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**BEEF PRODUCTION ON HIGH  
PRICED LAND.**

BY  
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## BEEF PRODUCTION ON HIGH PRICED LAND.

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### THE PLACE OF BEEF CATTLE PRODUCTION AMONG THE PERMANENT INDUSTRIES OF THE CORN BELT.

(By H. J. Waters, Dean Missouri College of Agriculture and Director of the Experiment Station.)

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It may be accepted as final that the permanently prosperous systems of farming in Missouri and elsewhere must be based on animal husbandry, and must involve the feeding on the farm of the



Fig. 1. Cattle of this breeding can be made fat at almost any age. Yearlings used by the Experiment Station in feeding trials.

principal products of the land and the returning to the soil of the largest possible proportion of the elements of fertility which the plant takes from the soil in growing.

Thus it is not a question as to whether live stock shall be grown extensively or not, but rather what particular kind of stock, or what special phase of live stock farming will prove most profitable and enduring.

It is true that hogs and sheep possess important advantages over beef cattle, particularly with respect to the cheapness of production and a somewhat higher average price at which the live

animal sells when fitted for the market. On the other hand, cattle possess certain very marked advantages over all other classes of live stock, such as comparative freedom from parasites, contagious diseases, injury from other animals, and the ability to convert large quantities of coarse and otherwise unmarketable material into food of very high value to mankind.

These facts become more and more important as the country becomes more densely populated and the diseases and parasites on our farms naturally increase in prevalence and extent of injury, and especially do they become more important when the necessity for manufacturing meat out of cheap and mainly coarse material grows larger.

The practice so common now, particularly in the corn belt, of converting large quantities of palatable and concentrated material like corn into meat products cannot long endure. This corn will sooner or later become so valuable for human food that it cannot be profitably converted into meats, and our animal products must then be manufactured chiefly from the coarse waste materials of the farm and the by-products of our factories.

It is perfectly obvious, therefore, that cattle utilized wholly or mainly for the production of beef must continue to be an important phase of our agricultural industry for an indefinite time.

If, therefore, this class of farm animals does not yield so large a profit as other kinds of animals on our high priced land and in the present state of the labor market, the situation is to be met by improving our methods of producing them rather than by going out of the business.

#### BETTER ANIMALS THE FIRST STEP TO TAKE.

In no other direction can more be immediately done and with such slight expense to meet this situation and to increase the profits to be derived from cattle than by making a marked improvement in the quality of the animals themselves.

Some fifteen or twenty years ago, when dairying was really beginning to be put upon a rational basis as an important agricultural industry, the first and most important step then taken was the elimination from the successful dairy farms of every cow that failed to produce enough milk and butter to pay a profit. A sort of minimum of production for profit was established, and all fail-



Fig. 2. The type of mother from which profitable calves must come. Shorthorn cow owned by the Missouri Agricultural College.

ing to come up to this mark, so to speak, were consigned to the butcher. At first this dead-line was fixed at a very conservative point, viz., about 200 pounds of butter in a year, so as not to have so large a proportion of the average herd fall behind as to be discouraging to the owner. Later this amount was gradually raised, until now in the very best dairy herds 350 or 375, and in rare cases 400 pounds of butter per year would be regarded as the minimum production of a cow that is entitled to a permanent place.

Precisely the same principle must be applied to the beef herds on the high priced land of our corn belt, if this industry is to continue to hold its own in competition with pork and mutton, and horse and mule, and dairy production. Thus, every cow failing to produce a calf worth \$20.00 in the fall and in addition, after the calf is weaned, to produce enough milk and butter to pay for her feed and the labor involved, up to within a reasonable time of calving, should be sold for immediate slaughter as unfit for a herd cow. Applying the dairy herdsman's method still further, this minimum price for a steer calf at weaning time should be rapidly raised above \$20.00, or the amount of milk and butter the cow is required to produce should be rapidly increased.

In this connection it may be well to say that it is out of the question to expect very high development of the beef qualities at the same time that very high dairy qualities are developed. These two qualities are apparently antagonistic one to the other, and this antagonism manifests itself very markedly when an attempt is made to carry them both along to a high degree of development. In other words, beyond a very reasonable degree of development, the two have not yet been carried together in one and the same animal. If a very high development of the beef qualities of the animals is sought, it must be expected that the dairy qualities must be somewhat subordinated.

Conversely, if the dairy qualities are to be sharply intensified, it is unreasonable to expect the calves to have more than mediocre beef quality. We hear much about the dual purpose cow, which in general is a mediocre beef cow and a fairly good milker, or a mediocre milk cow and a moderate beef animal.

Nevertheless, the average cow of the corn belt now kept chiefly for the production of beef calves is so mediocre a beef animal that she ought really to be a high class dairy cow at the same time. Or this same average cow is a poor enough milker so that she ought to produce a beef calf worth practically twice as much as it is without having her milking qualities affected in the slightest by this rela-

tively high development of the beef qualities. In short, this cow has neither the beef nor the dairy quality very highly developed, and she will stand to have her capacity in one or the other of these directions practically doubled without affecting adversely her present capacity in the other direction. A cow may be excused for lack of high beef qualities if she possess superior dairy qualities. Or, we may overlook a reasonable deficiency in her capacity to give milk or produce butter if she have the form of a beef animal to a very marked degree, and if her calves possess the qualities required to top the market. But a cow poor in both of these directions has nothing to commend her and does not deserve a place on our farms.

The first step would be to eliminate perhaps one-third of the poorest cows, and to eliminate perhaps a large majority of the bulls now in use, and to establish the fixed policy of using as sires none but registered animals of one of the standard beef breeds, such as the Shorthorn, the Angus, the Hereford, or the Galloway, and to stick to one breed rather than to follow the haphazard and miscellaneous crossing that is now so common.

The day has long since passed when any man can afford to use an unregistered sire of any class of farm animals. Not only should the sire be registered, but it should have a good pedigree and should be withal a good individual. This means that to head our grade herds even something better than the culls from our pure bred herds are required. The cattle raiser must be willing to pay for real quality in his sire. The truth is, the culls from these pure bred herds should be slaughtered for butcher stuff instead of being allowed to perpetuate their deficiencies and weaknesses.

A really good pure bred sire is indispensable to success and profit in raising grade cattle, just as it is in raising registered animals. This point cannot be too strongly emphasized.

In short, let the farmer make a systematic effort toward the improvement of his herd, and in five years' time his steer calves will bring an average of \$25.00 per head, where they now bring an average of less than \$15.00. As stated before, there is no one step that is so important to make, and that is so fundamental to the whole beef industry as this one. Upon it depends the entire subsequent profits of the handling of cattle. From such herds would be bred steers worth on the market, 6 cents or 8 cents a pound, in comparison with the average of 4 cents or 5 cents a pound for the plainer sorts.

It is self-evident that it costs no more to make this high class:

beef than it does the cheaper sort. If a manufacturer had the choice of making out of the material he was using a grade of shoes, for example, worth \$4.00 per pair instead of \$2.50 without additional labor or other increase in cost, and requiring only a little closer and more intelligent attention to the finer details of the business, is it not to be supposed that he would make his material into the better grade of shoe? The cases are fairly parallel, and it is our duty to convert our feed and labor into the most valuable and highest priced material possible.

#### AFTER THE CALF IS BORN.

The calf is born with certain tendencies which cannot, so far as we know now, be materially changed, and must be accepted for better or for worse. These relate, among other things; to the size the animal will attain when fully mature, if nourished in the ordinary manner; the length of time required for it to mature; the form it will have when finished; the predisposition either to grow rapidly and not fatten until late, or to fatten at almost any stage of its existence that a sufficient amount of food is given to supply the requirements of maintenance, growth, and fat.

These factors affect vitally the whole financial outcome and are, so far as we now know, controlled by the breeder rather than influenced by the feeder. After the animal is born, therefore, it is practically beyond control in these respects, and it is of the utmost importance that the feeder adapt his methods of feeding and handling to the peculiarities of form, temperament, early maturity, size, quality, etc., of the individuals with which he has to deal. To take an animal for baby beef, for example, that has a tendency to grow rapidly and mature late, would be just as short-sighted as to keep until it is three years old before being put into the feed lot, an animal that has the tendencies toward early maturity very strongly marked, and that is naturally under size, over refined, and wholly unfitted to subsist on the rough feed of the stalk field and straw stack. To take a miscellaneous collection of steers representing all gradations between these two extremes and give them the same treatment and endeavor to finish them at the same time and in the same manner, would be equally wasteful of feed and labor. To state the general proposition differently, to attempt to market an animal at 900 pounds that was designed by its breeding to be finished at 1,500 pounds, or to attempt to make a 1,500 pound steer out of an animal that reaches its highest development at 1,000 pounds, is committing a deliberate and palpable blunder.

In order to economize in labor, it is necessary, of course, to handle all the steers in a given bunch essentially alike, which means that a certain amount of culling is required in order that all that are to be kept shall belong to the same class and respond profitably to the same treatment. Then it is only required that the treatment given be that which is best adapted to the type of animals involved.

To breed steers of uniform type and tendencies, so that they will not require heavy culling at weaning time or the following spring, is one of the most difficult undertakings of the cattle raiser. The beginner should not, however, be discouraged. Men have succeeded to a marked degree in this direction, but it has taken many years of patient work and watching, and a liberal use of good blood.

#### TWO PRINCIPAL CLASSES OF CATTLE RAISERS.

The men who are breeding and raising cattle for beef in Missouri may be divided into two principal classes, each requiring for the best results radically different methods of procedure. The one class is on the better corn land of the State, and the other on land not so well adapted to corn, but primarily adapted to pasture purposes. The men of the first class must rely upon full feeding operations for their principal profits, while the other must get through the winter as cheaply as possible and rely upon gains made at pasture as the chief source of income.

##### *I. Raising Beef on High Priced Land.*

The first class represents the man on productive and high priced land, with only a limited area of rough, untillable land for pasture. Whatever pasture he has, therefore, is on land that is well adapted to the growing of other crops. This class is by far the more important in point of numbers and aggregate investment in Missouri.

Such men, as a rule, are long on corn and winter forage, and generally limit their grazing area and facilities for summering stock to the needs of their breeding herds and work stock. They must, therefore, depend upon winter feeding for their main profits. They have more forage and grain than would be required to merely carry through the winter in stocker condition the animals they can graze through the summer. It is true they might increase their pasture area and cut down correspondingly their corn and forage crop areas, but, broadly speaking, this sort of land is more profitably grown in some hay or grain crop than run to pasture. In other

words, this land is too valuable to be used extensively for pasture. Or, stated differently, pasture crops do not, as a rule, produce enough forage to pay a reasonable return on this sort of land.

