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SHORT FED STEERS
A COMPARISON OF METHODS OF FEEDING

By HERBERT W. MUMFORD and H. O. ALLISON

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Summary of Bulletin No. 142

1. Under the conditions of the experiment, the profit to be derived from short feeding cattle was 7.36 percent interest on the total expenditure for ninety days for lot 1 and 18.88 percent for lot 2.

2. With expenses as figured the necessary margin per cwt. between buying and selling price in Chicago in order to break even was $1.137 for lot 1 (common method of feeding) and $1.166 for lot 2 (chopped hay and self-feeder), when the pork produced is not considered.

3. Mixed feed when fed thru a self-feeder is especially advantageous for accustoming cattle to a heavy grain ration in a short time.

4. By the use of mixed feed and the self-feeder the necessity of a skillful feeder is reduced.

5. Cattle fed chopped hay mingled with concentrates thru a self-feeder will consume larger quantities of feed than when the same feeds are fed separately at regular periods twice per day.

6. By chopping the hay, mingling it with the grain and feeding thru a self-feeder as in lot 2, more rapid gains were secured and at slightly less cost per pound than when these same feeds were fed separately twice per day as in lot 1.

7. The larger gain of lot 2 resulted in better finish, 15 cents per cwt. higher selling price, and $2.05 per steer more profit (not including pigs) than lot 1.

SHORT FED STEERS
A COMPARISON OF METHODS OF FEEDING

By HERBERT W. MUMFORD, Chief in Animal Husbandry, and
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INTRODUCTION

Among common methods of beef production there is recognized the practice of short feeding or "warming up" of cattle. This process usually requires from 60 to 100 days and the cattle are generally marketed in a half fat or unfinished condition. In this, as in most enterprises of this sort, the variations of common practice are wide. These variations are in the grade and condition of cattle selected for feeding, the methods of handling, and the rations used. Some feeders, for instance, select heavy fleshy cattle of the better grades while others select cattle thin in flesh, but generally mature, and of the lower grades. Then too, the variations in the methods of handling the cattle are wide, the chief difference being in the policy of forcing rapid and large gains by the use of a rather expensive ration as compared with that of smaller gains by the use of limited quantities of feed or less expensive feeds.

The factors surrounding and the possibilities of short feeding are considerably different from those of long feeding where the cattle are fed for six months or longer and generally marketed in finished condition. It is not intended, however, at this time to compare the practice of short feeding with that of finishing beef cattle. We introduced this work rather to study the methods and possibilities of short feeding. To do this, a test was conducted with two carloads of cattle under conditions comparable to those existing in Illinois. In this work the relative merits of two different methods of feeding were studied and other available data were collected thus supplying a basis upon which the business of short feeding cattle may be judged.

Conditions of the Experiment

The steers used in the experiment were purchased on the Chicago market August 22, 1905. They consisted of thirty-four head of good to choice, fleshy, three-year-old feeders. All were dehorned and the average weight was 1,073 pounds in Chicago. They were natives and northwest rangers mixed, but all were undoubtedly strictly grass cattle. Upon arrival at the experimental farm, they were divided into

two lots of seventeen head each. In this division every effort was made to make the lots as nearly alike as possible in quality, condition and weight. In order to make the test as practical and simple as possible, the usual preliminary feeding period was dispensed with and the steers were put on experiment two days after their arrival.

To secure the corrrect weight of the steers at the beginning of the experiment, they were weighed on three consecutive mornings, August 24, 25, and 26, before feeding and watering. The average of these weights was then taken as the correct weight at the beginning of the test which began on August 25. The experiment was divided into periods of two weeks, the cattle being weighed at the end of each period under the same conditions as to water and feed.

Both lots received the same feeds consisting of corn meal, oil meal, and clover hay. Lot 1 received these according to the common method of feeding, that is, whole hay and concentrates fed separately at regular feeding periods twice per day. In the case of lot 2 the clover hay was chaffed by running it thru an ordinary ensilage machine and it was then mingled with the grain portion of the ration and fed thru a self-feeder, to which the cattle had access at all times.

Four pigs were placed in each lot to utilize whatever undigested feed passed thru the steers. While it was thought at the time that more pigs might have been used to advantage, the difficulty in securing them made the trial impossible.

FEED LOTS AND EQUIPMENT

With the exception of the method of feeding, the conditions surrounding both lots were alike. Owing to the prevailing warm weather at the begining of the experiment, it was thought best not to confine the steers to a small feed lot with no shade other than that provided by the shed. Consequently they were given the run of small paddocks 237 x 112 feet which adjoined the feed lots. Along one end of these extended a double row of soft maple trees which furnished ample shade and under which the cattle spent most of their time during the day. These paddocks were sodded with blue-grass, but as it had been pastured during the forepart of the season there was no available feed when the cattle were turned in, and because of the tramping and soiling from the droppings, the steers obtained no feed from this source. It may be said, however, that the pigs ate some of the grass and likely profited slightly thereby.

