

September, 1922

No. 195-A

Colorado Agricultural College

EXTENSION SERVICE

Fort Collins, Colorado

STEER FEEDING IN COLORADO

By CHAS. I. BRAY ✓

Dept. of Animal Husbandry



Alfalfa, beet pulp, corn silage and Colorado steers make prime beef.
The silage is used after the pulp gives out or may
be fed with the pulp.

CO-OPERATIVE EXTENSION SERVICE IN AGRICULTURE AND
HOME ECONOMICS—COLORADO AGRICULTURAL COLLEGE
AND U. S. DEPARTMENT OF AGRICULTURE CO-OPERATING

Distributed in Furtherance of Acts of Congress of May 8
and June 30, 1914

HINTS FOR STEER FEEDERS

1. A choice feeder steer must have large girth, deep flanks, short neck, short, broad head, a soft, mellow coat of hair and thick, natural fleshing over back, loin and quarters.

2. Breeding counts in the feedlot. Choice steers are not produced by scrub or dairy sires.

3. Successful feeding is preceded by careful buying. "Well bought is half sold." Profits can be wiped out by reckless buying.

4. Do not plunge heavily into feeding because someone else made big money last year. Also, do not stay out because the last season was a bad one. The pendulum may swing the other way in either case.

5. Keep steers full. The feed eaten over and above maintenance is what puts on flesh. Nervousness, excitement, mud, discomfort and injuries from horns of other steers all increase maintenance requirement and reduce gains.

6. Under Colorado conditions, feed heavily on roughage and other cheap feeds at the start and save the heaviest grain feeding for the last four or six weeks of the fattening period.

7. Wise feeders watch costs carefully in buying feeds. It is not necessarily the best feeds, but the best feeds for the money that make profits.

8. Make steers clean up the waste feeds on the farm. Straw, corn fodder and beet tops can best be marketed thru steers if used in proper combinations with other feeds.

9. Where heavy corn-rations are fed, a few hogs in the feedlot may regain 10 percent or more of the grain fed.

10. It rarely pays to hold mature steers after they are finished. Every pound of gain put on after this point is reached is put on at a loss.

11. With steers at 10 cents a pound, one percent of unnecessary shrinkage in shipping means \$20 to \$24 loss per car. Bed cars well, fill cars comfortably full and cut out succulent feeds or excessive water before shipping.

STEER FEEDING IN COLORADO

By CHAS. I. BRAY

Steer feeding is usually a separate business from cattle raising, and is more commonly connected with general farming. Cattle raising, while carried on successfully on all but the highest priced land, is best suited to cheap, grazing land, unsuited for other purposes, such as the semi-arid and mountain districts of the western states. Steer feeding, on the other hand, is better suited to sections where there are extra supplies of cheap feed, such as in the corn belt or the irrigated valleys of Colorado. However, one does not necessarily have to be located in these sections to feed steers successfully. Any farmer who has enough rough feed on hand can afford to feed it to stock rather than let it waste or sell it off the farm. It is the purpose of this bulletin to give some brief information about the steer-feeding business for the benefit of those who have not had much experience in this work.

WHY CATTLE ARE FATTENED

Cattle are fattened before slaughter because meat from fattened cattle has a better color, a finer flavor, is more juicy, keeps better, is more tender, and sells for more on the market than thin beef. To put it another way, people like well-fattened beef and are willing to pay extra for having it. The feeder, recognizing this demand, buys thin cattle from the range, ripens them on the excess feeds available and sells them to the packer, counting on a rise in price per pound to pay him a profit. The more cheaply the feeder can get these thin cattle into finished condition, the greater will be his profits.

WHY FEED STEERS ON THE FARM

Steer feeding is a business that fits in conveniently with the work of the ordinary farm, starting after crops are harvested and ending before spring planting begins. Steer feeding provides a market for the hays and other roughages produced on the farm during the summer. By providing work during the winter months the farmer can employ a more permanent and satisfactory class of farm labor.

Feeding stock saves fertility that would otherwise be lost if feeds were sold directly off the farm. A ton of alfalfa hay or barley contains \$6.00 to \$8.00 worth of fertility value, 75 per cent of which the steer will return to the farm if the manure is carefully handled. Steer feeding does not as a rule produce large profits, though, with large-scale feeding opera-

tions, cheap feeds, and a normal market, profits of \$10 to \$30 per steer are made frequently. Profits made by the beginner are more likely to be below \$10 per steer, but when fertility, sale of rough feeds, and winter wages are considered, the returns may be considered high enough to warrant continuing in the business. At least a carload of steers should be fed if possible but the beginner should not venture far beyond his available supply of roughage. It rarely pays to buy much rough feed unless one is an experienced feeder and knows feed values or has other cheap feeds available, such as wet pulp or silage.

METHODS OF FATTENING CATTLE

Cattle may be fattened on grass alone, grass with a grain ration, hay alone, and hay and other cheap feeds with a heavy grain ration, or with a light grain ration gradually increased to a heavy ration the last part of the feeding period. The latter is preferable under Colorado conditions.

Large numbers of Colorado cattle are fattened on grass without extra feed, and sold for slaughter in the fall. This is a cheap method, but brings the cattle on the market in competition with thousands of others shipped from similar localities at a time of low prices. Grass-fed cattle do not bring as good a price as grain-fed cattle. Grain feeding on grass is practiced in the corn belt and farther east but is not a Colorado practice. In many of the mountain sections of Colorado, where there is plenty of nutritious mountain hay, the cattle are fattened on hay alone, often with very good finish. This is a good way of marketing the hay from these districts.

As a rule it is best to feed grain with the roughage if the grain can be obtained reasonably. Those who have either young, thin or low-grade cattle to feed, or who have large quantities of hay or other coarse fodders, usually take a longer time to finish their cattle, starting in slowly and using little grain until near the finish. On the other hand, those who have good, well-matured steers with plenty of cheap grain to feed them will put their cattle on feed as rapidly as possible, feed a heavy grain ration and finish in three to four months, often finishing two lots of cattle in a season. Such feeders will often try to get their first lot of cattle on the market before Christmas so as to take advantage of the good prices sometimes realized at that time. The long feed with limited grain allowance is most common in Colorado as Colorado has plenty of hay and other cheap feeds but imports corn.

Steers of poor quality or feeder cows are not fattened to the same degree as are good steers. The lower grade stock goes to the butcher trade and sells lower, and does not usually

put on gains cheaply. The cows may sometimes put on gains very fast as they take a big fill. The methods to be followed in fattening depends then on the available feed supply, the grade of cattle fed, and the time the cattle are to be marketed.

SELECTION AND PURCHASE OF FEEDERS

Since the fat steer is the final product of the beef producer, we will know best what kind of feeder steer to get if we first study a fat steer. Fig. 1 shows the cuts of meat outlined on a prize-winning beef steer, with the approximate retail price of each. The high-priced cuts are the prime ribs, the porterhouse, the sirloin, and the round. The cheap

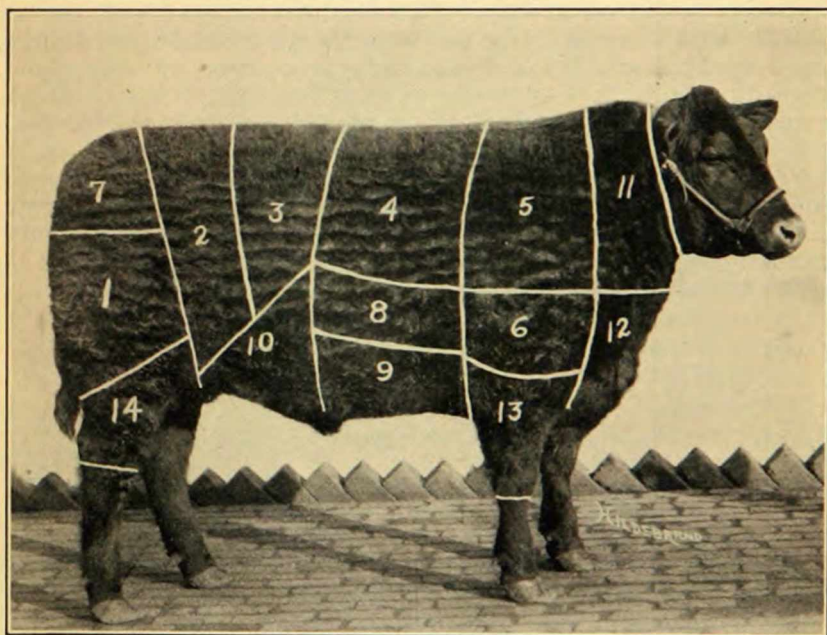


Fig. 1—An international grand champion steer, showing the location of the cuts of beef with relative prices per pound.

1. Round	25c	8. Short Rib	12c
2. Sirloin	30c	9. Plate	10c
3. Porterhouse	35c	10. Flank	5-15c
4. Rib	22½c	11. Neck	10c
5. Chuck	17½c	12. Brisket	10c
6. Shoulder	15c	13. Fore Shank	5-8c
7. Rump	17½c	14. Hind Shank	5-8c

cuts are the chuck, neck, plate, flank and shanks. The carcass is about equally divided between the high-priced cuts and cheap ones, but the high-priced half is worth over twice as much as the cheap half. A good steer should be thick and meaty in the region of cuts 1, 2, 3, and 4 and relatively

light in cuts 5, 6, 7, 8, 9, and 10, as well as in the head and legs. Since meat must be of fine texture, the steer must show quality and this is indicated by a soft, pliable skin, fine, soft hair, clean bone and general smoothness of covering. As the fat steer brings more money on the retail market, the steer must be capable of putting on fat evenly and economically.

THE STOCKER AND FEEDER

In selecting stockers and feeders, the aim is to get animals that will put on gains economically and rapidly and sell to best advantage when finished. To do this the feeder steer must have the same general form and quality desired in the fat steer. He must show evidence of good, natural flesh and easy-fattening ability. The feeder steer that will fatten rapidly and economically has a large girth and deep flanks, short neck, short, broad head, high proportion of beef blood. He will give further evidence of easy keeping by a soft, thick, glossy coat and a good covering of natural flesh. The shallow-bodied, long-nosed, nervous steer with sunken eyes, narrow chest and light girth makes slow and expensive gains. An indication of unthriftiness is a harsh, rough hide and prominent ribs and hips. If a steer does not show a high percentage of beef blood, he cannot bring the best price on the market when fat.

CONDENSED SCORECARD FOR FEEDERS

Form:	Rectangular, broad, deep, low set, straight back and underline, ribs well sprung, loin broad and thick, thighs thick, deep and wide, not cut high between hind legs, flanks deep, legs short and straight.....	40
Quality:	Hair soft and smooth, skin elastic and pliable, bone not coarse	15
Indications of Easy and Economical Fattening:	Large girth, short thick neck, short, broad head, wide muzzle, large nostrils, prominent, clear eyes, quiet disposition.....	25
Breeding:	Showing a large proportion of beef blood.....	15
Growth:	Good weight for age, not stunted.....	5

IMPORTANCE OF BREEDING, TYPE AND WEIGHT

What the feeder needs is the steer that will bring the highest profit for him over total expense. The buyer must not only know how to pick good type but also good bargains. To do this he must have an idea of values, and must know how a certain class of steer is likely to fatten and how it will sell when fat. Since every buyer wants the best type of steer, the price of the good stuff goes up and so may not always be the most profitable to feed.