By pursuing a systematic crop rotation in which the hay crops are wholly or almost exclusively legumes, such as red clover, cow-peas and alfalfa, and by being particular not to run the land in corn or small grains too frequently, and especially by being careful to feed all the corn and forage on the farm instead of selling a part of it each year, and by carefully saving and applying with a manure spreader all of the manure produced, the productiveness of this class of land may be kept up without laying down large areas to permanent pasture.

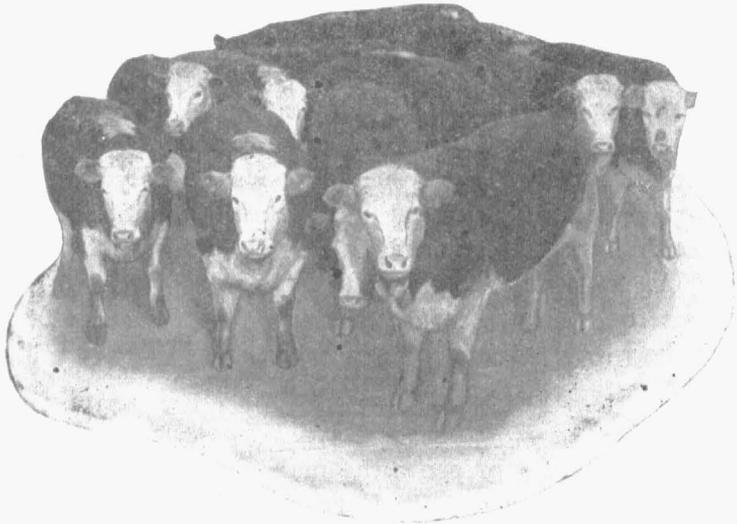


Fig. 3. A profitable type of early-maturing cattle.

On lands not of the very strongest type this system of farming may be slightly modified, by giving especial attention to the production of legume hays and buying onto the farm a portion at least of the corn to be fed with these hays. On a still lighter class of soils this latter plan might be modified still further, by making a part of the grain purchased some concentrate rich in nitrogen and phosphorus, like cottonseed meal or linseed meal.

It goes without saying that crops that exhaust the soil and possess at the same time a comparatively low feeding value, like timothy, millet and sorghum, would have no place in this system of farming or feeding. They deserve a very small and unimportant place in any system of farming that is adapted to Missouri conditions.

*Baby Beef*—For this class of men there can be no argument concerning the advantages of pushing the animals along as rapidly as possible and marketing them as baby beef. It is from the standpoint of this man, and not from the view-point of the professional feeder who buys his animals when they are ready to put in the feed yard, that this matter will be briefly considered. It was clearly pointed out in a previous annual report of the Board of Agriculture\* that these professional feeders prefer animals of reasonable maturity because they fatten more rapidly, more uniformly, more certainly, and require somewhat less attention to the niceties of feeding. These men, in buying feeders, are indifferent to the question as to what they may have cost the man to raise them, so long as they may buy them ready to be put in the feed pen, dehorned, vaccinated against blackleg, etc., with sufficient margin to fully or practically offset the additional cost in the gains required to be made in fitting them for market.

The attitude of this professional feeder toward the matter of baby beef is not a safe guide for the raiser of cattle and should really not influence in the slightest his practice. The two men sustain a radically different relation to the problem, and each should be controlled by his own set of conditions. The one thing which has contributed more than any other to the haziness and confusion of the whole matter has been our failure to define sharply this difference. One in buying his feeders can overcome the handicap age imposes upon the cost of gains, but the raiser of cattle has no such recourse and must squarely face the issue of paying for every day the animal lives, whether it gain, stand still, or lose in weight.

Obviously the man who raises cattle on high priced land should feed them out as baby beef, and would have occasion to raise and feed in the same connection a large number of hogs, the legume area being especially adapted to the growing and finishing of hogs with a minimum loss from disease and with a maximum profit.

For a man so situated to try to keep his steers over to be grazed the second summer as yearlings, and especially to hold them through the second winter merely for the opportunity to full feed

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\*For an extended discussion of the baby beef proposition from the standpoint of the professional feeder, as distinguished from the cattle raiser, see an article by the writer entitled "Limitations of Baby Beef Production," 30th Annual Report of the Missouri State Board of Agriculture, pp. 114-166. Also bulletin 76, Missouri Experiment Station, p. 29. Also a bulletin of the Missouri Experiment Station soon to be published, by Professor F. B. Mumford, reporting in detail the results of eight years of careful feeding experiments with cattle of different ages at this station.

them on grass as two-year olds, would be wasteful of feed and opportunity.

The animals should be on full feed before the weaning process begins, so as to prevent the heavy shrinkage that it usually entails. Following this should come vaccination against blackleg, and dehorning.

The full feeding should continue until early the following June or July when, if the cattle are bred right, they will be as fat as they can be profitably made under ordinary states of the market, and will weigh from 950 to 1,050 pounds, and will have paid for their feed and raising and left a good profit.

Cattle of this weight, when of good quality and carrying a reasonable finish, are never over-supplied on the market, and bring, especially at that time of year, as good a price as any class of cattle sold.\*

It goes without saying that steers to be profitably handled in this way must be well bred, uniform in type and quality, and must be capable of making rapid gains, of fattening early and finishing up smoothly.

For a general discussion of the feeds to use and general methods of handling the cattle, the reader is referred to the second part of this paper, which deals especially with these problems.

## *II. Raising Beef on Thinner Soil.*

The second class of farmers is composed of men whose land is better adapted to grazing than to grain growing, and is too rough, too much inclined to wash, or too thin to be successfully and profitably grown in corn, except at intervals. Such a man is long on pasture and short on grain and, as has been stated before, must look to the grazing period for his profits, and must plan to get his cattle through the winter at the minimum expense and in a moderately fleshed condition, in order that they may graze most profitably.

It is true a man so situated might grow an excess of clover and cowpea hay for the benefit it would be to his land as well as for its value in growing stock, and then buy extra corn and feed his calves out the following summer on grass, precisely as described for the first class of farmers. If he be located convenient to a large, regular and cheap corn supply, there is no reason why this practice would not be as profitable in one case as in the other, and

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\*For a full discussion of the influence of the season of the year, weight, quality and fatness upon the selling price of cattle on the market, see Missouri Experiment Station Bulletin No. 76, pp. 42-51.

the farmer on thin land would have even more reason than the one on the stronger land for adopting this practice, since he stands in greater need of the plant food which would be acquired without cost in the purchased feeds. In no other way can the fertility and productiveness of land be built up so rapidly and so cheaply, except, perhaps, by feeding dairy cows, which would, on account of the higher priced product obtained, justify the purchase of larger quantities of feed rich in nitrogen and phosphorus, such as cottonseed meal, linseed meal, etc.

In general, however, the farmer on the thinner grazing land will not have such a corn supply available at a price that will enable him to feed this class of stock, and his only recourse would be to make his money out of the cheap gains made on grass. This means that he should carefully save all of his corn stover and feed it with his clover or cowpea hay and a limited amount of corn to his calves through the first winter.

The question as to whether it is best to sell as calves or carry them through the first winter and sell as yearlings at grass—in short, the whole question as to when to sell, can only be answered by the individual himself, because he alone is in possession of all the facts with respect to supply of feed, etc.

If they are to be sold as calves, they should be carried up to the selling point in a strong, vigorous condition, and be offered with the milk bloom on. At no other time in the life of a steer does it look so attractive and promising—not even when finally fattened for slaughter. But if to be wintered, they should be weaned while the grass is yet good, so that growth may be not checked, or if the grass be short, they should be taught to eat and be fed liberally with some good forage, like bright clover hay, and a limited amount of grain through this weaning process. The dehorning and vaccinating against blackleg should immediately follow.

*Calves Should be Well Wintered*—It is especially important that such cattle be made to grow well the first winter, which means that they should be fed liberally. The rate of growth at this period of their life is normally much more rapid in proportion to the weight than later. Therefore, to restrict the growth process at this stage of the animal's life, may affect the size of the animal and it certainly will increase the cost of growing it to a normal size. The fact that they are to be grazed the following summer rather than fattened renders it imperative that they be not so heavily fed as to carry to grass any considerable amount of fat. It is the poorest possible policy to lay fat on animals in the winter at a large ex-

pense, to be lost the following summer at pasture.\* This is reversing the almost universal practice of successful farmers. Gains are made very much cheaper in summer than in winter. Whenever possible, fat should be stored in summer to assist in cutting down

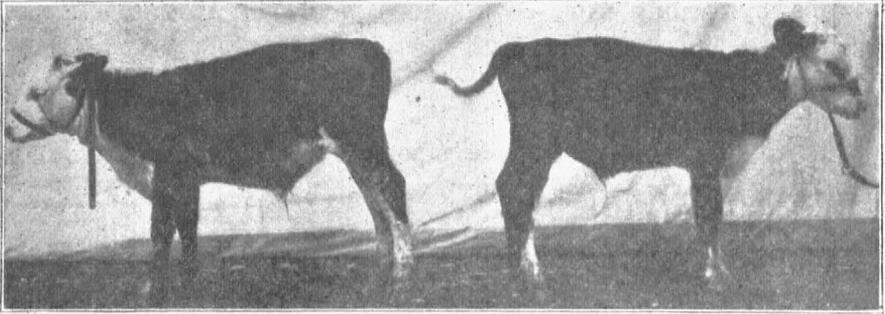


Fig. 4. Calves of excellent breeding that have been underfed.



Fig. 5. Calves that have been well-bred and well-fed.

the expense of the wintering process. It is the part of good management, therefore, to have an abundant supply of grass, so that all the fat possible may be made in summer at pasture, to be used the following winter in helping to carry the stock through in case of a shortage in the winter forage.

*Fat Not Necessarily Wasted when Animals are Permitted to Get Thin*—It is a very old, and in general, a good maxim, to “never lose the calf fat.” This is the same as saying an animal should never be allowed to get thin, or should never be allowed to lose its stored fat. Certain circumstances, however, that compel an animal to use this fat need not in the strictest sense compel it to lose it,

\*For a full discussion of this point, see Missouri Experiment Station Bulletin No. 75, on Wintering Yearling Cattle, pp. 46-53.

notwithstanding the fact that the animal has disposed of it and is thin. It might be likened to a man with money deposited in a bank. He sees an opportunity to use this money to good advantage, and withdraws it from the vaults of the bank, and in one sense spends it, but really invests it, or exchanges it for another form of wealth which he considers to be more valuable or useful to him. The results of some experiments\* now in progress at the Missouri Experiment Station strongly indicate that fat in young and growing animals may be used to support the growth process if necessary. It is not to be believed that fat may contribute directly to the growth of the animal, that is, to the increase in size and weight of the muscular tissue, skeleton, hide, etc., but when such an animal is on a limited ration it is entirely possible that the stored fat of the body may be used to supply a portion at least of the animal heat and the energy required in the ordinary activities of the animal, thus protecting the proteids in the food so that they may be used by the animal for making growth. If the animal had no stored fat to use for the protection of the proteids in the feed, or if this fat resorping process, so to speak, could not go on in the animal organism, these proteids would need to be burned to supply fuel for the organism instead of being manufactured into muscle and skin and other body tissue.

