

Methods of Feeding BEEF CALVES

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PART I

Fattening—Hand-Feeding, Self-Feeding, Long, Ground and Pelleted Hay, Ratios of Hay to Grain

PART II

Wintering—Frequency of Feeding and Implantation of Stilbestrol

**OHIO AGRICULTURAL
EXPERIMENT STATION**

Wooster, Ohio

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PART I

FATTENING—Hand-Feeding, Self-Feeding, Long, Ground and Pelleted Hay, Ratios of Hay to Grain

PART II

WINTERING—Frequency of Feeding and Implantation of Stilbestrol

EARLE W. KLOSTERMAN, A. L. MOXON and L. E. KUNKLE

PART I. FATTENING

Methods of feeding fattening cattle vary widely throughout the United States. The method used may be dictated, at least in part, by the feeds available, number of cattle on feed, the feed lot arrangement or the balance between equipment and labor available. Nevertheless, personal preference of the feeder is the main deciding factor in many instances.

Numerous experiments have been conducted to compare self-feeding and hand-feeding grain to fattening cattle. The advantages and disadvantages of these two methods have been summarized by Morrison (7). Self-fed cattle have generally gained slightly faster with less labor required but with slightly higher feed costs because of a greater consumption of grain and less roughage. Comparative results of self-feeding complete mixed rations are more limited; (9) however, results obtained at the Ohio Agricultural Experiment Station in 1928 (1) showed no advantage for grinding the roughage portion of the ration and feeding it mixed with the concentrates. Similar results have been reported by other Stations (7).

In recent years there has been a great deal of interest in pelleting feeds for cattle. Results of experiments to date have indicated the value of pelleting to be greatest with high-roughage rations. With much of

the present day equipment, hay is more easily pelleted when finely ground. These factors have stimulated further research on the value of different ratios of hay to grain and value of finely ground roughage.

Procedure:

The cattle used in these fattening experiments were choice Hereford steer calves obtained direct from ranches in northern Texas. They were shipped by rail to Wooster in early October of each year. In order to prevent a complication of results by shipping fever, the experiments were not started until after the cattle had recovered or until it was apparent that this difficulty would not be encountered. The experiments were generally started in November. The steers were assigned to lots at random within weight groups and were weighed individually every 14 days during the experiment. They were fed in a barn with access to outside paved lots.

The experiments were continued until the cattle were estimated to be of average choice slaughter grade. Except for the 1957-58 experiment, the steers were sold on bids direct to packers where individual carcass weights and grades were obtained. From these data, the sale weight of the cattle and assigned values for the carcass grades, the live value of the various lots of cattle was calculated. The cattle fed in 1957-58 were sold by lots at a public market and no carcass data were obtained.

All lots of cattle were allowed free access to water, salt and a mineral mixture of two parts steamed bone meal, two parts ground limestone and one part salt. Other ration components and methods of feeding are given in the following discussions of the separate experiments.

Experiment I, 1955-1956:

This experiment was conducted to compare various combinations of self-feeding and hand-feeding fattening steers. All lots were fed ground ear corn, solvent extracted soybean oil meal and good quality, clover-timothy mixed hay. All lots were fed corn-silage for the first 140 days at which time the supply available was exhausted. When hay was mixed with the concentrates, it was ground through a hammer mill with a three-quarter inch screen. Rations were mixed in a small spiral mixer. The following rations or methods of feeding were compared:

- Lot 1. Self-fed a mixture of 13 percent coarsely ground mixed hay, 77 percent ground ear corn and 10 percent soybean oil meal.
- Lot 2. Self-fed a mixture of 14 percent coarsely ground mixed hay and 86 percent ground ear corn and self-fed soybean oil meal.
- Lot 3. Self-fed the same hay-corn mixture as fed to Lot 2 and self-fed a mixture of soybean oil meal and urea. This mixture varied from 95 percent soybean oil meal and 5 percent urea at the start of the experiment, to 90 percent soybean oil meal and 10 percent urea at the end.
- Lot 4. Self-fed a mixture of 89 percent ground ear corn and 11 percent soybean oil meal and self-fed long hay.
- Lot 5. Hand-fed the same corn-soybean oil meal mixture which was self-fed to Lot 4 and self-fed long hay.
- Lot 6. Hand-fed ground ear corn, soybean oil meal and hay.