The feed lots proper were paved with brick and measured 36 x 48 feet, with a 12 foot shed running along the north side. In these small lots the cattle were fed and allowed to run at all times. The steers had access to pure, fresh water supplied in galvanized steel tanks into which it was drawn from the University plant. The concentrates were supplied to lot 1 in an open feed-box similar to that used in the ordinary feed lot, while the clover hay was fed in mangers along the side of the lot. As the hay and grain were mixed for lot 2, a specially adapted self-feeder was constructed thru which the mixture would run as the cattle needed it.

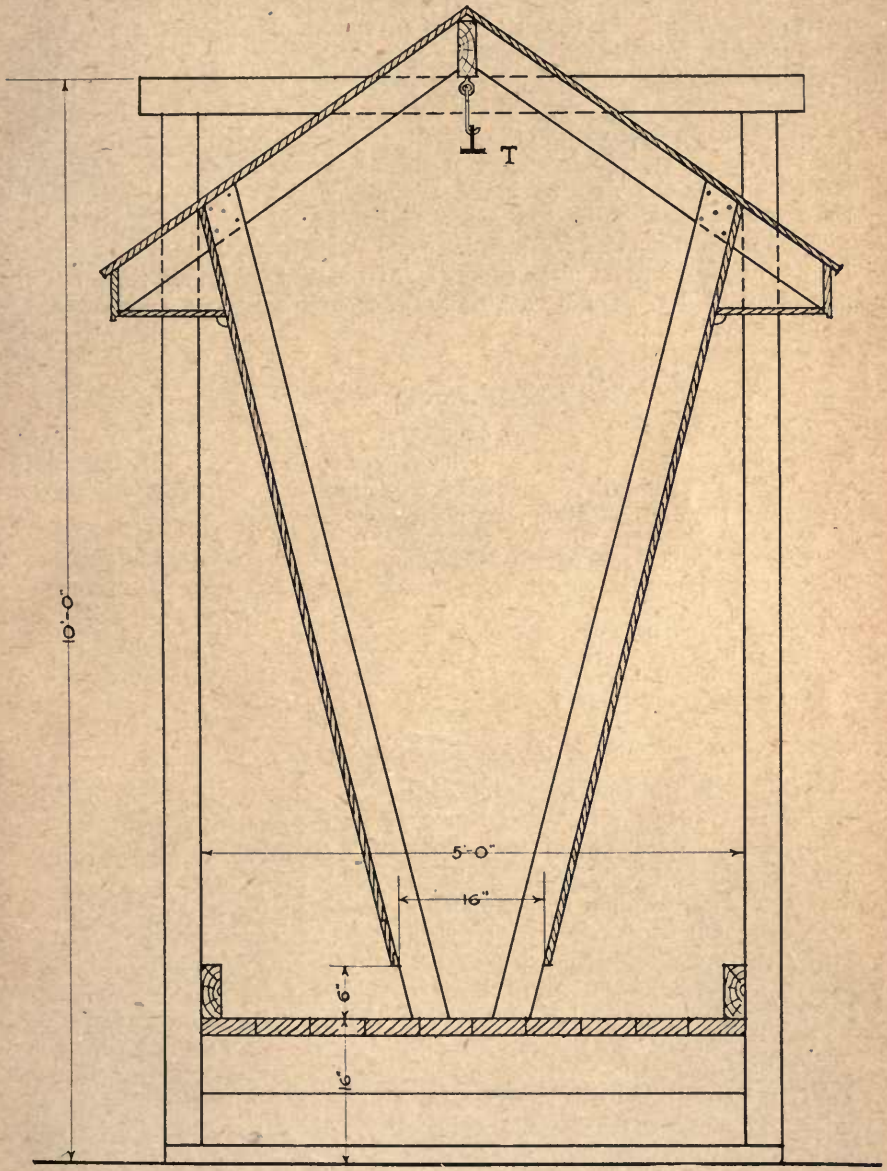

PLATE 1. SECTIONAL VIEW OF SELF-FEEDER.

Plate 1 shows a cross section of the self-feeder giving the essential features of its construction. It was so arranged that the feed could be conveyed by means of a feed carrier on a suspended track from the barn to the feeder into which the feed was dumped. The track was similar to those used for hay carriers and is shown at point T. The rectangular frame which was 5 feet wide and 10 feet high was constructed of 4 x 4-inch material. This served as a frame for the feeder as well as a support for the track. It will be noticed from the cut that the bin was but 16 inches wide at the opening and this opening was 6 inches high. This construction seemed necessary in order to enable the cattle to work the feed out as needed and to prevent clogging. The studding, which were 2 x 4-inch material, were placed four feet apart inside the bin and served as supports to the sides. Other than these points the feeder was not essentially different from those commonly in use in the corn belt.