The outcome of it all seems to be, therefore, that it is possible to lay on fat in summer cheaply and to draw upon this reserve in winter to such an extent that the amount of feed required to carry the animal through the winter is reduced without seriously interfering with the rate of growth. Precisely this has taken place on the ranges since animals first inhabited this area, and this is what occurs on our best farms, even when young animals are fed moderately in winter following a period of liberal nourishment at pasture.

We are perfectly familiar with the phenomenon of young and rapidly growing animals going out to grass in the spring somewhat heavier than when they came into winter quarters the fall before, but thinner, i. e., carrying less fat than they did in the fall, but taller, and materially larger. In general, to carry such animals through the winter without the loss of any of the fat, would require a heavier and richer ration than is ordinarily given to this class of stock, even on our best farms. It is obvious, therefore, that fat that is so used is neither lost nor wasted, but is rather exchanged

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\*Results not yet published.

for growth which at the time is deemed to be of more importance to the owner of the animal than the fat.

As referred to elsewhere, to reverse this process with respect to the seasons of the year, and store fat in the winter with expensive grains to be used in the summer to help the animal grow, is using fat that has been manufactured at the highest possible cost to make a product which at this season of the year is cheap to make and of relatively low value.

It is not to be understood from this that too much reliance should be placed on the fat stored in summer for supporting the growth process in winter. In truth, except in seasons of very scarce and high-priced winter forage, it would be safer to attempt to hold enough of the summer fat to keep the animal thrifty and vigorous and support the growth process in winter mainly by the feed then supplied. To make this matter clearer, it may be stated that whenever the body weight of the animal is held stationary, i. e., without gain or loss, and the animal continues to grow taller and larger but thinner, which in the case of young animals always happens, the fat is being used to support growth in accordance with the manner outlined above. When the animal declines in weight the fat is being used wastefully by being burned up to supply the ordinary maintenance requirements of the animal, and in ordinary practice this use of fat is wholly unjustifiable. When the animal is made to gain rapidly enough to prevent it from getting thinner it is reasonable to suppose that sufficient food is being given to supply the insistent demands of the growth process, and under these circumstances it is assumed that no previously stored fat is being resorbed.

*Maintain the Maximum Rate of Growth*—It should be kept constantly in mind that it is growth that is now sought to be produced in these animals. A steer uses its feed for three separate and distinct purposes, viz.: Maintenance; production of growth; production of fat.

It has already been pointed out that the nourishing of these animals on such a plane in winter as to cause them to store up much fat when they are to be grazed the following summer is inadvisable. It is nevertheless very important that the highest rate of gain be maintained that is possible, without laying on a considerable amount of fat. It is not known exactly how far the growth process may be promoted without causing the storing of fat as well. That is, we do not yet know what the upper limit of growth is before the animal begins to deposit fat. Nor do we know how much

this falls short of the maximum rate of growth of which the animal is capable. Clearly this would vary greatly with different individuals, and likewise with the same individual at different periods in its life and in different conditions of flesh. Occasionally we find an animal with the tendency to fatten so marked that it is impossible to maintain a very moderate rate of growth without the deposit

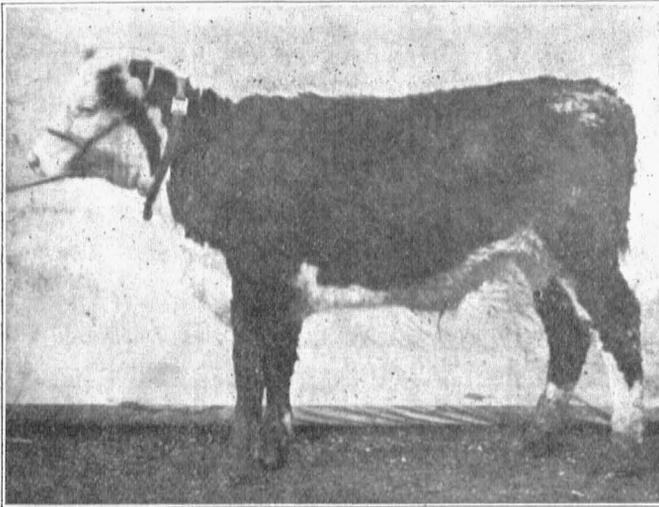


Fig. 6. The sort of steer that will grow slowly and fatten easily. Such animals have the early maturing quality so highly developed that they lack in thrift and size.

of fat occurring at the same time. In other words, the two processes, in this animal at least, are in a sense, inseparable. The other extreme is the very vigorous, growthy, late-maturing animal that will when young, and frequently up to the age of eighteen months, eat to the full limit of its appetite of a concentrated and palatable ration and will gain perhaps as much as two pounds a day for a considerable length of time without showing any material deposition of fat. In this case the upper limit of the growth process is reached in the early life of the animal, at least, without, at the same time, having it overlap the fattening process.

Between these two extremes stands the average animal as at present developed, which will maintain in its younger life, or say within the first year or year and a half of its life, a rate of growth that will be considerably under the maximum gain in live weight, of which the animal is capable. To feed this animal, then, all it will eat of an ordinary grain ration would require that a considerable portion of the feed consumed be not manufactured into new growth tissue, but be merely stored on the body as fat.

The cattle man, however, is only interested in the general proposition that there is an upper limit of growth without the storing up of any appreciable amount of fat. It is believed that cattle that are to be handled as stockers should be kept in winter as near

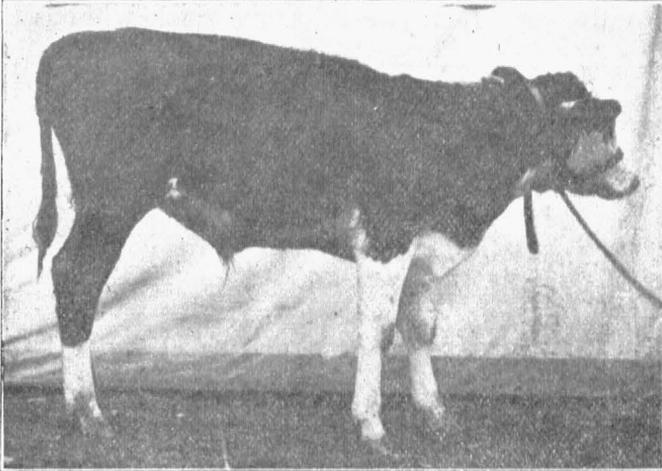


Fig. 7. The growthy and thrifty type. Matures slowly and makes a large steer. Fattens slowly while young.

this point as possible. In summer all the gain that is possible on grass alone is acceptable. Anything short of this will unduly prolong the growing period and at the same time increase unnecessarily the cost.

*Maintain Good Pastures in Summer*—Too much emphasis cannot, therefore, be laid on the fact that in this system of cattle growing the profits come from the gains made on grass in summer, and from marketing to good advantage the coarse, rough material, such as corn stover, straw, etc., and the feeding of the legume hays on the farm so as to maintain the fertility. To so overstock the pastures that the cattle will fail to make profitable gains in summer, and consequently go into winter quarters thin, weak, and dwarfed in size is to virtually throw away the entire profit of the enterprise. Or to make good gains in the early part of the summer on the flush of grass and to permit this to be lost through short grass, inadequate water facilities, etc., during the hot, dry months of July and August and early September, is equally wasteful.

Besides, to make cattle of good quality, such as we must now produce to pay a profit, means a uniform and liberal nourishment from birth to maturity.

## FEED AND CARE DURING THE FIRST WINTER.

Under this system the chief part of the ration of our cattle must be roughage, but calves from weaning time until grass, deserve, and will pay a profit on, a more liberal ration. At this age they are less capable of utilizing fodders of low palatability and nutritive value than later in life and less than the breeding stock of the farm. This means that a considerable part of the roughage for the calves the first winter must be legume hay, but with the supply of corn fodder on the ordinary farm it is not necessary or even advisable to make clover or cowpeas the sole roughage. Something like one-third of the daily roughage consumption should be of field cured corn stover. When wheat or oat straw is available it is a good plan to let them have the run of the strawstack. Then feed them liberally on bright, well cured clover or cowpea hay. If the pea hay should contain very much grain, the amount offered would, of course, be correspondingly less. Ordinarily the rest of the ration should be corn. Perhaps the best form in which this can be fed is shelled. If facilities are already provided, and it is not too costly this corn may be crushed, cob and all, to good advantage. It should never be fed as corn meal, i. e., shelled corn finely ground, without mixing it with ground oats or bran. These two latter feeds, however, are entirely too expensive to be used for this purpose. The calves will often learn to do their own shelling, and in such cases ear corn is most satisfactory. The amount of grain to give will vary with the season of the year and the weather, but in general, three pounds per head in the fall and about four pounds per head during the worst weather of winter and early spring will be found to be about right. Instead, however, of feeding a fixed amount, it is best to be governed wholly by how the animals do. If they are thrifty and vigorous and yet not showing a disposition to fatten, it is certain that they are being fed approximately to the profitable limit. The moment they begin to show a disposition to fatten, the feed should be slightly reduced. If, on the other hand, while still growing they show a tendency to get thin, and the coat shows an unthrifty condition, the amount of legume hay or grain should be increased.

*Winter Pasture*—In earlier times, when land was more abundant and much cheaper than now, it was a very common and well approved practice to save a considerable area of blue grass to be grazed during the winter. So long as this pasture remained good, cattle required no additional feeding, except during extreme

weather. In general, however, this is not an economical practice, because the amount of grass produced when allowed to grow without being cropped during the summer is less than when grazed. This is essentially an attempt to make hay out of blue grass, minus the expense and labor of harvesting, curing and feeding it. Moreover in many seasons a large part of the summer growth is seriously injured by rains and freezes, and only the lower stratum which is well protected, remains unweathered and palatable. With the present high price of land and the necessity for getting the maximum crop from each acre each year, this practice will become less and less common. It should not be understood, however, that the pasture may not be so managed as to be strong at the close of the growing season, but in general it will be found best to have it eaten off reasonably close by the time real winter weather sets in. This, therefore, involves the taking care of the cattle from the early winter to the time grass comes again in the spring.