Six lots of 7 steers each were fed these rations for a 231-day feeding period. Average daily rations as consumed, average daily gain, feed requirements and carcass data obtained are given in Table 1.

The fastest but also the most expensive gains were obtained in Lot 2 where soybean oil meal was self-fed. The addition of 5 to 10 percent urea (Lot 3) reduced the consumption of soybean oil meal from an average of 5.1 pounds to 1.8 pounds per head daily. Considering the high nitrogen content of urea, however, these steers still consumed somewhat more crude protein than required to meet their needs. No excessive scouring or other difficulties were noticed in either of these two lots of cattle.

There were only small differences in rate of gain, feed costs or carcass data between Lots 1, 4, 5 and 6. Lots 5 and 6 were hand-fed the same feeds in nearly similar amounts as Lots 1 and 4 by an experienced cattle feeder. Under these conditions there was apparently little difference in performance of the cattle whether self-fed or hand-fed.

The feed costs given in Table 1 are for the cost of the feed only and do not include a charge for grinding and mixing. In a larger feed lot operation these charges could be balanced against a larger labor requirement for hand-feeding.

TABLE 1.—Methods of Feeding Fattening Cattle
Experiment I, 1955–1956

	Complete mixture self-fed	Hay-corn mixture, soybean meal self-fed	Hay-corn mixture soybean meal- urea mixture self-fed	Corn- soybean meal mixture, hay self-fed	Corn- soybean meal mixture hand-fed, hay self-fed	Hand- fed
Lot number	1	2	3	4	5	6
Steers per lot	7	7	7	7	7/6*	7
Av. initial weight, lb.	512.0	520.0	518.0	510.0	530.0	506.0
Av. final weight, lb.	996.0	1031.0	1005.0	967.0	1014.0	983.0
Av. daily gain, 231 days, lb.	2.09	2.21	2.11	1.98	2.03	2.07
Av. daily ration:						
Corn and cob meal, lb.	11.7	8.1	10.8	11.3	9.7	10.4
Soybean oil meal, lb.	1.6	5.1	1.8	1.5	1.3	1.6
Urea, lb.	----	----	0.16	----	----	----
Corn silage, lb.	6.9	10.4	8.9	6.3	11.5	9.7
Mixed hay, lb.	2.1	1.4	1.9	2.7	3.1	2.5
Minerals, oz.	0.8	0.4	0.6	0.4	0.5	0.4
Salt, oz.	0.5	0.5	0.3	0.3	0.2	0.2
Feed req. per cwt. gain, lb.:						
Corn and cob meal	558.0	364.0	513.0	569.0	477.0	504.0
Soybean oil meal	75.0	230.0	87.0	73.0	62.0	75.0
Urea	----	----	8.0	----	----	----
Corn silage	329.0	470.0	422.0	318.0	567.0	467.0
Mixed hay	99.0	64.0	89.0	138.0	152.0	121.0
Minerals	2.5	1.0	2.0	1.0	1.5	1.0
Salt	1.0	1.0	1.0	1.0	0.7	0.5
Feed cost per cwt. of gain	\$16.95	\$19.12	\$17.30	\$17.48	\$16.65	\$16.77
Carcass grade factors†	10.9	11.0	11.0	11.1	10.7	10.6
Dressing percentage	63.7	63.8	63.2	62.2	63.5	62.8
Live value per cwt.‡	\$22.95	\$23.00	\$22.76	\$22.51	\$22.86	\$22.50

*One steer removed because of sub-normal gain.

†Low, average and high choice: 10, 11, 12 respectively.

‡Calculated from carcass grade, weight and prices as follows: average and low prime, \$37.50, \$37.00; high, average and low choice, \$36.50, \$36.00, \$35.75; high good, \$35.00.

FEED PRICES USED

Corn -----	\$ 1.40 per 70 lb.	Mixed hay -----	\$25.00 per ton
Soybean oil meal ---	75.00 per ton	Minerals -----	3.00 per cwt.
Urea -----	120.00 per ton	Salt -----	1.50 per cwt
Corn silage -----	10.00 per ton		

Experiment II, 1956-1957:

Five lots of seven steers each were fed the following rations for a total of 252 days.

