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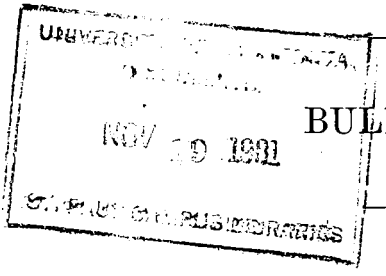

BULLETIN No. 76.

Division of Animal Husbandry.

JUNE, 1902.

FATTENING STEERS.

1. Fattening Steers of Different Types.
2. Feeding Steers for Short and Long Periods.
3. Feeding Steers in the Stable and the Open Shed.

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FATTENING STEERS.

THOMAS SHAW.

This bulletin contains three experiments. The first relates to fattening steers of different types, the second to feeding steers for short and long periods, and the third to feeding steers in the stable and the open shed.

SECTION NO. 1.

FATTENING STEERS OF DIFFERENT TYPES.

It is pretty generally understood by those who deal in dressed meat, that there is a marked difference in the value of the meat per pound furnished by dressed carcasses, even though the animals which produce the meat should be of the same age, and though they should be brought to the same perfection of finish. This difference therefore must be dependent on type, which is another way of saying that it is dependent on form. That meat from animals not possessed of the generally recognized orthodox beef form can be grown as profitably as from animals of the opposite type is generally conceded. It is also conceded that they cannot be so profitably fattened during what may be termed the feeding or finishing period. But there is a difference in opinion as to the precise cause or causes of the less profit thus obtained. Some claim that it arises entirely from the relatively lower price obtained from the meat when made. Others claim that it arises in part from less capacity to make increase in weight. This experiment, therefore, was conducted in the hope of obtaining some light on the question.

Time Covered by the Experiment.—The experiment began Nov. 1st, 1897 and ended March 21st, 1898. It, therefore, covered a period of 140 days. This period was somewhat shorter than it ought to have been to bring out the results sought in the best form, but it was closed thus early that some of the steers might be slaughtered for use by the School of Agriculture.

The Objects of the Experiments.—Precisely stated, the chief objects of the experiment sought information:—1, As

to the relative capacity of steers of different types to make gains during the fattening period; 2, As to the relative difference in value in the meat thus made; and 3, as to the difference in relative cost and profit in making it. The secondary objects of the same sought information:—1, as to the relative consumption of food; 2, the relative daily gains from feeding it; and 3, as to the outcome generally from feeding steers with the prices for food and meat as in the experiment.

The Animals Used.—The animals used, six in number, were purchased from Mr. C. D. Gilfillan, of Redwood Falls. They were chosen from a lot of steers that had been purchased for fattening wherever they could be obtained, and they were chosen with a view to obtain animals differing in type. They were as nearly as could be judged from appearance two years old past, and were what may be termed Shorthorns more or less highly graded.

They reached the farm Oct. 8th, 1897, and were fed suitably until the experiment proper began.

Conditions Governing the Experiments.—The steers were divided into three lots of two each. In one lot were two steers possessed of what may be termed a fairly good beef form, that is to say, they were somewhat blocky in type and were possessed of smoothness in outline in a considerable degree. Moreover, they had good backs and a round spring of rib. They were in fairly good condition as to flesh. In another lot were two steers of what may be termed the intermediate type. They were not of forms really undesirable, but they were not so good in form as the two steers already described, and they were better in form than the other two animals of the experiment about to be described. They were in medium condition as to flesh. In the next lot were two steers large in form and somewhat rangy. They had a coupling somewhat long, a rib of rather open and downward spring, and were moreover a little coarse in bone. But the conclusion must not be reached that they were scrub steers. They probably had as much improved beef blood as the others, but in the beef form they were less desirable. They were somewhat larger than the other animals but they

were less well fleshed. These will be designated as lots 1, 2 and 3 respectively in the experiment.

The time covered by the experiment was divided into five periods of 28 days each. The animals were all tied in single stalls side by side. They were fed food the same in kind during each of the periods of the experiment. They were also given the same quantities of meal, but the proportions of the meal in the mixture were changed from time to time, as will be shown below. They were also given the same amount of corn ensilage per day and in addition all the hay they would consume.

Food and Feeding.—During the first period they were fed 8 pounds each daily of bran, barley and corn, in the proportions of 2, 1 and 1 parts respectively, by weight. During the second period the meal was the same in kind, but 9 pounds were fed daily. During the third period they were given 10 pounds daily of bran, barley, corn and oil cake, in the proportions of 1, 1, 1, and 1 parts. During the fourth period they were given daily 9 pounds of bran, barley and corn, in the proportions of 1, 2 and 2 parts and in addition 2 pounds of oil cake. And during the fifth period they were fed daily 9 pounds of bran, barley and corn in the proportion of 1, 1 and 3 parts, and were given in addition 3 pound of oil cake. The barley and corn were ground. The oil cake fed in the nutted form. They were given 20 pounds of corn ensilage daily, and as before stated, all the hay that they would eat up clean.

The meal and ensilage were given twice a day, viz., morning and evening, the meal being thrown into the feed box on the ensilage and then stirred a little. The hay was given three times a day. The steers were curried enough to keep them presentable. They were given exercise about twice a week for an hour or so on fine days. They were watered with pails twice a day, that is to say, about the middle of the forenoon and afternoon of each day, and they had access to salt at will. They were prepared for the experiment by feeding them properly with a view to the same for a short time before the experiment began.

Estimated Value of the Food.—The food was estimated

at what may be termed market values in the state. These were as follows:

Bran per ton	$ 7.50
Barley per bushel	.18
Corn per bushel	.22
Oil cake per ton	22.00
Hay per ton	4.00
Ensilage per ton	1.25

The hay was mixed clover and timothy, the timothy predominating. As oats were relatively dear, it was determined not to use them in the experiment. But better results would probably have been reached had oats been used to some extent, especially during the first weeks of the experiment. In the effort to secure relative cheapness, too much was sacrificed in the protein content of the same, and this doubtless influenced the gains adversely.

Food Consumed.—Table LXX gives the total amount of hay, ensilage and grain consumed by each steer during the experiment, the sum of the amounts consumed by the steers in each lot and the averages of the same, and also the grand totals relating to the consumption of food.

TABLE LXX.—Food Consumed by the Steers.

		Food Consumed by Steers.			
		Hay lbs.	Ensilage lbs.	Grain lbs.	Total lbs.
Lot 1.—	1	1180	2718	1396	5294
	2	1189	2718	1396	5303
	Total	2369	5436	2792	10597
	Ave.	1184.5	2718	1396	5298.5
Lot 2.—	1	1212	2601	1396	5209
	2	1313	2718	1396	5427
	Total	2525	5319	2792	10636
	Ave.	1262.5	2659.5	1396	5318
Lot 3.—	1	1101	2715	1396	5212
	2	1195	2718	1396	5309
	Total	2296	5433	2792	10521
	Ave.	1148	2716.4	1396	5260.5
Lots 1, 2 and 3.—					
	Grand Total	7190	16188	8376	31754
	Grand Average	1198.3	2698	1396	5292.3

The average consumption of food by each steer was not far different, the steers in lots 1 and 3 consuming practically the same amounts. The difference in the average consumption of food between the steers in lots 3 and 2, the lowest and highest consumers of the same, was only 26 pounds. As the meal fed to each was always the same in quantity as well as in kind, this small difference in the consumption of fodder is in a sense surprising.

Table LXXI, gives the total daily consumption of hay, ensilage and grain consumed by each steer throughout the experiment, the sum of these food factors, and the average of the same for each lot and also the grand totals.

TABLE LXXI.—Daily Consumption of Food by the Steers.

		DAILY CONSUMPTION OF			
		Hay lbs.	Ensilage lbs.	Grain lbs.	Total lbs.
Lot 1.—	1	8.4	19.4	10	37.8
	2	8.5	19.4	10	37.9
	Total	16.9	38.8	20	75.7
	Ave.	8.45	19.4	10	37.85
Lot 2.—	1	8.7	18.6	10	37.3
	2	9.4	19.4	10	38.8
	Total	18.1	38.0	20	76.1
	Ave.	9.05	19.0	10	38.05
Lot 3.—	1	7.9	19.4	10	37.3
	2	8.5	19.4	10	37.9
	Total	16.4	38.8	20	75.2
	Ave.	8.2	19.4	10	37.6
Lots 1, 2 and 3.—					
	Grand Total	51.4	115.6	60	227.0
	Grand Average	8.6	19.2	10	37.8

The same uniformity, of course, exists between the daily consumption of food that was noticed and in the total consumption of the same by the steers in each lot. As is shown in Table LXXII below, there was much uniformity also in the increase made. There was only a difference of 3 pounds in

the sum of the gains made by the steers in lots 1 and 2 which was in favor of the former, and of 27 pounds between lots 1 and 3 which was in favor of the latter.