QUALITY AND COST OF FEEDS

The feeds used were corn meal, oil meal, and clover hay. The corn graded No. 2 yellow, and the clover hay No. 1. The oil meal was "Old Process," ground linseed cake, pea size. The cost of these feeds and their preparation was as follows:

	Per ton
Cost of grinding corn, $0.060 per cwt. or	$ 1.200
Chopping hay by running thru ensilage machine, $0.05 per cwt. or	1.000
Shelled corn, $0.35 per bu. or	12.499
Ground corn, including cost of grinding	13.699
Clover hay	8.000
Chopped clover hay	9.000
Oil meal (ground linseed cake, pea size)	28.000

METHOD OF FEEDING STEERS

Owing to the shortness of the feeding period it was thought best to get the cattle on full grain feed as soon as possible in order to secure the greatest gain in live weight and best finish, as this principle was thought to be desirable in short feeding. Oil meal was used to supplement the ground corn because it has been found at the Illinois Station that it contributes to the production of larger gains by stimulating the appetite so that larger quantities of concentrates are consumed to advantage.* The full grain feed was reached by gradually increasing the grain ration in lot 1 and the proportion of concentrates to roughage in lot 2, the rate of change varying somewhat with the appetite of the cattle. At the end of four weeks they were practically on full feed with no bad effects noticeable except with one steer in lot 1. He appeared to have a slight attack of indigestion and did not eat well from September 16 to 22.

Table 1 shows the average daily ration per steer by periods. These periods correspond with the periodical weights which were taken every two weeks. Period 1 extended from August 25 to September 8;

*Illinois Bulletin No. 103 Page 80.

Period 2, September 8 to 22; Period 3, September 22 to October 6; Period 4, October 6 to 20; Period 5, October 20 to November 3; Period 6, included 19 days from November 3 to 21.

TABLE 1. AVERAGE DAILY RATION PER STEER BY PERIODS (POUNDS)

Lot	Feeds	Periods						Average 89 days, Aug. 25 to Nov. 21
		1	2	3	4	5	6	
1	Ground corn...	9.45	18.69	17.92	20.91	23.19	22.81	19.05
	Oil meal.....	1.81	2.98	2.71	3.23	3.23	3.41	2.92
	Clover hay....	18.47	14.60	15.05	13.39	11.53	9.13	13.45
2	Ground corn...	10.78	21.59	22.01	27.26	25.20	22.06	21.52
	Oil meal.....	2.06	3.27	2.52	3.82	3.79	3.31	3.13
	Chopped clover	16.63	17.85	12.60	12.18	10.50	8.39	12.77

It will be seen from Table 1 that lot 2 cosumed the most feed. This was also noticeable from the appearance of the cattle during the experiment as lot 2 carried the best fill. We can attribute this to no other cause than the method of feeding, as lot 1 could not be induced to take more feed.

The decreased consumption in Period 3 in the case of lot 1 was due to a change in ground corn which it was impossible to avoid. While the meal seemed sweet and good in every way, it was ground by the burr process while the plate grinder had previously been used. As a result it took the cattle in lot 1 several days to become accustomed to it, whereas with lot 2, the corn being mingled with the hay, the falling off was not so noticeable.

TABLE 2. PROPORTION OF CONCENTRATES TO ROUGHAGE

	Periods						Average 89 days
	1	2	3	4	5	6	
Lot 1	1:1.64	1:0.67	1:0.72	1:0.55	1:0.43	1:0.34	1:0.61
Lot 2	1:1.29	1:0.71	1:0.51	1:0.39	1:0.36	1:0.33	1:0.51

The above table shows the proportion of concentrates to roughage for both lots during different periods. The plan was to cater to the appetites of the cattle in these proportions and as a result lot 1 took a larger proportion of hay than lot 2. When we consider that the cost of digestible nutrients in the case of lot 1 is .9029 cents per pound in form of hay and .8692 cents per pound in form of corn (which is .0337 cents per pound greater in the form of hay than in corn),* it is probable that this larger proportion of roughage would work as a handicap to lot 1 in the cost of producing gain. It will be noticed that from the first period on, the proportion of grain was gradually increased until at the close of the experiment the grain ration was about three times that of the roughage.

*Average Composition of American Feeding Stuff —Henry's Feeds and Feeding.