The sowing of wheat or rye for winter pasture, especially for calves, has something to commend it, but its value is in many cases somewhat overestimated. Where wheat is grown for the grain and is on strong enough land to stand pasturing without materially injuring the crop, and will at the same time produce pasturage enough to be of real worth to the cattle, it is worth considering. But to sow rye or wheat specially for pasture on land that is not particularly adapted to either of these crops, and therefore, get sparse growth and one which will give the cattle only a taste of green succulent food, and therefore a distaste for dry and comparatively unpalatable feed like field-cured corn stover, will be making winter pasture harmful rather than helpful.

It is a common notion that rye is a hardier and stronger growing and altogether more productive plant than wheat, and is most generally recommended for this purpose. According to the writer's experience, however, wheat for fall and winter grazing is quite the equal of rye and has the advantage of keeping the farm free from rye, which is a very important matter when wheat is to be grown for the grain. Besides rye seed is usually difficult to get. It is true that rye comes along somewhat faster in the spring after vegetation in general starts, but this is a time of year when there is less pressing need for green feed than earlier.

In general, cattle on wheat fields or winter rye pasture will require closer watching than when handled in any other way, because they are likely to become very thin and exceedingly weak before the owner realizes it, and will require careful nursing and

heavy feeding to bring them back to strength and vigor again. The length of time required for a bunch of thin, weak wheat field calves to get well started to gaining, either when grazed or full fed, must have impressed itself upon every cattle man who has had experience with them. All this is intended to be a word of caution against relying too largely upon this class of winter feed rather than to discourage a reasonable use of it.

Of course, there is always considerable winter pasture in the stalk fields in addition to the stalks themselves. The grass that has grown during the summer along the fences, in the uncultivated waterways, etc., cannot be utilized in any other way to advantage than by running the cattle in the field after the corn is removed.

We are gradually approaching a system of agriculture, however, which will not have stalk fields for the cattle to run on in winter. The corn fodder will be field cured and fed to the stock direct, or preserved in a silo. For the present, however, we are producing more fodder on many farms than it would be profitable to utilize in this way, and the stalk field is the inevitable result and must be utilized essentially as it is now. The mistake is very common, however, of relying too much or too long upon the stalk field, i. e., of requiring the animals to eat it out too closely before they are given anything else. Such practice almost invariably involves a shrinkage in weight. It goes without saying that any shrinkage in weight is, under ordinary circumstances, unjustifiable.

#### WINTER SHELTER.

The practice of the farmers of the corn belt has been open to some criticism along this line, but he has not blundered so seriously as one not wholly familiar with all the facts might suppose. At any rate, it is not necessary to begin the cattle business in a rational way to build expensive barns. In the latitude of Missouri, the cattle will be well off with free access to a shed open to the south, wholly closed on the north, and with a windbreak on the east and west. The shed should be so located as to insure good drainage and should be deep enough to permit the animals to keep out of the storm when it comes from the south, but not so deep as to not be almost entirely flooded with sunshine when the weather is clear. It is of the utmost importance that the ground under the shed be kept dry. Under ordinary circumstances, however, cattle should not be compelled to remain under the shed either by confining them there or by having the lots so small, and therefore so muddy that there is no other reasonably comfortable

place for them. During a severe storm it will of course be advisable to confine them to prevent the weaker ones from being forced to remain outside, but in general, sunlight and fresh air, with an opportunity to get away from the odors of the barn or shed and find a sunny slope protected from the wind, will go a long way toward keeping the appetite whetted to the utmost and keeping the cattle in the most thrifty condition possible. In ordinary weather the cattle themselves are the best judges of when they should repair to the barn or shed and when to remain outside.

It goes without saying that young animals require more shelter than older ones, other things being equal. It is more strikingly true that poorly nourished animals require more protection from cold than do those that are well nourished. The truth is that the confining of cattle in a warm barn when they are on full feed is detrimental to their rate of gain and to the economy with which they will gain.\* To expose thin and poorly nourished animals to cold and storms is exceedingly unprofitable as well as cruel.

The comparatively small cost of suitable sheds makes it entirely feasible to build more than one on the farm and to make the prime consideration of their location the convenience to the feed. At best it is both troublesome and expensive to handle coarse fodder. The nearer, therefore, the animals are to this supply, the more convenient and in all respects the more satisfactory it is. A practice all too common is the confining of stock in muddy lots near the house all winter and hauling in all of the feed from even the most remote parts of the farm, then being at the expense of hauling the manure back. This is an awkward and expensive arrangement that may be corrected at comparatively little expense, by building one or more additional sheds.

The proper preservation of the manure and the convenience with which it may be handled and applied to the parts of the farm needing it, must have full consideration in the location and arrangement of sheds, feed lots and yards.

*The Silo on the Beef Farm*—One of the most common and yet fundamental errors is the assumption that the silo is profitable only to the dairy farmer. The truth is, the silo is quite as important for the beef man. Particularly is this true of the man who is wintering cattle in accordance with system here outlined.

With silage, the grain may be omitted, the corn silage, if properly made containing enough grain. What we have found to be an exceedingly profitable ration is corn silage and a legume hay and

\*For the results of experiments bearing on this point, see Missouri Experiment Station Bulletin No. 76, pp. 54-61.

so much field cured corn stover or wheat straw as the animal will relish for a change. Good thrifty calves of the beef type should be given about 12 to 16 pounds of silage and nearly all the clover or cowpea hay that they will eat, with access to bright clean corn stover or a straw stack.

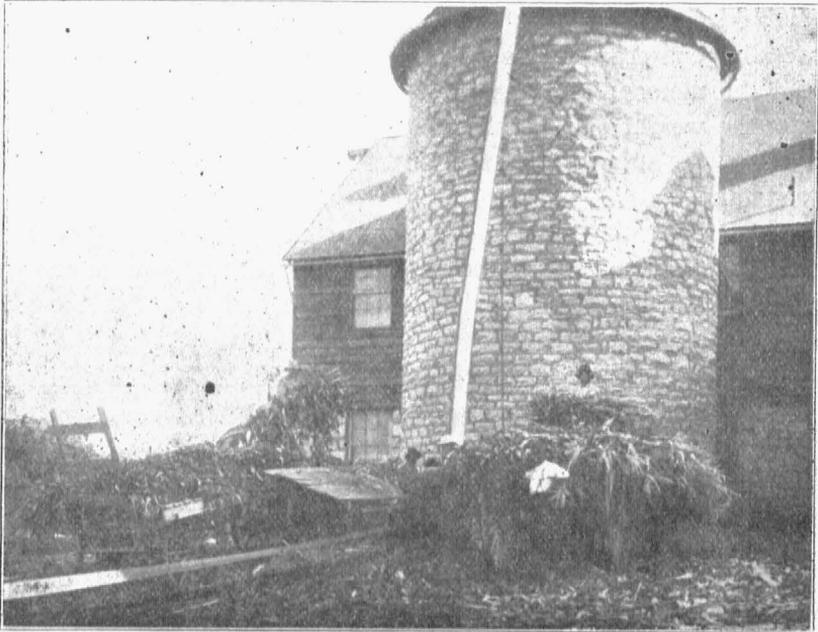


Fig. 8. Making silage at the Agricultural College with which to winter the beef herds.

#### FEED AND CARE DURING THE SECOND WINTER.

The winter care of cattle becomes simpler as the animals grow older and as their capacity to utilize coarse material of low palatability increases. Then the rate of growth in the second winter is not so rapid as in the first in proportion to the size of the animal, or in proportion to the ability of the animal to eat. Moreover, it is perhaps not so vital to the general outcome that the upper limit of the capacity to grow be reached in this second winter as it was in the first. Nevertheless, well bred yearlings will respond profitably to a system of feeding that is liberal enough to maintain good gains, and yet these gains will not seriously interfere with their capacity to gain at pasture the following summer.

If these animals are to be grazed as two-year olds, they will respond best, taking the whole season into consideration, to one system of handling and feeding, whereas if they are to be put on

feed at the approach of grass and fattened as two year olds, they are best handled in another way.

One of the commonest mistakes is to allow what the farmer calls the "grass shrink" to occur. This means that the cattle have been allowed to remain on pasture until the grass is so short, or on account of fall rains the late growth is so immature and washy, that the animals shrink decidedly in weight. It is a universally good practice to supplement the pastures with some sort of feed the moment they become so short as to fail to maintain at least the weight of the animal. It is better to adopt the policy of feeding the animals the moment the pasture ceases to produce good gains.

Another common mistake is the turning of cattle to pasture too early in the spring when the grass is yet soft and washy and contains really very little nourishment. It is bad both for the stock and for the pasture.



Fig. 9. Harvesting pure-bred corn on the Agricultural College Farm for the silo.

As before intimated, the method of wintering should be varied in accordance with what is to be done with the animals the following summer.

*If to be Grazed the Following Summer*—If the steers are to be grazed the following summer, it has already been pointed out that there is a very definite limit to the amount of fat it is profitable to put on these animals in winter.

In this case the feeds to be used should be essentially the same as recommended for calves, with the difference that more field-cured corn stover and straw, particularly oat straw, may be used to advantage. But under no circumstances should cattle of this sort be wintered on corn and corn fodder, or corn and millet, or corn and timothy, or corn and sorghum, or corn and prairie hay. A legume hay is absolutely essential to the most profitable results. This is very clearly shown by a large number of experiments which have been conducted at the Missouri Experiment Station, of which the following will serve as a fair type:

THE VALUE OF DIFFERENT ROUGHAGES IN WINTERING YEARLING  
CATTLE.

	Total gain per lot.
6 lbs. shelled corn; timothy hay.....Total.....	318 lbs.
6 lbs. shelled corn; clover hay.....Total.....	641 lbs.
6 lbs. shelled corn; millet hay.....Total.....	119 lbs.
6 lbs. shelled corn; sorghum hay.....Total.....	166 lbs.
6 lbs. shelled corn; one-half corn stover, one-half clover hay. Total.....	533 lbs.

With steers of this sort, from four to six pounds of shelled corn per day is as much as can profitably be fed under the circumstances, and this may be omitted entirely if corn silage made in the proper manner be used instead of corn stover. In that case about 15 to 25 pounds of silage and from one-half to two-thirds of all the legume hay they will eat and access to corn stover or straw will supply conditions most favorable for cheap and liberal gains.

