

have been labeled for the control of intestinal worms of swine, sheep, and poultry. The department has discovered that such preparations are not effective in the control of worm infestation of any animal. Through the action of the courts the department has seized many large shipments of these types of products found in interstate trade.

The Food and Drug Administration conducts tests of products labeled for vitamin content to determine whether or not the article can truthfully be represented as actually containing adequate amounts of the various types of vitamins claimed in the labeling. Legal action has been instituted against manufacturers of several of these products that were not found to contain adequate amounts of cod-liver oil or yeast, or that were not potent in the vitamins claimed in the labeling.

In enforcing the insecticide act, the department tests disinfectants bacteriologically and chemically. Disinfectants have often been labeled with many unwarranted and misleading statements. For instance, the recommendation that a disinfectant be sprayed around the premises and be added to the drinking water to prevent disease such as hog cholera, infectious abortion, chicken pox, pullorum disease, and roup, leads the user to believe that he has done everything necessary to prevent disease when, in reality, he has merely taken inadequate measures against a few of the many possible sources of disease communication.

Under the insecticide act, many other preparations for livestock and poultry, such as fly killers and repellents, flea and lice powders and liquids, dips for animals, mange ointments, lotions and liquids, preparations for screw worms and grubs, and for various forms of scabies of livestock, receive constant consideration. Many farmers and poultrymen also erroneously believe that certain chemicals administered as medicine, or mixed with feed or water, will protect their animals from external parasites, such as flies, lice, and ticks. Hundreds of liquids, tablets, and powders have been recommended for use in this way. The department has issued warnings against these remedies, and in many cases has forced the makers, through court action, to cease selling preparations of this nature.

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EXPERIMENTS With Beef and Dual-Purpose Cattle Aid in Efficient Production Cattle raised chiefly for beef, or herds serving the dual purpose of producing beef and milk for human food, are kept on about one farm in every four in the United States.

Three general types of beef-cattle enterprises are conducted, namely: The production of feeder and slaughter cattle on western ranges; the further fattening of these feeder cattle in the corn and other grain producing sections; and the breeding, raising, and finishing of beef on general livestock farms. Dual-purpose cattle are produced chiefly in areas not too remote from urban centers to afford a ready market for milk or butterfat, yet where land values and pasture and feed resources are favorable. Any of these enterprises requires considerable investment in land and livestock. None should be undertaken without careful, intelligent planning, and, if possible, some first-hand experience. All offer excellent foundations for systems of balanced farming.

In the broad scheme of agriculture, beef and dual-purpose cattle more than pay their own way. Like other farm animals, they leave on the farm for the maintenance of soil productivity, approximately 75 per cent of the fertilizer value of the feed they consume. Like sheep, they have great adaptability to rough land and sparse grazing. To a greater extent than any other class of domestic animal, however, they make efficient use of unmarketable roughage, much of which the farmer would otherwise have to waste. And, in labor requirements, beef-cattle production fits in well with crop farming because it demands comparatively little attention during the cropping and harvesting season.

About half of the beef-cattle are raised in the range area which is principally west of the one-hundredth meridian, and about 30 per cent of the cattle that go to market from that area go directly from grass into slaughter channels.

The general trend in the production of steers for more than a decade has been toward cattle lighter in weight, earlier maturing, and of higher quality. Twenty-five years ago most of the steers marketed were 3 years old or more. At present most of them are 2-year-olds, with a large proportion of yearlings and considerable numbers of fat calves.

A major problem in beef production has long been that of developing types of breeding animals and systems of feeding that would make the greatest possible use of grass, coarse roughages, and other inexpensive feeds without undue sacrifice of quality in the finished product. This problem is especially important to-day and promises to continue so for some time to come. One reason is that there is now a tendency to turn land from cultivated crops to grass, where the land must be used for livestock or be abandoned. Another is the growing competition of other agricultural products. A third is the fact that much skill and a certain amount of concentrated feeds are required to produce the choice young beef demanded to-day.

In dual-purpose-cattle breeding the chief endeavor is to develop families that will breed true in the production of heavy-milking cows which will also get calves capable of being finished as good-quality beefs. Such dual-purpose animals are popular on many general livestock farms, particularly in sections where increased land values make it difficult to realize a profit from specialized herds.