TABLE 3. AVERAGE DAILY GAIN PER STEER IN POUNDS BY PERIODS AND AVERAGE FOR WHOLE TIME

Lot No.	1	2	3	4	5	6	Average 89 days
1	4.117	1.910	3.025	2.976	3.466	2.554	2.984
2	4.147	2.794	3.088	3.655	4.242	2.337	3.326

TABLE 4. SUMMARY OF TABLE 3 (POUNDS)

	Periods			
Lot No.	Aug. 25 to Sept. 22	Sept. 22 to Oct. 20	Oct. 20 to Nov. 21	Aug. 25 to Nov. 21
1	3.014	3.000	2.941	2.984
2	3.470	3.371	3.146	3.326

Table 3, shows the average daily gain per steer during the periods corresponding to those in Table 1. Owing to the great variation in the weights of steers it has seemed best to summarize these six periods into three in order to study the relative rate and cost of gains. Consequently periods 1 and 2, 3 and 4, and 5 and 6 are summarized in Table 4. From this it can be readily seen that lot 2 made the larger gains, but the difference in rate of gain decreases as the feeding period advances. This indicates that the mixed feed fed thru a self-feeder may be especially advantageous for accustoming cattle to a grain ration. It also indicates that the difference in its favor would probably be more marked in the short than in the long feeding period.

TABLE 5. AVERAGE COST PER POUND OF GAIN BY PERIODS AND AVERAGE FOR THE ENTIRE EXPERIMENT

	Aug. 25 to Sept. 22	Sept. 22 to Oct. 20	Oct. 20 to Nov. 21	Aug. 25 to Nov 21 89 days
(Value of pork produced not credited to steers)				
Lot 1	$0.0650	$0.0770	$0.0832	$0.0753
Lot 2	0.0650	0.0797	0.0798	0.0749
(Value of pork produced credited to steers)				
Lot 1	0.0637	0.0753	0.0817	0.0739
Lot 2	0.0638	0.0747	0.0763	0.0711

Table 5 summarizes the cost of gains. While the data presented here are probably not sufficient to warrant a definite conclusion, it indicates that the diminishing efficiency of the feed consumed as the feeding advances was slightly more marked in lot 1 than in lot 2. In the lower part of the table the value of the pork produced was deducted from the expense, thus reducing the cost per pound gain of beef. Another point of significance as shown by Table 5, is the similarity in the average cost of gain for the two lots for the entire period.

Large consumption of feed in order to produce maximum gains is generally associated with expensive gains. In this case, however, the self-fed cattle (lot 2) produced an average daily gain per steer of .342 pounds more, and not figuring value of pork produced, the cost was four hundredths of a cent per pound less than the hand fed lot, (lot 1). It should also be kept in mind that the cost of the chopped hay was one dollar per ton more than the ordinary hay and this extra charge was figured in the cost of gain. This indicates strongly then, that for short feeding cattle, there is an advantage in chopping the hay, mingling it with the grain and feeding thru a self-feeder.

TABLE 6. WEIGHT OF STEERS AND EXTENT OF GAINS IN POUNDS

	Total Wt. 17 steers		Average Wt. per steer		Average gain in 89 days	
Lot No.	Beginning of Exp.	Close of Exp.	Beginning of Exp.	Close of Exp.	Total per steer	Per steer per day
1	18,110	22,625	1065.29	1330.88	265.58	2.98
2	18,176	23,200	1069.17	1364.70	295.52	3.32

Table 6 shows the total and average weights of the steers at the beginning and close of the experiment and the total and average daily gain per steer. As the increase in live weight of mature cattle is largely fat, we might suppose that the steers in lot 2, which had gained 29.94 pounds per steer more, would be fatter and consequently worth more on the market. This was corroborated by the values placed on the steers in Chicago at the close of the experiment.

MARKETING

In preparing the cattle for shipment three feeds of timothy hay were substituted at the last for the clover hay usually fed. Two of these were included in the feed before the final weights were taken. No special account is made, however, in the feed tables of this hay, as it was thought to be of too little difference in value and importance to be considered as affecting the gains or the cost to any noticeable extent. The last feed lot weight was taken on the morning of November 22, before the cattle had been fed or watered. They were then fed timothy hay and about half the usual grain feed. They also had access to water for an hour, after which it was removed.

In the afternoon, between three and four o'clock, the cattle were quietly driven a distance of about a mile to the loading chutes, where they were loaded at about five o'clock. They arrived and were unloaded in Chicago the following morning at 6:30 Thursday, November 23. After being allowed to fill, their value was estimated by expert judges. Lot 1 was estimated at $5.45 and lot 2 at $5.60 per cwt. on the then existing market. This makes a margin between buying and selling price of $1.20 per cwt. in the case of lot 1, and $1.35 per cwt. for lot 2. For commercial reasons the two loads were turned together and sold as one bunch for $5.60 per cwt. The Chicago weight was

taken at 9 a. m. November 23 and showed a shrinkage for the entire thirty-four head of 1,175 pounds, an average of 34.558 pounds per steer.

As the cattle were sold together the dressing percentages obtained were for the entire 34 head. They are as follows, 58.10 percent beef; 6.80 percent fat, and 6.65 percent hides. There is little to be said concerning these figures. In general, however, the cattle were "Good" to "Choice" in grade at the time of marketing.