- Lot 1. Self-fed a mixture of 13 percent coarsely ground mixed hay, 77 percent ground ear corn and 10 percent soybean oil meal.
- Lot 2. Self-fed alfalfa hay and self-fed ground ear corn.
- Lot 3. Self-fed pelleted alfalfa hay and self-fed ground ear corn.
- Lot 4. Self-fed mixed hay, self-fed ground ear corn and self-fed a mixture of soybean oil meal and salt which averaged approximately 95 and 5 percent, respectively.
- Lot 5. Hand-fed mixed hay, ground ear corn and soybean oil meal.

The pelleted alfalfa hay fed to Lot 3 was made from the same hay as fed long to Lot 2. This hay was purchased in northwestern Ohio. One-half of the hay was hauled to Wooster in the bale and one-half was finely ground and pelleted by a commercial dehydrating plant.

Average daily rations as consumed and results obtained in this feeding experiment are presented in Table 2.

The cattle in Lots 1, 4 and 5 all gained at much the same rate, at nearly equal feed costs and produced carcasses which averaged very similar. Thus, when similar daily rations were consumed, the method of feeding had little influence upon the performance of the cattle.

The method of feeding used in Lot 4 appears to be a practical means of self-feeding cattle without the necessity of mixing protein supplement with all of the grain fed. It would require the mixing of protein supplement and salt but the volume of mixing required is much smaller than mixing the entire ration. The amount of salt used in this experiment was varied during the early part of the study to determine the amount required to limit soybean oil meal consumption to the desired level. These results indicate that, when fed with the ration used in this experiment, a mixture of 95 percent soybean oil meal and 5 percent salt will be consumed in approximately the proper amounts to balance the protein content of the ration.

TABLE 2.—Methods of Feeding Fattening Cattle
Experiment II, 1956–1957

	Complete mixture self-fed	Alfalfa hay, corn self-fed	Alfalfa pellets, corn, self-fed	Hay, corn, soybean meal- salt mixture self-fed	Hand- fed
Lot number	1	2	3	4	5
Steers per lot	7	7	7	7	7
Av. initial weight, lb.	479.0	480.0	485.0	483.0	484.0
Av. final weight, lb.	986.0	945.0	952.0	1003.0	988.0
Av. daily gain, 252 days, lb.	2.01	1.85	1.85	2.06	2.00
Av. daily ration:					
Ground ear corn, lb.	11.8	10.7	12.8	11.4	10.5
Soybean oil meal, lb.	1.6	----	----	1.3	1.5
Corn silage, lb.	3.8	5.0	4.4	5.3	7.4
Mixed hay, lb.	2.1	----	----	4.2	2.1
Alfalfa hay, lb.	----	5.0	3.0	----	----
Minerals, oz.	0.5	1.0	1.1	0.3	0.5
Salt, oz.	0.5	0.4	0.6	0.7	0.2
Feed req. per cwt. gain, lb.:					
Ground ear corn	588.0	580.0	692.0	551.0	526.0
Soybean oil meal	77.0	----	----	61.0	75.0
Corn silage	189.0	268.0	240.0	258.0	370.0
Mixed hay	106.0	----	----	201.0	103.0
Alfalfa hay	----	271.0	160.0	----	----
Minerals	2.0	3.0	4.0	1.0	1.0
Salt	2.0	2.0	2.0	2.0	1.0
Feed cost per cwt. gain	\$16.79	\$16.44	\$17.99	\$17.02	\$16.32
Carcass grade factor*	11.0	10.6	11.3	11.0	11.4
Dressing percentage	64.2	61.9	63.8	62.9	63.0
Live value per cwt.†	\$23.85	\$22.89	\$23.75	\$23.36	\$23.47

*Low, average and high choice: 10, 11, 12 respectively.

†Calculated from carcass grade, weight and prices as follows: prime \$38.25; high, average and low choice \$37.50, \$37.00, \$36.75; high good \$36.25 per cwt.