For convenience in quoting prices, cattle at the yards are divided into market classes according to weight, type, quality, and condition. A choice feeder is described on page five. Choice feeder steers have the breeding, quality, capacity and

thick, natural flesh on ribs, back, loins, and thighs to make choice, fat steers. Good feeders may be a little off on several points, or may be noticeably off in one particular, such as on breeding or beef form. Good feeders usually make good-to-choice finished steers. Fair or medium steers are more leggy, narrow and shallow bodied, compared with the previous grades. They are not as well bred but may be profitable if bought sufficiently cheap. Common and inferior steers are mostly of scrub or dairy origin and are rarely profitable.

The following are the Denver quotations on feeders November 25, 1920. The winter of 1920-21 was a disastrous one for steer feeders, and the market at this time was draggy and did not show the difference between good and poor classes that is usually shown.

Good to Choice—950-1050 lbs.....	\$8.25 and	\$9.00
Fair to Good—950-1050 lbs.....	7.50 and	8.25
Good to Choice—850-950 lbs.....	8.25 and	8.75
Fair to Good—850-950 lbs.....	7.25 and	8.00
Good to Choice—600-700 lbs.....	7.50 and	8.25
Fair to Good—600-700 lbs.....	6.75 and	7.50
Feeding Cows	5.25 and	6.25

These quotations show the value that is placed upon breeding, quality, and weight.

The lowest grade of steers quoted is valued at \$6.75 and the highest at \$9.00, a difference of \$2.25 per cwt. This means in effect that experienced cattle feeders believed they could make more profit in buying the better steers even if they paid 33 per cent more for them than for the poorer ones. In one class alone (950 lb. to 1050 lb.) there was a difference of \$1.50 per cwt. between the fair and choice grades. The reason for this difference will be shown later in the selling prices of the finished animals.

In the good-to-choice class there is a difference of 75 cents per hundred between the light and heavy steers, due to the lighter steers taking longer to finish. The reason is that profits come from increasing the value per pound of the original live weight. A 1000-pound steer that increases in value three cents per pound, after fattening, means \$30 increase, (on 1000 lbs.), while the same increase on a 600-pound steer at 3 cents would be only \$18.00. Other things being equal price included, the heavier steer is the more profitable.

The following is a market report on finished steers 135 days later (March 31) showing prices paid for stock that might have been bought around November 25. Little money could be made at these prices after paying 9 cents for feeders.

BEEF STEERS		
Good to Prime—1100-1300 lbs.....	\$9.00 and	\$9.25
Good to Choice—1050-1250 lbs.....	8.50 and	9.00
Fair to Good—1000-1250 lbs.....	7.75 and	8.25
FAT COWS		
Good to Choice	6.50 and	6.85
Fair to Good	5.50 and	6.25



Fig. 2—Champion feeder steers at Chicago International, 1918. Bred and fitted in Colorado.

Comparing these prices with the feeder prices on page 7 there was more "spread" or margin on the poorer classes. The best steers sold for an increase of only 25c per 100 pounds over the original prices while on the lower grade steers the increase in price was from \$.75 to \$1.00 and on the cows \$.25 to \$.60 per cwt. Such comparative values change from season to season but they show that there has to be more difference between buying price and selling price in the cheap grades than in the better classes of steers. The better classes of steers sell closer to the cheaper grades on a poor market than when there is a good market.

BUYING FEEDERS

The most successful operator is usually the most shrewd buyer. "Well bought is half sold." Many a man has lost all chance of profit before he starts to feed, through paying too much for his feeders. One man may fatten cheap feeder cows or Mexican steers at a profit, because he buys cheaply, while another may buy the highest class of feeders and lose money because he pays too much. This does not mean that it pays to buy cheap grades of cattle. It means that the buyer must know values as well as type.

"Warmed over" cattle are those fed by some one for a few weeks and resold. They look well and sell high but generally the second buyer comes out with a loss instead of a profit. They are not often found in Colorado.

When, How and Where to Buy: In Colorado the natural time to buy feeders is when the cattle are coming off the range in the fall. The feeder then has his hay and straw on hand and the by-products of the sugar factories are available. Few cattle are fattened in Colorado at any time other than winter.

Feeders may be purchased directly from the producer, either in small lots from the farmer or by carloads from the range. Or they may be bought through commission men, either local buyers or the standard firms at the Denver yards. The advantage of local purchases is the saving of freight and commissions. The disadvantage of local buying is that it is hard to get uniform lots, or uniform prices or any considerable number to select from.

The advantages of buying through commission agents is the greater likelihood of getting standard market grades and prices. The beginner also gets the benefit of the commission buyer's knowledge. It is often not necessary to go in person to purchase stock at the yards, as reliable firms handle mail orders satisfactorily. They are able to find what is wanted more easily than the average purchaser, and know what to pay for it. The yards also furnish a variety to select from that cannot be obtained locally. The beginner should usually purchase through a commission house, unless he can buy through some experienced neighbor.



Fig. 3—Same steers as shown in Fig. 2 when given award of grand champion carload of fat steers one year later. Prime feeders make prime beef.

Feeders who handle stock on a large scale often go direct to the range and buy from the range breeders. To do this the buyer needs to know cattle values and where to get the stock he wants. One who has this information can save considerable on freight and commissions by direct buying, and may act as a commission man for his neighbors.

A number of the larger ranches producing high quality feeders have been selling to the corn-belt feeders on mail orders for a number of years with satisfaction to both parties. Others have been shipping their output to the principal feeding centres and selling to the feeders at auction.

It has not been so easy for the smaller breeders and feeders to get together. More direct selling may take place as the work of the farm bureaus gets better organized. Several Ohio county bureaus got together in 1921 to buy their feeder steers direct from the Colorado range. The advantages reported were fast through shipment, better and more uniform cattle, steers fresh and ready to go on feed and make good gains, tops not picked off by the packers, saving on com-



Fig. 4—High grade feeders coming off range in the fall at the Colorado Experiment Station.

missions and yardage and elimination of stop-overs. In all the buyers believed they saved \$.50 to \$1.00 per cwt. after paying \$15.00 per car for buyers expenses. Some of these reasons do not apply with equal force to Colorado buyers, as the Denver market forms a conveniently located clearing-house between the range and the Colorado feedlots. Direct buying, of course, does not guarantee that the buyer will get what he wants or that he will get better bargains than in the regular stock market.

FREIGHT "PAID TO THE RIVER"

Because of the high cost of hauling freight across the mountains feeder cattle shipped from the western side of the range get a cheaper freight rate per mile to Missouri River points than they can to the Denver market. In other words, the railroads can give a better rate for the short but expen-

sive haul across the range if they are sure of getting the longer and easier down-hill haul from Denver to the Missouri river. It makes little difference to the railroads whether the steers go through direct or stop over to be fed in Colorado. If the steers stop in the Denver yards and sell to a Colorado feeder, this credit for freight paid is transferred to the purchaser.

After the cattle are fattened this feeder may then ship to the Missouri river markets, paying only a small charge for the stop-over privilege, also such local rates as are necessary and paying also on the increased weight put on by the cattle. Cattle bought at the Denver market are shipped out to the feedlots on a local-feeder rate, which is about two-thirds the regular freight charge. With freight "paid to the River", the cattle are worth a little more to the feeder and consequently this should be considered in buying. The regular freight rate from central Colorado points to the Missouri river markets was $51\frac{1}{2}$ c per cwt. (in 1921). On experiment station steers bought with freight paid, in 1919, the total cost of shipping to Kansas City was only 23 cents, including all local freight charges, and freight on excess weight put on. This was a saving of $30\frac{1}{2}$ cents per cwt. on total weight or

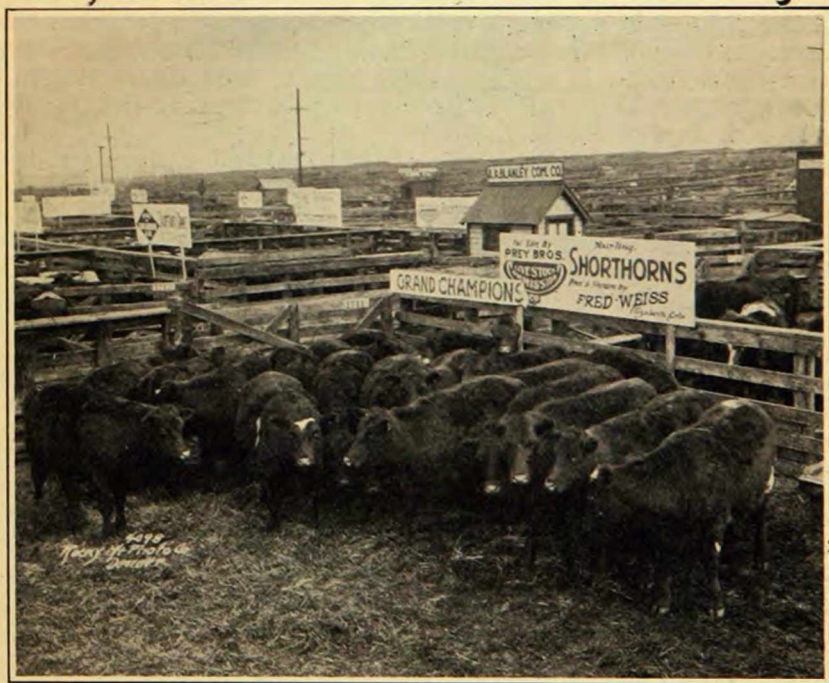


Fig. 5—Grand champion feeders. National Western Stock Show, Denver.

40 to 50 cents per hundred on the original weight of cattle bought. Consequently feeder cattle, with freight paid to the river markets, are worth about one-half cent a pound more on the Denver market than those without that privilege, providing they are to be shipped east when fat.

FINANCING THE CATTLE FEEDER

Since early days, a considerable part of the western cattle business has been run on borrowed capital. In December, 1920, the U. S. Department of Agriculture estimated, on the basis of a careful questionnaire, that the banks of Colorado had short-term loans outstanding to farmers of over \$66,000,000, of which 42.5 per cent or over \$28,000,000, was secured by mortgage on livestock.

Many farmers who produce sufficient hay and other roughages for feeding several carloads of steers, and have the equipment for handling them, do not have sufficient cash in the fall to buy the steers. On the one hand, the interest on the money required to buy 100 steers at \$50.00 each, for six months at 8 per cent is \$200. On the other hand the fertility value of the feed, estimated at \$1.00 per month per steer ($\frac{1}{2}$ ton manure at \$2.00 per ton) would be \$600, which, however, must help pay for the labor of feeding. Then there is the chance of getting a market price on waste feeds on the farm and a possible profit of from \$5.00 to \$30.00 per steer in a good year. If a man knows how to feed steers and has the equipment, it will evidently pay to borrow the money rather than sell the feed.

Money for feeding is generally borrowed either from the home bank where one keeps an account, or through the commission company from whom the steers are bought. The home banker is more likely to have a personal interest in the success of the borrower, also the best knowledge of his honesty, his credit standing, and his ability as a feeder. If the prospective borrower has never fed cattle he may not find it as easy to borrow any large amount, nor as a rule would it be a good plan for him to do so, unless he has superior business ability. Cattle loans are considered relatively safe, so that loans may be made up to the full value of the cattle.

The method of making loans will vary considerably according to the locality, the condition of the money market and the character and ability of the borrower. An experienced feeder whose credit is good and who owns considerable property may get all the money he needs on a personal note. Another who for any reason is not considered a good risk may have to give a chattel mortgage on his stock and feed. Tenants must have their notes endorsed by parties of some financial standing before loans can be obtained. Where the feeders are to be purchased at some distant point the bank may

allow the applicant to pay with a check on the bank up to a certain amount, holding up the check until the cattle are in the feed lots where a chattel mortgage can be made on them. Where the loan is made by the commission company thru whom the cattle are bought, papers are all completed and signed at the yards.