*If Cattle are to be Fed the Following Summer*—In this case it is usually good policy to increase the grain the middle of February or first of March, and have the animals in good strong thrifty condition by the time grass comes. The presence of fat stored in winter will not be deleterious to the gains made in summer on full feed, and will materially shorten the summer feed required. No change in the kind of feed to be used would be recommended. Ordinarily it is not advisable to undertake this heavier feeding earlier than the latter part of February or the first of March, because it is seldom profitable to attempt to make heavy gains during the unsettled weather of late winter. By the middle or latter part of March, however, or about the time the cattle will be normally well started on half feed, weather conditions are very favorable for cheap and rapid gains. When grass comes the animals may be continued on half feed through May and June, or may be even reduced somewhat below half feed. Or, the grain ration may be gradually increased until they are on full feed, depending entirely upon the state of the market, upon whether it is important to get them fin-

ished early or not, and upon the kind of grass. If the weather is disposed to be somewhat dry and the earlier growth of grass is very nutritious and palatable, they will make excellent gains and go on fattening on a limited supply of grain. If, on the other hand, the season be rainy and warm and the grass rank and washy, the tendency of the cattle will be to grow and not to fatten, unless they are crowded on full feed, and even then it is oftentimes difficult to more than make a big growth during these two months.

*If the Cattle are to be Sold as Feeders*—In case the cattle are to be sold as feeders, it is quite important that they be warmed out, as described in case they are to be fed. This warming process has two very important advantages.

First, it enhances very materially the appearance or attractiveness of the cattle so that they will sell more readily and at a better price than when thin and carrying a starry coat.

Second, by this process the alimentary tract is filled and the weight of the animal is increased out of proportion to the cost of the same. For example, in putting a steer on full feed there is an increase in weight of from 20 to 60 pounds, depending upon the size of the animal, that is mainly "fill," but which brings as much per pound as any other weight when the cattle are sold alive and is of value, as has already been pointed out, in making him look thicker, flank down better, have a more restful and contented expression, and in short, altogether more thrifty and attractive.

This applies to cattle to be sold from grass in the fall as well as to those which are to be offered from the wintering pens in the spring. That is, cattle that are to be sold from pasture in the fall may be very profitably fed for 30 or 40 days, or even 60 days, beginning with green corn. The gains secured and the improvement in the appearance of the animal are out of all proportion to the cost, and will be reflected in the price the animals will bring per pound and in the weights when driven over the scales.

It would seldom be found profitable to carry cattle through the third winter. That is, they should be sold the spring or fall they are two years old at least. With plenty of grass, two-year olds graze very profitably.

*Gains Made on Grass in Summer by Yearlings and Two Year Olds Contrasted*—Sometime ago the writer asked more than a thousand of the most successful cattlemen of Missouri, Illinois, and Iowa what was, in their experience, the average gain of yearling and two year old cattle at grass without grain, and the following is a summary of their answers:

## AVERAGE GAIN PER MONTH FOR THE ENTIRE SEASON ON GRASS ALONE.

	Year- lings.	Two year olds.
Missouri .....	47 lbs.	53 lbs.
Iowa .....	48 lbs.	52 lbs.
Illinois .....	45 lbs.	52 lbs.

This was figured on the basis of a six months grazing period, or from about the first of May until the end of October. The cheapness of these gains will be apparent when it is realized that a liberal charge for the pasturage of cattle of this sort is from 75 cents to \$1.00 per month.

Assuming that 75 cents per month be charged for yearlings, the average cost per pound of gain on the basis of the estimates in the foregoing table, taking 47 pounds per month as the average, would be approximately \$1.50 per hundred.

Assuming a charge of \$1.00 per month for pasturage for two year olds, and an average gain of 52 pounds per month, would make the summer gain cost an average of \$1.92 per hundred.

When these figures of the cost of gains are contrasted with 6 cents, 7 cents, or 8 cents per pound for gains made in winter, the advantages of making all the gains possible in summer are self-evident.

## PART II. FATTENING CATTLE FOR THE MARKET.

The man who fattens cattle for the market is not usually the man who raises cattle. The fattening of cattle has come to be a profession large enough to engage the entire attention of an important class of farmers. As a rule these feeders have no particular interest in where or how the cattle may have been raised, so long as they have been bred properly and may be bought at a price that will bear the expense of the fattening process. In the fitting of cattle for market, the laying on of fat is the prime consideration, and the doing of this in the shortest possible time, has always been regarded as especially important. In the raising of cattle, as has been pointed out in the earlier part of this article, the production of growth is of chief importance.

Growth is, commercially speaking, relatively cheap to make, and sells for a comparatively low price. Fat, on the other hand, is from every point of view the most expensive animal product to make, and has a high commercial value, because of the degree to which it enhances the value of the carcass already produced. It is

in consideration of this enhancement of the value of the carcass that the fattening process is commercially possible. This is tantamount to saying that the value of an animal is enhanced by the fattening process out of all proportion to the value of the actual pounds of gain made.

#### THE PROFESSIONAL FEEDER AND BABY BEEF.

The professional feeder of the corn belt is not yet making baby beef. His preference is very decidedly for cattle in about their two year old form. The reasons for this have already been stated, and are more fully set forth in a discussion of the subject in the last annual report of the State Board of Agriculture, by the writer, entitled "Limitations of Baby Beef Production," and in Experiment Station Bulletin No. 76, pp. 14-31. But the man who is raising his own feeders on high priced land, with a shortage of pasture, as has already been pointed out, will be practically forced to feed his cattle out as baby beef or sell them as calves.

#### SEASON OF THE YEAR BEST SUITED TO FATTENING CATTLE.

The tendency in late years among our cattle feeders has been very sharply toward the abandonment of winter feeding and the general adoption of summer feeding at pasture. It appears, from the experience of these professional men and from very extensive experiments conducted at the Missouri Experiment Station, that cattle may be fitted for market in less time and at materially less cost in summer than in winter.\* The following summary of the Missouri Station experiments will emphasize the importance of the summer season over winter for fattening cattle.

#### COMPARISON OF RESULTS OF SUMMER AND WINTER FEEDING.

	Summer.	Winter.
Time covered by experiment.....	3 yrs.	5 yrs.
Number of steers involved.....	88	105
Average number days on experiment per lot.....	209.3	107
Number of lots.....	12	.....
Total grain consumed.....	355,334 lbs.	238,872 lbs.
Total roughness consumed.....	.....	91,450 lbs.
Total gain in weight.....	43,612 lbs.	23,910 lbs.
Grain eaten daily per steer.....	.....	21.29 lbs.
Roughness eaten daily per steer.....	.....	8.15 lbs.
Grain required per pound of gain.....	8.14 lbs.	9.99 lbs.
Roughness required per pound of gain.....	.....	3.82 lbs.
Average daily gain per steer.....	2.37 lbs.	2.13 lbs.

\*For a full discussion of this subject, see Missouri Experiment Station Bulletin No. 76, pp. 31-42.

The quality of the cattle used in the different experiments was essentially the same. The cattle used in the winter trials were about six months older than those used in the summer tests. In other words, the summer feeding began in the spring, when the cattle were just two years old, whereas the winter feeding experiment began in the fall, when the cattle were approximately 30 months old. This is to the disadvantage of the winter feeding, because the presumption is that the cattle being six months younger when fed in summer were making gains somewhat cheaper. It will be noted, however, that the average length of the feeding period in the winter trials was only 107 days, whereas in the summer experiments it was 210 days, or practically twice as long. This means that the summer-fed cattle were made much fatter, and it is fair to assume that whatever advantage they possessed in point of youth was more than offset by the additional length of the feeding period and the extra amount of fat they were made to carry before the experiment closed. If the comparison is unfair at all, the injustice is done rather to the summer than to the winter-fed cattle.



Fig. 10. Comfort and contentment are important factors in making rapid and cheap gains.

It will be interesting to note that the average daily consumption of roughness per head in winter by cattle on full feed was 8.15 pounds. This means that each steer ate per month about 245 pounds of hay. Rating this hay at \$5.00 per ton, makes the monthly consumption 61 cents per head. If the hay be worth \$6.00 per ton, the monthly charge for roughness would be 73 cents; at \$7.00 per ton, the cost would be 88 cents per steer; with hay rated at

\$10.00 per ton, the charge for this portion of the steer's ration would be \$1.22 per month.

The price per month for pasture of steers on full feed would easily fall somewhere between 61 cents and \$1.22. This means that the roughness consumed in winter will practically offset the cost of grass in summer. The problem is, therefore, narrowed down to a direct comparison of the grain required to produce a pound of beef under the two systems and the relative amount of labor and other expenses involved.

It will be observed that 10 pounds of grain made one pound of beef in winter as an average of all steers, or that a bushel of corn (for the bulk of the grain used was shelled corn in both summer and winter) made 5.6 pounds of beef.

The average of the summer trials shows that 8.14 pounds of grain produced a pound of gain, or that a bushel of corn represented 6.88 pounds of beef, a difference in favor of summer feeding of 22.7 per cent on the cost of grain alone.

It will be noted that the steers gained more rapidly in summer than in winter, the average for winter feeding being 2.13 pounds per day, and in summer, 2.37 pounds per day.

These summaries, therefore, furnish a general answer to the objections raised by numerous writers to the tendency among our feeders toward the discarding of winter feeding and the adopting of summer feeding.

*Advantages of Summer Over Winter Feeding*—The grounds upon which feeders base their preference for summer feeding are various and cover a wide range. The advantages of summer feeding, in the light of all the foregoing data may be summarized as follows:

First. Gains made in summer will require less grain.

Second. Steers will gain more rapidly and get fat quicker.

Third. Steers can be made thick and prime on corn and grass in summer with greater certainty, more uniformity, and with the use of less expensive supplementary feeds like cottonseed meal or linseed meal, than is possible in winter on dry feeds alone.

Fourth. The hog makes larger gains and returns more profit in summer than in winter, and there is a much lower death rate among them.

Fifth. There is a considerable saving in labor in summer feeding over winter feeding, in view of the fact that only the grain has to be hauled, and in view of the further fact that as a rule the steers need to be fed but once a day. The manure is scattered

by the cattle themselves, and the hauling of it out upon the ground is dispensed with. Grass is cheaper than hay, as has already been pointed out, and makes better gains. The handling of the roughage is likewise disposed of.

#### KIND OF GRAIN TO USE.

In the heart of the corn belt, it goes without saying, corn must be the principal and in many cases the only grain used. Under certain circumstances it will be highly advisable to add to the grain some supplemental feed like linseed meal or cottonseed meal, but under these circumstances only in very limited quantities and mainly for a special purpose.

Generally speaking, these supplemental feeds may not be profitably depended upon for making gains, but used principally to improve the attractiveness of the animal and to tide him over the finishing period when gains on corn alone are normally slow and high priced.

