1972

Cost of Producing Beef with Different Types and Weights of Cattle

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Currently, there is much interest in changing the U.S.D.A. grading standards. Some suggest that we completely eliminate the use of them. There are many reasons for this, but the major one is that many feel that the present system does not always correctly identify the most desirable carcasses. Many cattle now come to market at 15 to 18 months of age and are not marbled because of their youthfulness. This beef will be tender, however, because of its youthfulness and will usually contain enough fat to add juiciness and flavor even though it is not well marbled. In addition, there is much interest in using large type cattle to produce beef, such as the dairy and exotic breeds. Carcasses from large type cattle will not contain as much fat as carcasses from cattle of average size when slaughtered at weights that have the greatest demand at the present time. They are at a smaller proportion of their mature size at these weights and carcasses of cattle tend to contain a given amount of fat at a given proportion of their mature size. With these changes taking place in the beef industry, it is of interest to determine what slaughter weight and point in fatness is the most economical in minimizing the cost of producing beef and if we can produce a given amount of beef more economically by using large type cattle or our traditional cattle types.

As feedlot cattle increase in weight, they deposit an increasing amount of fat per unit of gain. Figure 1 shows the estimated amount of fat at a given weight for two types of cattle. As a pound of fat contains 2¼ times as much energy as a pound of protein, the energy required per pound of gain increases as the proportion of fat in the gain increases. Furthermore, as cattle increase in weight and body fat, they consume less feed in relation to total energy requirements. Average expected total costs of gain at different weights are shown in figure 2. If cattle are too light when slaughtered, enough pounds may not be added to overcome initial costs of the feeder calf or feed and overhead costs of the beef cow. The problem becomes one of finding the point where enough weight is added to overcome initial costs but not so much that excessive amounts of fat are deposited, resulting in higher feed costs per unit of gain and greater amounts of fat having to be trimmed from the carcass. Table 1 gives the estimated costs to produce 10,000 lb. of slaughter weight at various slaughter weights of average and large type cattle. Accumulated costs of gain were calculated for slaughter weights of 800 through 1,400 lb. for average size steers with a weaning weight of 430 lb. and for slaughter weights of 1,000 through 1,600 lb. for large size steers with a weaning weight of 500 lb.

These costs of gain were calculated from net energy requirements and average expected energy intakes for steers on a least cost two-phase feeding program. Overhead costs were included at 15 cents per head daily to include interest, medication, death loss, labor and facilities. Based on data presently available, large size cattle were assumed to have a 10% higher rate of gain and the same

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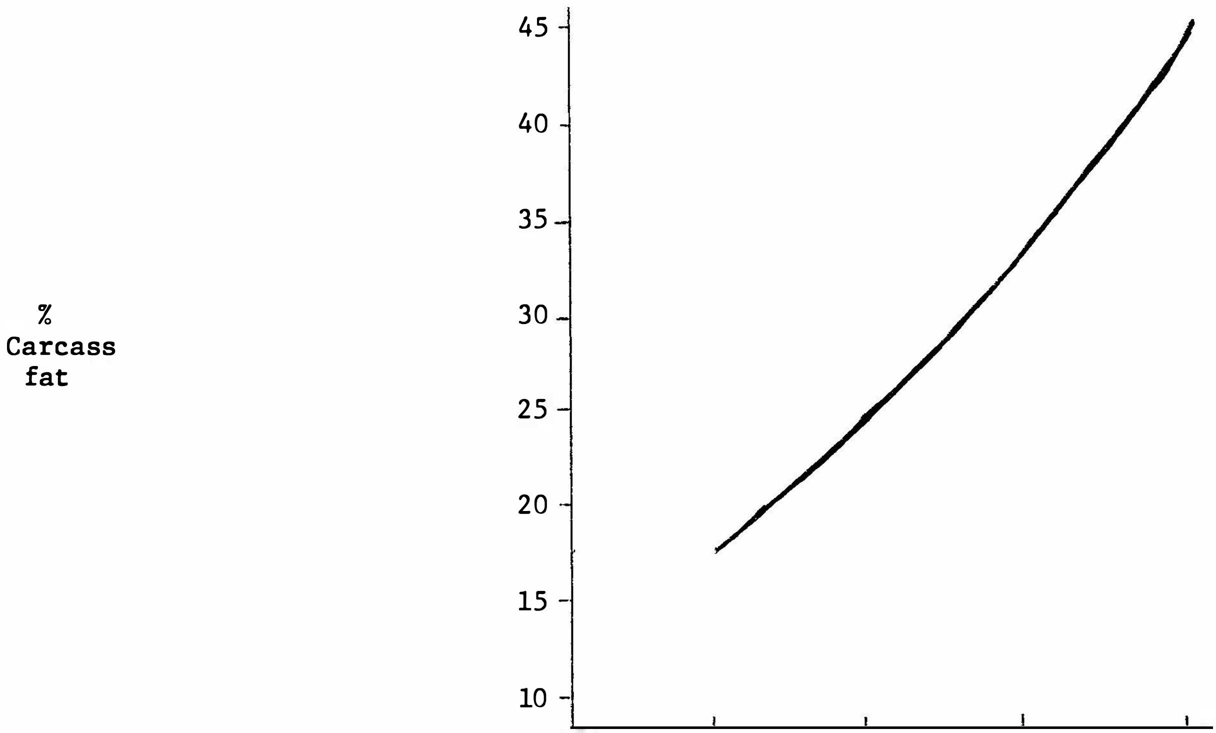
Prepared for the Sixteenth Annual Cattle Feeders Day, October 27, 1972.