The making of a loan may be more intricate in some sections of the country, especially where the feeders note is to be discounted thru the Federal Reserve Banking System. The applicant will have to furnish a sworn statement of his financial standing, outstanding notes, mortgages, etc., land owned, or leased, and on amount of feed and equipment. The bank inspectors will then check up on the correctness of this report and if the cattle are already bought will check also on numbers, ages, brands and condition of stock. If the application is granted the applicant then signs a promisory note for the amount advanced, and a chattel mortgage is executed on the cattle. For re-discount with the Federal Reserve Banks the note cannot be made for longer than six months. The Federal Reserve Banks also set a limit on the price per cwt. to be paid for cattle in any one season, and will not discount paper that goes above this amount.

Over-borrowing is, of course, objectionable. Borrowed money does not in itself make feeding profitable and is some-

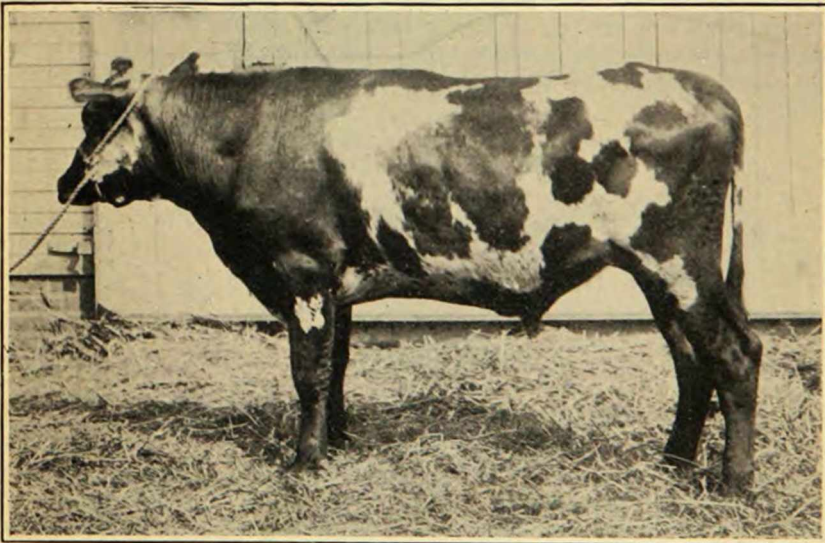


Fig. 6—A common feeder steer. This animal shows a slight improvement in vigor and capacity over Fig. 7. It may be fattened profitably if not bought at too high a price, but has too much dairy blood for a high-priced feeder. Note leanness of thigh and loin.

—Courtesy of Illinois Experiment Station.

times spent too carelessly. Loans do not grow any smaller in a bad year, and the interest has to be paid whether profits are made or not. It is better to buy a few less steers and have some feed left over, than to run short in the spring when feed is high or have to sell unfinished cattle on a glutted market. A common way to get in bad is to buy heavily one year because the borrower or someone else made big money feeding cattle the year before. Just for that reason, there is likely to be more competition to run up the prices of feed and steers in the fall and overload the market for fat cattle in the spring. If loans are paid promptly when due, it is easier to get credit another time. The farmer sometimes thinks that the banker should renew his note whenever asked to do so. Sometimes he cannot do this, and the borrower may get caught.

FEEDING STEERS ON CONTRACT

Another plan which may aid the man with feed but no money for steers, is feeding under contract. To some extent this means lending the steers to the feeder in return for part of the profits. The development of contract feeding during the fall of 1921 was largely due to the unstable and uncertain market conditions which followed the disastrous feeding season of 1920-21. Prospective feeders did not know what they could pay, and the breeders were faced with the prospect of either very low prices or being left with steers on their hands. Several arrangements were tried, whereby breeders and feeders shared together the risks of the market and divided the profits.

In one contract tried in Colorado, the owner furnished the cattle, paid the freight to the Denver yards, assumed full loss on steers dying from disease or natural causes, and half the loss on steers dying through careless handling and feeding. The feeder furnished the feed and all feeding expenses, paid the freight to and from the feedlots and received as payment the finished market price per pound, Denver weights, for all gains put on. The owner got as his share the finished market price per pound on the original weight of steers furnished, loss from death deducted.

The objection to this type of contract is that the cost of putting on a pound of gain is generally higher than the price received per pound for the finished steer. As shown on page 15 the steer-feeder makes money on the "margin" or "spread" between the buying and selling price of the steer per pound and rarely on the pounds of gain put on. This is shown by the table below, which gives feeder costs, selling prices, costs of gains, and profits, in several feeding experiments at different experiment stations.

Relation Between Purchase Price, Feed Costs per Pound, Selling Prices and Profits per Steer in Various Feeding Tests.

Station Year Lot Number	Missouri	Nebraska		Colorado	
	1915-16 5	1921-13 7	1917-18 5	1918-19 1.(pulp 5(silage)	
Cost per lb. of Feeders	7.54c	6.25	9.78	11.25	11.25
Cost per lb. gain	10.88c	8.31	18.26	12.1	16.9
Selling price per lb.	9.75	8.00	13.50	15.65	15.00
Profit per steer	\$7.63*	\$13.47	\$6.06**	\$36.33	\$9.57

* Hog profits omitted.

** Excluding interest and hog profits.

These experiments show that except where there is a very cheap feed available, like wet pulp, the feeder would be almost certain to lose, while the owner would have all the advantage of the spread between buying and selling price. For example, Colorado silage lot, in above table, allowing the feeder credit for 50 pounds of fill at the start, the owner would have made \$36.37 profit per head, while the feeder would have lost \$28.81. Similarly, in the Nebraska experiment (lot 5), the owner would have made \$28.70 per steer above market price of feeders, while the feeder would have lost \$24.82.

DIVIDING NET RETURNS ON 2 TO 1 BASIS

In another type of contract reported, the net return from steers was divided on the basis of 2/3 to the owner and 1/3 to the feeder, shipping expenses and feedlot losses being shared in similar proportion. The feeder contracted to put on 200 pounds gain per steer, market weight, in 120 days.

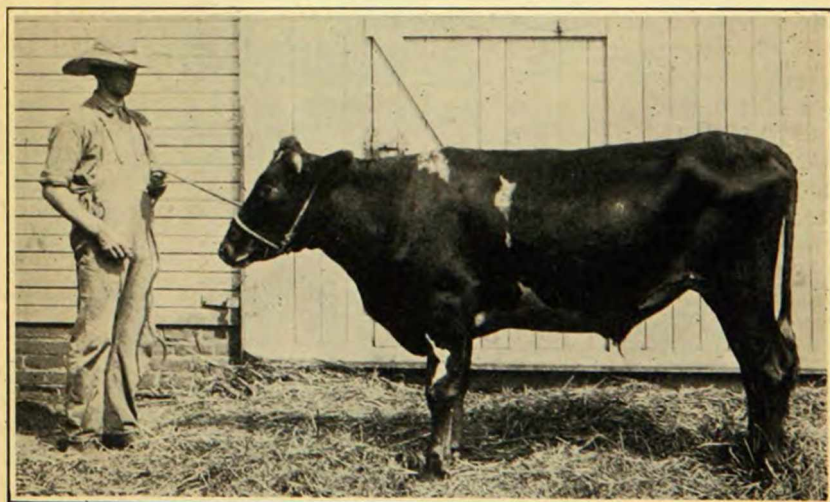


Fig. 7—This inferior feeder steer has a poor heart girth and lacks capacity for feed and beef conformation. Note the lean neck, sharp withers, bare loin, high flanks and cat hams—a good steer to leave alone.

—Courtesy of Illinois Experiment Station.

All gains put on above that amount were to be divided equally. The time clause is important as it prevents serious dispute as to rapidity of fattening or of time of marketing.

This plan is based on the fact that the cost of feed used in finishing is often just about half the cost of the steers. In the 1918-19 Colorado experiments, where the steers cost \$111.24 each (at feedlot, with fill) the feed costs for the six lots were \$45.11; \$43.71; \$56.97; \$51.76; \$51.57 and \$57.18; running both above and below the $\frac{1}{2}$ cost of the feeders. The first two lots were fed wet pulp. This division will hold fairly good where steers are of good, mature type and do not have much more than 200 pounds gain put on, market weights. The above steers were fed 150 days, but the first 40 days were on roughage only.

The steers in the above experiment (silage lot No. 5) put on 196 pounds, shrunk weights, and brought \$172.27 net, which, divided on the above basis, would have given the owner \$114.84, or \$3.71 profit which is just 8 per cent on \$111.00 for five months. The feeder would have received \$57.42 or a profit over feed of \$5.84. This shows then a very fair division of profits, but naturally the owner would not wish to risk so much for 8 per cent return on his money.

There is a question however as to the division of the returns on gains above 200 pounds, assuming that 200 pounds is enough to put the steer in marketable condition. If costs of gains are higher than the sale price it would appear that all the proceeds from gains above 200 pounds ought to go to the feeder, if not a larger amount.

To illustrate this, an analysis has been made of an experiment at the Purdue Expt. Station in 1910. Ten steers weighing 897 pounds in the feedlot at \$4.65 per cwt., were fed for 160 days but were weighed, valued and the profits determined at 120 days. The table below shows how the profits would have been divided on the plan of this contract. It also includes the Nebraska lot (No. 5) from the previous table.

Division of Steer-Feeding Profits, According to Contract Plan on Basis of One Steer.

Days on Feed	Purdue Experiment		Neb. Expt.
	120 days	160 days	130 days
Cost per Steer	\$41.73	\$41.73	\$81.17
Feed per Steer	\$26.84	\$35.03	\$54.70
Gains per Steer	298 lbs.	372 lbs.	238 lbs.
Profit, (not including pork or interest)	\$18.06	\$14.64	\$6.06

A. Division of Net Returns and Profits, Feeder to Get One-third Returns Up To 200 Pounds Gain, and One-half Returns After That.

Owner's Share	\$56.57	\$58.87	\$95.26
Feeder's Share	\$30.06	\$32.53	\$48.91
Owner's Profit	\$14.84	\$17.14	\$12.59
Feeder's Profit	\$3.22	\$ 2.50 loss	\$ 6.33 loss

B. Division of Returns as Above, Except That Feeder is Paid One and One-half Times Market Price on Gains Above 200 Pounds.

Owner's Profit	\$ 7.74	\$ 4.76	\$ 7.46
Feeder's Profit	\$10.32	\$ 9.88	\$ 1.40 loss
Feeder's Profit including pork	\$14.47	\$15.38	\$ 1.77

This table shows very clearly that under plan A the feeder would be likely to lose, while the owner would get more than his share of profit. In the Purdue experiment where the steers were valued at \$7.25 at 120 days and at \$7.20 per cwt. at the end of 160 days, even if the feeder got full market price (7.2c) for the gains put on after the 120-day period, he would still lose, as the 74 pounds gain put on cost \$8.81 or 12 cents per pound. Under plan B, the feeder being paid $1\frac{1}{2}$ times market price for extra gains, he would still have received only 10.8 cents per pound, which, with the profit on pork, would help him to break even. In this case the market had fallen, causing a slight loss by holding, but if the market had gone up there would have been a gain. The sum labeled "Owners Profit" refers only to the share of the returns on fattening, and has nothing to do with the profits the producer might have made on raising the steers. This is probably the most satisfactory type of contract.