FEED PRICES USED

Corn -----	\$ 1.40 bushel	Alfalfa hay -----	\$25.00 ton
Soybean oil meal -----	70.00 ton	Pelleted alfalfa -----	35.00 ton
Corn silage -----	10.00 ton	Minerals -----	3.00 cwt.
Mixed hay -----	25.00 ton	Salt -----	1.50 cwt

The steers in Lots 2 and 3 were fed to determine the value of pelleting hay when fed with corn in a fattening ration. Pelleted hay has been found to have a high value in Illinois Experiment Station studies for wintering cattle (10). The value has resulted primarily from an increased feed intake when compared to feeding long or chopped hay. In this experiment the alfalfa hay pellets fed to Lot 3 were made from the same hay as that fed to Lot 2. When the cattle had free access to ground ear corn in a self-feeder, pelleting the hay did not increase its consumption. Results in Table 2 indicate that the steers actually ate less of the pelleted hay; however, there was some wastage of the self-fed, long hay in Lot 2 which did not occur when it was pelleted. This saving of feed was not adequate to pay the cost of pelleting.

The feed costs given in Table 2 are for the cost of the feed and cost of pelleting the alfalfa hay but do not include any other grinding or mixing charges.

Experiment III, 1957-1958:

Results of the previous experiment conducted in 1956-57 showed no value for pelleting alfalfa hay when ground ear corn and long or pelleted alfalfa were self-fed separately to fattening steers. When the steers could eat all of the ground ear corn they wanted they did not eat any more of the pelleted hay than they did of the same hay in the long form. Because of this and the fact that the greatest value for pelleting had been found with high roughage rations, the 1957-58 experiment was designed to feed larger amounts of pelleted alfalfa with ground ear corn.

In this experiment, pelleted alfalfa and ground ear corn were mixed together and self-fed in one feeder. The alfalfa pellets used were one-fourth inch in diameter. Lot 1 was fed a mixture of equal parts, by weight, of ground ear corn and pelleted alfalfa. Lot 2, two parts corn to one of pellets and Lot 3, three parts corn to one of pellets. All steers were implanted with 36 mg. of stilbestrol per head at the start of the experiment. Salt and minerals were self-fed in separate boxes. At the end of the experiment, the steers were sold by lots at the Cleveland Public Market. The results obtained for the 182-day experiment are presented in Table 3.

Differences obtained in average daily gain were not large, although the cattle fed the higher proportion of corn gained somewhat faster.

**TABLE 3.—Ratios of Ground Ear Corn and Pelleted
Alfalfa Hay for Fattening Steers
Experiment III, 1957–1958**

Lot	Ground ear corn Alfalfa pellets 1:1	Ground ear corn Alfalfa pellets 2:1	Ground ear corn Alfalfa pellets 3:1
	1	2	3
Number in lot	7	7	7
Av. weight, December 10, lb.	563.0	548.0	555.0
Av. weight, June 10, lb.	1003.0	992.0	1025.0
Av. daily gain 182 days, lb.	2.42	2.44	2.58
Av. daily ration:			
Ground ear corn, lb.	11.6	14.7	16.9
Alfalfa pellets, lb.	11.6	7.3	5.7
Salt, oz.	0.8	0.4	0.8
Minerals, oz.	1.1	0.7	1.3
Feed per cwt. of gain, lb.:			
Ground ear corn	479.0	602.0	657.0
Alfalfa pellets	479.0	301.0	221.0
Salt	2.0	1.0	2.0
Minerals	3.0	2.0	3.0
Total	963.0	906.0	883.0
TDN per cwt. of gain, lb.	589.0	590.0	590.0
Feed cost per cwt. of gain	\$18.08	\$17.37	\$17.13
Sale price per cwt.	\$26.50	\$27.00	\$27.50

FEED PRICES USED

Corn -----	\$ 1.40 bushel	Minerals -----	\$3.00 cwt.
Pelleted alfalfa -----	35.00 ton	Salt -----	1.50 cwt.

They also sold for a slightly higher price per hundredweight. Feeding larger amounts of pelleted alfalfa reduced the amount of corn required per unit of gain. However, with little difference in cost of the two feeds there was no saving in cost per hundredweight of gain. It is interesting to note that the pounds of total digestible nutrients required per unit of gain were identical for the three lots. The alfalfa used was estimated to contain 50 percent TDN and the ground ear corn 73 percent.

Relative supplies and current values of hay and ear corn would determine which of these three rations might be most profitable.