Breeds of Cattle and Their Improvement

According to the 1930 census, one-thirtieth of the beef and dual-purpose cattle in the United States were registered purebreds. The beef breeds were represented by 770,000 purebreds and the dual-purpose breeds by 34,000.

Among the beef breeds, there are more registered Herefords than all the other registered beef cattle combined. Herefords greatly predominate in the Great Plains and Rocky Mountain States. One of their qualities is their rustling ability. The Shorthorn predominates in the greater part of the Corn Belt, because of its adaptability to localities where feed is abundant, and its ability to produce good quantities of milk as well as beef. The Aberdeen-Angus breed is found in large numbers throughout the Corn Belt and other areas which produce an abundance of fattening feeds. Cattle of this breed are especially popular for feed-lot use and for their ability to yield well-marbled beef of high quality.

The milking Shorthorn and Red Polled breeds form the bulk of the registered dual-purpose cattle, and are found largely in the East North Central and West North Central States.

The choice of a breed is not so important as the selection of individuals within a breed when a farmer is going into cattle production or striving to improve his herd. Any of the recognized breeds are good, and it is generally advisable to choose the one raised by most of the best breeders in the district. There are facilities, then, for procuring new blood near at hand; marketing is simplified; and, if the climate or other conditions are particularly trying, strains of cattle, especially adapted there, probably will have been developed within the district. It is for this reason that cattle which have given excellent results on farms in the North sometimes disappoint when shipped to the far South or to semiarid western ranges.

As with other classes of livestock, the purebred is the reliable means of achieving lasting improvement in a herd of cattle. Although many grade animals are of higher quality than some inferior purebreds, they usually owe their good points to a close relationship to a good purebred; and, while purebreds, whether good or poor, breed reasonably true, the best grades can not be counted on to produce offspring like themselves.

A conclusive demonstration of the value of good purebred sires in grading up a herd of native beef cows was begun in 1914 at Sni-a-Bar Farms, Grain Valley, Mo. The cows used in this demonstration are described as "common red cows" and were purchased at the Kansas City stockyards where they had been shipped for slaughter. The bulls selected for the demonstration were registered Shorthorns of good individuality. The results of this cooperative work showed that after the third or fourth cross the grade offspring compared very favorably with purebred stock in conformation and quality, and that the greatest single improvement occurred in the first cross. Only exceptionally good sires can be expected to bring about any very marked improvement after the fourth cross.

In an experiment in which the department cooperated with the Arkansas Agricultural Experiment Station it was demonstrated that although the cost of maintenance is less for native calves, the sale price of purebreds and grades is sufficiently higher to make up more than the difference. In this experiment the first-cross calves made a return per head of more than six times that of the native calves. This and many other experiments in breeding purebred sires to native cattle have shown conclusively the value of prepotent sires in grading up a herd. They have also shown that a farmer can make an excellent beginning with a herd of very inferior native cattle if he breeds them to good bulls.

There are areas in the Southwest, particularly in the Gulf coast regions of Texas and along the Mexican border, where our popular breeds of beef cattle have great difficulty in withstanding the hardships of intense heat, insect pests, and scarcity of water. Cattle of the Brahman breed and, more recently, Africander cattle from South Africa, have been imported to cross with native cattle and the purebreds predominant in that region for the purpose of improving their adaptability to the environment.

Breeding experiments at the United States Iberia Livestock Experiment Farm at Jeanerette, La., in which grade Hereford cows were bred to Brahman bulls for a period of several years, showed that

Brahman crossbred calves were larger at weaning time and at 1 year of age than calves from similar cows, sired by purebred Hereford bulls, but that there was a tendency for them to gain more slowly than the Herefords from that age on. Brahman crossbreds have done exceedingly well when fattened on grass or in short dry-lot fattening periods, but in long feeding periods they are excelled in total gains and finish by cattle in which the blood of the established beef breeds predominates.