Weights of the Animals.—Table LXXII, gives 1, the weights of the individual animals at the commencement of the experiment and at its close; 2, the total increase made by each; 3, the average daily increase; and 4, the grand totals of averages of the same.

TABLE LXXII.—Weights and Increase.

		Weights When Experiment		Increase	
		Began Nov. 1 lbs.	Cl'sed Mar. 21 lbs.	Total lbs.	Daily lbs.
Lot 1.—	1	1156	1381	225	1.61
	2	1121	1350	229	1.62
	Total	2277	2731	454	3.23
	Ave.	1138.5	1365.5	227	1.615
Lot 2.—	1	1059	1293	234	1.67
	2	1105	1322	217	1.55
	Total	2164	2615	451	3.22
	Ave.	1082	1307.5	225.5	1.61
Lot 3.—	1	1083	1328	245	1.75
	2	1148	1384	236	1.69
	Total	2231	2712	481	3.44
	Ave.	1115.5	1356	240.5	1.72
Lots 1, 2 and 3.—					
	Grand Total	6672	8058	1386	9.89
	Grand Average	1112	1343	231	1.65

The increase made was not really large, and yet it was fair considering the small amount relatively of meal fed. It only averaged 10 pounds per day. Had 2 or 3 pounds additional been fed daily, the results would probably have been more satisfactory in the line of average daily increase.

The gains were not very evenly made. The steers in lot 1 made an average gain in the firse period of 61.0 pounds. In the second period they dropped down to 39.5 pounds. The steers in lot 2 made an average gain of 72 pounds the

first period and dropped to 30 pounds in the fourth; the steers in the third lot made the most uniform gains. All the reasons for this fitfulness of the gains are not clearly apparent, but it may have been affected to some extent by the variations in weights which occur when weighing animals. The steers in lot 3 together, made 27 pounds more of increase than those in lot 1; and 30 ponnds more than those in lot 2. This may in part be accounted for by the less flesh relatively carried by the former when put under experiment.

Cost of Food Consumed.—Table LXXIII gives the cost of food consumed by the individual animals in each lot, and the averages of the same; and also the grand averages for the steers in all the lots.

TABLE LXXIII.—Cost of Food Consumed.

		COST OF			
		Hay	Ensilage	Grain	Total
Lot 1.—	1	$2.36	$1.70	$ 6.84	$10.90
	2	2.38	1.70	6.84	10.92
	Total	4.74	3.40	13.68	21.82
	Ave.	2.37	1.70	6.84	10.91
Lot 2.—	1	2.42	1.63	6.84	10.89
	2	2.63	1.70	6.84	11.17
	Total	5.05	3.33	13.68	22.06
	Ave.	2.53	1.66	6.84	11.03
Lot 3.—	1	2.20	1.70	6.84	10.74
	2	2.39	1.70	6.84	10.93
	Total	4.59	3.40	13.68	21.67
	Ave.	2.29	1.70	6.84	10.83
Lots 1, 2 and 3.—					
	Grand Total	14.38	10.13	41.04	65.55
	Grand Average	2.40	1.69	6.84	10.93

The cost of food was indeed low on the whole. This was owing first, to the comparatively low price of the food fed, and second, to the large proportion relatively of fodder

fed. There was of course a uniformity in cost in keeping with the uniformity shown in the consumption of food.

Daily Cost of Food Consumed.—The daily cost of food consumed by each steer, the average daily cost of the same in each lot, and in all the lots taken together, is given below:

Lot 1.	1	7.79	cents.
	2	7.80	"
	Average	7.79	"
Lot 2.	1	7.78	"
	2	7.98	"
	Average	7.88	"
Lot 3.	1	7.62	"
	2	7.81	"
	Average	7.71	"
Lots 1, 2 and 3.	Grand Average	7.79	"

The steers in lot 3 were fed a little more cheaply than the others, in keeping with this somewhat lower consumption of food by them.

The cost of making 100 pounds of increase with the steers in the different lots is given below, also the average of the same in each, and the grand average of the steers in all the lots:

Lot 1.	1	$4.84
	2	4.77
	Average	$4.80
Lot 2.	1	$4.66
	2	5.15
	Average	$4.90
Lot 3.	1	$4.39
	2	4.63
	Average	$4.49
Lots 1, 2 and 3.	Grand Average	$4.72

The cost of making 100 pounds of increase was in each instance a little more than the valuation put upon the ani-

mals per 100 pounds when sold. With the steers in lot 1, it was higher by 5 cents; with those in lot 2, by 12 cents, and with those in lot 3, by 76 cents. The actual cost of increase was lowest with the steers in lot 3, and with both animals in the lot.

Profit Made.—Table LXXIV gives, (1) the individual value of the steers when the experiment began and closed; (2) the cost of food, and (3) the net profit made; also the totals and averages for these with the steers in the respective lots, and the grand averages of the same for the steers in all the lots.

TABLE LXXIV.—Values and Profit Made During the Experiment.

		Value when Exp. began	Cost of Food	Total Cost	Value when Exp. Closed	Profit
Lot 1.—	1	$46.24	$10.90	$57.14	$65.60	$ 8.46
	2	44.84	10.92	55.76	64.12	8.36
	Total	91.08	21.82	112.90	129.72	16.82
	Ave.	45.54	10.91	56.45	64.86	8.41
Lot 2.—	1	38.65	10.89	49.54	54.95	5.41
	2	40.33	11.17	51.50	56.18	4.68
	Total	78.98	22.06	101.04	111.13	10.09
	Ave.	39.49	11.03	50.52	55.56	5.04
Lot 3.—	1	35.74	10.74	46.48	49.80	3.32
	2	37.88	10.93	48.81	51.90	3.09
	Total	73.62	21.67	95.29	101.70	6.41
	Ave.	36.81	10.83	47.64	50.85	3.21
Grand Total		243.68	65.55	309.23	342.55	33.32
Grand Average		40.61	10.93	51.54	57.09	5.55

When the steers were put upon experiment, those of each lot were valued according to quality on the basis of the market values at South St. Paul, by persons who understood the same, and at the close of the experiment they were valued similarly, this valuation when the experiment began put the steers in lot 1 at $4.00 per 100 pounds; those in lot 2 at $3.65; and those in lot 3 at $3.30. When the experiment closed it put the steers in lot 1 at $4.75 per 100 pounds; those in lot 2 at $4.25; and those in lot 3 at $3.75. It

would doubtless have been more satisfactory to the public, had the steers been actually sold on the market on their merits, but it was decided that they should be disposed of as indicated below, under the proper heading.

The total profit from feeding the six steers, viz., $33.32 was not large. This arose to some extent from the rather small gains made by the steers, but to a greater extent from the relatively small difference per 100 pounds between the values when the experiment closed as compared with the same when it began. The difference in these values with the steers in lot 1 was 75 cents per 100 pounds; with those in lot 2, 60 cents; and with those in lot 3, 45 cents. The average difference was 60 cents.

Though the profit made on the steers in lot 1 was $5.20 more than from the steers in lot 3, this was owing entirely to greater relative increase in value which the finishing brought to the steers in lot 1. The steers in lot 3 were slightly ahead in increase in weight, and they had also the lead in lowness in cost of production. This fact emphasizes the great importance of correct from in animals to be fed for the block.

Disposal of the Steers.—Some of the steers were slaughtered for use in the dining hall of the School of Agriculture. They were slaughtered at different times as needed, but that of course does not affect the findings of the experiment. Those not so slaughtered were sold at the New Brighton stock yards

FINANCIAL STATEMENT.

Value of the 6 steers in the experiment at its close March 21, 1898, on the basis of market values.....		$342.55
Value of the same on Nov. 15, 1897, when the experiment began on the same basis.....	$243.68	
Cost of food.....	65.55	
Total.....		309.23
Total net profit.....		33.32
Net profit on one steer.....		5.55

Observations.—The food was charged as previously stated at market values, which are in nearly all instances in advance of the cost of making the same. A greater profit,

therefore, would have been made on the steers had the food been charged at the cost of production.