energy requirements for maintenance per unit of metabolic size and gain at comparable stages of growth and finish as average size cattle. Cow costs were added to costs of gain to give total cost of production at a given weight. Average South Dakota cow costs and calving percentages presented by Dinkel and Dearborn in the 1972 Cow-Calf Field Day report were used as the basis for calculating cow costs. For average size cattle, this cost ($120.00/head/year) was divided by 0.9 calves expected per cow to give a net cow cost of $133.00. For large size cattle the cow was assumed to be 200 lb. heavier, requiring 1,200 megacalories more digestible energy and 72 lb. more protein per year. With energy valued at 75 cents per megacalorie and protein at 7 cents per lb., this adds $14.00 to the basic cow cost. Also, $1.20 was added for additional interest on a 200 lb. heavier weight. These values were added to the basic cow cost of $120.00, which was then divided by 0.86 calves expected per cow to give a large size cow cost of $157.00.

The results of these calculations are illustrated in figure 3. It appears that the total cost to produce 10,000 lb. of slaughter weight are minimized at 1,000 to 1,100 lb. slaughter weight for average size cattle and 1,100 to 1,300 lb. for large size cattle. This is the point at which these cattle are near or at the fatness of the high good or low choice grades of the present U.S.D.A. carcass grade standards. Slaughtering cattle before and after this point appears to increase the cost of producing beef in the industry as a whole. Slaughter weights that result in maximum profits per head may not correspond to these weights, however, depending on feed costs in relation to prices for cattle at finished weights and price spreads between feeder cattle cost and market prices for finished cattle.

These calculations also show that larger size cattle will produce a given quantity of beef at a somewhat lower cost than smaller size cattle. This is primarily a result of the 10% faster gain reducing overhead costs per pound of gain. Further cost reduction could be obtained if smaller size cows were used to produce larger size feeder cattle through proper crossbreeding. This would reduce the cow cost per lb. of beef produced.

It appears from figures 3 and 4 that the cost of producing beef can be minimized by feeding cattle to the fatness of the present high good and low choice grades and by using larger type cattle to produce heavier carcasses. An additional cost advantage can be gained by proper crossbreeding to produce larger type calves from small cows, thus reducing cow feed costs per lb. of beef produced. Based on these calculations and mature sizes of breeds presented in various publications, table 2 presents projected optimum slaughter weights for various breeds of cattle. Reproductive efficiency, milking ability, heterosis, postweaning performance and carcass characteristics must be taken into account when deciding which lines within breeds and what breeds and crosses should be used to produce beef (Dinkel and Dearborn, 1972). It appears, however, that, as we move toward a demand for less fat and less emphasis on marbling and acceptability of heavier carcasses, using larger size cattle to produce lean, high cutting carcasses at a heavier final weight may substantially increase economic efficiency in producing beef.



% of mature weight	25	50	75	100
Steer wt. of avg. type cattle, lb.	360	725	110	1460
Steer wt. of large type cattle, lb.	430	865	1300	1730

Adapted from data of J. T. Reid, Cornell University; R. L. Preston, Ohio Agricultural Research and Development Center and W. N. Garrett, University of California.

Figure 1. Estimated percent carcass fat of feedlot cattle at various proportions of their mature weight (Mature weight is assumed to be the point where muscle growth is nearly complete).