Experiment IV, 1958-1959:

Experiment III, conducted in 1957-58, showed only small differences in feeding value between mixtures which contained three different ratios of pelleted alfalfa hay and ground ear corn. It supplied no information on the value of pelleting the hay portion of the ration. The 1958-59 experiment was conducted to obtain further information on these two questions:

This experiment was designed to compare the value of long, ground and pelleted alfalfa hay when fed with two ratios of ground ear corn. Approximately 50 tons of alfalfa hay were purchased in one lot in northwestern Ohio. One-third was hauled to Wooster in the bale and fed long. One-third was ground and one-third ground and pelleted in one-quarter inch pellets. The ground hay was ground to the same degree of fineness as that which was pelleted. Each type of hay was fed with equal parts ground ear corn or two parts ground ear corn and one-part hay.

The ground and pelleted hays were mixed with the ground ear corn and self-fed. The long hay was self-fed with ground ear corn hand-fed in amounts to approximate that eaten by the steers fed the pelleted hay. Each of these rations was fed to a lot of seven choice quality Hereford steers. All steers were implanted with 36 mg. of stilbestrol per head at the start of the experiment.

This experiment was continued for 224 days. At the end of this time all steers were slaughtered at a packing plant where individual carcass grades and weights were obtained. From these data, and carcass values for the various grades, the live value per hundredweight was calculated. Results of this experiment are presented in Tables 4 and 5.

Statistical analyses of the average daily gains obtained showed no significant differences due to level of ground ear corn included in the ration. This analysis, however, showed that steers fed ground hay gained significantly faster than those fed either long or pelleted hay. There was also a significant interaction between hay preparation and level of ground ear corn. That is, steers fed ground hay tended to gain faster with two parts corn to one of hay while the reverse was true when the hay was pelleted.

A comparison of lot means, however, indicated that these differences were due primarily to the rapid gains made by the one lot of steers fed two parts ground ear corn and one part ground hay. These steers gained significantly faster than those in any other lot but there were no

TABLE 4.—Summary of Two Ratios of Ground Ear Corn and Long, Ground or Pelleted Alfalfa Hay for Fattening Steers
Experiment IV, 1958–1959

	Long Hay	Ground Hay	Pelleted Hay	Average
Equal parts ear corn and hay:				
Av. daily gain, lb.	2.09	2.24	2.29	2.21
Av. daily ration, lb.	21.1	20.4	21.2	20.9
T.D.N. per cwt. gain, lb.	625.0	557.0	569.0	584.0
Feed cost per cwt. gain	\$15.49	\$15.19	\$16.46	\$15.71
Carcass grade factor	9.0	9.9	10.4	9.8
Dressing percentage	59.4	59.7	62.1	60.4
Live value per cwt.	\$25.64	\$25.92	\$27.43	\$26.33
Two parts ear corn, 1 part hay:				
Av. daily gain, lb.	2.16	2.54	2.08	2.26
Av. daily ration, lb.	21.8	21.6	18.6	20.7
T.D.N. per cwt. gain, lb.	635.0	554.0	580.0	590.0
Feed cost per cwt. gain	\$15.74	\$14.56	\$15.86	\$15.39
Carcass grade factor	9.7	11.1	10.0	10.3
Dressing percentage	61.0	62.1	60.9	61.3
Live value per cwt.	\$26.07	\$27.63	\$26.73	\$26.81
Average:				
Av. daily gain, lb.	2.12	2.39	2.18	
Av. daily ration, lb.	21.4	21.0	19.9	
T.D.N. per cwt. gain, lb.	630.0	556.0	575.0	
Feed cost per cwt. gain	\$15.62	\$14.88	\$16.16	
Carcass grade factor	9.4	10.5	10.2	
Dressing percentage	60.2	60.9	61.5	
Live value per cwt.	\$25.86	\$26.78	\$27.08	

significant differences between gains made by steers in the other five lots. Since these results were due mainly to the performance of the one lot of steers, there is a question as to whether or not there was any real advantage in feeding finely ground hay.

There was very little wastage of feed when ground ear corn was mixed with ground or pelleted hay and self-fed. The steers self-fed long hay pulled hay out of the feeder and hence wasted an undetermined amount. During the last half of the experiment the long hay was partially limited in an effort to reduce this wastage. The feed consumption

and requirement data given in the tables were calculated from feeds weighed to the cattle and hence include this wastage. This explains, at least in part, the higher feed and TDN requirement of the steers fed long hay.