A third kind of contract has been suggested, where the owner assumes the entire risk and responsibility, and contracts to pay the feeder either a flat price per pound gain, or a certain margin above sale price per pound. The contract

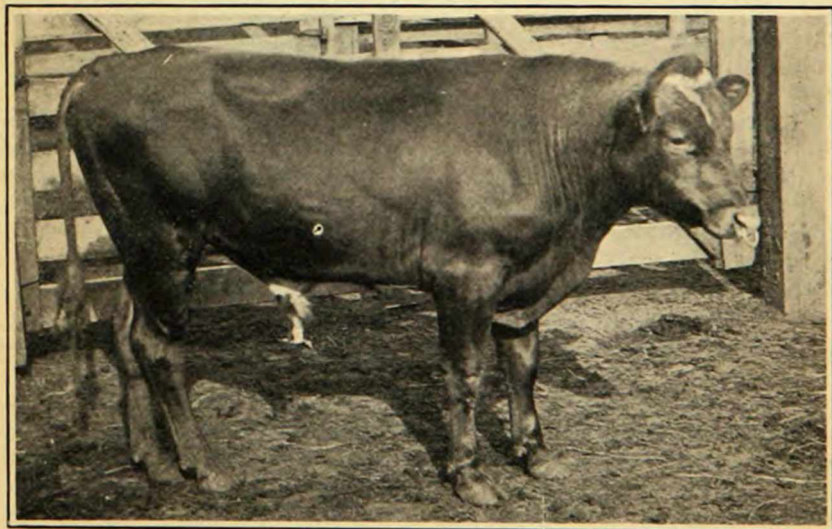


Fig. 8—Good feeder bull.—Courtesy of Illinois Experiment Station.

should set a definite time in which to put on a certain gain, after which the contracting parties may close the deal or continue by mutual consent, depending on the state of the market. It will make considerable difference whether feedlot weights or market weights are final. A shrink of 6 per cent on a 1200-pound steer means a 30 per cent shrink on 280 pounds of gain put on. The feeder should have a fairly good idea about the amount of feed for which he can put on a pound of gain.

Whether contract feeding becomes a regular practice or not will depend upon the feeders. If they cannot make as much with this method as by borrowing money and buying their own steers, they will not make contracts. If the market assumes a normal level, it may be more convenient to buy in the usual way. Part of the benefits of the contract system can be realized by direct buying. Successful feeders who would be most sought after for contracts are the ones who will most likely prefer taking their own risks.

MAKING USE OF WASTE FEEDS

When steers are first bought it is possible to make some profitable gains by running them on stalk fields, meadows, stubble fields and beet fields for a few weeks. Beet tops sell in the field (1918-1920) for \$8.00 and \$10.00 per acre and produced, in 1918, 107 pounds gain per acre of tops after crediting 277 pounds of alfalfa hay eaten with a due share of gains. The steers pastured on tops gained faster after going into the feedlots than others kept in the feedlot the same period while these steers were on tops. In other words, the steers pastured on tops should have received credit for at least 30 pounds more gain on tops because of their increased capacity to fatten.

The U. S. Department of Agriculture estimated in 1914 that the corn fodder and straw wasted in the United States amounted to \$102,000,000 each year. Both these feeds make satisfactory roughages if combined with some alfalfa or with cottonseed meal, or with silage.

FEEDLOTS AND EQUIPMENT

Feedlots should be as sheltered as can be conveniently arranged. If on a slope facing south, the lots will be easier to keep dry. If sloping ground is not available, some drainage should be provided. Each steer will require about 3 feet of rack space and trough space. The feed racks and gates should be so arranged that it will be easy to feed the bulky feeds, hay, pulp or silage, direct from the wagon, without rehandling. Pulp troughs and hay racks are sometimes placed along the fences, so as to avoid driving into the lots.

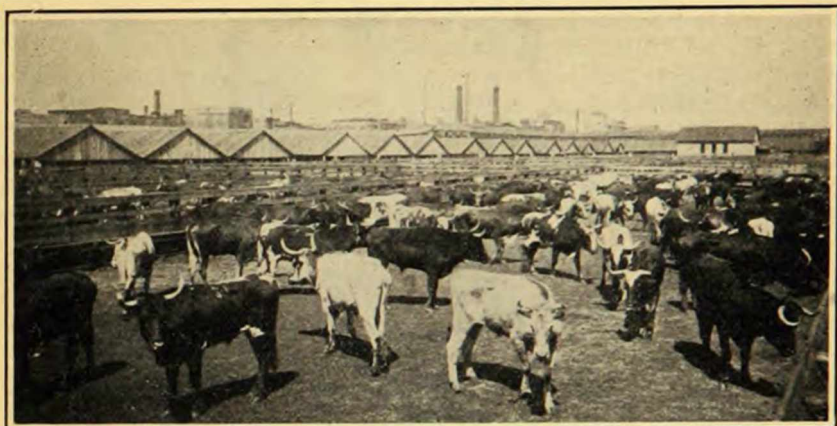


Fig. 9—Texas or Mexican cattle are not seen on the market as often as formerly. They may fatten fairly well if handled right but must be bought cheaply, and should be dehorned.
—Courtesy of Illinois Experiment Station.

This saves some labor and trouble where one man is doing the hauling, but as the steers feed from only one side of the racks or troughs it is not economical of equipment. Grain feeds and silage are usually fed in bunks as in Fig. 15.

Where silos are located in or at the edge of the feedlot, a carrier track and feed carrier may be used instead of the wagon, especially for small lots of steers. The advantage of the feed carrier is that while it has to be filled by hand it can be emptied instantly. The wagon, on the other hand, can be backed under the chute to fill but requires emptying by hand, and may sometimes be inconvenient to get when wanted.

Corral fences should be strong enough and high enough to hold the cattle, and if needed for wind breaks should be tight boarded and at least 8 feet high. The corrals should be large enough that they will not be tramped into a bog in wet weather. They should be small enough that the cattle will not run around too much.

A clean water supply is necessary. The circular, steel troughs are very satisfactory as they do not burst readily and last a long while. When well made the concrete troughs are the most permanent of all. The sides of concrete troughs should slope outwards at the top and be well re-enforced so as to withstand the pressure of ice in winter. Gasoline engines are now used a great deal for pumping water for cattle.

THE FATTENING PROCESS

With the animal in its natural state, fattening is simply laying up nutrients in time of plenty to be drawn on when food is scarce. Man has taken advantage of this faculty,

and uses the animal to change materials unsuited for human consumption into more desirable form. From the animal's standpoint, the fat laid on under the skin, or around the kidneys and intestines has as much fuel value as any other, but the consumer of meat cares most for the fat laid between the muscle fibres. Since well-bred beef cattle put more of their fat in the muscles than do dairy cattle or scrubs, they are more in demand by feeders and bring higher prices when fat.

Fat is only put on after the demands of the body for heat, energy, and repair material have been provided for. These necessary requirements are called maintenance. Maintenance uses up nearly half the average ration of the steer. To fatten a steer economically means to feed as much above the maintenance requirement as the steer can eat. Too many beginners try to fatten their animals on a three-quarter ration, and get only half the gains they should. The missing part of the ration comes out of the half that would put on gains, and not out of maintenance. Maintenance is the "overhead" that brings in no returns in the feedlot, so that it pays to feed a steer all he can handle **over and above maintenance** without spoiling his appetite and digestion. It is gains that make money in the feedlots, and gains come from the last pounds or extra pounds of feed that the steer eats.

Another secret of success is to be found right here. Anything that **increases** maintenance **reduces** the amount of nutrients that can be used to put on fat. Any system of man-

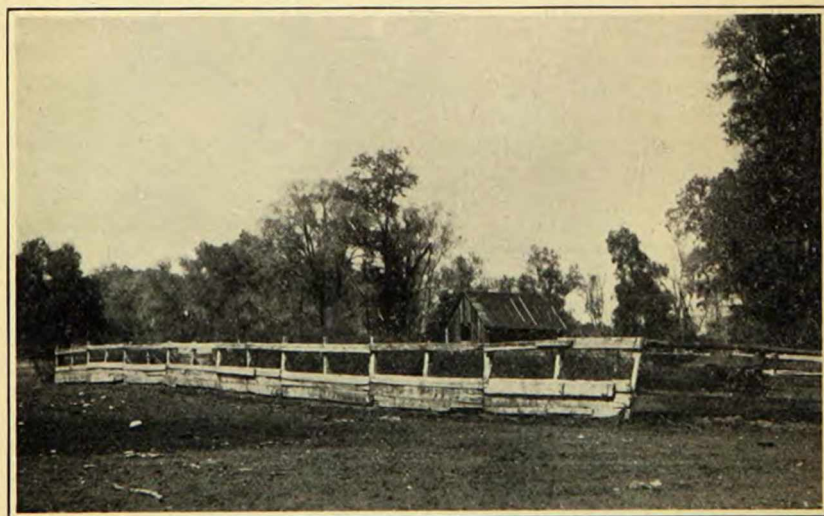


Fig. 10—Type of rack for hay feeding used near Fort Collins. Sixteen feet wide, one hundred twenty-eight feet long. Hay handled in large amounts direct from stack. Little labor required in feeding. Neck space 22" to 24" deep and 24" to 26" from ground.

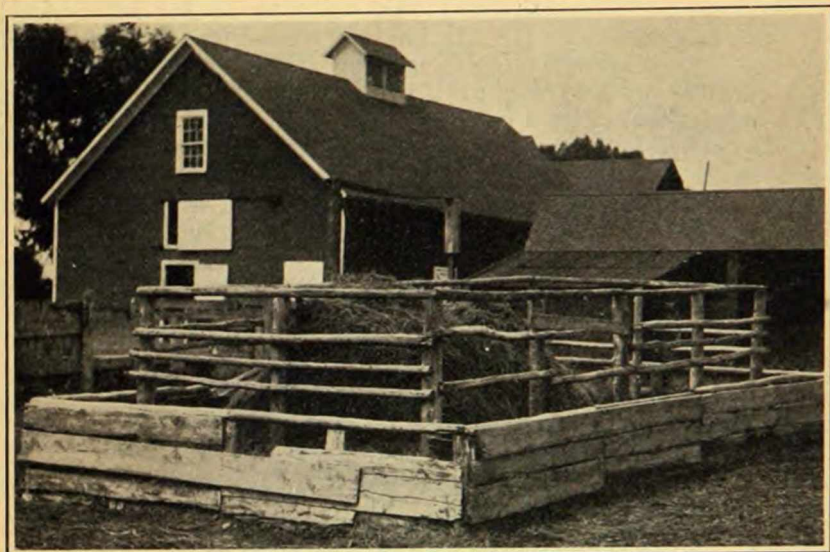


Fig. 11—Another type of hay feeder for small lot. Requires more labor in feeding than that shown in Fig. 10, but is preferred where hay is limited in quantity.

agement that keeps the maintenance requirement low, leaves that much more to make gains. Nervousness and excitement, too much exercise, discomfort from muddy lots, and injury from horns of other animals, all increase the maintenance requirement and lessen gains. Extremely cold storms increase maintenance by increasing the heat or fuel requirement of the steers but moderately cold, dry weather increases gains by sharpening the appetite. A windbreak and a well-drained lot are usually all that is needed in Colorado to insure sufficient warmth and comfort.

STARTING STEERS ON FEED

The question of **how soon** steers can be gotten up to a full grain ration is not as important in Colorado as **how long** the steers can be run profitably on cheaper feeds. In states where corn is cheap and plentiful, and two lots of steers are to be finished in one winter, one after the other, the steers are put on a full corn ration in four to six weeks and get 15 to 20 pounds of corn a day, finishing in 90 to 100 days.