Record of Performance

Within the last two years a new and highly promising method of improving beef and dual-purpose breeds of cattle has been evolved. It has become generally known as the record-of-performance method. By it each sire and each dam are given a performance score based on the proved utility value of the offspring. This value is expressed as a single numerical term on the basis of 100 points as the ideal. It is

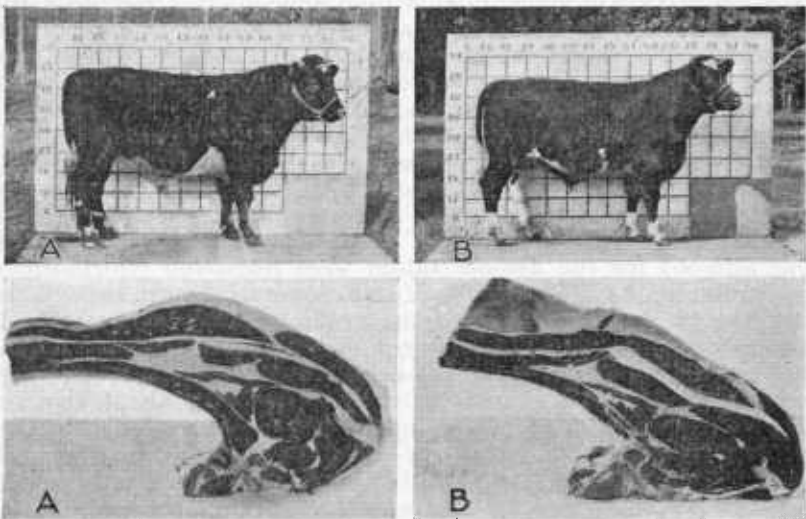


FIGURE 34.—Two beef steers which showed wide variation in efficiency of production, together with rib cuts from their carcasses. These animals are purebred Shorthorns sired by the same bull. When finished at 900 pounds weight on the same feeds, they graded alike in quality of carcass. However, steer A was much less efficient in use of feeds, having gained an average of 14.3 pounds of beef for each 100 pounds of total digestible nutrients eaten, as compared with 17.4 pounds for steer B. Their final performance scores, when both efficiency and quality are considered, were 79 and 93, respectively. The rib roasts were practically equal in tenderness and general desirability.

arrived at by measuring an animal's performance in two important respects: (1) The number of pounds of beef it produces from birth to maturity or slaughter for each 100 pounds of total digestible nutrients eaten; and (2) the quality of beef it produces as measured by carcass grade and tenderness of the cooked meat scored by experienced judges.

This method of evaluating performance requires that each calf be fed individually in order to determine its feed consumption. For that reason it is not yet ready for use by farmers generally, although results with cattle as well as with other classes of livestock indicate that farmers may eventually be able to recognize the efficient animals merely by observing the rapidity with which they grow during certain periods of their development.

The chief value of this work to date has been to reveal, for the first time in animal-husbandry research, some surprising differences in efficiency among cattle of like breeding, and to indicate that animals more efficient than any we now have can be bred.

Among both beef Shorthorn and dual-purpose Shorthorn steers thus far subjected to these performance tests, there have been efficient animals producing 40 per cent more beef, from the same quantity of exactly the same kind of feeds, than did closely related animals of the same type and of apparently equal vigor and health. There was less variation among these animals in quality of product than in efficiency of growing that product; yet when the two factors were