ITEMIZED STATEMENT OF COST OF FEEDERS

To 34 steers, 36,490 lb. @ $4.25 per cwt.	$1,550.82
Commission	20.00
Freight, two cars	41.88
Feed prior to experiment	4.00
Total expense	$1,616.70

The above statement shows the expense to be $1,616.70, and since the cattle only weighed 36,286 pounds at the beginning of the experiment, having shrunk 204 pounds, or 6 pounds per head, their actual cost was $4.455 per cwt. at the feed lot.

ITEMIZED FINANCIAL STATEMENT

Lot 1, 17 steers

To 17 steers, 18,110 lb. @ $4.455 per cwt.	$806.800
14.416 tons ground corn @ $13.699 per ton	197.488
2.214 tons oil meal @ $28.00 per ton	61.999
10.175 tons clover hay @ $8.00 per ton	81.404
Freight Champaign to Chicago, commission, feed and yardage	38.440
Total expenditures	$1,186.131
By 17 steers 22,037.5 lb. @ $5.45 per cwt.	$1,201.043
140 lb. pork @ $5.00 per cwt.	7.000
Total receipts	$1,208.043
Total expenditures	$1,186.131
Total profit	$ 21.912
Profit per steer	1.288

ITEMIZED FINANCIAL STATEMENT

Lot 2, 17 steers

To 17 steers, 18,176 lb. @ $4.455 per cwt.	$ 809.740
16.282 tons ground corn @ $13.699 per ton	223.050
2.375 tons oil meal @ $28.00 per ton	66.500
9.661 tons chopped clover @ $9.00 per ton	86.950
Freight Champaign to Chicago, commission, feed and yardage	38.440
Total expenditures	$1,224.680
By 17 steers 22,612.5 lb. @ $5.60 per cwt.	$1,266.300
325 lb. pork @ $5.00 per cwt.	16.250
Total receipts	$1,282.550
Total expenditures	$1,224.680
Total profit	$ 57.870
Profit per steer	3.404

The itemized financial statement shows that no charge was made for the labor involved in feeding the steers after the feed was prepared. The general custom is to allow the value of the manure produced to balance the cost of the labor involved. There seemed to be but little difference in the amount of labor necessary to feed the two lots, altho it was of a little different nature. For lot 1 the skill of the feeder was an important factor and called for regularity in the work. On the other hand for lot 2 the work was not necessarily regular, but involved considerable labor in mingling the concentrates with the chopped hay.

The larger amount of pork produced in lot 2 accounts for part of the difference in profit. The reason the pigs did better in this lot was partly due to the steers throwing small quantities of feed out of the self-feeder. Being from this source it seems proper to credit the account with this full amount of pork produced.

In general, the financial results of this experiment are favorable to the method of feeding used for lot 2. While the data given in this publication are not extensive, they indicate that for short feeding cattle the plan of chaffing hay, mingling it with grain, and feeding thru a self-feeder is worthy of further investigation and trial by feeders.

TABLE 7. EFFECT OF VARIOUS PRICES OF CORN ON PROFIT OR LOSS

Lot 1

Cost per bushel, cents	35	40	45	50
Profit total	+$21.912	—$ 3.831	—$29.574	—$55.317
Profit per steer	+ 1.288	— 0.225	— 1.739	— 3.253

Lot 2

Cost per bushel, cents	35	40	45	50
Profit total	+$57.870	+$28.795	—$ 0.280	—$29.355
Profit per steer	+ 3.404	+ 1.693	— 0.016	— 1.726

The matter of profit or loss in feeding operations naturally depends upon the cost of the feed as compared with the price of beef. For this reason the above will be of interest as it gives the effect of various prices of corn on the financial statement. In the above table the plus or minus signs refer to profit or loss. Five cents per bushel difference in the price of corn changes the total expense of lot 1, $25.743; of lot 2, $29.075; or an equivalent in the final cost of the market weight of the cattle of 11.6 cents per cwt. in case of lot 1, and 12.8 cents with lot 2.

TABLE 8. PROFIT OR LOSS AS INFLUENCED BY THE MARKET

	Falling		Stationary		Rising	
	Total	Per steer	Total	Per steer	Total	Per steer
Lot 1	—$33.181	—$1.951	+$21.912	+$1.288	+$77.005	+$4.529
Lot 2	+ 1.331	+ 0.078	+ 57.862	+ 3.403	+114.393	+ 6.729

The cattle were bought and sold on practically a uniform or stationary market. That is, they would have sold at the time they were purchased for about the same price that they did at the close of the experiment had they been in the same condition. These conditions do not always exist, however, so in order to see the effect of a fall or rise of 25 cents per cwt. in the market Table 8 is presented. Under the falling market the selling price for lot 1 is figured at $5.20, stationary $5.45, and rising at $5.70 per cwt., making a difference in total receipts in each case of $55.094. For lot 2 the falling market was figured at $5.35, stationary $5.60 and rising at $5.85 per cwt., making a difference in total receipts in each case of $56.531. The minus signs in the table indicate a loss while the plus signs indicate a profit.