**TABLE 5.—Two Ratios of Ground Ear Corn and Long, Ground or Pelleted Alfalfa Hay for Fattening Steers
Experiment IV, 1958–1959**

Ratio Ground Ear Corn : Hay	Long Hay		Ground Hay		Pelleted Hay	
	1:1	2:1	1:1	2:1	1:1	2:1
Lot number	4	5	3	6	1	2
Number steers	7	7	7	7	7	7
Av. weight, Nov. 25, lb.	521.0	527.0	527.0	529.0	528.0	525.0
Av. weight, July 7, lb.	989.0	1010.0	1029.0	1098.0	1041.0	991.0
Av. daily gain, 224 days, lb.	2.09	2.16	2.24	2.54	2.29	2.08
Av. daily ration:						
Ground ear corn, lb	11.0	12.2	10.2	14.4	10.6	12.3
Alfalfa hay, lb.	10.1	9.6	10.2	7.2	10.6	6.3
Salt, oz.	0.4	0.5	0.4	0.6	0.7	0.3
Minerals, oz.	0.7	0.7	0.6	0.8	0.7	0.7
Feed per cwt. gain, lb.:						
Ground ear corn	525.0	564.0	453.0	566.0	463.0	589.0
Alfalfa hay	484.0	447.0	453.0	282.0	463.0	301.0
Salt	1.0	2.0	1.0	2.0	2.0	1.0
Minerals	2.0	2.0	2.0	2.0	2.0	2.0
Feed cost per cwt. gain	\$15.49	\$15.74	\$15.19	\$14.56	\$16.46	\$15.86
T.D.N. per cwt. gain	625.0	635.0	557.0	554.0	569.0	580.0
Carcass grade factors*	9.0	9.7	9.9	11.1	10.4	10.0
Dressing percentage	59.4	61.0	59.7	62.1	62.1	60.9
Live value per cwt.†	\$25.64	\$26.07	\$25.92	\$27.63	\$27.43	\$26.73

*High good, 9; low, average and high choice, 10, 11, 12 respectively.

†Calculated from carcass grade, weight and prices as follows:

Prime	\$47.50
Choice	\$44.50
Good	\$42.00
Standard	\$40.00 per cwt

Some difficulty with bloat was experienced with one steer in Lot 2 fed pelleted hay and one in Lot 3 fed ground hay. This may have affected the production data of these two lots. The bloat was not sufficiently serious, however, to necessitate changing the ration or removing these two steers from the experiment.

Average carcass data between lots were somewhat variable, however, there was an indication that steers fed long hay graded and yielded lower than those fed ground or pelleted hay. This was true even though they gained nearly as much as steers fed pelleted hay.

DISCUSSION AND SUMMARY

Results of these experiments are in agreement with previous research on the relative value of various methods of feeding fattening cattle (7). When similar daily rations were fed, there was little difference in performance of steers which were hand-fed, self-fed or fed by a combination of these two methods. There appeared to be little advantage in coarsely grinding the hay and mixing it with the ground ear corn and supplement. The cattle in these experiments were fed by an experienced feeder. Undoubtedly, there would be an advantage in favor of self-feeding if the feeder were not an experienced cattleman.

Soybean oil meal was self-fed satisfactorily to fattening steers without complication even though they consumed over five pounds per head daily. High feed costs, however, would make this an impractical method of feeding. The inclusion of 10 percent urea with the soybean oil reduced consumption but, considering the high nitrogen content of urea, the steers still ate considerably more crude protein than required to meet their needs. Self-feeding a mixture of salt and soybean oil meal proved to be a satisfactory method of feeding supplement to cattle which were self-fed ground ear corn. This eliminated mixing the entire ration and would be superior to hand-feeding supplement to cattle which were being self-fed corn or corn silage. When supplement is hand-fed to cattle which are being self-fed other feeds, it is likely that some cattle will eat more than needed while others will not receive the required amount.

When ground ear corn was self-fed, the only advantage in self-feeding pelleted alfalfa hay over long hay was a saving in amount of hay wasted. This saving was not sufficient to pay the cost of grinding and pelleting the hay.

When ground ear corn and pelleted alfalfa hay were mixed in ratios of 1:1, 2:1 or 3:1 and self-fed there was only a slight advantage in favor of the rations containing the higher proportions of corn. Similarly, there was no significant difference in performance of cattle fed equal parts ground ear corn and hay or two parts ground ear corn to one of hay in another experiment.