*Some Supplement Needed in Winter*—Corn is deficient in protein. This deficiency may be supplied in practice in winter feeding in one of two ways: By using some such feed as linseed meal, cottonseed meal, gluten feed, or bran, on the one hand, or by using a legume hay for roughage, such as clover, cowpeas or alfalfa, on the other hand. Under the head of "Different Kinds of Roughage" it is clearly pointed out that the most profitable way to meet this situation is to provide a legume hay grown on the farm. It is not always, however, feasible to do this, and under such circumstances one of the supplemental concentrates like cottonseed meal or linseed meal must be used.

In twelve years of careful experimenting at the Missouri Experiment Station with a great variety of feeds, with cattle of all ages, from calves to three year olds, and of all grades, from western range cattle to the best bred market-topping natives, we have never found a situation in which we could afford to feed a ration so poor in protein as corn combined with a non-legume roughness, such as timothy hay, millet hay, sorghum hay, prairie hay, corn fodder, or straw. In other words, if we do not have a good legume roughness to combine with the corn, some supplemental feed rich in protein has always given a return in increased gains, in a higher finish, in a better bloom, and in a better selling quality that has made its use profitable. In short, in winter feeding this extra protein seems indispensable to satisfactory results.

Our experience has been uniformly favorable with the use of from two to four pounds of linseed meal or cottonseed meal per day in connection with all of the shelled corn the steers would eat when the roughage was one of these non-legume fodders. As already stated, the cheapest and most profitable gains have uniformly been from the use of corn and some legume hay for roughage, but when the use of one of these hays is out of the question, the use of a supplemental feed in winter is invariably profitable.

*A Supplement not so Much Needed in Summer Feeding*—Summer feeding, with bluegrass and white clover as a roughage, is quite different from winter feeding with such material as timothy hay, prairie hay, millet or sorghum for roughage. The grass is relatively rich in protein, and being quite palatable, it is presumed that the animals eat enough of it to supply the protein required over and above that which is furnished by the corn. At any rate, our ten years of experiments in summer feeding with various sorts of supplements have shown a very small profit over and above the feeding of corn straight, and in a majority of cases this profit has had to be found in the superior selling quality of the cattle rather than in the extra gains made. These experiments have included all ages of cattle, from yearlings to three year olds, and has involved a study of all the common supplements.

These definite results have come out of these experiments: A large and long continued use of a supplement has proven uniformly unprofitable. That is to say, the making of the ration one-fourth or one-third cottonseed meal or linseed meal throughout the entire feeding period of four to seven months has shown poorer financial returns than the feeding of corn straight.

The feeding of so small a proportion of supplement as one-ninth or one-eighth of the entire grain ration throughout the entire feeding period has not been uniformly profitable, but has come nearer paying out in all cases than the large use of supplemental feeds. It does seem, however, that the feeding of a limited quantity, something like two and a half to three pounds per day, of one of these supplements during the last 60 or 70 days has given uniformly satisfactory results. This amount used over this length of time seems to be sufficient to put all the bloom and finish on cattle of ordinary grade, over and above that which corn and blue grass will supply, that it is profitable to give them.

In summer, therefore, there is a very definite limit to the profitable use of these supplements, while in winter, as has already been pointed out, there is no circumstance, except with an abund-

ant supply of legume hay, in which these supplements cannot be used in the proportions of from one-fifth to one-eighth with decided advantage.

*Various Kinds of Supplemental Feeds Contrasted*—As between linseed meal, old process, pea size, and standard cottonseed meal, there is in general comparatively little difference. Our experience, however, has shown that young cattle, particularly yearlings, manifest a decided preference for linseed meal, and will show a better return and a better finish from its use. With three year olds, the cottonseed meal is slightly to be preferred, the price per ton being the same. Formerly, when linseed meal was selling at from \$5.00 to \$6.00 per ton more than cottonseed meal, the latter was universally to be preferred, except for very young cattle, but with the two classes selling at essentially the same price, the linseed is to be generally recommended.

In our experience the hogs have done better following the linseed fed cattle than those receiving any other ration.

Concerning the various gluten feeds, it may be said that they are so variable in composition and character as to be of doubtful value. We have had one car of this feed, for example, to be quite as palatable and apparently as valuable as either linseed or cottonseed meal, and the next car quite unpalatable and undesirable. On the whole it has not given the consistent and satisfactory results we had hoped it would, and it needs to be further tested before being generally recommended.

In general, the value of bran in fattening cattle is largely over estimated, and is far beneath its cost. Except for the feeding of show cattle or the finishing of a bunch of strictly fancy Christmas cattle, the writer knows of no circumstance under which bran can be profitably used in fitting cattle for market.

In general, the same may be said of oats, except on farms far removed from the market and where the expense of transporting the oats to the railway and the hauling of linseed meal back would be prohibitive. Even under these circumstances, a good, bright clover hay, or bright, well cured, alfalfa hay would be cheaper and would serve the same general purpose on the ordinary grade of fattening cattle. This, again, does not apply to the making of show cattle, nor to the finishing of fancy Christmas cattle.

#### THE VALUE OF DIFFERENT KINDS OF ROUGHAGE.

The importance of roughness in fattening cattle has in general been underestimated by the feeder. This is clearly brought out by

the answers to a question submitted to a large number of our most successful professional feeders sometime ago. The question put to them was: "What roughness do you prefer during the fattening period, and do you allow the steers to have all of it they will eat?" In the following summary of their answers, the most impressive fact is the great variety of opinions there expressed. Every kind of roughness produced on the farm, from the husks on snapped corn alone to the best quality of clover or alfalfa hay, fed to the full limit of the appetite of the animal, is included. Altogether 416 answers were returned, representing forty-two counties in the State. It is interesting to observe that their preferences were as follows:

KIND OF ROUGHNESS PREFERRED BY THE PRACTICAL FEEDER.

	Number.	Per cent.
Hay.....	54	12.9
Clover hay.....	50	12.0
Clover and timothy.....	45	10.8
Timothy hay.....	42	10.1
Hay and stover.....	24	5.8
Stover.....	22	5.3
Clover and stover.....	20	4.8
Hay and stover.....	16	3.8
Flax Straw.....	16	3.8
Snapped corn—no roughness.....	16	3.8
Timothy or clover.....	12	2.9
Little roughness—snapped corn.....	11	2.6
Straw.....	11	2.6
Hay and straw.....	9	2.2
Oat straw.....	9	2.2
Clover and millet.....	9	2.2
Limited roughness—ear corn.....	9	2.2
Sorghum and hay.....	7	1.7
Hay and oat straw.....	6	1.4
Millet.....	6	1.4
Prairie hay.....	6	1.4
Hay, stover and millet—all they will eat.....	6	1.4
Sheaf Oats, clover and stover.....	3	.72
Sheaf oats, cut and clover hay.....	2	.48
Hay and sheaf oats.....	2	.48
Mown oats.....	2	.48
All kinds of roughness.....	1	.24
Total.....	416	.....

One would be forced to conclude, from these results, that in the judgment of the professional feeder the roughness in full feeding exerts very little influence upon the result, and is in reality a matter of comparatively little importance.

## FEEDING EXPERIMENTS WITH DIFFERENT KINDS OF ROUGHNESS.

Our experiments during the past twelve years with various kinds of roughage, both for wintering and for fattening cattle show, however, that the kind of roughness does exert a profound influence upon the cost of gain and a large influence upon the finish or quality of the cattle at the end. These results for fattening cattle are none the less striking than are those for cattle that are being merely wintered.

The following tables will give in a concise form the essential results of two years' work in which timothy hay, clover hay, and cowpea hay are contrasted. These may be regarded as fairly representative of all the experiments and as an accurate forecast of what will happen whenever these feeds are offered in comparison one with another:

## COMPARISON OF DIFFERENT ROUGHNESS FOR FATTENING STEERS.

First trial—1889-1900—119 days—4 two year old steers in each lot—full fed on shelled corn.

Kind of feed.	Corn eaten, bu.	Roughness eaten, lbs.	Total gain, lbs.	Av. daily gain per steer, lbs.	Pounds grain per lb. of gain.	Gain per bushel of corn, lbs.
Corn and timothy hay.....	166	3,813	802	1.69	11.51	4.87
Corn and cowpea hay.....	188	3,662	1,257	2.64	8.31	6.74
Corn, clover hay and corn stover	185	{*1,626 †1,889}	937	1.94	11.29	4.96

Second trial—1900-'01—105 days—4 two year old steers in each lot—full fed on shelled corn.

Kind of feed.	Corn eaten, bu.	Roughness eaten, lbs.	Total gain, lbs.	Av. daily gain per steer, lbs.	Pounds grain per lb. of gain.	Gain <sup>r</sup> per bushel of corn, lbs.
Corn and timothy hay.....	157.5	2,540	789	1.97	11.19	5.00
Corn and clover hay.....	176.2	4,768	1,135	2.84	8.69	6.44
Corn and cowpea hay.....	175.3	4,783	1,134	2.84	8.65	6.47
Corn, clover and corn stover.....	176	{*2,475 † 868}	1,140	2.85	8.30	6.74

\*Clover hay.

†Corn stover.

It will be noted from these tables that in the first trial the combination of corn and timothy produced in the one trial 4.87 pounds of gain per bushel of corn, and 5 pounds in the other, or an average of 4.93 pounds for the two trials. When, however, clover or cowpea hay was substituted for timothy, a bushel of corn was capable of producing from 6.44 to 6.74 pounds of gain, or an

average of 6.58 pounds—an increase of 1.65 pounds of beef for each bushel of corn fed, due to a difference in the kind of roughness fed. With steers selling at 5 cents per pound, this means that the feeder is getting  $8\frac{1}{4}$  cents a bushel more for his corn by combining it with some hay like clover or cowpea than if it be combined with good timothy.

If one-fifth of all the corn produced in Missouri is fed to cattle, the increased profits from combining it with clover or cow peas, as compared with timothy, would amount to \$2,500,000.00.

Not only do the legume hays, such as clover, cowpeas and alfalfa, increase very materially the rate of gain and decrease its cost, but the steers show at the end of the feeding period a higher finish, carry more bloom, and are altogether smoother. By reason of these facts, and the further fact that they are considerably fatter, they will sell for from 10 cents to 35 cents per hundred more on the market. Moreover, it is shown elsewhere that the hog does better following cattle that are fed a legume hay than do those following a hay like timothy.