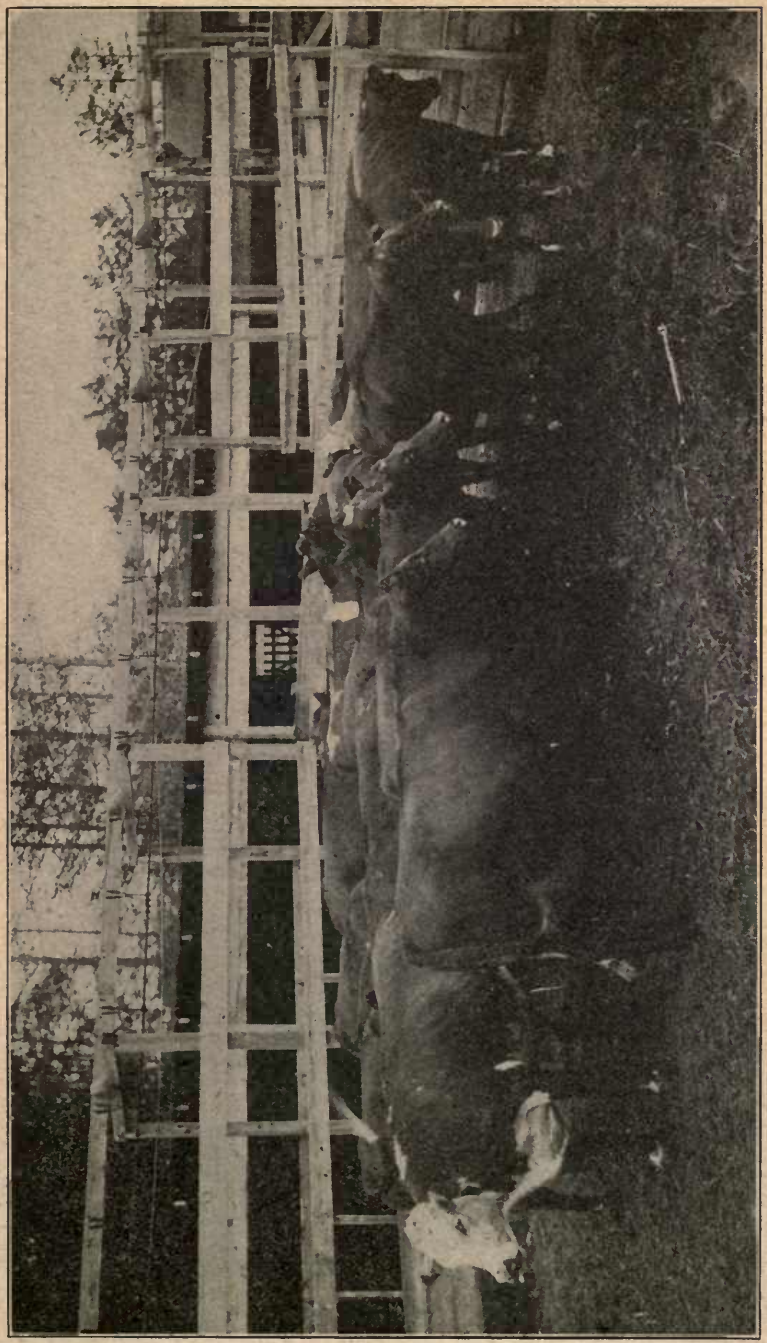

PLATE 2. LOT 1, AS FEEDERS.