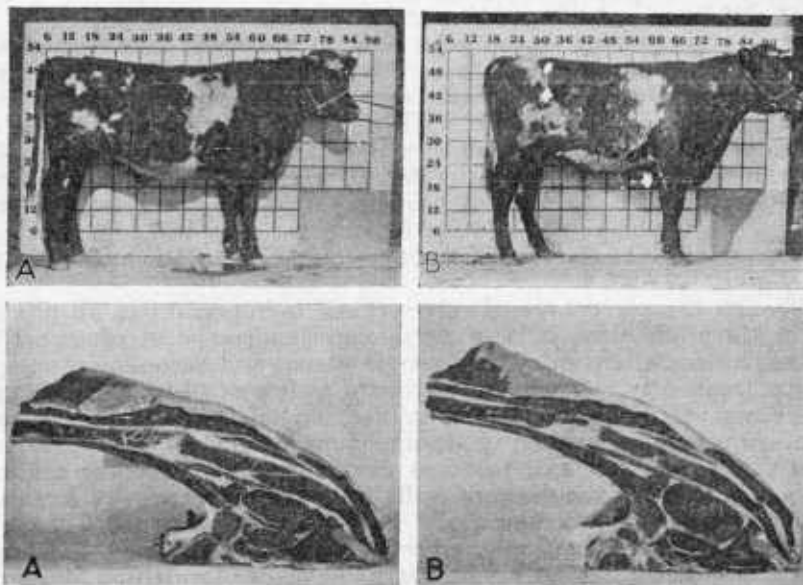


FIGURE 35.—Two dual-purpose steers which showed wide variation in efficiency of production, together with rib cuts from their carcasses. These animals are Shorthorns, of dual-purpose type, sired by the same bull and from cows which are half-sisters. When finished at 900 pounds' weight on the same feeds, they graded alike in quality of carcass. However, steer A was much less efficient in the use of feeds, having produced an average of 14.9 pounds of beef for each 100 pounds of total digestible nutrients eaten, as compared with 18.6 pounds for steer B. Their final performance scores, when both efficiency and quality are considered, were 75 and 91, respectively. The rib roasts were judged to be of practically equal quality.

combined to obtain the final performance score the beef calves still ranged from 75 to 93 points and the dual-purpose from 71 to 91. (Figs. 34 and 35.)

These records indicate even more significance than has been generally appreciated in the saying, "The eye of the master fattens the cattle." It undoubtedly applies not only to fattening but also to breeding and selection of animals which will do well in the feed lot. Frequently, in these tests, two calves sired by the same bull and of seemingly equal individual merit at the start showed widely different ability to make rapid and economical gains. A wise feeder observes such differences. If he is an able breeder he remembers these differences and, for improving his herd, he looks to the matings that produced the quick-gaining calves. Farmers have not attempted, however, actually to measure the differences among cattle in feed-lot efficiency, nor to correlate these with the quality of the carcass pro-

duced. Show-ring performance has too often been the principal guide in selecting breeding stock, without sufficient regard to actual utility value. Two of the most noteworthy findings in this record-of-performance work are that quality in an animal's carcass is not obtained at the expense of efficiency of gains, and that strains that will breed uniformly for high efficiency in both respects can be developed.

Some Points in Management

In the feeding and management of beef and dual-purpose cattle, two goals stand out above all others. One is to make maximum use of inexpensive home-grown feeds and pastures. The other is to get a good calf from each cow each year.

During the grazing season good pasture alone will take care of all classes of beef cattle except those being given a high degree of finish for market. Dual-purpose steers and dry cows may be handled like similar classes of beef cattle. When maximum milk production is expected of dual-purpose cows they should receive, for each 5 pounds of milk they produce, approximately 1 pound of grain mixture containing 15 to 20 per cent of protein. When not on pasture they should get all the alfalfa or other legume hay they will consume and a grain mixture at the rate of 1 pound for each 3 to 4 pounds of milk they give.

Though the percentage of calves raised is important in all phases of cattle production, it is of particular significance in range-cattle management, where unfavorable environment and lack of close supervision frequently result in the raising of as few as 40 to 50 calves per 100 cows. Of the many factors influencing calf crops, those of chief concern are the condition of the breeding herd and the topography and size of the range or pastures used during the breeding season. Other factors are the ratio of bulls to cows, barrenness in females, and the system of breeding used.

Small calf crops are usually preceded by inferior feeding conditions. Scarcity of feed invariably results in a low plane of nutrition for cows, and when this occurs the estrous cycle is not normally developed. The condition of the bulls during the breeding season has been found to have a closer relation to a high-percentage calf crop than the ratio of bulls to cows, and feeding grain at this time is a common practice among successful ranchmen.