2. The value of the manure is supposed to offset the cost of bedding and labor, and also the interest of the money involved.

IMPORTANT FACT SUMMARIZED.

VALUES.	
1. Average value per 100 pounds when the experiment began, on the basis of market values	$3.65
2. Average value per 100 pounds when the experiment closed, on the same basis	4.25
3. Average advance in value per 100 pounds	.60
WEIGHTS.	Lbs.
1. Average weight of the steers in lot 1 when the experiment began, Nov. 1, 1897	1138.5
2. Average weight of the steers in lot 2	1082.0
3. Average weight of the steers in lot 3	1115.5
INCREASE IN WEIGHT.	
1. Average increase in weight of the steers in lot 1 during the 140 days of feeding	227.0
2. Average increase in weight of the steers in lot 2	225.5
3. Average increase in weight of the steers in lot 3	240.5
DAILY INCREASE IN WEIGHT.	
1. Average daily increase in weight by the steers in lot 1	1.62
2. Average daily increase in weight by the steers in lot 2	1.61
3. Average daily increase in weight by the steers in lot 3	1.72
FOOD CONSUMED.	
Average daily consumption of meal per animal by the steers in each lot	lbs. 10.0
1. Average daily consumption of food by the steers in lot 1	37.85
2. Average daily consumption of food by the steers in lot 2	38.05
3. Average daily consumption of food by the steers in lot 3	37.6
COST OF FOOD.	Cts.
1. Average cost of food per day, per animal, for the steers in lot 1	7.79
2. Average cost of food per day for the steers in lot 2	7.88
3. Average cost of food per day for the steers in lot 3	7.71
COST OF INCREASE.	
1. Average cost of making 100 pounds of increase with the steers in lot 1	$4.80

tive consumption of food; and 2, as to the relative daily gains that would result therefrom.

The Animals Used.—The animals chosen for the experiment consisted of 10 steers, which were purchased near Lake City by Mr. A. Boss, the farm foreman. They were Shorthorn grades of a fairly good type. They were by a pure bred sire, and out of cows more or less mixed in their blood lines. They were two years old the previous spring, hence, they were turned off when approximately three years old, the following season. They reached the station Nov. 7, and were put upon a proper ration until the experiment began. They were divided as evenly as possible with reference to quality, but the steers fed for the longer period had, on the whole, a little advantage in weight.

Conditions Governing the Experiment.—The ten steers used in the experiment consisted of two lots, with five in each. The steers designated as lot 1, were to be fed for 84 days or 12 weeks, and upon what may be termed a forcing ration. This term of feeding was to be divided into 6 periods of 2 weeks each. The food was to be the same in kind, but not always the same in the proportions of the grain fed, and it was to be increased in quantity with the commencement of each successive period. The steers in this lot were then to be valued and also the steers in the other lot, that a comparison might be made between the results from the two lots at that time, that is to say, when the experiment closed with the steers in lot 1. The steers in the other lot, designated as lot 2, were to be fed for 140 days or 28 weeks, and they were to be fed upon a moderate grain ration. This term of feeding was to be divided into five periods of 28 days or four weeks each. The steers in lot 2 were to be fed the same kinds of food as those in lot 1, but in this instance, as in the other, it was to be varied in the proportions of the meal fed, and also in the quantities of the same during each successive period. They were then to be valued or sold at the end of the experiment, and the net results, viewed from the standpoint of profit, compared with those obtained from the steers fed for the short period.

As the steers in lot 2 were fed grain in the ground form, and in quantities considerably less than the quantities of corn

usually fed by forced feeders, swine were not made to follow the animals. Nor were there facilities for this work, as the steers in both lots were tied in stalls and under conditions which made it impossible to have pigs glean in the droppings.

Food and Feeding.—The meal portion of the ration for both lots was composed of bran, corn and oil cake throughout the experiment. These foods, except the oil cake, were chosen first, on the ground of relative cheapness. The oil cake was used in part at least, to give tone to the digestion.

As previously intimated, the steers in lot 1 were fed for 6 periods of 14 days each. In the first period they were fed bran, ground corn and oil cake in the nutted form, in the proportions of 4, 5 and 1 parts respectively, by weight, and at the rate of 10 pounds each per day. In the second, the proportions were 3, 6 and 1 parts, and 12 pounds each were fed per day. In the third, the proportions were 2, 6 and 2 parts, and 14 pounds each were fed per day. In the fourth, the proportions were 1, 7 and 2 parts, and 16 pounds each were fed per day. In the fifth and sixth periods, the proportions were the same as in the fourth period, but in the former of these, they were to get 18 pounds per animal per day, and in the latter 20 pounds.

As also previously intimated, the steers in lot 2 were to be fed for 5 periods of 28 days each. In the first of these, they were to be fed bran, ground corn and oil cake, in the proportions of 6, 3 pnd 1 parts, respectively, and at the rate of 8 pounds each per day. In the second, the proportions were 5, 4 and 1 parts, and the amount fed was 9 pounds each per day. In the second, the proportions were 5, 4 and 1 parts, and the amount fed was 9 pounds each per day. In the third the proportions were 4, 4½ and 1½ parts, and the amount fed was 10 pounds each per day. In the fourth, the proportions were 3, 5 and 2 parts, and 11 pounds were fed per day. And in the fifth, the proportions were 1, 7 and 2 parts, and 12 pounds each were fed per day.

Both lots were to be fed 20 pounds per animal of corn ensilage per day, and as much hay as they would eat up clean. But, for reasons to be given below, the ensilage was discontinued after Jan. 9th, that is to say, 42 days after the experiment began. The hay consisted of timothy and clover,

and was only of medium quality. As long as ensilage was fed, the meal was given morning and evening with the ensilage, and the hay was given in three feeds. Water was given twice a day in pails, that is to say, in the middle of the forenoon and afternoon respectively, and the steers had access to salt at will. They were exercised two or three times a week for a short time in a yard, but only when the weather was fine.

Behavior of the Steers on Feed.—Previous to the experiment the steers in both lots had been led up by judicious feeding to the grain rations intended for them. From the first several of the animals in both lots did not take kindly to the corn ensilage. This may have been to some extent owing to individual tastes in the animals, but more doubtless to the indifferent character of the ensilage. It was somewhat acid and seemed to produce scouring more or less, hence, its discontinuance at the date named, after which the evidences of such looseness in the bowels disappeared.

Moreover, the steers in lot 1 did not seem to be able to utilize all the meal given them. In that lot, steer No. 5 did not take all his grain allowance the week commencing Dec. 26. The same was true of steers 1 and 2 the week commencing Jan. 2. When January 30 was reached, it was found necessary to reduce the meal for all the steers in lot 1, that fed to No. 5 being reduced by one-half. During the last week none of the steers in this lot could consume the full allowance. The full allowance was 700 pounds for the week, and they only took 574 pounds. On the other hand the steers in lot 2 took the regular allowance of grain without getting off their food, but as they suffered somewhat from scouring while the ensilage was being fed to them, this of course hindered the gains that would otherwise have been made. There was also another disturbing factor which doubtless influenced adversely the increase made. When the steers were put upon experiment, the feeder of the station, Mr. Geo. Craig, was absent, and on his return he was ill for many weeks. It was not until well on towards the close of the experiment with the steers in lot 1, that he was able

to take charge of the experiment. The feeding was of necessity handed over to students who had no previous experience in such work, and who were pressed with studies. Although they did the best they could under the circumstances, they were unable to give the animals that close attention which is necessary in conducting such work.

Estimated Value of the Food.—The food was estimated at what was considered average market values in the state. These were as follows:

Corn, per bushel	$ .22
Bran, per ton	9.00
Oilcake	22.00
Hay	4.50
Ensilage	1.25

Five cents per 100 pounds was allowed for grinding the corn.

Food Consumed.—Table LXXV gives the total amount of meal, hay and ensilage, and the sum of those consumed by each steer during the experiment; also the total consumption of each kind of food by the animals in each lot and the average of the same.

TABLE LXXV.—Food Consumed by the Steers.

