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DIVISION OF ANIMAL HUSBANDRY.

JUNE, 1898.

FATTENING STEERS IN WINTER.

1. FATTENING MINNESOTA STEERS.
 2. FATTENING RANGE STEERS.
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ST. ANTHONY PARK, RAMSEY COUNTY, MINNESOTA.

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FATTENING MINNESOTA STEERS.

SECTION NO. 1.

THOMAS SHAW.

This bulletin contains the results of two experiments in feeding steers conducted essentially on the same lines and with the same object in view, but with some slight variations in the foods used. The chief object of the experiments was to glean information bearing upon the amount of grain, approximately, that would bring the greatest value when fed along with such fodder as corn, ensilage and hay. The chief variations consisted in some modifications in the kinds of grain used, in the proportions of these, and in the source whence the steers were secured. In Section No. 1, they were farm-grown steers, but in Section No. 2, they were reared on the range.

On coming West, the attention of the writer was early drawn to the custom which seemed to prevail everywhere of feeding what seemed to be extravagantly large amounts of grain. As much as 25 pounds of corn and even more than that quantity was usually fed per day to one steer of 1,000 pounds weight and upwards, when followed in the feed lot by one pig. Now, suppose the pig is allowed 5 pounds per day, which would seem to be a fair allowance, there is still left for the steer 20 pounds, and more than that in proportion as the grain is increased beyond 25 pounds per day, for the steer and the pig, as much more as the increase exceeds the amount named. This to the writer appeared to be extravagant feeding, and to the degree of being positively wasteful, in fact a style of feeding that could not be sustained in any country in which the prices of coarse grains have become relatively dear. True, these prices have usually been cheap in this western land of bountiful production. But it will not be so always, nor indeed is it probable that

the era of prices so low will ever come to us any more. These prices are even now making a sharp advance. They may fall again. Doubtless they will. But we may rest assured that the normal level of the prices for coarse foods will gradually go upward. This has been the experience in all the past in newly tilled areas as their tillage grows o' der. Viewed from such a stand point, the principle involved in these experiments assumes an importance that cannot well be over-estimated. If the assumptions of the writer should prove to be correct, first, with reference to the extravagance of western feeding, and second, with reference to the probable advance in the prices of coarse fodders, it would mean that sometime in the not distant future, our methods of feeding will have to be so modified as to amount to what may be termed a revolution in the same. I know very well that the sentiments just expressed will not meet with the approval of many, but I make them all the same, under the firm conviction that the future will justify the stand taken.

To throw some light on the economics of this question these experiments have been engaged in; with that object in view they have been prosecuted from year to year. And with the same object in view, with the concurrence and approval of the authorities of the University, they will still be continued in one form or the other until the views advanced shall have been sustained or disproved, as the case may be.

Time Covered by the Experiment.—The feeding began January 6th, and ended June 4th, 1896. It thus covered a period of 150 days. The lateness of the season at which the feeding began arose from the difficulty of securing the steers. It was sought to obtain them in the state. Although one of the three lots was purchased as early as September 1st, 1895, the animals in the third lot were not secured until the opening of the following year. In this we have an evidence of the relative limited production of good feeding-animals in the state. The difficulty of the effort was further enhanced by the high prices which had been paid for finished

animals the previous spring, and which had the effect of causing holders to rate their store animals at a price that could not be paid for them for successful feeding.

The Objects Sought in the Experiment.—Chief among the objects sought in the experiment were the following: 1, to ascertain the relative maximum increase from feeding light, moderate or heavier quantities of grain to steers that are being fattened during a somewhat prolonged term of feeding; 2, to ascertain the relative financial outcome from such feeding; and, 3, to ascertain the relative merit in steers of different grades for being thus fed. The secondary objects sought to learn: 1, the relative daily gains made; 2, the relative amounts of food consumed in making them; and, 3, the relative cost of producing these gains.