Not only are numbers of calves important, but also their uniformity in both age and quality. The breeding season can be materially shortened by using comparatively small pastures and maintaining cows and bulls in thrifty condition. A recent 3-year ranch study in which the department cooperated with the Colorado and Wyoming experiment stations, showed a difference of 7 per cent in calf crop in favor of controlled breeding on pastures as compared with range breeding. The breeding of heifers, unless they are particularly well cared for, was found to result in a comparatively small calf crop and a high death loss. Culling the herd by eliminating nonbreeders, poor mothers, and irregular breeders was found to be a helpful practice. Good management on a favorably located ranch is frequently rewarded with 70 to 80 calves raised for each 100 cows bred.

In range-cattle production it is of prime importance that ranges and pastures be so used as to get the greatest returns without permanent injury to the forage. Studies made in cooperation with ranchmen in a

number of range States have demonstrated that this can be accomplished only through ownership or long-time leases of the land. Those ranchmen who depend on the use of open ranges invariably allow their stock to overgraze and seriously injure the carrying capacity of the range.

At the Northern Great Plains Experiment Station, Mandan, N. Dak., grazing experiments have shown that the carrying capacity of the range can be increased as much as 40 per cent by practicing a system of deferred and rotation grazing. It is impractical, however, to carry out such a system unless the range is controlled by the operator over a period of years.

In range management, it is desirable to reserve protected range for winter grazing. When this can be done one of the most expensive items in the cost of range-beef production—the winter feed supply—can be reduced materially.

At the United States Range Livestock Experiment Station, Miles City, Mont., 53 per cent of the breeding cows have been kept on the range throughout the entire winter for a 4-year period 1925-1929. During one adverse season, only, was it necessary to feed a supplement—cottonseed cake being fed for 42 days. Cows kept on the range during 60 per cent of the winter season and in the feed lot 40 per cent of the time consumed 26 pounds of cottonseed cake and 2,570 pounds of dry roughage. The cows kept on the range lost 80 pounds per head as compared with 30 pounds for those kept in the feed lot. This loss in weight did not affect the birth or weaning weight of the calves. Only in areas having heavy snowfalls, therefore, is it necessary to winter breeding herds in the feed lot.

In carrying calves until they are yearlings or older, it is very important that they be wintered economically as the winter feed bill is the item of expense that offers the greatest possibility for reducing costs of production. Home-grown roughage should be used, and when not of good quality or of high feeding value it should be supplemented with a protein concentrate such as cottonseed cake. Experiments at Miles City in wintering steers on different planes of nutrition show that steers carried on medium and low planes make only slightly less total yearly gains than steers carried at a high level, with net costs of production much lower.

The grinding of grain and roughage and other methods of preparing feed for beef cattle are not generally profitable, as the increased quantities consumed and the greater production do not offset the costs of preparation. Ground grains, however, are commonly used in the grain mixture of dual-purpose cows in order to obtain maximum production.

Salt should be kept before cattle at all times. Under most conditions where cattle get a variety of feeds, including legumes, no other mineral need be supplied. If legumes are not being fed, a mixture of equal parts of finely ground limestone and bone meal is desirable. There are areas in the South and Southwest, however, where the growth of cattle grazing on certain types of soils is retarded and calf crops are low, owing to deficiencies of other minerals, notably phosphorus. Research work is being done on this problem.

Following a study of the serious condition known as salt sickness among cattle in Florida, the agricultural experiment station of that State recommends that cattle in regions subject to salt sickness be given constant access to a mixture of 100 pounds of common salt, 25 pounds of red oxide of iron, and 1 pound of finely ground copper sul-

phate, thoroughly mixed. The investigators add the warning that copper sulphate, commonly known as bluestone, is poisonous in concentrated form and should be pulverized and mixed thoroughly with the other ingredients.

Most dual-purpose cows in the market-milk and creamery sections are milked, most of the milk and cream being sold. The steer calves are pail-fed whole or skim milk and marketed as veal. Three other types of handling are practiced. Under one, the steer calves are pail-fed whole milk for a few weeks and then have skim milk, pasture, grain, and hay for six months, after which they are sold as feeders or finished on hay, grain, and silage in dry lot. Under another, the heaviest producers are milked and the milk and cream sold. The remaining cows nurse one or two calves each, which are marketed as veal or as fat calves. Under still another system the low producers nurse calves twice daily, and the calves are given grain and hay in the barn as soon as they will eat or are creep-fed with the cows on pasture and sold as fat calves or fat yearlings.