Lot	No. of Steer	FOOD CONSUMED.							
		Nov. 28—Feb. 20				Feb. 20.—April 17.			Grand Total
		Grain lbs.	Hay lbs.	Ensil. lbs.	Total lbs	Grain lbs.	Hay lbs.	Total lbs.	lbs.
1	1	1238	861	723	2822				2822
	2	1176	860	715	2751				2751
	3	1230	861	719	2810				2810
	4	1235	862	723	2820				2820
	5	1119	861	736	2716				2716
	Total	5998	4305	3616	13919				13919
	Ave.	1200	861	723	2784				2784
2	1	756	948	731	2435	640	912	1552	3987
	2	726	902	731	2359	644	845	1489	3848
	3	756	926	725	2407	644	843	1487	3894
	4	756	925	605	2286	644	791	1435	3721
	5	756	987	731	2474	644	1004	1648	4122
	Total	3750	4688	3523	11961	3216	4395	7611	19572
	Ave.	750	938	705	2392	643	879	1522	3914

It will be noticed that the forced feeding did not avail to secure corresponding gains. The steers in lot 1, consumed on an average from the beginning of the experiment Nov. 28, 1898, until Feb. 20, 1899, when it closed with them, 2784 pounds, of which 1200 pounds were meal. The steers in lot 2 consumed on an average during the same period, 2392 pounds of which 750 were meal. The steers in lot 1, therefore, consumed 450 pounds more meal than those in lot 2. By reference to Table LXXVII, it will be noticed that the average increase made by the steers in lot 1 was only 107 pounds, while those in lot 2 gained 118 pounds during the same period, or 11 pounds in favor of the latter.

Table LXXVI, gives the quantity of each food consumed daily by each individual steer in both lots; the total daily consumption by each; also the daily consumption by the steers in each of the two lots.

TABLE LXXVI.—Daily Consumption of Food by the Steers.

Lot	No. of Steer	FOOD CONSUMED DAILY.							Whole Ex. lbs.
		Nov. 28—Feb. 20.				Feb. 20—April 17.			
		Grain lbs.	Hay lbs.	Ensil. lbs.	Total lbs.	Grain lbs.	Hay lbs.	Total lbs.	
1	1	14.6	10.3	8.6	33.5				33.5
	2	14.0	10.3	8.5	32.8				32.8
	3	14.6	10.3	8.6	33.5				33.5
	4	14.6	10.3	8 6	33.5				33.5
	5	13.3	10.3	8.8	32.4				32.4
	Total	71.1	51.5	43.1	165.7				165.7
	Ave.	14.2	10.3	8.6	33.1				33.1
2	1	9.0	11.3	8.7	29.0	11.4	16.3	27.7	28.5
	2	8.6	10.7	8.7	28.0	11.5	15.1	26.6	27.5
	3	9.0	11.0	8 6	28.6	11.5	15.1	26.6	27.8
	4	9.0	11.0	7.2	27.2	11.5	14.1	25.6	26.6
	5	9.0	11.7	8.7	29.4	11.5	17.9	29.4	29.4
	Total	44.6	55.7	41.9	142.2	57.4	78.5	135.9	139.8
	Ave.	8.9	11.1	8.4	28.4	11.5	15.7	27.2	28.0

The average daily consumption of food by the steers in lot 1 to the close of the experiment was 4.7 pounds more

than that of the steers in lot 2, and the average daily consumption of meal the costly element of the food, was 5.3 pounds more, and yet as previously stated, the increase was in favor of the steers in lot 2.

Weights of the Animals.—Table LXXVII, gives the weights of the individual animals in both lots at the commencement of the experiment and at its close, and also the total individual increase made during the same.

TABLE LXXVII.—Weights and Increase.

Lot	No. of Steer	WEIGHTS			INCREASE			DAILY	
		Ex. Began Nov. 28. lbs.	Feb. 20. lbs.	April 17. lbs.	Nov. 28, to Feb. 20. lbs.	Feb. 20 to April 17. lbs.	Total lbs.	Nov. 28, to Feb. 20. lbs.	Whole Experim't lbs.
1	1	1105	1247		142		142	1.7	1.7
	2	1140	1230		90		90	1.1	1.1
	3	1167	1260		93		93	1.1	1.1
	4	1186	1310		124		124	1.5	1.5
	5	1165	1250		85		85	1.0	1 0
	Total	5763	6297		534		534	6.4	6.4
	Ave.	1153	1259		107		107	1.3	1.3
2	1	1220	1385	1468	165	83	248	2.0	1.7
	2	1233	1333	1447	100	114	214	1.2	1.5
	3	1266	1395	1482	129	87	216	1.5	1.5
	4	1115	1205	1295	90	90	180	1.1	1.3
	5	1225	1330	1383	105	53	158	1.3	1.1
	Total	6059	6648	7075	589	427	1016	7.1	7.1
	Ave.	1212	1330	1415	118	85	203	1.4	1.4

It has already been noticed that the average individual increase up to the closing of the experiment with the steers in lot 1 was in favor of the steers in lot 2. The low increase made by the former, linked with the fact that they were off feed more or less during the experiment, would certainly tend to show that a forcing meal ration is not good for the steers when confined. It will also be noticed that it was not during the first weeks of the experiment that such derangement occurred, hence it was not owing to any mistake in leading up to full feeding that led to such a result. It may

be that if the steers had been fed in a yard where they could have taken more exercise, that the trouble which came would have been much less pronounced, or entirely absent, as steers thus at liberty are frequently fed a larger amount of grain. The gains made by the steers in both lots were low, and at least some of the reasons for the same have been given, when speaking of the behavior of the steers on feed. The increase made by the individual steers in both lots is noticeably variable. For instance, No. 1 in lot 1 gained 1.7 pounds daily and No. 5 in the same lot, 1 pound. In lot 2, No. 1 gained 2 pounds per day, on an average, and No. 4 only gained 1.1 pounds.

Cost of Food.—Table LXXVIII gives the cost of each food factor fed to the individual animals in both lots throughout the experiment, the sum of these, and also the average of the same by lots.

TABLE LXXVIII.—Cost of Food Consumed.

Lot	No. of Steer	COST OF FOOD CONSUMED.							
		Nov. 28—Feb. 20.				Feb. 20—April 17.			Grand Total
		Grain	Hay	Ensil.	Total	Grain	Hay	Total	
1	1	$6.93	$1.94	$ .54	$9.41				$ 9.41
	2	6.57	1.93	.54	9.04				9.04
	3	6.88	1.94	.54	9.36				9.36
	4	6.91	1.94	.54	9.39				9.39
	5	6.37	1.94	.55	8.86				8.86
	Total	33.66	9.69	2.71	46.06				46.06
	Ave.	6.73	1.94	.54	9.21				9.21
2	1	3.96	2.13	.55	6.64	3.69	2.06	5.75	12.39
	2	3.79	2.03	.55	6.37	3.77	1.90	5.67	12.04
	3	3.96	2.09	.54	6.59	3.71	1.89	5.60	12.19
	4	3.96	2.08	.45	6.49	3.70	1.78	5.48	11.97
	5	3.96	2.22	.55	6.73	3.71	2.26	5.97	12.70
	Total	19.60	10.55	2.64	32.82	18.58	8.89	28.47	61.29
	Ave.	3.93	2.11	.53	6.57	3.92	1.77	5.69	12.26

The difference in the average total cost of the food fed to each steer in lot 1 was $2.64 in excess of the same fed to each

steer in lot 2, during the corresponding period. Notwithstanding the increase in weight made by the latter was greater than the same made by the former. The difference in the cost of meal fed to the steers in lot 1 was greater by $2.80 per animal.

Table LXXIX, gives the average daily cost of food for the individual steers in both lots and also by lots:

TABLE LXXIX.—Daily Cost of Food Consumed.

Lot	No. of Steer	DAILY COST OF FOOD.		
		Nov. 20–Feb. 20	Feb. 20–Apr. 17	Whole Experim't
1	1	11.2cts		11.2cts
	2	10.8		10.8
	3	11.2		11.2
	4	11.2		11.2
	5	10.6		10.6
	Total	55.0		55.0
	Ave.	11.0		11.0
2	1	7.9	10.0cts	8.8
	2	7.6	10.1	8.6
	3	7.8	10.0	8.7
	4	7.7	10.0	8.5
	5	8.0	10.6	9.0
	Total	39.0	55.0	43.6
	Ave.	7.8	10.2	8.7

While the average cost per day for feeding the steers in lot 1 was 11 cents, that for feeding the steers in lot 2 for the corresponding period was 7.8 cents or 2.2 cents less. This daily cost for food rose to 8.7 cents per animal by the close of the feeding period.