In Colorado, feeds like hay and pulp are cheap and corn has to be shipped in, so that the practice is to have a long feeding period, starting with very little grain and never going over 8 to 10 pounds grain a day. The fattening process has been likened to the blowing up of a football or auto tire, easy at first, but getting harder as the process continues. It has been shown more profitable in Colorado to feed heavily on the roughages and cheap feeds at the start and save the

heaviest grain rations till the last six weeks or two months of feeding. One lot of College experiment steers fed in 1918, got only alfalfa hay and wet pulp for the first 40 days of feeding yet gained practically 2 pounds a day. The following period of 110 days when they received from 2 to 3 pounds of cottonseed cake and 2 to 5 pounds of beet molasses, they only gained 2.41 pounds a day. The cost for the first period was 8.7c per pound gain and for the period they were getting concentrates the cost was 13.2c per pound gain. The concentrates are necessary for finishing but do most good during the latter part of the feeding period. In feeding tests in 1905, steers fed pulp and alfalfa, made 2.43 pounds gain per day with a 5-pound ration of grain during the **second** five-week period of feeding, and only made 2.55 pounds gain per day the **fifth** five-week period on a 9.6-pound grain ration. Had a heavy grain ration been fed during the early period, the gains could not have been much larger and would have been much more expensive.

PRINCIPLES OF FEEDING

In one feeding experiment, at the Colorado Experiment Station, different rations varied from a \$36.00 profit per steer to a \$23.00 loss. It is evident then that some knowledge of rations and of feeding methods is necessary to success. While much of this knowledge is gained thru experience, the beginner can save time and money by learning from the experience of others.

There is not space here to discuss feeding standards and tables of digestible nutrients, and their use in calculating balanced rations. A bulletin on "Principles of Feeding" is published by the Extension Division of the Colorado Agricultural College. The names of good textbooks on feeding will be given on application.

A **ration** is what an animal is given to eat in 24 hours. The food an animal eats may be said to have two uses: 1. **Repair or building** material which includes protein and mineral matter. All animals need a certain amount of protein. Protein is the part that makes lean meat and cell walls, and repairs tissues. 2. **Fuel or fattening** material consists of the fats or oils and the carbohydrates, such as starches, sugars, and digestible fiber. These make fat and supply energy and heat. The mineral matter is not considered in cattle feeding as feeds are supposed to have enough of this with the exception of salt.

A **balanced ration** is one that has the right amount of protein in proportion to the carbohydrates and fats. The feeds which are relatively high in protein are the legumes (alfalfa, the clovers, sweet clover, cowpeas, etc.) and concentrates like bran, oats, cottonseed meal, oil cake or gluten feed. The

carbonaceous feeds are the grain feeds like corn, kafir, barley, milo, millet, and by-products like beet pulp and beet syrup, grass hays (timothy, prairie hay, sudan grass etc.) and the various fodders, as corn fodder, corn silage, cane hay, kafir fodder, and straw. Wheat may be considered fairly well balanced. Balancing a ration means getting the right amount of feeds out of one group to combine properly with those taken from the other group.

Palatability is of importance in fattening. It is the amount a steer eats **over** and **above** what he needs to maintain his weight that makes fat. The aim is to keep him eating as much as possible, without going off feed. The steer will not do this unless feeds are palatable. This is why poor quality hay is frequently cut and sprinkled with molasses or salty water, why barley is usually ground and mixed with oil meal or cottonseed cake, and why feeds should be sweet, clean, free from mould, and not fed in such large amounts that they lie around in the trough to be slobbered over.

Succulence is of considerable value in a ration. One reason why grass is such a valuable feed is that, in addition to being cheap and well balanced, it provides succulence. The principal effect of succulence is to keep the digestive system in good order. In the series of steer-feeding experiments just completed at the College, the rations containing beet pulp or silage averaged much higher profits than the dry rations. In 1918 the profits on succulent rations were \$36.33, \$36.15 and \$9.57 per steer as compared to \$0.42, \$0.26 and a \$23.63 loss for dry rations. This comparison may not be exactly fair to the dry rations as the wet pulp fed in the first two lots is very cheap as well as succulent. Steers fed succulent feeds usually sell 15c to 75c per cwt. higher on the market in addition to making larger gains. Cost must be considered however, in buying succulent feeds, as water has no feed value of its own.

Cheapness: The wisest and most successful feeders are those who watch costs in buying feeds. Because alfalfa and corn are considered the best feeds does not mean that they are always most profitable. Straw and alfalfa mixed may give nearly as large returns as straight alfalfa in some combinations, at less cost. Grains like kafir corn, barley, wheat screenings or dried pulp may often sell at more profitable prices than corn. Hominy feed and gluten feed are considered equal to corn for fattening steers yet in 1918 when corn was high they were selling at \$6.00 to \$10.00 less per ton. Silage may be profitable at \$8.00 per ton when alfalfa is \$15.00, but not when alfalfa is \$6.00 per ton. The great advantage of wet beet-pulp has been its cheapness. Ten pounds of wet pulp will equal one pound of corn, yet sells for \$.75 per ton when corn is \$20.00, or \$1.25 when corn is \$60.00,

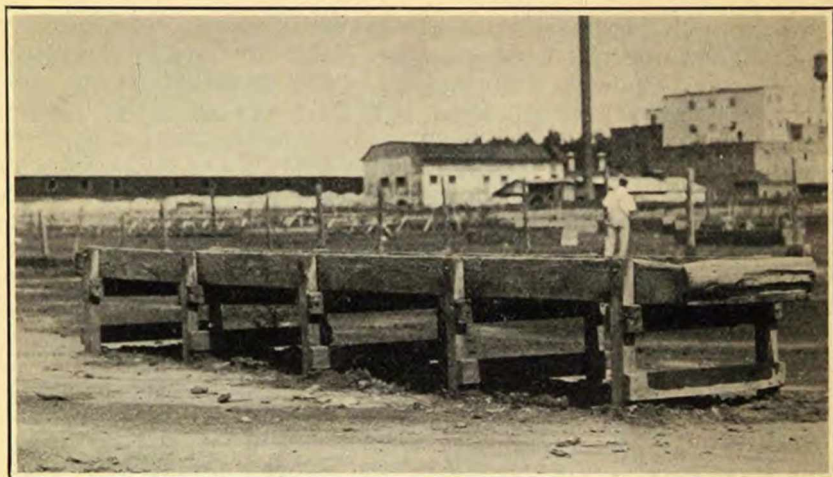


Fig. 12—Bunk for feeding grain, silage, or cut hay and molasses.

making it a very cheap feed for anyone close to the factory. The cost of hauling runs up rapidly, making it an expensive feed at any distance over five miles, unless hauled by train. Oats, while worth more than corn for dairy cows, should not be bought at corn prices for fattening cattle. Beet syrup is worth 75 per cent its weight of corn, yet often sells for half the price of corn. The main object is to get the most feed value for the money. A low-priced feed is not necessarily the best value.

Comparative Value of Feeds: It is not possible to make tables of feed values that will hold true under all circumstances and in all combinations. The following comparisons are generally correct. Counting corn as 100 per cent value, wheat and hominy feed will rank at 100 per cent, dried molasses pulp 98 per cent, though more than 100 per cent when fed in right combinations, oats and barley 95 per cent, kafir milo and rye 90 per cent, emmer and millet 75 to 80 per cent, and beet molasses 75 per cent. All these feeds except oats belong to the carbonaceous or fattening feeds, and need to be balanced with nitrogenous feeds, usually with a legume hay and a little linseed or cottonseed meal. The cheaper feeds (rye, millet, emmer) will give better results when mixed with more palatable concentrates like corn or barley. Small hard grains like kafir, rye, and millet should always be ground and barley and wheat rolled or cracked. Oats are not used to any extent except in getting steers on feed.

Nitrogenous Feeds and Their Use. Comparisons are not so easy to make with the nitrogenous concentrates. These have two uses, first as supplements to the carbonaceous feeds, and second, as fattening feeds themselves. As supplements

they may be rated very largely on their digestible protein content. Cottonseed meal has 33 to 37 per cent protein, linseed meal 30 per cent, gluten feed 21 per cent, cocoanut meal 18 per cent, bran 12 per cent. That does not mean that one pound of cotton seed meal has as much feeding value as three pounds of bran. It means that where the main need of the ration is for protein, the cottonseed meal or cake may balance it more cheaply than the bran. For instance, in comparing these two feeds for dairy cows in an unbalanced ration, one pound of cottonseed meal was worth two of bran while in a balanced ration one pound of meal would only replace $1\frac{1}{4}$ pounds of bran. The same has been true with beef cattle. Experiments have been made where cottonseed meal seemed equal to two pounds of corn, but that was in rations that were not balanced. In a well balanced ration 1 pound cottonseed cake would probably replace $1\frac{1}{4}$ pounds of corn, and might not be as good as corn in a ration that was lacking in starchy nutrients.

In Colorado the main use of these feeds is to balance the rations. In localities where these feeds are cheaper than corn, such as the southern states, cottonseed meal is used as a fattening feed. One or two pounds of cottonseed or linseed will usually be enough to balance a grain ration where alfalfa hay is the roughage.

Roughages. Alfalfa is considered the best roughage for fattening. It is nutritious and palatable and, being nitrogenous, is ideal for feeding with corn, barley or beet pulp. Timothy and clover and the mountain park hays would probably rank next from the steer feeders standpoint. Prairie hay, timothy and cane hay do not rank high when fed as the only roughages but do much better if combined with alfalfa. At the North Platte, Nebraska, Station, steers wintered on alfalfa alone made 1.2 pounds gain per day; on cane hay only 4 pounds, but on equal parts alfalfa and cane they made the same gain as those on alfalfa alone. Prairie hay alone made only .7 pounds gain per day but fed with alfalfa, made 1.1 pounds per day, just $\frac{1}{10}$ pound less than on straight alfalfa.

The problem of the farmer is not buying roughages but the using of what roughages he has. These may include corn fodder, corn stover and straw, all of which should be used. The corn, cane, kafir and milo crops should be put in the silo where at all possible, and the straw can be combined with alfalfa hay in the manner suggested above. Where there is no legume hay available there is still need for a silo to put the rough, carbonaceous feeds in shape for feeding. Whether with or without a silo, these feeds must be balanced with cottonseed or linseed meal or cake.

Feeding Beet Pulp. The following suggestions are largely from the Colorado Experiment Station Bulletin 97, published

in 1905 by Carlyle, Griffith and Meyer. Observe absolute cleanliness, feed in troughs or bunks and only in such amounts as the cattle will eat without waste, and without leaving any to freeze over night. It is advisable to feed either good alfalfa hay with beet pulp or alfalfa and straw mixed with whatever grain ration is used. The feed racks for hay and the troughs for pulp should be fairly close together, so that the steers will not have to go far to either one. If beet syrup is fed it may be poured on the pulp or hay or mixed with the hay and grain. Pulp that has been some time in the silo is preferable to fresh pulp. In hauling pulp any distance, use large wagon beds and four horses to save man labor.

Silage for Fattening Steers. Silage has been proved an excellent feed for fattening steers. Experiments at the Colorado Station in 1918-20 showed a marked difference in favor of silage and hay over hay alone as roughage for fattening steers. Averaging three years results at the Experiment Station in a preliminary feed of forty days, steers, on alfalfa hay and corn silage without any grain feed, put on 1.73 pounds gain per day, requiring 19.1 pounds of silage and 6.7 pounds of hay per pound of gain.