Whether it is more profitable to sell milk or cream or to feed the milk to calves is, of course, determined by market prices of milk, butterfat, hay, grain, veal, and beef. At the United States Animal Husbandry Experiment Farm, Beltsville, Md., experiments have shown that younger calves pay considerably more for milk than do older calves and that after calves reach 150 pounds in weight there is a gradual decrease in the value of whole milk for calf feeding.

Finishing Cattle for Beef

There are two distinctly different methods of fattening cattle for market. One is to finish them on harvested feeds alone, and is known as the dry-lot method. The other is to market them for slaughter directly from grass. The former is used chiefly in regions of abundant harvested feeds, the latter in the Rocky Mountain range country, the Great Plains, and the Appalachian region.

There is a strong tendency in recent years, however, for farmers even with abundant pastures to supplement them with grain during at least the latter part of the finishing period. There is a tendency also for farmers in grain-producing regions to take advantage of the comparative cheapness of gains on grass by feeding grain liberally to their cattle while they are on grass and finishing them as fat calves or yearlings.

The most advantageous system will be determined by the farmer's resources in pastures, his finances, and the quantity of harvested feeds he desires to market as beef, as well as by his personal experience and other considerations.

Studies by the department, summarized in Table 5, have shown the approximate quantities of feeds required for each pound of finished beef produced by cattle when marketed at various ages. In each case the cost of carrying the breeding herd is charged against the animal. The data in this table are based on the quantity of feed required by fat weanling calves on Corn Belt farms and by feeder calves in the range area and their finishing in the Corn Belt feed lots as yearlings and 2-year-olds. The yearlings require proportionately more grain than the 2-year-olds because a larger percentage of the final weight is the result of grain feeding. In the case of weanling calves, most of the feed is consumed by the breeding herd and is therefore grass and other roughage.

TABLE 5.—*Feed required, per pound of finished beef, by weanling calves, yearlings, and 2-year-olds*

Kind of cattle	Grain	Roughage
	Pounds	Pounds
Calves.....	3	34
Yearlings.....	6	25
2-year-olds.....	4	31

The different classes of feeds comprising the roughage shown in Table 5 were found to be approximately as shown in Table 6.

TABLE 6.—*Proportions of various roughages consumed by cattle marketed at various ages*

Kind of cattle	Pasture	Legumi- nous and mixed hays	Silage, stover, and straw
	Per cent	Per cent	Per cent
Calves.....	55	22	23
Yearlings.....	50	30	20
2-year-olds.....	69	22	9

Generally speaking, to market beef in the form of calves requires the heaviest investment in breeding stock, while marketing it as 2-year-old animals requires the least. Pastures better than average, and more intensive supervision and management, are needed in successful calf and yearling production. The beef animal 2 years old or older requires the least amount of harvested feed but produces a carcass heavier than is desired by many markets and consumers. A sirloin steak an inch thick from a well-finished 2-year-old will weigh from 2 to 3 pounds; one from a choice fat calf will weigh only about half as much.

In cooperation with the University of Missouri the department has carried on extensive investigations in fattening calves at Sni-a-Bar Farms, Grain Valley, Mo. Results have shown that well-bred beef calves fed grain from the time they are from 2 to 3 months of age until they are weaned at approximately 8 months of age gained 100 pounds more than calves that had no grain. The supplement-fed calves made very economical gains and were in suitable condition for slaughter at weaning time. The grain was fed to the calves in creeps and was not accessible to the cows.

Throughout the experiments, although small pastures—about 2 acres per cow—were used, it took a month or more and considerable handling to train the calves to begin eating regularly in the creeps. Locating a creep near the watering place and shade tends to insure more satisfactory results. However, when pastures have extensive shaded areas and several sources of water, the only practical way yet found to feed supplementary feed to calves is to keep them in a barn, separate lot, or pasture and turn the cows in for them to nurse regularly twice a day. If a feed trough is fastened on the calves' side of the gate where the cows are let in, the calves will learn to eat readily.