Cost of Increase.—Table LXXX gives the cost of making 100 pounds of increase by the individual animals in both lots, also the average cost of the same by lots.

TABLE LXXX.—Cost of Making 100 Pounds Increase.

Lot	No. of Steer	COST OF INCREASE PER 100 POUNDS.		
		Nov. 28 to Feb. 20	Feb. 20 to Apr. 17	Whole Experim't
1	1	$ 6.63		$ 6.63
	2	10.04		10.04
	3	10.07		10.07
	4	7.58		7.58
	5	10.42		10.42
	Ave.	8.95		8.95
2	1	4.02	$ 6.94	5.00
	2	6.37	4.98	5.63
	3	5.11	6.44	5.45
	4	7.21	6.09	6.66
	5	6.41	11.30	8.04
	Ave.	5.82	7.15	6.19

The difference in the average cost of making 100 pounds of increase by the steers in both lots, up to Feb. 20, when the experiment closed with the steers in lot 1, is $3.13 in favor of the steers in lot 2. The cost of increase with both lots was considerably more than the said increase was worth. This was largely owing to the very indifferent gains made. With only one animal, viz. No. 1 in lot 2, was the increase in weight made during the experiment worth as much as the cost of making it. This steer made an increase in weight of 248 pounds against 158 pounds made by No. 5 in the same lot, notwithstanding that the latter consumed 135 pounds more food. The cost of making 100 pounds of increase with the latter was $3.04 more than with the former. Such results emphasize the great difference in digestive and assimilative power in individual animals.

Profit Made.—Table LXXXI gives the value of each individual steer when the experiment began and ended; 2, the cost of the food fed; 3, the total outlay for each individual steer; 4, the profit made on each; 5, the totals of cost, values and profit with the steers in both lots; and 6, the averages of the same.

TABLE LXXXI.—Values and Profit Made During the Experiment.

VALUES AND PROFITS.										
Lot	No. of Steer	Value Nov 28 Exp't began	Nov. 28–Feb. 20				WHOLE EXPERIMENT			
			Cost of Food	Total Cost	Value Feb. 20	Profit	Cost of Food	Total Cost	Value when Exp't Closed	Total Profit
1	1	$44.00	$9.41	$53.61	$57.99	$4.38	$9.41	$53.61	$57.99	$4.38
	2	45.60	9.04	54.64	57.20	2.56	9.04	54.64	57.20	2.56
	3	46.68	9.36	56.04	58.59	2.55	9.36	56.04	58.59	2.55
	4	47.44	9.39	56.83	60.91	4.08	9.39	56.83	60.91	4.08
	5	46.60	8.86	55.46	58.12	2.66	8.86	55.46	58.12	2.55
	Total	230.52	46.06	276.58	292.81	16.23	46.06	276.58	292.81	16.23
	Ave.	46.10	9.21	55.31	58.56	3.25	9.21	55.31	58.56	3.25
2	1	48.80	6.64	55.44	60.94	5.50	12.39	61.19	73.40	12.21
	2	49.32	6.37	55.69	58.65	2.96	12.04	61.36	72.35	10.99
	3	50.64	6.59	57.23	61.38	4.15	12.19	62.83	74.10	11.27
	4	44.60	6.49	51.09	53.02	1.93	11.91	56.57	64.75	8.18
	5	49.00	6.73	55.73	58.52	2.79	12.70	61.70	69.15	7.45
	Total	242.36	32 82	275 18	292.51	17.33	61.29	303.65	353.75	50.10
	Ave.	48.47	6.57	55.04	58.50	3.46	12.26	60.73	70.75	10.02

When the steers were put upon experiment they were valued at $4.00 per 100 pounds. On Feb. 20th when the experiment with the steers in No. 1 closed they were valued by a competent person at $4.65 per 100 pounds, and those in lot 2 at the same date at $4.40 per 100 pounds. The steers in lot 2 at this valuation gave a greater net profit at that date than the steers in lot 1.

The average profit on each steer fed for the longer term, that is for 140 days, was $10.02, and on each fed for the shorter period of 84 days $3.25, a difference of $6.77 in favor of the former. It is not probable, however, that this difference would have been so much with the steers in lot 1, had more caution been used in guarding them from getting off their food for periods more or less prolonged, by promptly reducing the meal ration when the first symptoms of such a condition manifested themselves.

Disposal of the Steers.—Subsequent to the close of the

experiment the steers in lot 2 were sold to Mr. Peter Van Hoven for the stock yards at New Brighton. The price paid was $5.00 per 100 pounds.

FINANCIAL STATEMENT.

Estimated value of the 5 steers in lot 1, on Feb. 20, 1899, at $4.65 per 100 pounds	$292.81	
Value of 5 steers in lot 2, on April 17th, 1899, at $5.00 per 100 pounds	353.75	
Total value for 10 steers fed		646.56
Estimated value of 10 steers when put upon experiment Nov. 28, 1898, at $4.00 per 100 pounds	472.88	
Cost of food	107.35	
Total outlay		580.23
Total net profit		66.33
Net profit on one steer		6.63

Observations.—1. Since the food fed was charged at the average market values in the state, these would represent more than cost of the same to the grower and would, therefore, be so far unfavorable to the making of profits.

2. The value of the manure it is believed will offset the cost of bedding and labor and also the interest on the money involved.

3. The undesirability of changing feeders while fattening cattle is emphasized in this experiment.

IMPORTANT FACTS SUMMARIZED.

VALUES.

1.	Estimated value per 100 pounds with the steers in both lots when the experiment began, Nov. 28, 1898..	$4.00
2.	Estimated value of the steers in lot 1, per 100 pounds when the experiment closed with them, Feb. 20, 1899.	4.65
3.	Value of the steers in lot 2, per 100 pounds when the experiment closed with them, April 17, 1899	5.00
4.	Average advance in value per 100 pounds with the steers in both lots	.82½

WEIGHTS.

		Lbs.
1.	Average weight of the steers in lot 1 when the experiment began, Nov. 28, 1898	1153
2.	Average weight at the close of the experiment, Feb. 20, 1899	1259
3.	Average weight of the steers in lot 2, when the experment began, Nov. 28, 1898	1212

4. Average weight at the close of the experiment April 17, 1899	1330

INCREASE IN WEIGHT.

1. Average increase in weight per animal per day by the steers in lot 1 while being fattened for 84 days	1.3
2. Average increase in weight per animal per day by the steers in lot 2 while being fattened for 84 days	1.4
3. Average increase in weight per animal per day by the steers in lot 2 while being fattened for 140 days	1.4

FOOD CONSUMED.

1. Average daily consumption of meal by the steers in lot 1 while being fattened for 84 days	14.2
2. Average daily consumption of meal by the steers in lot 2 while being fattened for 84 days	8.9
3. Average daily consumption of meal by the steers in lot 2 while being fattened for 140 days	10.0

COST OF FOOD.

	Cts.
1. Average cost of food per day for the steers in lot 1 while being fattened for 84 days	11.0
2. Average cost of food per day for the steers in lot 2 while being fattened for 84 days	7.8
3. Average cost of food per day for the steers in lot 2 while being fattened for 140 days	8.7

COST OF INCREASE.

1. Average cost of making 100 pounds of increase by the steers in lot 1 while being fed for 84 days	$8.95
2. Average cost of making 100 pounds of increase by the steers in lot 2 while being fed for 84 days	5.82
3. Average cost of making 100 pounds of increase by the steers in lot 2 while being fed for 140 days	6.19

INCREASE IN VALUE.

1. Average increase in value with the steers in lot 1 from 84 days of feeding	$12.46
2. Average increase in value with the steers in lot 2 from 84 days of feeding	10.03
3. Average increase in value with the steers in lot 2 from 140 days of feeding	22.28

PROFITS.

1. Aggregate net profits from feeding the 5 steers in lot 1 for 84 days	16.23
2. Aggregate net profits from feeding the steers in lot 2 for 84 days	17.33
3. Aggregate net profits from feeding the 5 steers in lot 2 for 140 days	50.10
4. Average net profit from feeding one steer in lot 1 for 84 days	3.25
5. Average net profit from feeding one steer in lot 2 for 140 days	10.02

CONCLUSIONS.