Finely ground alfalfa hay was found to be fully equal to finely ground and pelleted hay when mixed with ground ear corn and self-fed. Carcass grades of cattle fed ground or pelleted hay mixed with equal parts ground ear corn or two parts corn to one of hay were somewhat higher than the grades of cattle fed long hay and similar amounts of corn. Feed costs per unit of gain have been higher for cattle fed pelleted hay than those fed long hay. The advantages of feeding pelleted hay have not been sufficient to pay the cost of grinding and pelleting.

There are some other advantages for pelleting hay which have not been mentioned. These include: more compact storage, ease of handling and adaptability to mechanized feeding. Under some farming or feed-lot conditions, these factors would partially justify the cost of pelleting.

PART II. WINTERING

Although more limited than dry lot fattening in Ohio, there are a certain number of beef calves which are held over the winter for later grazing and fattening. This procedure is well adapted to the utilization of meadow crops and other roughages. These experiments were conducted to study the effects of frequency of feeding and stilbestrol implantations upon rate of gain and efficiency of feed utilization.

Research with sheep in England (2) and with dairy calves at the North Carolina (6, 9) and Virginia Stations (3) has shown that animals fed several times daily utilized their feed more efficiently than those fed only once or twice daily. Even though total feed intake was equalized, animals fed 4, 8 or 10 times daily gained significantly more than those fed once or twice daily. This response, however, seemed to be true only for growing animals since multiple feeding did not increase production of dairy cows.

Stilbestrol, whether implanted subcutaneously or administered orally, has been shown to have a definite stimulatory effect upon gains of fattening steers. The effect has been less marked with fattening heifers.

More limited investigations have been conducted with cattle on rations other than fattening; this is especially true in the case of heifer calves (4, 8).

Procedure:

The objective of these experiments was to compare the growth rate of Hereford heifer calves fed once daily to that of similar heifers fed the same ration divided into three equal portions and fed three times daily. Two experiments have been conducted with the same procedure being followed each year.

These experiments were conducted at the Mahoning County Farm, Canfield, Ohio. Feeder, heifer calves were shipped direct from a ranch in northern Texas. The experiments were started approximately six weeks after the heifers arrived at the farm. They were separated into lots at random within weight groups and were weighed individually every 28 days. Two lots were fed in a barn and two lots in an attached "L" shaped open-sided shed. All cattle were allowed free access to water, salt and a mineral mixture of two parts steamed bone meal, two parts ground limestone and one part salt. Approximately one-half of the heifers in each lot were implanted with 36 mg. of stilbestrol per head at the start of the experiment.

The two lots of heifers which were fed once daily were fed in the morning. All feeds were fed in the same bunk. Due to a tendency for the heifers to waste some hay when all feeds were put in the bunk at the same time, silage and grain were fed first and hay a few hours later. Those lots which were fed three times daily were fed in the morning, noon and evening and all feeds were put in the bunk at the same time.

Experiment I, 1957-1958:

Seventy-eight choice grade Hereford heifers were divided into four lots. The rations fed and results obtained are presented in Table 6.

In either of the two comparisons, Lots 1 and 2 or 3 and 4, there was practically no difference in rate of gain or feed utilization between heifers fed once daily or those fed the same amount of feed in three equal portions, morning, noon and evening. During the first 56 days on experiment, the heifers fed 3 times daily gained more rapidly but during the latter part of the feeding period the reverse was true so that, for the entire experiment, there was no difference due to frequency of feeding. The two lots of heifers fed in the barn gained significantly more than those fed in the shed.