In cooperation with the West Virginia Agricultural Experiment Station, the department has conducted a series of experiments at Lewisburg, W. Va., to determine the value of adding a grain supple-

ment to grass in finishing 2½-year-old steers, and the relative value of various methods of feeding the supplement.

The first three years' work showed that a daily supplement of about 6 pounds of coarsely ground shelled corn and 1.6 pounds of cottonseed meal per steer, when fed to 1,000-pound feeder steers on good grass pasture from May to September, produced a daily gain of 2.6 pounds. Similar steers on grass alone made an average daily gain of 1.9 pounds. The supplement increased the total gain per steer approximately 100 pounds. This additional gain, owing to a greater finish on the steers, enhanced their sales value 10 per cent. The increased selling price considerably more than offset the additional feed cost. The supplement-fed cattle had a higher dressing percentage, were fatter, and possessed more salable carcasses. The strictly grass-fed cattle had a higher percentage of bone in the rib samples analyzed, and the meat was not so bright red in color as that of the supplement-fed cattle.

The second 3-year study was for the purpose of determining the relative value of different times of beginning the grain supplement in a finishing period of 135 days. The results showed no advantage in feeding grain from the beginning of the pasture grazing season, as the lot receiving a supplement of corn and cottonseed meal after being on grass 56 days was significantly the outstanding lot so far as profit was concerned.

In dry-lot fattening there are two general types of rations, dry and succulent. Corn and either clover or alfalfa hay constitute perhaps the most popular dry ration. The most widely used combination of feeds in succulent rations consists of corn, cottonseed or linseed meal, mixed hay, and corn silage.

A comparison of the feed requirements of 3-year-old steers, 2-year-olds, yearlings, and calves, when fed a ration of corn and legume hay, has shown efficiency to vary directly with the age of the fattening animal. The younger the feeder, the more efficient is the feed utilization. The actual daily gains, however, increase in rapidity as the age increases. On a ration of corn and legume hay, calves will produce 100 pounds of gain on 65 per cent of the feed required for 3-year-olds. The corresponding figure for yearlings is 88 per cent, and for 2-year-olds 91 per cent, showing the much greater efficiency in feed utilization of the younger cattle. On a ration of corn, protein concentrate, mixed hay, and corn silage, young cattle are even more efficient as compared with older animals. In this case, calves require only 58 per cent as much feed as 3-year-olds to produce equal gains, and yearlings 81 per cent as much.

Cooperative feeding experiments by the department, the Texas Agricultural Experiment Station, and the Agricultural and Mechanical College of Texas show that hays as well as the grain from the sorghums are excellent feeds for fattening cattle. The experiments have shown also that it is advisable to grind the grain but that there is no advantage in using threshed grain, as the ground heads produced greater gains, at lower cost, than did unground milo heads or threshed milo either ground or unground.

Self-feeding of beef cattle is still in the experimental stages. Recent experiments indicate that self-feeders may be used satisfactorily after cattle are on full feed. Somewhat greater gains may be expected but the increased gains are not usually compensated for, as the cost of gains is usually more expensive when cattle are self-fed than when they are hand-fed.

Present knowledge indicates that from 70 to 80 per cent of full feeding is preferable to full feeding, so far as economy of gains is concerned. However, market demands and prices of feeds should be taken into consideration. If the feeding period is limited to a definite time, or if there is a likelihood of a falling market near the end of the period, it may pay to full feed. The chief objective, after buying the animals at a reasonable price, is to get them on the market when the demand is greatest for the grade of product being offered.

Quality in Beef

Within the last few years considerable new information on the factors responsible for quality in beef has been obtained by the department in cooperation with various State experiment stations.

In cooperative work with the West Virginia station, comparisons of beef from cattle finished on grass alone with that from cattle receiving a supplement of grain have shown that grain-fed cattle have a distinctly higher dressing percentage and yield fatter, more attractive, and more salable carcasses. When cooked, the beef from the cattle receiving the grain supplement shrank more from loss of fat drippings, whereas the beef from the grass-fed animals had more loss from evaporation. When the two kinds of beef were tested for palatability, the differences were small; and only in such respects as aroma, flavor of fat, and richness and quantity of juice was beef from the grain-fed animals consistently superior.