The following are prominent among the conclusions that may be drawn from the experiment:

1. That corresponding increase in weight was not obtained from feeding steers on a forcing meal ration during a short period of feeding, and that because of this, such feeding resulted in more or less waste in the meal fed.

2. That the average daily increase was greater with the steers in lot 2, during the 84 days of the feeding period than with the steers in lot 1, notwithstanding the much lighter meal portion given to the former.

3. That the steers fed on a light meal portion and for 140 days gave a greater profit by $6.75 per animal over those fed for 84 days on a forcing meal portion.

4. That the steers fed on the forcing meal portion were much prone to get off their feed, while no trouble arose from this source with the steers fed on the light meal portion.

5. That the general behavior of the steers in lot 2 fed on the light meal portion for 140 days was much more satisfactory throughout, than that of the steers in lot 1, to which the forcing meal portion was fed for 84 days.

SECTION NO. 3.

FEEDING STEERS IN THE STABLE AND THE OPEN SHED.

THOMAS SHAW.

The important question as to whether steers can be fattened more rapidly and cheaply when confined in stables and tied up in stalls in the same, than when fed in sheds with constant liberty of access to a yard, has never been fully settled, although a limited amount of experimenting has been done in feeding animals thus. The opinion has commonly been held that steers could be fattened more rapidly in the stalls than in open sheds in a winter climate of low temperatures. But many farmers in the Northwest have evidently held the view, that with foods relatively cheap as they have been in the Northwest and labor relatively dear, the most profitable returns would accrue from feeding in

open sheds. The evidence witnessing this view is found in the extent to which such a system prevails in the area named. The experiment was undertaken therefore for the purpose of throwing light on this important question. And just here it may be proper to drop the caution, that the findings of the experiment will not be equally applicable to all climatic conditions, even where the mean temperatures may be similar or nearly so. It is more than probable that feeding in open sheds will be more profitable relatively in a bright winter climate, with cold more or less steady, as in our state, than feeding in open sheds in a climate in which changes in winter temperature are frequently accompanied by considerable precipitation in the form of rain or sleet.

Time Covered by the Experiment:—The steere were put on full feed Nov. 6, 1899. The experiment closed March 26, following. It therefore covered 20 weeks or 140 days. They were kept on feed until June 6, when they were sold at the South St. Paul stock yards as hereinafter stated. They had been accustomed to a meal ration for a short time previous to the commencement of the experiment proper, hence by the time that the experiment began the steers were in condition for taking a reasonably heavy meal ration.

The Objects of the Experiment.—The chief of the objects sought in the experiment were the following: 1, to ascertain the relative gains that would be made by the steers while being fattened in the stall as compared with steers on similar food but fed in a shed and having constant access to a yard; 2, to obtain information with reference to the relative amounts of food consumed; and 3, to learn which of the two systems of feeding would be attended with the greater profit under Minnesota conditions. Chief among the secondary objects were the following: 1, to glean information with reference to daily gains in the two instances in the respective periods of feeding; 2, to ascertain the relative daily consumption of food during the various periods of the experiment; and 3, to gather information generally bearing upon the relative merits of the two systems of feeding.

The Animals Used.—The animals put into the experiment were what may be termed good grade Shorthorn steers, with the exception of two animals in each lot which

showed in the form evidences of a good sprinkling of dairy blood. They were purchased for the Station by Mr. Andrew Boss, the Station foreman. They were nearly all sired by the same pure Shorthorn bull. They reached the Station Oct. 17, 1899, and were at once put on a mild ration of meal with corn fodder and hay. The meal consisted of bran, corn and oats fed in the proportions of 2, 1 and 1 parts respectively and in gradually increasing quantities beginning with 3 pounds per day per animal. In this way they were prepared for the experiment. Although the exact individual ages of the steers could not be known, it would be approximately correct to say that they were two years old past the previous spring hence they would be three years old when marketed.

Conditions Governing the Experiment.—There were 7 steers in each of the two lots. When chosen for the experiment several days prior to its actual commencement, there was a difference of only 7 pounds in the aggregate weights of the steers in the two lots, but this difference widened somewhat by the time the experiment began, at that time it was 91 pounds. They were very evenly chosen as to quality, as they were nearly all from the same sire. It is seldom possible to begin an experiment in feeding live stock when the conditions would be more favorable at the outset.

The steers fed indoors will be referred to as lot 1. They were tied in single stalls and in a stable comfortable and well ventilated. They were allowed the freedom of a yard two or three times a week on sunny days and for an hour or so at a time. They were tied around the neck with chains which slid up and down on an iron rod at the side of the stall, hence, they were comfortable whether standing or lying down on a soft, well littered bed. And they were curried with sufficient frequency to keep them comfortable and suitably presentable to an every day visiting public. They were watered in pails twice a day about midway between the noon meal and the morning and evening meals.

The steers fed in the shed will be spoken of as lot 2. They had access to a yard 35x66 feet, including the space covered by the shed. The yard was surrounded by a fence 6 feet high, the boards being put on up and down and close together.

The shed was 10x42 feet and had posts 10 feet high in front and 6 feet high in the rear. It was boarded close all around, except where the doorway was made on the side facing the southwest. The cracks were battened. Both shed and yard were kept well bedded, particularly the former, and the animals could go in and out at will day or night.

The meal was fed in a manger in the shed and the fodder was usually fed in a manger along one side of the yard. They were watered at a tank in the open yard and at times corresponding to the watering of the steers inside. The water was not heated. Both lots had access to salt at will.

The experiment was made to cover five periods of 28 days each and the meal was more or less modified in the components fed from time to time as described below under the head of Food and Feeding. This was done with the view of meeting the needs of the animals more completely as the experiment progressed. They were weighed at the beginning of the experiment and every Monday subsequently.

Food and Feeding. The meal fed during each of the five periods of the experiment was as follows:—viz. During the first period corn, bran and oats in the proportions of 4, 4 and 2 parts respectively; during the second period corn, bran, oats and oil cake in the proportions of 5, 3, 1 and 1 parts; during the third period, corn, bran, oats and oil cake in the praportions of 6, 2, 1 and 1 parts; during the fourth period, corn, bran and oil cake in the proportions of 6, 2 and 2 parts; and during the fifth and last period, corn, bran and oil cake in the proportions of 6, 1 and 3 parts.

In determining the kinds of meal that should be fed the aim was to feed those that were cheapest and, that would at the same time make a food properly balanced to meet the end sought. Bran was gradually decreased and corn was gradually increased until the fourth period was reached. Oats were fed with much moderation and were finally dropped out in the fourth period. They were fed not so much because of relative cheapness but because they seem to be an excellent food adjunct where animals are fed heavily on corn in leading them up to such heavy feeding without impairing the digestion. Oil cake introduced in the second period was gradually increased since it is particularly well adapted to

being fed along with corn, the latter half of the feeding period. It may thus be advantageous in some instances to feed a certain proportion of food that is dear to keep things in balance.

The meal was fed directly and was gradually increased in quantity as the feeding progressed as is shown in Table LXXXIII. It was fed in the ground form and without admixture with other food.

The fodder consisted of cultivated hay mixed in character, that is to say it consisted of timothy and clover. They were fed of this all they would eat with reasonable cleanness. The meal was fed morning and evening, and hay was given three times a day.

Estimated Value of the Food.—The food was estimated at what may be termed approximate average market values in the State. They were as follows:

Hay	$ 5.50 per ton
Corn	.22 per bu.
Oats	.21 per bu.
Bran	10.00 per ton
Oil Cake	24.00 per ton

Five cents per 100 pounds, the average price in the State was allowed for grinding the corn and oats. This charge is not included in the price of the grains given above. The oil cake was fed in what is termed the nutted form.

Table LXXXII gives the total consumption of each kind of food by the steers in both lots during the entire experiment and also the sum of these, and with the steers in lot 1 the consumption of food by each individual animal. The amount of food eaten by each individual in lot 2 could not be given since they were fed together.

TABLE LXXXII.—Food Consumed by the Steers.