**TABLE 6.—Frequency of Feeding and Implantation of
Stilbestrol in Wintering Heifers
Experiment I, 1957–1958**

	BARN		SHED	
	Fed three times daily	Fed once daily	Fed three times daily	Fed once daily
Lot number	1	2	3	4
Number in lot	18	18	21	21
Av. weight, Nov. 20, lb.	466.0	468.0	467.0	470.0
Av. weight, April 23, lb.	705.0	709.0	685.0	682.0
Av. daily gain, all heifers, lb.	1.55	1.56	1.42	1.38
Av. daily gain, stilbestrol, lb.	1.58	1.72	1.52	1.50
Av. daily gain, control, lb.	1.52	1.40	1.32	1.27
Av. daily ration:				
Ground ear corn, lb.	3.0	3.0	3.0	3.0
Hay-crop silage, lb.	15.5	15.5	15.5	15.5
Hay, lb.	7.5	7.5	7.5	7.5
Salt, oz.	0.3	0.5	0.4	0.4
Minerals, oz.	0.4	0.5	0.4	0.4
Feed per cwt. of gain, lb.:				
Ground ear corn	193.0	192.0	212.0	217.0
Hay-crop silage	997.0	993.0	1091.0	1120.0
Hay	484.0	481.0	530.0	543.0
Salt	1.4	2.1	2.0	2.0
Minerals	1.5	2.2	2.0	2.0

Stilbestrol implantation brought about a significant increase in average daily gain of 0.21 pound. This varied from 0.06 pound in Lot 1 to 0.32 pound in Lot 2. It is of interest that the response to stilbestrol was greater when the heifers were fed once daily than when fed three times. It seems possible that stilbestrol tended to stimulate appetite and when large amounts of feed were fed at one time the implanted heifers may have eaten more than those in the same lot which were not implanted with stilbestrol. They may have had less opportunity to do this when smaller amounts of feed were given more frequently. The

increase in gain of 0.21 pound per head daily due to stilbestrol implantation was fully equal to that obtained from similar heifers fed a fattening ration in another experiment.

One heifer aborted shortly after being implanted with stilbestrol. There were no complications following the abortion and no other serious side effects, such as prolapse, in any of the implanted heifers. The heifer which aborted was the only one in the experiment which proved to be pregnant.

Experiment II, 1958-1959:

Four lots of choice grade Hereford heifers were fed from November 21, 1958 to May 4, 1959. The same rations and procedures as followed the previous year were used. The rations fed and results obtained are presented in Table 7.

Results of this study were very similar to those obtained in the same experiment conducted during 1957-58. Nearly identical gains and feed requirements were obtained when heifer calves were fed once daily or when the same amounts of feed were fed in three equal portions. Average daily gain of all heifers implanted with stilbestrol was 0.26 lb. greater than those which were not implanted. In this experiment, there was no apparent difference in response to stilbestrol whether the heifers were fed once or three times daily.

DISCUSSION AND SUMMARY

Very similar results were obtained in these two experiments. This was true in regard to frequency of feeding and stilbestrol implantation. Practically identical results were obtained whether growing heifers were fed a ration of hay-crop silage, hay and limited corn once daily or the same amounts of feed divided into three equal portions and fed three times daily.

Stilbestrol implantation increased average daily gains by 0.21 lb. in the first experiment and 0.26 lb. in the second. These increases were fully equal to the response obtained from stilbestrol implantation in heifers fed fattening rations in other experiments at this Station (4). In the first experiment there appeared to be an interaction between frequency of feeding and stilbestrol implantation, however, this difference did not occur in the second experiment.

**TABLE 7.—Frequency of Feeding and Implantation of
Stilbestrol in Wintering Heifers**

Experiment II, 1958–1959

	BARN		SHED	
	Fed three times daily	Fed once daily	Fed three times daily	Fed once daily
Lot number	1	2	3	4
Number in lot	16	16	19	20
Av. weight, Nov. 21, lb.	497.0	491.0	497.0	492.0
Av. weight, May 4, lb.	721.0	709.0	721.0	712.0
Av. daily gain, all heifers, lb.	1.36	1.33	1.36	1.34
Av. daily gain, stilbestrol, lb.	1.51	1.49	1.51	1.43
Av. daily gain, control, lb.	1.23	1.17	1.23	1.26
Av. daily ration:				
Ground ear corn, lb.	3.0	3.0	3.0	3.0
Hay-crop silage, lb.	15.0	15.0	15.0	15.0
Hay, lb.	6.9	6.9	6.9	6.9
Salt, oz.	0.5	0.7	0.5	0.4
Minerals, oz.	0.4	0.5	0.3	0.2
Feed per cwt. of gain, lb.:				
Ground ear corn	220.0	226.0	220.0	223.0
Hay-crop silage	1100.0	1128.0	1102.0	1116.0
Hay	504.0	517.0	506.0	511.0
Salt	2.0	3.2	2.1	2.0
Minerals	2.0	2.5	1.2	1.1