Those on alfalfa alone put on .96 pounds gain per day and required per pound gain, 27.3 pounds of alfalfa.

In the first year test, beet molasses and cottonseed cake being added, the corn silage and alfalfa lot put on 306 pounds per steer. The alfalfa lot put on only 181 pounds of gain per head, costing nearly twice as much. The silage lot made \$9.58 profit and sold at 15 cents per pound. The hay lot lost \$23.63 per steer and sold at 14 cents per pound.

At the Indiana Station in 1916-17, experiments showed the profits per steer were increased \$10.08 by adding corn silage to a ration of corn, cottonseed meal and clover hay. In their 1914-15 experiments, steers on a corn, cottonseed meal and alfalfa ration, lost \$13.07 per head while with silage replacing part of the hay, the loss was only \$1.07. In 1909 experiments, 10 steers fed corn, cottonseed meal, clover hay and silage made \$18.09 profit per steer, and sold at \$7.60 per cwt. Those fed corn, cottonseed meal and clover hay made \$10.49 profit and sold at \$7.10 per cwt. Experiments at the Colorado Experiment Station in feeding barley, alfalfa and corn silage to steers compared with barley and alfalfa alone, indicated that when alfalfa was worth \$10.00 per ton and barley \$1.50 per cwt., the corn silage was worth \$4.89 per ton.

Making up a Ration. First take account of the roughage available that has to be used. Feed all the roughage the steers will eat as the roughages supply the cheapest nutrients. If alfalfa is the only roughage used with grain, steers will eat 20 pounds or more per day. If fed with beet pulp or silage

they will eat 8 or 10 pounds a day, and 80 to 120 pounds pulp or 25 to 35 pounds of silage. If straw or rough fodders are to be used, they will be fed in as large amounts as the steers will eat, allowing for considerable waste. It is not wise to try to make the steers eat every particle of straw or fodder. If three or four pounds of alfalfa can be fed with the rougher feeds, better results will be obtained. One way to feed this mixture is to cut the alfalfa and straw together and sprinkle them with molasses. This takes extra labor but with proper equipment the work can be done economically.

The next step is to make up the grain ration to suit the roughage used. If the roughage is alfalfa alone, the grain can be largely corn, barley or dried pulp, though a little protein feed like cottonseed meal will be an advantage. Where the bulk of the ration is wet beet pulp or silage, and if roughages like straw, corn fodder or prairie hay are used, then two or three pounds of cottonseed or linseed cake will be necessary for good feeding. Gluten feed, wheat, bran, peanut meal, etc., may be used in place of the cottonseed meal or oil meal, but are not so common.

The following rations are given as examples or suggestions. It is not to be expected that anyone will follow them absolutely regardless of feed prices or available feeds. An attempt has been made to show how most of the available Colorado feeds can be combined in fattening rations. Rations 5 and 6 are not recommended but are meant to show how dry-land roughages can best be used.

No. 1		No. 2		No. 3	
Alfalfa	6	Alfalfa	10	Alfalfa	20
Wet beet pulp.....	120	Corn or Sunflower		Dried beet pulp.....	4
Oat straw	4	silage	30	Corn	4
Beet molasses	5	Corn or barley	6	Cottonseed meal	1
Cottonseed cake	3	Cottonseed cake	2		
No. 4		No. 5		No. 6	
Corn silage	50	Oat or rye hay	6	Prairie hay	10
Oat straw	5	Kafir silage	35	Corn fodder	15
Corn or barley	6	Emmer	4	Kafir corn	3
Cottonseed cake	3	Barley	4	Wheat bran	4
		Oil meal	3	Oil meal	3

Hogs Following Steers. Where cattle are fattened on heavy grain rations, especially whole grain, considerable grain goes through the steers unused. By turning hogs after the cattle most of this can be made into pork. One 100-pound hog to every four or five steers will usually be enough. Small pigs, brood sows or heavy fat hogs should not be put in the lot with steers as they are too likely to get hurt. It is best to keep the hogs in a lot of their own at night where they may get some extra feed and where they may be kept when the steers are at the feed troughs. It is best to count on feeding the hogs some grain directly as there is not much feed to be gained following steers fed wet pulp, silage, cottonseed

meal or ground grain. In the cornbelt hogs may regain 10 to 15 per cent of the original grain fed the steers but they will not get more than 3 or 4 per cent on average Colorado rations.

Salt. Steers on feed need salt and should have it within reach at all times. Granular stock salt may be put out in troughs, but the most common method is to use blocks of compressed sulphur salt, which are put in the feed bunks.

BABY BEEF

The prevailing tendency in beef production has for the past century been in the direction of more quick-maturing beeves and in favor of smaller carcasses of higher quality. Steers used to be marketed at five and six years old; now the three-year-old has almost disappeared. Instead of the market calling for heavy steers weighing 1600 to 1800 pounds the "handyweight" steer of 1100 to 1200 pounds is now in common demand.

The consumer wants smaller cuts with better texture and not so much tallow. Beef consumption per capita (inspected meats) has gone down from 78 pounds in 1910 to 56 pounds in 1920 (Meat and Live Stock Digest). Whether due to harder times, or to the anti-meat-eating campaigns during the war,

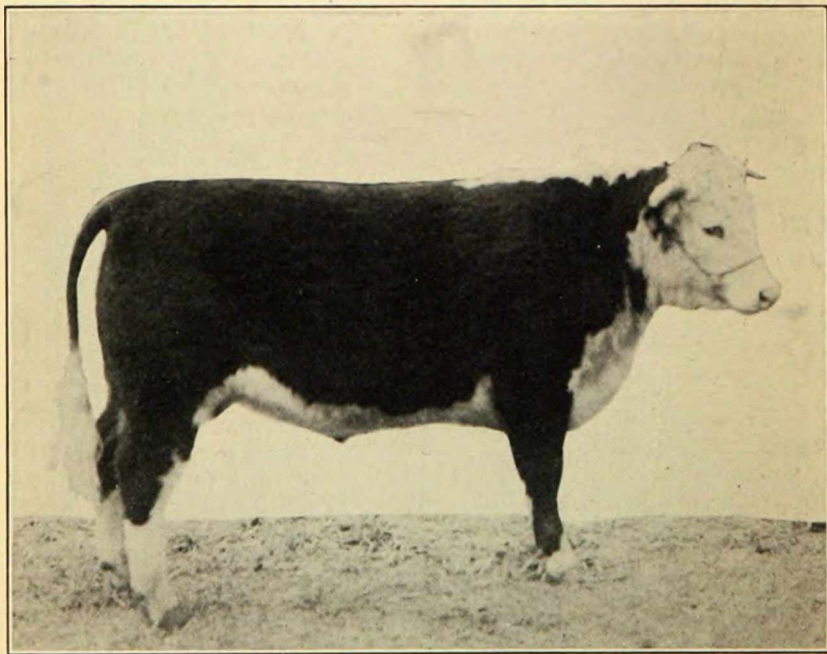


Fig. 13—Morris, a typical baby-steer. Third in senior calf class at Denver, 1916. Won first as yearling and champion as two-year-old.

or to natural preferences and more discriminating tastes is immaterial. The fact is that the smaller cuts are what the public asks for, and will pay for.

Another reason for present tendencies is the lack of free grazing land now, on which the large steer was once developed with little charge for feed and labor. Land, labor and feed are now high priced and there is more economy in getting the calf turned into money and out of the way of the succeeding crop at the earliest opportunity. Calves put on gains for about $\frac{2}{3}$ the feed required by 2-year-olds, so that they can be fed out on a smaller margin between buying and selling price.

Another advantage is that at this age heifers will sell for as good a price as steers.

Baby-beef feeding is, however, not a simple matter of putting calves in the feedlot in place of mature steers. Baby beeves must be of the best breeding and quality, sired by thick-fleshed pure bred beef sires, and out of a good grade of cows.

Then they must be started on feed at the time they are weaned if not a little earlier, so that they do not lose their milk fat. The feed must be of good quality, not the coarse stuff that old steers will eat. They will eat a little oat straw along with good silage, but will not eat as heavily of roughage in proportion to grain as do the older steers. These baby steers must be forced to fatten instead of growing, and will need a longer fattening period than mature steers.

The following rations are adapted from various bulletins including Farmers Bulletin 811, "The Production of Baby Beef", which will be sent free on request, by the Department of Agriculture at Washington, and to which the prospective feeder is referred for further information.

SOME SUGGESTED RATIONS FOR BABY BEEF

Heavy Ration		For Dry Land		In Irrigated Sections	
Corn	11 lbs.	Kafir chop	7 lbs.	Corn	5 lbs.
Oats	2 lbs.	Oats	3 lbs.	Barley chop	5 lbs.
Oil Meal	1 lb.	Cotton S. M.	2 lbs.	Oil Meal	2 lbs.
Silage	7 lbs.	Cane silage	12 lbs.	Corn Silage	10 lbs.
Alfalfa	4 lbs.	Prairie hay	3 lbs.	Oat straw	2 lbs.

These amounts are only given as suggestions, as it is supposed that the rations will be varied according to the size and appetites of the calves. In a six to ten months feeding period the grain ration would run from 5 to 14 pounds of concentrates per day.

Baby beef production is best suited to stock farms where there is feed and equipment for finishing the calves on the same farm where they are raised, though this does not mean that those who have an opportunity to buy feeder calves cannot do so with profit. The calves must be of beefy, quick-maturing type. Dairy-bred steers should be finished off at

400 pounds for veal, not fed for baby beef. Whether the range breeder in the western part of Colorado will find it profitable to sell his produce as calves has not been proven. The main profit in that section lies in the grazing, which a calf will not use to as much advantage as a yearling or two-year-old.

What has been said about feeding calves applies to some extent in feeding yearlings. They must be good ones, and must be well fed, though not for so long a period as the calves. It takes a good feeder to fatten yearlings successfully, as they have a tendency to grow rather than fatten.

RESULTS OF SOME FORMER FEEDING EXPERIMENTS AT THE COLORADO EXPERIMENT STATION

Feeding Steers on Beet Pulp, Alfalfa Hay and Farm Grains. (50 Steers in a Lot.) 1904.

The rations compared were as follows:

1—Alfalfa hay 10.6 lbs.	Beet pulp 96 lbs.	Barley and oats 6.5 lbs.
2—Alfalfa hay 11.1 lbs.	Beet pulp 99 lbs.	Corn 6.5 lbs.
3—Alfalfa hay 12.5 lbs.	Beet pulp 123 lbs.	No grain.

These are the average rations fed and were not given in these exact amounts all through the experiment. The steers ate about twice as much pulp per day the first few weeks as they did at the last, partly on account of the greater water content of the pulp. The grain feed began at 2 pounds per day and increased to 10 pounds at the finish. No feed prices



Fig. 14—Pulp-fed steers near Fort Collins sugar factory.

are given in the original bulletin but they must have been about the same as in the following 1905 experiment, \$5.00 per ton for alfalfa, 50 cents per ton for pulp, \$20 per ton for corn, and \$22 per ton for barley and oats.

The gains per day, feed eaten and costs of feed were as follows:

Lot No.	Daily Gain	Feed Eaten per Steer in 175 Days			Cost of 100 Lbs. Gain
		Alfalfa	Pulp	Grain	
1	1.9	1850	16780	1127 barley and oats	\$6.53
2	2.0	1940	17300	1127 corn	\$5.93
3	1.57	2180	21525		\$3.79

The higher cost of gains on oats and barley as compared with corn is due partly to the higher gains on corn, and partly to the evidently higher price of the oats and barley.