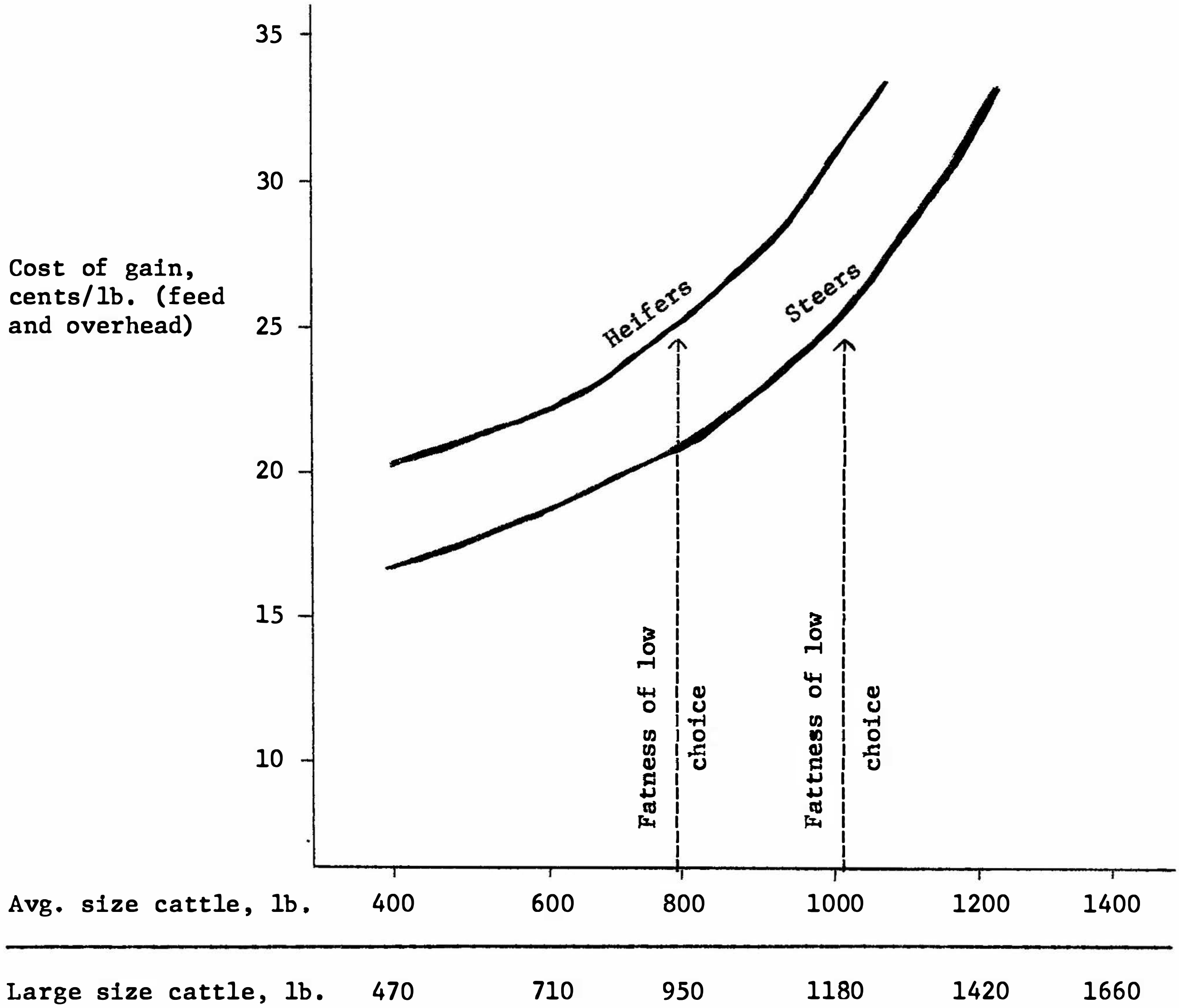


Figure 2. Average expected total cost of gain on feedlot cattle at average expected feed intakes on typical economical feeding programs.