#### PREPARATION OF FEED.

This is one of the very oldest questions in connection with the feeding of animals. The first thought in the mind of the average man who seeks to apply better methods to stock feeding is in reference to the manner in which the food shall be prepared. To the novice it is in this line that there seems to be the greatest opportunity for reform. When the Experiment Stations were established, this was the first problem in nutrition to be attacked. Nevertheless, the practice of the feeder is not essentially different in this regard from what it was a quarter of a century ago. Particularly is this true of the feeder of beef cattle. While it has been found highly profitable to expend considerable energy and money in preparing the foods for the highly specialized dairy cow, the average beef animal seems to have time enough and sufficient energy of not a very expensive sort to do the work of dividing and preparing the feed which it was at first sought to spare him, by cutting, chafing, grinding, soaking, cooking, and so on.

We interviewed a large number of experienced cattle feeders of Missouri, Illinois and Iowa on this point, putting to them this question: "Do you crush, shell, grind or soak your corn, or do you feed it in the ear whole?"

## METHOD OF PREPARATION OF GRAIN PREFERRED.

	Missouri.		Iowa.		Illinois.		All States.	
	No. Rep'ts.	Per cent.						
1 Husked ear whole . . . . .	215	29.5	15	16.6	3	8.3	233	27.3
2 Husked ear broken . . . . .	79	10.8	8	8.8	12	33.3	99	11.6
3 *Snapped ear . . . . .	91	12.5	5	5.5	2	5.5	98	11.4
4 Shelled dry . . . . .	68	9.3	11	12.2	6	16.7	85	9.9
5 Ear first half, shelled later . .	48	6.3	17	18.8	1	2.8	66	7.7
6 Ear winter, shelled summer . .	38	5.3	6	6.6	1	2.8	45	5.2
7 Ear or shelled . . . . .	28	3.9	4	4.4	1	2.8	33	3.8
8 †Crushed . . . . .	47	6.3	2	2.2	4	11.1	53	6.2
9 ‡Ground . . . . .	24	3.2	4	4.4	.....	.....	28	3.2
10 Ear winter, soak summer . . .	15	2.0	4	4.4	.....	.....	19	2.2
11 Shelled, soaked . . . . .	11	1.5	6	6.6	.....	.....	17	1.9
12 Ear soaked . . . . .	12	1.6	1	1.1	2	5.5	15	1.7
13 Snapped winter, ear sum'er . .	10	1.4	2	2.2	.....	.....	12	1.4
14 Ear winter, crushed sum'er . .	9	1.4	2	2.2	.....	.....	11	1.2
15 Crushed or shelled . . . . .	10	1.5	1	1.1	2	5.5	13	1.6
16 Ear aged cattle, crush calves and yearlings . . . . .	12	1.6	.....	.....	.....	.....	12	1.2
17 Crushed winter, soaked summer . . . . .	4	.5	.....	.....	2	5.5	6	.7
18 Ear first, shell or grind finish . . . . .	1	.1	2	2.2	.....	.....	3	.3
19 Ear aged cattle, shell calves and yearlings . . . . .	4	.5	.....	.....	.....	.....	4	.4

\*Snapped corn is a term applied quite commonly in the Mississippi Valley to corn that has been broken off the stalk with the husk and shank adhering.

†The corn and cob ground or crushed together.

‡Corn meal or shelled corn ground.

These tabulated data clearly show that the bulk of the feeders give little or no attention, under most circumstances, to the preparation of the grain, or that they feed it essentially in its natural condition.

*Ear Corn*—For example, it appears that ear corn, either snapped\* or husked, fed whole or broken, was reported as fed *exclusively* by 53 per cent of the Missouri feeders, by 47 per cent of the Illinois feeders, and by 31 per cent of the Iowa feeders, or by an average of 50 per cent of all the men answering the question concerning the preparation of feed.

It furthermore appears that ear corn was used exclusively or for a part of the year or during the early part of the feeding period by 75.6 per cent of the Missouri feeders interviewed, 71 per cent of the feeders from Iowa, and 53 per cent of those from Illinois, or an average of 74 per cent of all the feeders interviewed.

*Shelled Corn*—It appears, that shelled corn, dry, was fed, either exclusively, or at some season, or in some part of the feed-

\*Ear corn with the husk adhering.

ing period, by 23 per cent of the Missouri feeders, 31 per cent of the Iowa feeders, and 22 per cent of the Illinois feeders, or an average of 25 per cent of all those interviewed.

*Corn and Cob Meal*—It is a significant fact that only 47 out of the 726 Missouri feeders interviewed, or 6.3 per cent, reported that they crushed their corn exclusively. Of the 90 Iowa feeders interviewed, 2 so reported, and of the 36 Illinois feeders, 4, making a total of 53 out of 852, or 6.2 per cent of all the feeders interviewed.

*Corn Meal*—That the feeders consider that they have not found it profitable to put much effort into the preparation of feed is still more strikingly shown by the fact that only 24 Missouri feeders, out of a total of 726, reported feeding corn meal; only 4 out of 90 Iowa feeders so reported, whereas none of the 36 Illinois feeders followed this practice. This means that 28 out of 582, or 3.2 per cent of all the feeders interviewed, grind corn, as a regular practice, for their cattle.

Taking all of those who reported the use of crushed or ground corn, either exclusively or at some special season of the year, or at some time in the fattening process, or with some classes of cattle, it was found that but 14.7 per cent of the Missouri feeders, 12.2 per cent of the Iowa feeders, and 22.2 per cent of the Illinois feeders follow this practice.

*Soaked Corn*—It will be noted that a considerable number report in favor of soaking the corn instead of crushing or grinding it. Necessarily this practice is limited to spring, summer, or early fall feeding, as it is not feasible either to soak corn or to feed soaked corn in freezing weather. The results of some experiments conducted at the Kansas Station, while not conclusive, indicate that soaking was about as effective as grinding for cattle. If this be true, soaking must commend itself on account of requiring less expense than grinding, either of equipment necessary to perform the operation or of labor.

It frequently happens in summer feeding that the ear corn becomes so dry and hard that the cattle will not eat enough to make good gains. This is especially true when one is feeding a variety of corn with rough grains, closely compacted on a hard cob. In this case the corn must either be shelled, crushed or soaked. On many farms the soaking is the cheapest and easiest of the three operations and is perhaps quite as effective as either of the others if carefully done. Every precaution must be taken to feed it perfectly sweet, to keep the troughs cleaned out, and to change the water frequently. The customary length of time to soak corn is 12 to

18 hours, depending upon the compactness of the ear and the density of the cob. Toward the end of a long feed, shelled corn soaked 12 to 18 hours is very profitable and helpful in making a rapid finish or in maintaining rapid gains to the end.

*Chafing Hay, etc.*—Many attempts have been made to increase the efficiency of the ration by combining chafed hay or similar material with the grain. Undoubtedly a ration so compounded will be handled by the animal with less liability to scours and to getting off feed, and will be masticated and digested more perfectly, and will therefore be more completely utilized than when it is given in its natural state but, for the ordinary class of cattle, the labor involved has been found to be out of all proportion to the increased efficiency shown. The market does not demand that ordinary animals be made fat enough to require this nice attention to feeding. To make show animals, all of this is necessary, and is fully justified.

#### BETTER PREPARATION REQUIRED TOWARD THE LATTER END OF THE FEEDING PERIOD.

It is evident, from a study of the detailed answers to our question in regard to the preparation of feed, and particularly from a study of the summary of these replies just presented, that the practice of offering feed of finer texture, better quality, and higher palatability in the latter part of the feeding period than in the earlier part is well established. This is due to the fact that an animal in thin condition has a good appetite and will consume coarse and relatively cheap material in sufficient quantity to make profitable gains. Later, when the system is loaded with fat, the appetite becomes more delicate and discriminating, and requires to be catered to in quality, condition, and palatability to a marked degree, in order that a rapid rate of gain may be maintained and an economical finish be made. This is particularly true of cattle that are to be made very fat, and is more true of young animals than of older ones. It is more true of young than of older animal on account of the tendency of the former to use much of its feed for growth. In such cases a relatively large gain may show a very slight improvement in the condition of the animals. Therefore, a preparation of feed that would be wholly impracticable for the earlier or main portion of the feeding period might prove to be exceedingly profitable in the last 60 days. Failure to recognize this fundamental fact in cattle feeding distinguishes the unsuccessful feeder from the successful one.

## BETTER PREPARATION REQUIRED IN SUMMER THAN IN WINTER FEEDING.

It further appears, from these replies, that the feeder offers his grain in rather better form in summer than in winter. This is primarily due to the fact that grass in summer is more palatable than is the roughage usually offered in winter, namely, hay. In order, therefore, to make sure that the cattle will discriminate against the grass to a sufficient degree, or that they will eat a sufficient quantity of grain to make rapid gains and become fat in a reasonable time, it is necessary to offer them grain in a palatable form. In winter, when the roughage is not particularly palatable, sound corn in practically any form will be preferred to hay, so there is little difficulty in maintaining the proper proportion between the grain and roughage consumed. In other words, the grass in summer is much more likely to interfere with the animal's appetite for grain than is the hay in winter.

It is furthermore true that the grain in summer is dryer and harder, and therefore more difficult to masticate than in winter. The ears of corn that have been husked and stored in a crib are by midsummer so dry and the cob is so hard that it is practically out of the question for the steer to handle it in this form profitably; especially is this true if it be one of the improved and high shelling varieties of corn like Reid's Yellow Dent, Leaming, Boone County White, etc. Some of the old and unimproved cattle corns have so soft a cob as to not require this treatment even in summer. The yield of such a corn, however, is so low as to more than offset the advantage of the soft cob in cattle feeding. Moreover, the corn by this time is quite likely to have been soiled more or less by mice and rats, unless stored with the husk on. It is a very common and well approved practice to snap the corn and store it with the husk on if it is to be fed to cattle the following summer. It is usually husked just before being offered, comes out fresh, clean, is not unduly dried out, and is exceedingly palatable.

Another point undoubtedly influencing the practice is that the corn may be soaked in summer much more conveniently than in winter, as all difficulty from freezing is avoided. The only point to be guarded against is souring. If the corn is not soaked more than twelve hours and the box is cleaned out each time, the water changed frequently and the feed troughs are carefully cleaned each day, no difficulty of this nature will be experienced. For details

of the practice in these regards, the reader is referred to the remarks of the different feeders in the main tables under the head of Methods of Feeding.

#### MORE PREPARATION OF GRAIN REQUIRED FOR YOUNG CATTLE THAN FOR AGED ANIMALS.

This is almost self-evident. Three year old steers, for example, can handle ear corn and coarse roughage far more advantageously than can calves, say, that are just being weaned. It is not at all difficult to make a fair rate of gain on young animals, and to accomplish only this result would not require any special preparation of grain. But to make a gain that is sufficiently rapid to fatten the animal within reasonable time does require that the grain be offered in an easily assimilable form and that the roughage be of a very palatable and nutritious character. In other words, as has already been pointed out, the first draft a young animal will make on its food, outside of maintenance, is for growth, and it is necessary to induce the animal to eat and digest an amount considerably in excess of the requirement for maintenance and for growth in order to make it fat. The aged steer, on the other hand, has little use for food for growth, and puts practically its entire ration, outside of that required for maintenance, to the uses of fat production, and it is not, therefore, so vital a matter that the animal gain to the absolute limit of its capacity in order to get fat in a reasonable time or to prove profitable. Thus it comes about in practice that the feeders use ear corn for aged cattle, and crushed or ground or soaked or shelled corn for calves and yearlings.