The summary of all data including selling prices and profits is given as follows:

	Lot 1 Barley-Oats	Lot 2 Corn	Lot 3 No Grain
Weight at beginning.....	917.6	899.2	905.6
Value at 3 cents.....	\$27.52	\$26.98	\$27.16
Cost of feed, 175 days.....	\$21.65	\$20.68	\$10.87
Cost of labor.....	3.50	3.50	3.50
Weight finished (in lot).....	1249.3	1248.0	1189.5
Sale weight in Denver.....	1213.6	1216.9	1149.4
Shrinkage in shipping—per cent.....	2.86	2.49	3.71
Selling price per cwt.....	5.50	5.60	5.15
Selling value.....	66.75	68.15	59.19
Cost of marketing.....	1.53	1.54	1.46
Net Profit.....	\$12.55	\$16.45	\$16.20

The steers fed no grain made slightly more profit but the pulp used was figured in at very low price. It was found in the experiments of 1918 that it cost as much to haul pulp two miles as it cost originally at the sugar factory. In these experiments only 15 cents a ton was added to the factory cost for labor of hauling and handling.

The experiment emphasizes the value of using local feeds as much as possible and gives barley and oats combined a value of 95 per cent that of corn for fattening.

Feeding Steers on Beet Pulp, Alfalfa Hay and Ground Corn. 1905

The rations compared were as follows:

- 1—Alfalfa hay, 20 lbs. Ground corn, 6.6 lbs. Beet pulp, 93.4 lbs.
- 2—Alfalfa hay, 30 lbs. Ground corn, 6.6 lbs. No pulp.
- 3—Alfalfa hay, 22 lbs. Beet pulp, 97.3 lbs. No corn.
- 4—Alfalfa hay, 40 lbs. No corn or pulp.

The corn was valued at 85 cents per cwt., beet pulp 35 cents per ton, with 15 cents a ton extra charged for hauling, and alfalfa at \$5.00 per ton. The alfalfa was not of good quality, and the large hay rations fed are due to large amounts of waste.

The gains per day, feed eaten and costs of feed were as follows:

Lot	Daily Gain	Feed eaten per steer in 100 days			Cost per 100 lbs. gain
		Alfalfa	Pulp	Corn	
1	2.63	1999	9343	662	\$4.92
2	1.76	3137		662	7.64
3	1.84	2189	9729		4.29
4	1.47	4149			7.07

While the prices quoted at that time are somewhat out of date the amounts of feed used can easily be re-figured at present prices.

The summary of all data, including selling prices and profits are given as follows:

	Full ration Lot 1	Hay & Corn Lot 2	Hay & Pulp Lot 3	Hay Lot 4
Weight at beginning.....	951	968	941	968
Value at 3c per lb.....	28.77	29.04	28.23	29.04
Cost of feed 100 days.....	12.95	13.44	7.90	10.39
Cost of labor.....	3.25	3.25	3.25	3.25
Weight per steer at Ft. Collins.....	1,214	1144	1,125	1,115
Weight per steer at Denver.....	1,157	1,088	1,050	1,062
Shrink in shipping.....	57	56	75	53
Selling price per cwt.....	\$5.15	5.06	5.00	4.73
Total value.....	\$59.58	55.05	52.25	50.25
Cost of marketing.....	\$2.15	2.15	2.15	2.15
Net Profit.....	\$12.70	7.16	10.97	5.44

As will be seen, the alfalfa, pulp and corn ration made the largest gains, and the steers fed this ration brought the highest price per pound. It will also be seen that this ration contains all the essentials of a good ration; two fattening feeds, one especially cheap and succulent, and one protein roughtage to balance the ration.

The alfalfa and corn ration ranked next in selling price but not in either gains or profits. The reason for this is the absence of the cheapest feed in the test, the beet pulp, which is also the succulent feed. This shows the effect of cheap feeds and succulent feeds on profits.

The alfalfa and beet pulp ration was second in profits and second in gains, but did not show the finish of the alfalfa and corn lot. This shows the need or advantage of a starchy or fattening grain feed for putting on finish. The cheapness of the pulp (50 cents) delivered has much to do with the high profits. Had pulp been priced at even \$1.50 per ton delivered (75 cents per ton and 75 cents for hauling) the profits would have been cut to \$6.11 per head or less than lot 2.

The straight alfalfa ration is not to be recommended in the light of later experiments and would rarely prove profitable. The gains made in this lot were excellent considering the quality of the hay.

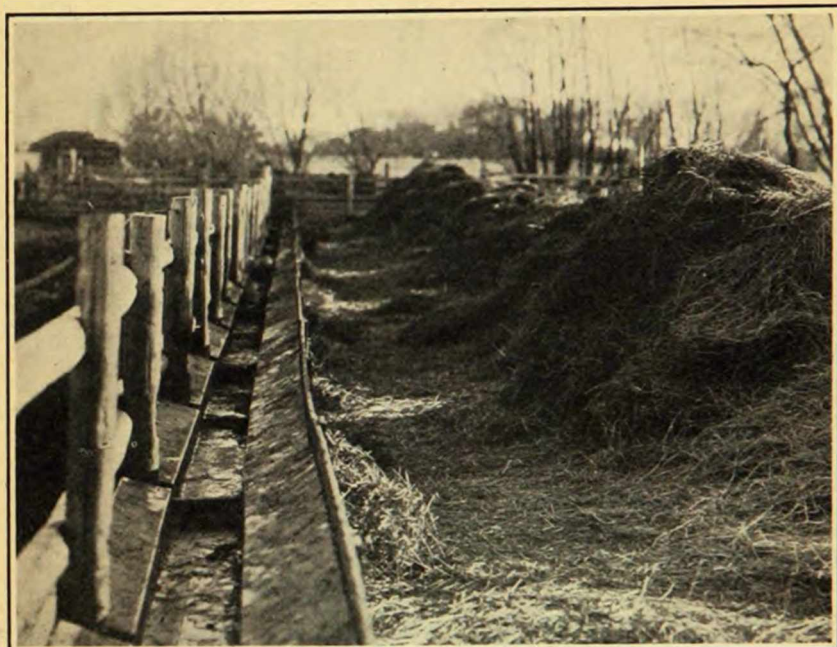


Fig. 15—A satisfactory type of trough for feeding uncut alfalfa and beet molasses. The molasses is poured over the hay in the trough which saves any that goes through. The stems against the trough are all that were wasted after a winter's feeding.

EXPERIMENTS WITH SUGAR BEETS FOR FATTENING STEERS 1907-08

This experiment was run in connection with another experiment in wintering range steers. The comparison of sugar beets with corn for fattening was run the first winter with yearlings and the following winter with two-year-olds. In addition to throwing light on the value of sugar-beets, it gives some valuable information on the comparative fattening ability of steers at different ages.

Experiment I. With Yearlings.
Feed, gain and cost of gains—16 weeks.

Lot	Gain per Head	Pounds feed for 100 lbs. Gain			Cost of Feed per 100 lbs. Gain
		Corn	Sugar-Beets	Alfalfa	
1	239	196	1108	641	\$6.33
2	216	443		720	\$6.23

In this trial of 16 weeks, Lot 1 was fed six pounds of corn and 30 pounds of sugar beets per day per head while Lot 2 was fed 12 pounds of corn. This meant replacing half the corn with sugar beets in the proportion of 5 pounds of sugar beets to one pound of corn.

The steers fed the sugar beets made somewhat better

gains than the others, averaging 23 pounds heavier at the close. It will be seen that 1108 pounds of sugar beets replaced 247 pounds of corn and 79 pounds of alfalfa hay, or 4.5 pounds of beets replaced 1 pound of corn and .32 pounds of hay in producing a given gain.

With corn at \$20.00 per ton, beets at \$5.00, and hay at \$5.00 the sugar beet ration cost \$6.33 for every 100 pounds gain produced, while the corn ration cost \$6.23. This indicates that sugar beets will replace corn in such a combination, at the rate of 4 to 1.

Experiment II. With two-year-olds.
Feed, Gain, and Cost of Gains. 22 Weeks.

Lot	Gain per Head	Pounds of Feed for 100 lbs Gain			Cost of Feed per 100 lbs. Gain
		Corn	Sugar-Beets	Alfalfa	
1	260	643		1190	\$9.41
2	259	330	1502	1000	\$9.55

The rations were the same as before. Lot 1 getting 12 pounds of corn per day and Lot 2 getting 6 pounds of corn and 30 pounds of beets. The two lots made equal gains. It took 1502 pounds of sugar beets to replace 313 pounds of corn and 190 pounds of hay in producing 100 pounds of gain; or 4¾ pounds of beets to replace 1 pound of corn and ¼ pound hay.

As the two experiments agree very closely regarding the comparative value of beets and corn it may be safely said that from 4½ to 5 pounds of sugar beets are equal in fattening value to 1 pound of corn. The corn-fed steers were valued at 10 cents per cwt. more on the Denver market.

It will be noticed that it cost almost exactly 50 per cent more to fatten the two-year-olds than to fatten the yearlings. The records do not show how the yearlings would have compared in value per pound with the two-year-olds if they had sold together on the same market. The two-year-olds were probably a little better finished.

HOW TO KNOW WHEN CATTLE ARE DOING WELL

Frequently a beginner in feeding cattle loses money through not knowing when his cattle are unthrifty, or not doing well. Usually he does not realize that they are not putting on good gains until he sells them. The most certain way to know what the cattle are doing, if one had scales handy, would be to weigh the steers occasionally, but few are equipped to do this.

Three things that can be watched are the droppings, the hair and the fullness of the barrel. If the droppings are too dry and hard, the cattle either need some laxative feed such as silage or linseed meal, or they are getting too much coarse dry fodder and not enough concentrates. If the man-

ure is sloppy or watery the steer is either being over-fed on grain, has been put on grain too suddenly, or is being fed something that is causing indigestion. The droppings should have the consistency of mortar. The hair should lie down smooth and look sleek. This will depend somewhat on the weather and whether the steer is naturally long haired or short haired. Generally, the steers that are doing the best are the first to shed their hair in early spring, while those on poor rations show a rough coat and shed later. The thrifty steer eats heartily when at the trough, then either lies down quietly or stands partly stretched out, chewing its cud. As the steer fattens, the body widens and deepens, the hind flank fills down with a roll of fat, the triangular space between the hip and the last rib fills out indicating the amount of fat being laid on internally, and the whole body smooths over. If steers do not develop in this way but appear gaunt and tucked up in the flanks, with rough staring coats, they either need a change of feed or more feed. If the droppings have the right consistency, the need is probably for more feed. If not, the ration is not of the right type and should be changed.

WHEN TO MARKET CATTLE

Some indications of a good fat steer are given above. The steer that is ready for market is smooth over the hips



Fig. 16—Champion load of commercial-fed steers, National Western Stock Show, 1921. The commercial class at the Denver show is for short-fed stuff of a finish that moves readily at practically all seasons of the year.