The influence of the animal's age upon the quality of its beef has been studied by the Iowa station, with the following conclusions: The age of the animal has slight influence on the percentages of the various cuts. Beef from yearlings and 2-year-olds has higher dressing yields and a better distribution of fat through the lean, and is more palatable to most tastes than beef from calves finished at approximately 8 months of age. Beef from younger animals is lighter in color than that from older animals, but will not ripen so satisfactorily.

The old question of the comparative merits of beef from heifers and steers also has received attention in a series of studies which have yielded interesting results. It was found that heifers and steers of the same breeding, age, and type, when fed the same feeds, reach desirable market weights and degrees of finish in different periods of time. Heifers fatten more quickly and should be marketed at lower ages than steers if they are fed alike. Heifers of good beef-type breeding which graded, on an average, Good to Choice when finished, reached, at about 725 pounds weight, a degree of fatness equal to that reached by the steers at 850 pounds. In the matter of dressing yields there is no consistent difference, though at equal final weights heifers tend to excel steers. Roasted ribs of the two sexes were scored in detail according to such factors as tenderness, quantity and quality of juice, texture, intensity and desirability of aroma, and flavor of fat and lean, and were consistently found to be of equal merit. In general, then, if farmers will finish and market unbred heifers at about 125 pounds lighter weights than steers, there will be no justification for market discrimination in the resulting beef.

Probably the characteristic in which beef most often fails to satisfy the consumer completely is tenderness. Recent studies by home economics specialists of the department and of various States have shown that there are cooking methods for making the least-tender cuts of beef both tender and palatable. In general, fore-quarter cuts and cuts

from older animals or animals which have not carried the bloom that comes from a high degree of finish, should be cooked slowly with moisture; whereas the cuts naturally more tender may be cooked quickly with dry, intense heat. There has been developed a roast-meat thermometer with which the cook may learn the temperature at the center of the roast and, by its guidance, bring a roast to the exact degree of doneness desired.

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TREND in Hog Production Is Toward Efficiency and Quality of Product Widely recognized for its efficient utilization of feed and its adaptability to various systems of farming, the hog is one of the most dependable sources of agricultural income. Swine are raised on approximately three-fourths of the farms in the United States. The total number on January 1, of each of the last five years, has ranged from about 52,000,000 to 62,000,000. Swine consume from 40 to 50 per cent of the corn crop and furnish approximately half the meat consumed in the United States. In value, they represent about one-tenth of all agricultural production. The hog's prolificacy and early-maturing qualities, together with the excellent keeping properties of the meat, when properly cured or canned, add further to its usefulness and popularity.

With changing conditions in the country's development the type of hog also has changed. The typical porker of to-day is a vastly different animal from the coarse, large-boned, long-legged hog of pioneer days. According to record, hogs were first brought into this country on the second voyage of Columbus, by way of the West Indies. Later, other hogs in large numbers were brought directly to Florida by De Soto and distributed throughout the South. These animals, of Spanish origin, descendants of wild European hogs, were permitted to run at large. In this unrestricted mingling of hogs there was random breeding, which in the course of a few generations produced a common type.

Meanwhile hogs of a better grade, maturing early because of an admixture of blood of Chinese hogs, were brought into the country from England and distributed along the Atlantic coast at various points from New England to Virginia. These hogs represented breeds already popular and regarded as efficient producers of pork in the British Isles and in the Netherlands. These hogs, too, were obliged to roam beyond the settlements and get their feed chiefly from the mast (acorns, bechnuts, etc.) in the woods bordering the clearings of the settlers.

As the pioneers moved westward, taking livestock with them, the hogs of British origin from the Atlantic coast and the descendants of those from Spain were merged in the eastern and southern sections of what is now known as the Corn Belt. There remained, however, here and there in the settled sections of the country, some more or less pure representatives of the original imported hogs, especially those from Great Britain. In the great bulk of hogs there was considerable deterioration in quality at all the settlements owing to management practices followed under pioneering conditions. Real interest in and effort toward improving hogs did not become of general concern to farmers before about 1800. Since then marked improvements have been made, as indicated by the superior quality of swine in each of the breeds now found throughout the United States.