*Hogs Utilize the Waste*—It will be noted that all of the discussion of this factor has so far been with relation to the influence of foods prepared in different ways upon the rate of gain of the steer, rather than upon the degree to which it is digested and utilized. This is so because hogs are invariably used to pick up whatever waste may occur from imperfect preparation of the feed before it is offered to the cattle. As a rule, hogs are worth more per pound live weight than are cattle. It is, therefore, a matter of comparative indifference to the feeder as to just how the uses of the grain are distributed between the steer and the hog.

The feeder is only interested in the total gain in live weight per unit of grain fed, and cannot, under ordinary farm conditions, afford to invest much labor and money in a preparation of the feed which increases the steer gains wholly or mainly at the ex-

pense of the hog gains. So long as the food is offered in palatable enough form to make the steer gain at a fairly rapid rate and to make it fat in a reasonable time, he is not interested in how much passes through the steer unmasticated or undigested. Whatever part of the grain the steer fails to use, the hog will utilize to good advantage.



Fig. 11. The hogs utilize the waste.

*Effect of Different Feeds on Hog Gains*—It is a common saying among cattle feeders that the profit is in the hog that follows the steer. Recent experiments at the Missouri Experiment Station and elsewhere clearly indicate that the amount of gain the hog makes will be affected in an important way by the kind of food given the steer which he follows. For example, it has been found that hogs following cattle eating corn and linseed meal do better than those following cattle fed on straight corn. Hogs following cattle eating corn and clover hay do better than those eating corn and timothy hay, and so on throughout the whole range of feeds. In general, feeds that are rich in protein and that favor a rapid and high development in cattle will likewise favor a rapid and high finish in the hog.

It requires no experimental data to support the statement that hogs as well as the cattle will do better on pastures with as large an admixture as possible of clover. In this connection one of the most profitable things than can be done is to prepare a clover or alfalfa pasture of sufficient size to accommodate the hogs that follow the cattle and let them graze on this clover after having cleaned up the waste from the cattle, instead of grazing on the steer pastures. This will tend to protect the steer grass from being unduly soiled by the hogs and to produce increased gain on the hogs.

Another excellent plan is to provide, if possible, contiguous to the steer pasture, a small field of cowpeas or soja beans, upon

which the hogs may be turned by the middle of August or September, and have this nutritious grain to supplement the corn they pick up after the cattle. This will enable the hogs to be finished well and rapidly and will give largely increased gains at a very slight expense.

#### SUPPLEMENTAL GRAINS FOR HOGS FOLLOWING CATTLE.

The profits from the use of some such supplemental feed as middlings, linseed meal or tankage will be almost as striking with hogs following cattle as when given to hogs fed the grain direct. It is never profitable to feed straight corn to hogs except when they are running on alfalfa, clover, or soja bean pasture. When following cattle on the ordinary blue grass pasture, therefore, and particularly when following cattle in a dry lot, a small amount of old process linseed meal or of tankage, or if these are not available, a limited amount of middlings, will invariably add materially to the profits to be derived from the hogs. This is very clearly shown by the results of a recent experiment in Ohio,\* when 1-3 of a pound of digested tankage was given daily per head of hogs following cattle on corn and mixed hay, in contrast with hogs following similarly fed cattle without the tankage. The hogs having no tankage gained 808 pounds, while those receiving the tankage gained 1,230 pounds. Conditions were otherwise identical. The amount of tankage used was 259.5 pounds, costing, laid down, \$4.88, from which an increased hog gain of 422 pounds was secured. The profit from this operation will be apparent when it is realized that this extra hog gain cost but little more than 1 cent per pound.

#### CHANGES IN FEED AND SURROUNDINGS.

Changes in feed, or location, or surroundings of cattle that are fat should never be made, except such as are decidedly for the better, and even then should only be made when imperative. After a steer is on feed and is beginning to show fat, whatever changes in the feed are necessary must be made very gradually, and should always be in the direction of improved quality and palatability. This law will admit of no violation, except in very rare cases where the cattle show too great a fondness for the roughage and seem to be eating too little grain on that account. Even then it will be more rational to attempt to bring the grain up to a standard of excellence where it will successfully compete with the roughness rather

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\*Ohio Exp. Sta. Cir. 73.

than to lower the grade of the ration by substituting a poorer roughness. Frequently when feeding at pasture the grass becomes very soft and washy, while it remains very palatable. In this case the remedy would be a hay of good quality to temper the grass.

The main point insisted upon is that the quality should be improved as the animals approach the finishing point. This may in a majority of cases be most effectively done by adding a limited quantity of old process linseed meal, from one-tenth to one-seventh of their whole grain ration, during the last 60 or 80 days. This will insure a large consumption of grain and, of course, rapid gains to the end, and will materially improve the coat and enhance the selling quality of the steer over and above an equally fat one that has not had some such food as linseed meal. It goes without saying that this linseed meal should be added very gradually to the ration.

#### PURE WATER CONVENIENT AT ALL TIMES.

In order to secure satisfactory results in steer and hog feeding, it is of the utmost importance that an abundant supply of pure, clear, cool water be furnished. This point was strongly emphasized by a great number of the experienced feeders making reports for this bulletin. It is furthermore important that the hog be required to drink in a separate place from the cattle, and that the water for each class of stock be protected against the other class of stock. It will not do to allow the steers to drink from the hog troughs, or the hog wallows, nor to permit the hogs to foul the water in the cattle troughs.

It is a well established law that all classes of stock should be watered regularly and should have an abundant supply, but this is especially important for animals which are under the strain of rapid production, such as the highly developed dairy cow when in full flow of milk, and the growing or fattening steer when on full feed and producing to its utmost capacity. A steer on full feed in one of our experiments\* voided in its dung and urine daily per thousand pounds live weight 32 pounds of water, as compared with 13 pounds as the average voiding of two other steers of the same weight that were fed only a sufficient amount to maintain body weight without gain or loss, the character of the ration being exactly the same in both cases. To restrict the amount of water drunk by the steers and hogs, either by its location being remote

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\*Not yet published.

from the feeding troughs and pastures, by reason of its irregular or inadequate supply, by reason of inadequate trough room, by reason of its filthy condition and uninviting surroundings, is to directly restrict the gains and to reduce the profits of the feeding operation. Wherever at all feasible, a constant supply of deep-well water, freshly pumped, in troughs of adequate size, should be provided in a locality convenient to the feed troughs, convenient to the ranges, and at a point where the droppings that naturally accumulate in the vicinity of the watering trough will be of value to the farm rather than be washed away by the first rains that come after they are deposited.

#### REGULARITY IN FEEDING AND QUIETNESS IN HANDLING.

Clock-like regularity in the feeding and watering of cattle on full feed is of the utmost importance. If possible, the same man even should always do the feeding, and it is important that this be the most intelligent and trustworthy man on the farm. It is scarcely possible for a man to get the best gains out of cattle and to get them all to come along uniformly and have no founders and "throw outs" unless he take a personal interest in the work in hand. To make the crop and general farm work the principal and the cattle feeding the subsidiary thing is likely to prove unfortunate for the cattle.

#### WHEN STEERS ARE READY TO BE MARKETED.

No sounder advice could be given the beginner than to study carefully the requirements of the market. This may be best done by visiting the market as frequently as possible and especially when the cattle of his own feeding are to be sold. To bring cattle to just the point of finish, or to just the degree of fatness that will make them most profitable, or to avoid carrying them too long, or to avoid selling them too early, is perhaps the most difficult point to determine in the entire range of beef production. No one can hope to develop good judgment in this direction without a thorough familiarity with the various market classes of cattle and without knowing how much fat each class requires to enable it to be sold to the best advantage. It would of course be fatal to follow one rule with all grades. Cattle of good quality will require a relatively higher finish because, as a rule, their cost price as feeders is so high that there will be too small a margin between it and the selling price to pay a profit if they are not made prime. Plain to

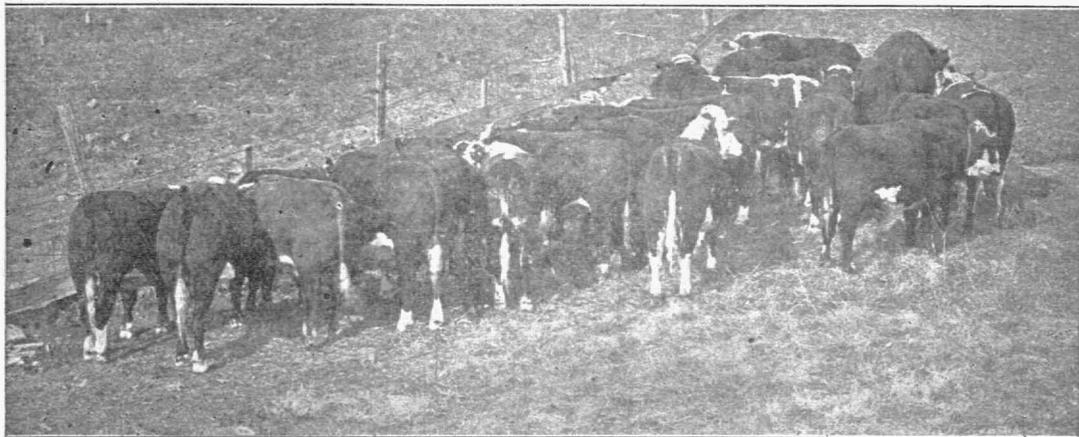


Fig. 12. Cattle having enough quality to justify being made thick fat.

common sorts, however, are not worth enough to justify being made thick fat, and must go to market carrying medium flesh if they pay a profit. The beginner, however, is more likely to err in the direction of shipping too early than of carrying his cattle too long. Frequently a six weeks' additional feed will make from 40 cents to 60 cents difference in the price of the cattle on the market. On the basis of 1,400 pound steers, this equals from \$5.60 to \$8.40 per head besides the value of the gains made. On the other hand, money is frequently lost by making cattle too thick, especially when they have not the quality to pay for so long a feed. Or, it may happen that the top of the market is not enough above the price commanded by good to choice cattle to pay for making them prime. To top the market and lose money is not profitable.