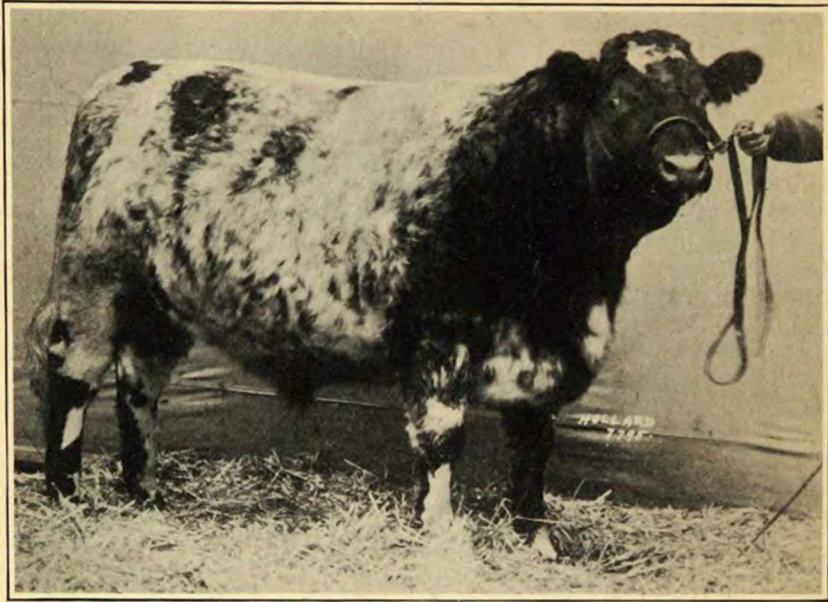


Fig. 17—Prime fat steer, champion yearling Shorthorn, National Western Stock Show, 1922.

and ribs with the shoulders well covered and the entire body smooth and sleek. A fat steer gives the impression of fullness; the sides bulge out; the flanks are full and deep and the cod is well filled. The eyes will usually appear more prominent owing to a cushion of fat developing in the eye socket. The exact degree of fatness required will be learned by experience, but when a steer reaches the condition described it is due to be marketed in a short time.

It rarely pays to hold steers after they are finished. If market prices for steers of that type are greater than the cost of putting on gains, or the price is going up rapidly it may pay to hold. If the steer has reached the point where he will sell for the top of the market which we will say is 10 cents a pound and it costs 12 cents or 14 cents a pound to put on further gains, it is evident loss to feed farther.

The big feeder has an advantage here, that he can sort out his fattest cattle and ship whenever there is a carload ready, while the small feeder has to hold his fat animals back to wait for those that are slower developing. Holding fat steers for the market to go up is poor policy for any but the most experienced feeders unless one has lots of feed on hand that he does not wish to carry over.

On the other hand it does not pay to ship unfinished cattle to market unless no more feed is available. Unfinished

cattle do not ship well, look badly on the market and bring unprofitably low prices.

PREPARING STOCK FOR MARKET

The aim of the shipper is not only to get his cattle to the best market, but to have the stock as comfortable as possible so as to have a light shrinkage. Shrinkage may vary from two to six per cent. As 1 per cent shrinkage on a thousand-pound steer is ten pounds, the difference on twenty steers at 10 cents per pound would be \$20.00 per car for each 1 per cent shrinkage.

Put plenty of bedding or sand in the car, as the cattle will ride better and look better when they get to market. Cattle shipped from grass, or those that have been on beet pulp or corn silage, should be fed hay a few days previous to shipment. If a heavy grain ration is being fed, this should be reduced for a couple of days. Cattle should have water a few hours previous to loading, but should not have a heavy drink immediately before loading. Cars should be comfortably filled, about twenty good-sized steers making a load in a 36 foot car. If cattle are over-crowded, they will shrink too much on account of crowding, while, if the car is not full, the steers will be jarred from one end of the car to the other in shunting the cars.

Cattle must have a brand inspection certificate before they can be shipped. The nearest brand inspector should be notified in time, so as to have the inspection made.

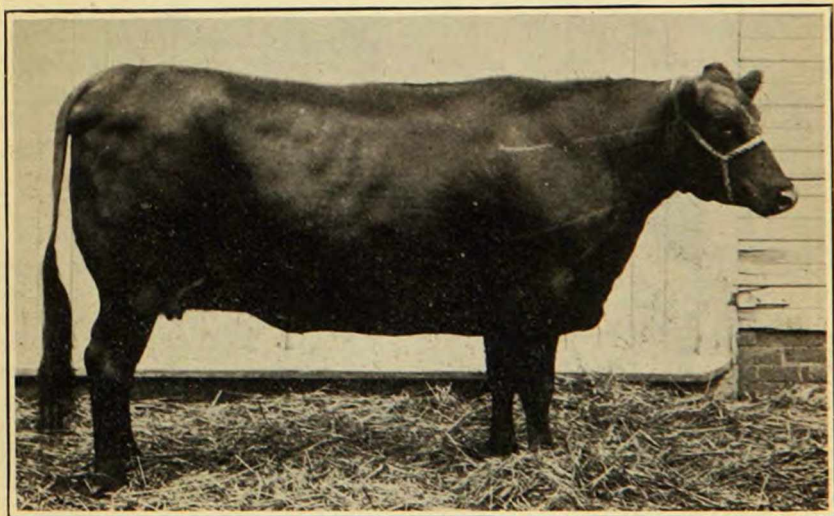


Fig. 18—Good fat cow of beef type.—Courtesy of Illinois Experiment Station.

The shipper should get a bill of lading from the railroad as a receipt for his stock, and should bill the cattle to a reputable commission firm. It is a good idea to write the commission firm ahead of time to get advice when to ship.

The following list of charges was checked over by a well-known commission firm at the Denver Yards Sept, 17, 1921:

Freight, Colorado points to Denver 10c-20c per cwt.
 Freight, Colorado points to River Markets 51½c.
 Freight, Colorado points to Chicago 73c.
 Minimum carload 22,000 lbs. in 36 ft. car.
 Insurance (transit) 10c per head.
 Fire insurance at yards, 15c per car.
 Feed in transit at feed yards, \$22.50 to \$50.00 per car.
 Yardage, 35c per head.
 Inspector's charges, 5c per head.
 Commission charges, 70c per head, \$14.00 per car.
 Feed in yards, depending on time in yards (for one day usually 600 lbs. hay at \$1.25 per cwt. per car.)

The shrinkage must be considered in deciding on a market to ship to. On a twelve-hour run the shrinkage may be two to four per cent; on a twenty-four-hour run, three to five percent; and for thirty-six hours and over, four to six percent.

Where a man has a few odd head to sell, they can be sold locally, or included in a mixed carload with other stock. Two or three men may ship together by partitioning off the car as needed, or marking the stock clearly that are not branded. Cattle and hogs can be advantageously shipped in one car. Where cattle and hogs are separated by a partition, the partition boards next to the floor should be on the

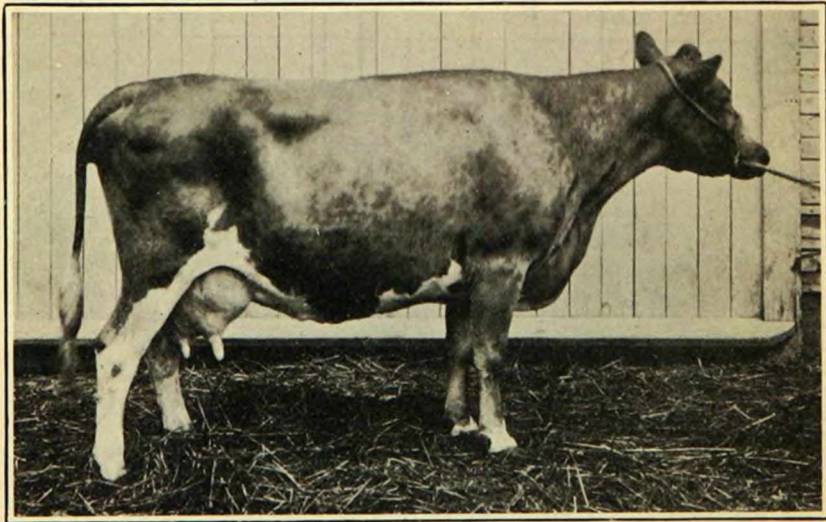


Fig. 19—Common cow, showing large amount of dairy blood.
 —Courtesy of Illinois Experiment Station.

side nearest the hogs, but higher, should be on the side of the cattle. In this way the jolting of the train will not knock them through the partition either way.

By writing explicit instructions to a commission firm regarding the ownership and description of the stock, the firm can weigh and sell the stock in separate lots and send the checks for each man's shipment direct to him, with the prorated share of freight and other expenses deducted.

Some good co-operative shipping associations are in operation in Colorado. These help the small shippers to get full value for their stock.

IMPORTANT FARMERS' BULLETINS ON BEEF CATTLE

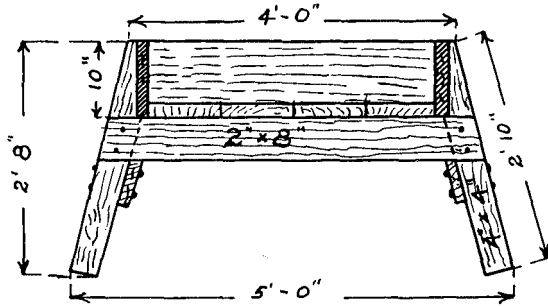
Free on Application to Secretary of Agriculture, Washington, D. C.

- 578—Handling and Feeding of Silage.
- 588—Economical Cattle Feeding in Corn Belt.
- 612—Breeds of Beef Cattle.
- 811—Production of Baby Beef.
- 655—Cottonseed Meal for Beef Cattle.
- 873—Utilization of Farm Wastes.
- 909—Cattle Lice and How to Eradicate Them.
- 718—Cooperative Shipping Associations.
- 1017—Cattle Scab.
- 1018—Hemorrhagic Septicemia.
- 1218—Beef production in the Corn Belt.

BULLETINS ON LIVESTOCK AND RELATED SUBJECTS

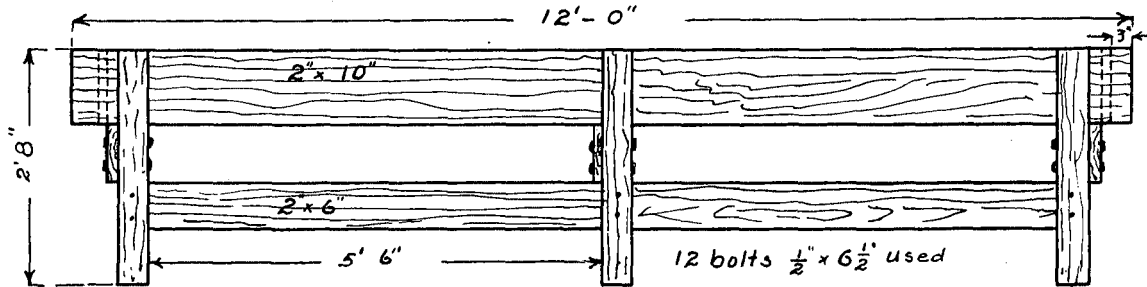
Address Extension Service, Colorado Agricultural College Fort Collins, Colorado

- 142-A—Poisoning by Larkspur.
- 144-A—Sheep on the Farm.
- 148-A—Cooperative Marketing of Livestock.
- 154-A—Hemorrhagic Septicemia in Sheep.
- 156-A—Prevention of Some Hog Diseases.
- 158-A—Sunflowers for Silage.
- 164-A—Stock Poisoning on the Range.
- 166-A—Some Common Parasites of Livestock in Colorado.
- 168-A—Management of the Dairy Herd.
- 172-A—More Silos and Larger Profits.
- 175-A—Abortion Disease of Cattle.
- 182-A—Prevention of Blackleg.
- 193-A—The Dairy Heifer and her Calf.
- 194-A—Principles of Pork Production.



END VIEW

For further information address
ANIMAL HUSBANDRY DEPARTMENT
COLORADO AGRICULTURAL COLLEGE
Fort Collins, Colo.



SIDE VIEW
 Scale $\frac{3}{4}$ " = 1'-0"

Cattle Feed Bunks used at Agricultural College