Lot 1	Hay lbs.	Grain lbs.	Total lbs.	Corn lbs.	Bran lbs.	Oats lbs.	Oil Cake lbs.
1	1606	1868	3474	1064	374	133	297
2	1608	1865	3473	1062	373	134	296
3	1642	1877	3519	1069	376	134	298
4	1528	1842	3370	1049	368	132	293
5	1654	1870	3524	1065	374	134	297
6	1652	1910	3562	1089	379	133	309
7	1393	1840	3233	1047	368	131	294
Total	11083	13072	24155	7445	2612	931	2084
Ave.	1583.3	1867.4	3450.7	1063.6	373.1	133	297.7
Lot 2							
Total	10527	15892	26419	9111	3098	1010	2673
Ave.	1503.9	2270.2	3774.7	1301.5	442.6	144.3	381.8

The total consumption of food by the individuals in lot 1 were more than ordinarily uniform. With the exception of the steers Nos. 4 and 7, the greatest difference in the total consumption of food in the 140 days of the experiment was only 81 pounds. The steers 4 and 7 in lot 1, low in consumption of food were also relatively low in gains. But No. 3 relatively high in consumption of food does not show results corresponding. It is an illustration of what happens occasionally in lots of cattle well chosen for being fed, but fortunately it happens so infrequently as to form the exception rather than the rule.

It will be observed that the steers in lot 2 consumed 556 pounds less hay than those in lot 1. This, however, is of but little account in comperison to the whole amount fed. But the steers in lot 2 consumed 2820 pounds more meal, that is to say, 403 pounds more per animal. The exercise obtainable by animals thus fed together with the lower temperatures to which they were exposed renders them capable of consuming more meal than when confined. And when given the liberty of choice they consume the added food in the form of meal rather than forage.

Table LXXXIII gives the grain and hay respectively,

consumed by the steers of the two lots during the different periods of the experiment.

TABLE LXXXIII.—Grain and Hay Consumed by Periods.

GRAIN CONSUMED BY PERIODS.					
	First	Second	Third	Fourth	Fifth
Lot 1	238	330	405	444	450
Lot 2	238	366	482	584	600
HAY CONSUMED BY PERIODS.					
	First	Second	Third	Fourth	Fifth
Lot 1	320	331	321	309	302
Lot 2	314	360	311	280	239

It will be noticed that there was a virtual increase in the amount of meal consumed during each period, and this was accompanied by a slight decrease in the amount of hay consumed. This was not so much the outcome of preferences of appetite on the part of the steers as of design in feeding them. They were not fed at the first all the meal they would have consumed lest their capacity to consume grain should be weakened and because it was believed they would become more capable of turning to good account increasing quantities of meal as the feeding period advanced. But of meal and hay together they were given at all times what they would consume. The steers in lot 2 consumed 2820 pounds of meal more than the steers in lot 1. On the other hand they consumed 556 pounds less hay, a difference, however, that is inconsiderable.

Table LXXXIV gives the average daily consumption of each food factor by the steers in the respective lots, the total consumption of the same, and also the daily consumption and total consumption of each kind of food by the steers in lot 1.

TABLE LXXXIV.—Daily Consumption of Food by the Steers.

Lot 1	Hay lbs.	Grain lbs.	Corn lbs.	Bran lbs	Oats lbs.	Oilmeal lbs.	Total lbs.
1	11.5	13.3	7.5	2.7	1.0	2.1	24.8
2	11.5	13.4	7.6	2.7	1.0	2.1	24.9
3	11 7	13.4	7.6	2.7	1.0	2.1	25.1
4	10.9	13.2	7.5	2.7	.9	2.1	24.1
5	11.8	13 4	7.6	2.7	1.0	2.1	25.2
6	11.8	13.7	7.8	2.7	1.0	2.2	25.5
7	10.0	13.1	7.5	2.6	.9	2.1	23.1
Total	79.2	93.5	53.1	18.8	6.8	14.8	172.7
Ave.	11.31	13.36	7.6	2.7	.97	2.1	24.67
Lot 2							
Total	75.2	113.5	65.1	22.1	7.2	19.1	188.7
Ave.	10.74	16.21	9.3	3.16	1.02	2.73	26.95

The steers in lot 1, consumed daily 11 pounds of hay and those in lot 2, 10.74 pounds, or, an average of 10.87 pounds. Of grain the steers in lot 1 consumed daily 13.36 pounds of meal and those of lot 2, 16.21 pounds, or an average of 14.78 pounds. The average daily consumption of meal was thus far below 28 pounds the amount of shelled corn frequently fed per day, to cattle in western feed lots when followed by swine. It will also be noticed that the average daily consumption of food, hay and meal was 25.81 pounds, that is to say, steers with an average weight of 1085 pounds at the commencement of a period of feeding which lasted 140 days consumed daily on an average through the said feeding period 25.81 pounds of hay and meal.

Weights of the Steers.—Table LXXXV gives the weights of the steers in both lots when the experiment began and ended, the total individual increase, the av rage daily increase, and the average of each of the respective items just enumerated.

TABLE LXXXV.—Weights and Increase.

Lot 1	Weight when Experiment Began Nov. 6, 1899 lbs.	Weight when Experiment Closed Mar. 26, 1900 lbs.	Total Individual Gain lbs.	Average daily Gain lbs.
1	1153	1406	253	1.81
2	1190	1445	255	1.82
3	1187	1395	208	1.49
4	1016	1246	230	1.64
5	960	1232	272	1.94
6	1023	1328	305	2.18
7	1020	1204	184	1.31
Total	7549	9256	1707	12.19
Ave.	1078.4	1322.3	243.9	1.74
Lot 2				
1	1130	1420	290	2.07
2	1133	1481	348	2.49
3	1212	1543	331	2.36
4	1147	1460	313	2.24
5	940	1289	349	2.49
6	942	1160	218	1.56
7	1136	1498	362	2.59
Total	7640	9851	2211	15.80
Ave.	1091.4	1407.4	316	2.26

The difference in aggregate weight in favor of the steers in lot 2 when the experiment began was only 91 pounds. At the close of the experiment it was 385 pounds, a net difference in increase of 504 pounds. The difference in the average increase made by each steer in lot 2 therefore was 72 pounds, a difference that is too large to be looked upon as accidental.

With the steers in both lots there was the same range of differences in individual daily gains as occur in all feeding experiments. With No. 7 of lot 1, the average daily gain was but 1.31 pounds and with the steer in lot 2 which stood beside the other and was fed food the same in kind it was

2.18 pounds, a difference of 87 pounds in favor of the latter. In other words there was a difference of 121 pounds in favor of No. 6. While he consumed only 326 pounds more food, with No. 6 in lot 2 the daily gain was only 1.56 pounds, while with No. 7 it was 2.59 pounds, a difference of 1.03 pounds per day in favor of No. 7. In this instance of course there is no means of knowing the difference in food consumed. It seems a little remarkable, however, that steers about the same age should show a difference in capacity to make increase approximating one pound per day.

The average daily increase made by the steers in both lots was certainly good for so long period of feeding. Nevertheless there is an average daily increase of .52 pounds or a little more than half a pound per day in favor of lot 2. The average of both lots was exactly 2 pounds per day.

Table LXXXVI gives the total cost of hay and grain respectively fed to the steers in the two lots, the average cost of these, and with the steers in lot 1 the individual cost of the same.

TABLE LXXXVI.—Cost of Food Consumed.

Lot 1.	Hay	Grain	Total
1	$4.42	$11.08	$15.50
2	4.42	11.07	15.40
3	4.52	11.14	15.65
4	4.20	10.93	15.13
5	4.55	11.09	15.64
6	4.54	11.36	15.90
7	3.83	10.94	14.77
Total	30.48	77.61	108.09
Average	4.35	11.09	15.44
Lot 2.			
Total	28.94	95.03	123.97
Average	4.14	13.57	17.71

While the hay fed to the steers in lot 1, cost but $30.48 the meal cost $77.61, a difference of $47.13. With the

steers in lot 2 the difference was even greater, the hay costing $28.94 and the meal $95.03, a difference of $66.09, that that is to say the meal cost considerably more than twice as much as the hay. As the tendency is for meal to increase in price more than fodder, relatively, the importance of securing the largest possible consumption of fodder compatible with good gains is emphasized. Every attention should therefore be given to the growing of fodder of good quality by those who are going to devote it to such a use.