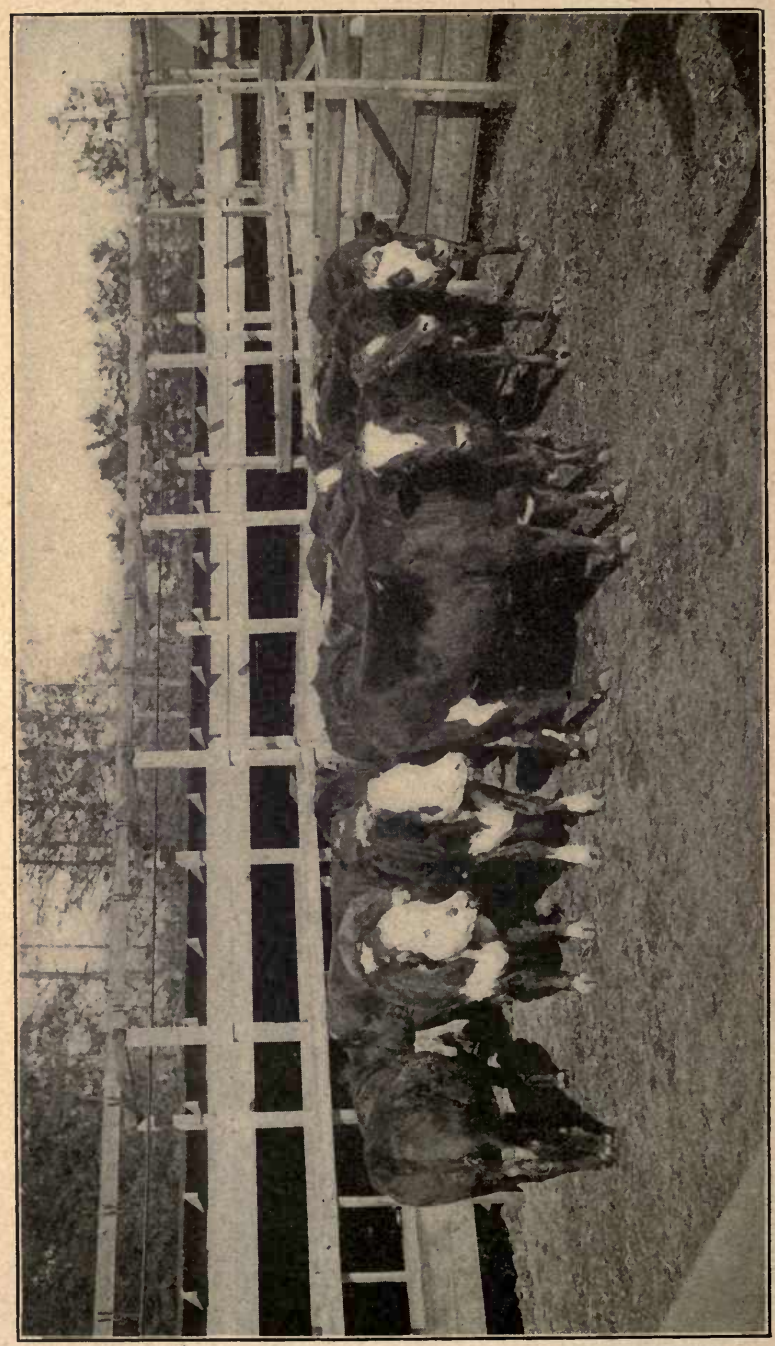

PLATE 3. LOT 1, AS MARKETED.

