannot be "in-and-outers". The only safe course in avoiding financial loss in the cattle feeding business is therefore to stay with it and average out over a period of years.

The difference between the cost-price of feeder cattle and the selling price of fat cattle is referred to as margin. When fat cattle prices are higher than feeder prices there is a positive margin. When fat cattle prices are lower than feeder prices there is a negative or reverse margin. If the cost of gain per pound does not exceed the selling price of fat cattle the feeder should be able to make a profit. But, because such a situation does not always exist, certain rules are listed below which experienced cattle feeders tend to follow as a means of adding profits.

(1) When fat cattle prices are higher than feeder cattle prices with the cost of gain in between, heavy-weight feeders are preferred because weight can be purchased cheaper than gain can be added.
Season variations in prices of feeder cattle, Billings, 1953-58 averages, USDA data.

(2) When fat cattle prices are higher than feeder cattle prices but the cost of gain is higher than either, again heavy-weight feeders are preferred.

(3) When feeder cattle prices are higher than fat cattle prices with the cost of gain lower than either, light-weight feeders are preferred because gain can be added for less than the cost of original weight.

Decisions on the above situations, of course, must be closely figured at any time as cattle and feed prices are continually changing. Also, the weight of feeders purchased and the amount of gain added must be consistent with general market demands for slaughter cattle.

**Marketing**

**Season Vs. Year Around Feeding**

For greatest returns from the feeding enterprise cattle can no longer be fed just to market but must be fed for a particular market or demand. Rather definite patterns on seasonal price trends by grades...
have been established for both feeder and slaughter cattle. The figures on pages 28 and 29, prepared by the Extension Marketing Specialist, show these trends quite well. This trend pattern for the Billings market is also consistent with that of other major livestock markets in the country.

Commercial cattle feeders, of course, tend to overcome these seasonal fluctuations in price by buying replacement cattle each time they sell fat cattle. This may be weekly, monthly
or quarterly. Farm feeders may not find themselves able to engage in such kind of buying and selling procedure but should consider market trends and the possibility of feeding more than one bunch of cattle a year. For example, a bunch of lower grade cattle fed for the spring market and a string of good to choice quality calves for the late summer market would tend to hit the usual high spots on both markets.

For the feeder who wants to handle just one bunch of cattle each year, calves bought in the fall and fed until mid-summer provide the least risk and the greatest return on feed and time invested. When fat they will usually meet a strong demand for light-weight, well finished beef.

Feedlot Construction and Equipment

The typical and most desirable type of feedlot for Montana conditions is one in which the cattle are fed from the outside of the lot or along an alley so they are never disturbed by equipment entering the lot. On page 27 is such an arrangement which is both sturdy and low-cost. Detailed plans for similar construction of complete feedlot layouts and bunks may be obtained at a nominal cost from the Extension Agricultural Engineer, Montana State College at Boze-
man or through any County Extension Office.

Site. Irrigated farm feeders will want as level a site as possible for a feedlot to prevent loss of liquid fertilizer. If conserving manure is no object in the feeding program a sloping site or gravel bar will provide good drainage.

Shelter. Feedlot cattle in Montana do not need overhead shelter except possibly in the northwestern part of the state. In all other cases cattle will surely need a tight windbreak on the two windward sides. Windbreaks should be at least seven feet high. Any substantial low cost material is good enough for a windbreak.

Size. Approximately 100 square feet per steer including shed area, is a rough minimum of space required. The practical maximum is 200 square feet per steer. In over-large lots cattle may run and play. This tends to reduce gains. Nervous cattle should never have excessive room.

Scales. These devices cannot be home-made but the feedlot plans available from the Extension Engineer as mentioned above include a site for scales. To be legal for buying and selling in Montana a scale must be of the pit-type and inspected and sealed by a state scale inspector. Details on requirements for legal scales, may be obtained from the State Commissioner of Agriculture at Helena. Other type scales will serve the feeder just as well for checking periodic gains on cattle.
Other Publications on Livestock

Bulletin 272  Beef Production in Montana
Bulletin 284  Wintering Montana Cattle
Circular 144  Do You Have Enough Feed?
Circular 264  What is an I P R Bull?
Circular 267  Bigger, Better, More Calves

These publications can be obtained without cost from any county extension agent or by writing to Montana Extension Service, Montana State College, Bozeman, Montana