Daily Cost of Food Consumed.—The average daily cost of food for the steers in the respective lots is given below, and also the daily cost of the individual animals in lot 1:

Lot 1.—No. 1	11.0	cents.
No. 2	11.0	cents.
No. 3	11.2	cents.
No. 4	10.8	cents.
No. 5	11.2	cents.
No. 6	11.4	cents.
No. 7	10.6	cents.
Total	77.2	cents.
Average	11.0	cents.
Lot 2.—Total	88.6	cents.
Average	12 7	cents.

The average daily cost of the food for the steers in lot 1 was 11 cents. The average daily gain was 1.74 pounds. The estimated value of the steers in both lots when sold was $5.35 per 100 pounds. The average daily increase made by each steer, therefore, was worth 9.41 cents, that is to say 1.69 cents less than the cost of making it. The average daily cost of the food fed to the steers in lot 2 was 12.7 cents. The average daily gain was 2.26 pounds. The average daily increase made by each steer, therefore, was worth 12.1 cents, that is to say, but .6 cents less than the cost of making it. The value of the increase made by the steers in lot 2 was not very far below the cost of the food used in making it, which is certainly an excellent result when the relatively dear price of the food fed is considered.

Cost of Increase.—The average cost of making 100 pounds of increase with the steers in the two lots is given

below and the individual cost of making the same with the steers in lot 1:

Lot 1.—1		$6.13
	2	6.08
	3	7.53
	4	6.58
	5	5.75
	6	5.21
	7	8.03
	Average	$6.47
Lot 2.—Average		$5.61

While the gains made by the steers were good, the average cost of making 100 pounds of increase by the animals in the two lots during the experiment was $6.04 or 69 cents more than the market value of the same. The fact emphasizes the importance of buying stockers for immediate feeding at a price per pound considerably less than the probable selling price, as the profit must as a rule come solely from the advance in value of each pound of the original weight of the animal when purchased.

The great difference in the cost of making 100 pounds of increase in the individual animals is also apparent. While No. 7 in lot 1 cost $8.03 to make 100 pounds of increase, the steer No. 6 in lot 1 cost $5.21, a difference of $2.82 in favor of the latter. Link this fact with the thought that latter was the largest consumer of food of all the animals in lot 1 and the former was the smallest and its significance will be apparent.

Profit Made.—Table LXXXVII gives (1), the average value of each steer when the experiment began in both lots; (2), the average cost of food for each steer during the experiment; (3), the total cost of food; (4), the average profit made on each animal; (5), the totals in each instance; and (6); facts regarding cost and profit with the individual steere in lot 1.

TABLE LXXXVII.—Values and Profits Made During the Experiment.

Lot 1	Value Nov. 6, Experiment Began	Cost of Food	Total Cost	Value Mar. 6, Experiment Closed	Profit
1	$50.16	815.50	$65.66	$75.22	$ 9.56
2	51.77	15.49	67.26	77.31	10.05
3	51.63	15.66	67.29	74.63	7.34
4	44.20	15.13	59.33	66.66	7.33
5	41.76	15.64	57.40	65.91	8.51
6	44.50	15.90	60.40	71.05	10.65
7	44.38	14.77	59.15	64.41	5.26
Total	328.40	108.09	436.49	495.19	58.70
Ave.	46.92	15.44	62.36	70.74	8.38
Lot 2					
Total	332.34	123.97	456.31	527.02	70.74
Ave.	47.48	17.71	65.19	75.29	10.10

The steers were valued at $4.35 per 100 pounds when the experiment began. This estimate was based on the price paid for the steers. It was just a little high in comparison with market values at the time, but it was considered an advantage to obtain so large a number of the animals from one sire. They were estimated at $5.35 per 100 pounds when the experiment closed on the basis of market values for such animals at the South St. Paul Stock Yards at the time.

The average profit made on the steers in lot 1 was $8.38 and on those in lot 2 $10.10, a difference of $1.72 per animal in favor of the steers fed in the shed as compared with those fed in the stall. This fact states the outcome of the main object of the experiment, nor does it tell all the truth, since the labor involved in feeding and caring for the steers in lot 2 was much less than that of feeding and caring for the steers in lot 1.

Disposal of the Steers.—They were finally sold at the market of South St. Paul on June 6th, with the exception of two animals in each lot which were off in form when the ex-

periment began as previously intimated. They were pronounced prime.

FINANCIAL STATEMENT.

Estimated value of 14 steers on March 26, 1900, when the experiment closed at $5.35 per 100 pounds.....		$1,022.21
Value of 14 steers when the experiment began Nov. 6th, 1899, on the basis of cost price, viz.: $4.35 per 100 pounds.....	$660.74	
Cost of food.....	232.06	
Total outlay.....		892.80
Total net profit.....		129.41
Average net profit on one steer.....		9.25

Observations.—1. Since the food was charged at the average market values in the state, these would represent more than the cost of growing the same, and would therefore be so far unfavorable to the making of profits.

2. The value of the manure is supposed to offset the interest on the investment, the cost of bedding and the labor.

3. The fact should be noted that the winter was more than ordinarily mild, which of course would be so far in favor of the steers fed in the shed.

IMPORTANT FACTS SUMMARIZED.

VALUES.

1.	Value per 100 pounds on the basis of cost when the experiment began Nov. 6, 1899.....	$ 4.35
2.	Estimated value per 100 pounds when the experiment closed March 26th, 1900.....	5.35
3.	Advance in value per 100 pounds.....	1.00

WEIGHTS.

		Lbs.
1.	Average weight of the steers in lot 1 when the experiment began Nov. 6, 1899.....	1078.4
2.	Average weight of the steers in lot 2 when the experiment began.....	1091.4
3.	Average weight of the steers in lot 1 when the experiment closed March 26, 1900.....	1322.3
8.	Average weight of the steers in lot 2 when the experiment closed.....	1407.4

INCREASE IN WEIGHT.

1.	Average increase in weight of each steer in lot 1 during the 140 days covered by the experiment.....	243.9
2.	Average increase in weight of each steer in lot 2 during the same time.....	316.0
3.	Average daily increase of each steer in lot 1.....	1.74
4.	Average daily increase of each steer in lot 2.....	2.26

FOOD CONSUMED.

1. Average daily consumption of hay per animal by the steers in lot 1 during the 140 days covered by the experiment	11.31
2. Average daily consumption of hay per animal by the steers in lot 2	10.74
3. Average daily consumption of meal per animal by the steers in lot 1	13.36
4. Average daily consumption of meal per animal by the steers in lot 2	16.21
5. Ayerage daily consumption of food per animal by the steers in lot 1	24.67
6. Average daily consumption of food per animal by the steers in lot 2	26.95

COST OF FOOD.

	Cts.
1. Average cost of food per animal per day with the steers in lot 1	11.0
2. Average cost of food per animal per day with the steers in lot 2	12.7

COST OF INCREASE.

1. Ayerage cost of making 100 pounds of increase with the steers in lot 1	$ 6.47
2. Average cost of making 100 pounds of increase with the steers in lot 2	5.61

INCREASE IN VALUE.

1. Average value of each steer in lot 1 on the basis of cost when the experiment began	46.92
2. Average value of each steer in lot 2 when the experiment began	47.48
3. Average value of each steer in lot 1 when the experiment closed on the basis of market values	70.74
4. Average value of each steer in lot 2 when the experiment closed	75.29
5. Average increase in value made by the steers in lot 1 during the experiment	23.82
6. Average increase in value made by the steers in lot 2 during the experiment	27.81

PROFITS.

1. Aggregate net profit from feeding the 7 steers in lot 1 for the 140 days	58.70
2. Aggregate net profit from feeding the 7 steers in lot 2 for the same time	70.71
3. Average net profit from feeding the steers in lot 1	8.38
4. Ayerage net profit from feeding the steers in lot 2	10.10

CONCLUSIONS.

1. That with the prices of food and meat as in this experiment it costs more to make a given increase in weight than the same is worth when it is made.

2. That the prices of food and meat as in this experiment a good profit can be made from fattening a suitable class of steers.

3, That in this experiment the steers fed in the shed as compared with those fed inside, consumed on an average 2.28 pounds more food per day at an increased cost for food of 1.7 cents per day but they also made a greater average gain per day of .52 pounds and a greater net profit per animal of $1.72 from 140 days feeding, and at a considerably less outlay for labor.

4. That because of the great economic importance of the subject of investigation, and because of the results obtained it is greatly important that further investigations shall be conducted along the same lines.