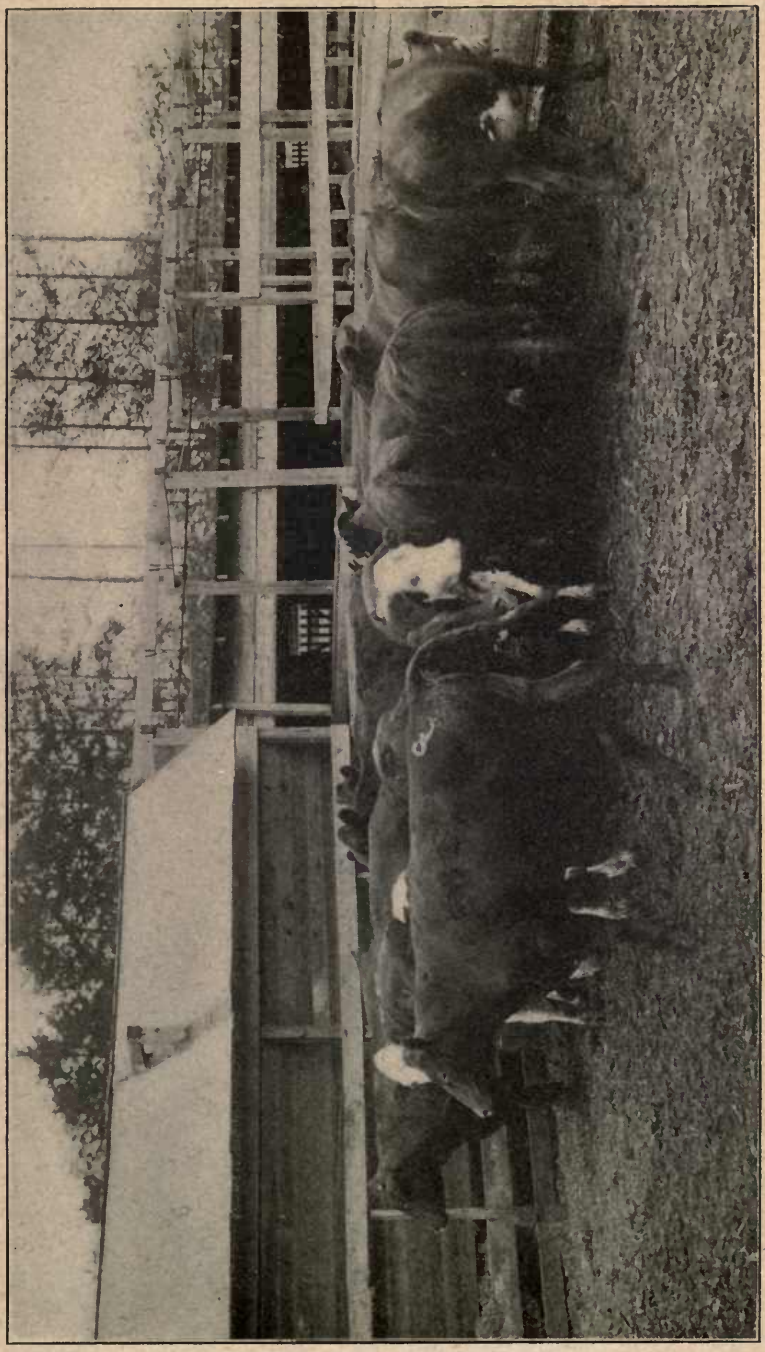

PLATE 4. LOT 2, AS FEEDERS.

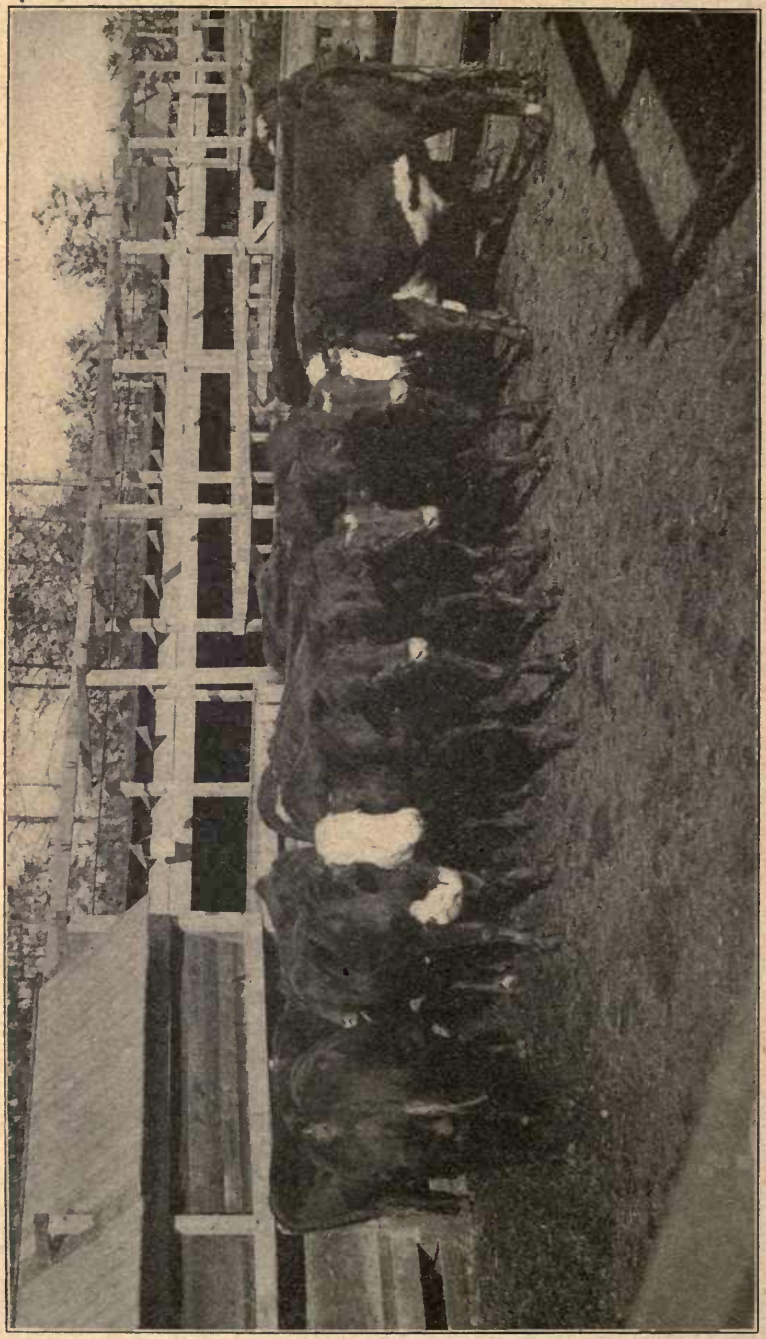

PLATE 5. LOT 2, AS MARKETED.

AUTHOR INDEX

INDEX

(*The headings in capitals are the subjects of entire bulletins*)