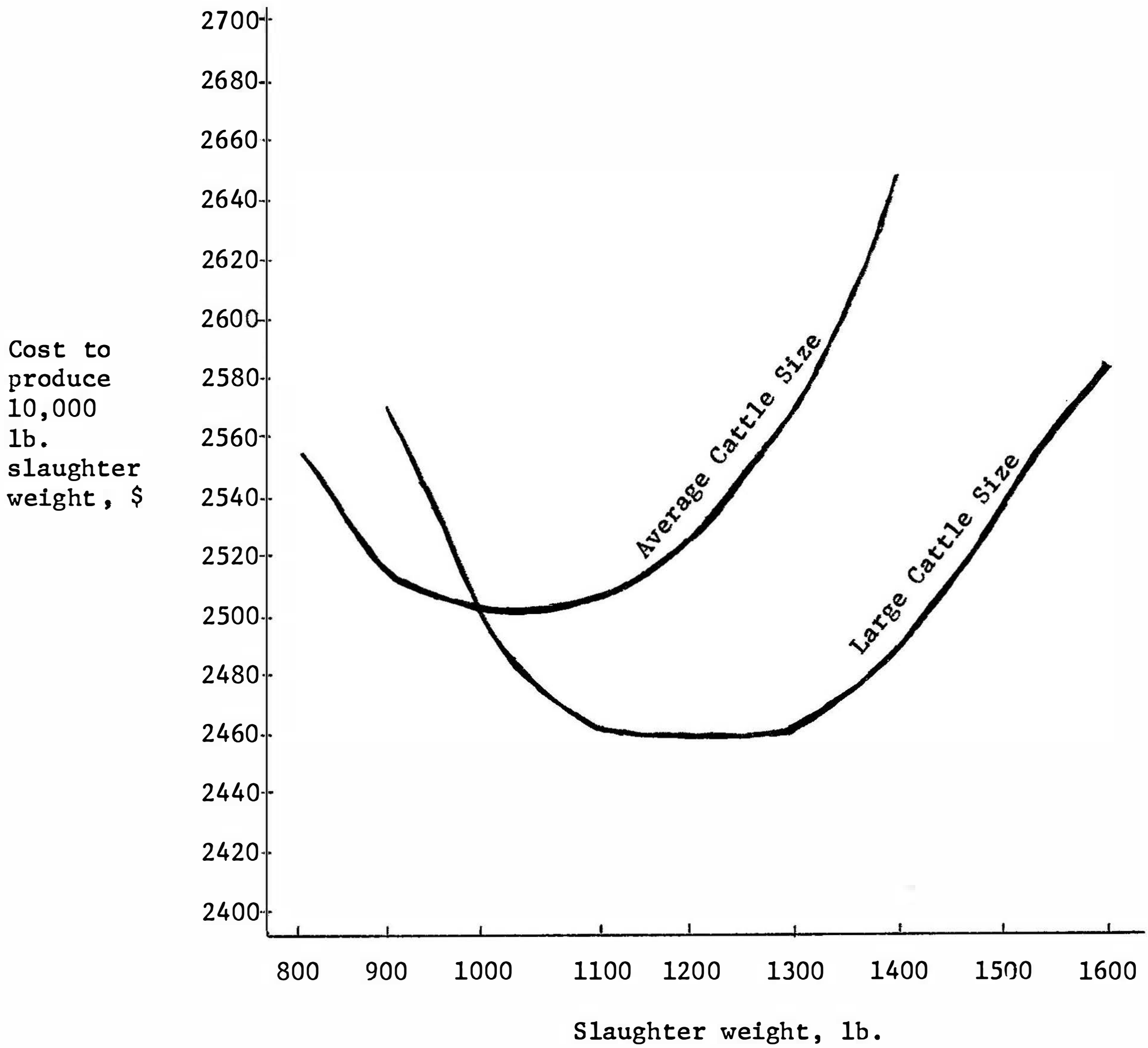


Figure 3. Estimated total costs to produce 10,000 lb. of slaughter weight at various slaughter weights of average and large type cattle, including cow costs.

Table 1. Estimated Costs to Produce 10,000 Lb. of Slaughter Weight at Various Slaughter Weights of Average and Large Type Cattle

Slaughter weight, lb.	800	900	1000	1100	1200	1300	1400	1500	1600
Average size cattle									
Cow cost/head, $[a]	133	133	133	133	133	133	133	--	--
Cost of gain/head, $[b]	71	93	117	143	172	204	240	--	--
Total cost/head	204	226	250	276	305	337	373	--	--
Total cost to produce 10,000 lb. slaughter wt., $	2550	2511	2500	2509	2541	2592	2664	--	--
Large size cattle									
Cow cost/lb., $[c]	--	157	157	157	157	157	157	157	157
Cost gain/head, $[d]	--	74	94	114	138	163	192	223	257
Total cost/head	--	231	251	271	295	320	349	380	414
Total cost to produce 10,000 lb. slaughter wt.	--	2560	2510	2460	2460	2460	2493	2533	2587

[a]Cow cost = $120 ÷ 0.9 calves/cow = $133 net cost/cow.
[b]Estimated average cumulative cost of gain at each weight, assuming a 430 lb. weaning weight.
[c]Cow cost = $135 ÷ 0.86 calves/cow = $157 net cost/cow. This assumes large type cows with 200 lb. heavier weight and 4% lower calving percentage than average type cows.
[d]Estimated average cumulative cost of gain at each weight, assuming a 500 lb. weaning weight and the same feed efficiency at the same proportion of mature size as average type cattle but 50 cents lower overhead cost per unit of gain due to a 10% faster daily gain.

Table 2. Projected Average Optimum Slaughter Weights for Various Breeds

Breed	Projected average optimum slaughter weights, lb.	
	Steers	Heifers
Small type Angus or Shorthorn	900	700
Large type Angus or Shorthorn	1100	850
Small type Hereford	950	800
Large type Hereford	1150	900
Brahman crosses	1150	950
Brown Swiss and Limousin	1200	1000
Charolais, Holstein, Maine Anjou and Simmental	1250	1050

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