The Animals Used.—The aim was to secure three lots of animals, with three in each, that would be fairly representative of good grades of the Shorthorn, Hereford and Aberdeen Poll breeds. They were to be two years old, of common cows of mixed breeding, but having a bearing to beef in their tendencies, and from a pure bred sire. All these objects were at length measurably realized, although it was not possible to get much information about the dams.

The Aberdeen Poll grades were purchased from David M. Fyffe, manager of Wavertree farm, Dundee, Minnesota. They reached the farm Sept. 8th, 1895, and were kept on blue grass pasture until early in November. From October 3rd, they were fed hay in increasing amounts as they would take it until the experiment began. On October 28th, they were housed at night, and beginning with November 3rd they were fed 4 pounds per head per day of grain, and without increase until January 6th, when the experiment began. The grain fed consisted of bran and ground corn fed in the proportions of 2 and 1 parts by weight. The aggregate weight of the steers when they reached the station was 2,620 pounds and the average weight was 873.3 pounds. They gained in the interval named 415 pounds. They were muleys

and black or iron gray in color. The average price paid for them at Dundee was $3\frac{5}{12}$ cts. per pound. The freight was charged at 18 cents per 100 pounds which was the rate charged for carload lots. But 50 cents per animal was allowed for pasture, as it was inferior, and during much of the time while the steers were on pasture, other food was fed to them. Adding \$89.43, the cost in Dundee; \$4.72, the estimate for freight; and \$7 59, the cost of food and pasture, gives \$101.74 as the cost of the steers on January 6th, 1896. The net cost therefore was \$3.35 per 100 pounds.

The three Shorthorn grades were bought at the South St. Paul stock yards, from E. M. Prouty & Co. They had been reared in North Dakota and were evidently well up in Shorthorn blood. They reached the Station October 25th, and were managed exactly in the same way as the Gallo-ways described above, until the commencement of the experiment on January 6th. The aggregate weight on arrival was 3,180 pounds, and the average weight 1,060 pounds. Subsequently and prior to the beginning of the feeding period they gained 245 pounds. The price paid at South St. Paul was \$3.65 per 100 pounds. Adding \$116.07 the cash price at the stock yards, \$3.13 commission, feed and yardage charges, and \$6.61 for food fed prior to the experiment, gives the sum of \$125.81 as the cost of the steers when the experiment began. The cost per 100 pounds therefore was \$3.67.

The three Hereford grades were purchased from M. Tousley, of Le Sueur, Minn. They reached the station on January 3d, 1896. They weighed together 2,940 pounds, an average of 980 pounds. They gained 20 pounds during the three following days. The price paid at Le Sueur was \$4.00 per 100 pounds. The freight was charged at 11 cents per 100 pounds, the charge for carload lots. Adding \$117.60 the cash price paid at Le Sueur, 88 cents the food for three days, and \$3.23 for freight, gives \$121.71 or \$4.11 per 100 pounds as the cost of the Herefords. The net cost

of the nine steers therefore, when the experiment began, was \$3.70 per 100 pounds.

Conditions Governing the Experiment.—Nine steers in all were put under experiment, that is to say, three animals of each grade. They were tied in stalls. Those of each grade stood side by side, and when any comparisons are made relating to breed they are spoken of in the experiment as Aberdeen Polls, Shorthorns and Herefords respectively. When comparisons other than these are made, they refer to lots and not breeds, as such. Lot 1 comprised the three steers that stood on the right hand of the breed groups, one of each. Lot 2 comprised those standing in the centre, and lot 3 those standing on the left. To the steers in lot 1 was fed the light grain food referred to further on, to those in lot 2 the intermediate grain portion, and to those in lot 3 the heavier grain food. The steers were curried occasionally. They were given exercise for a short time in a yard on fine days. The practice was to turn out those of each lot on alternate days, only one lot being out on one day. They were weighed when the experiment began and every week thereafter.

Food and Feeding.—The steers in lot 1 were fed 5 pounds of meal per head per day; the steers in lot 2, 7 pounds; and those in lot 3, 9 pounds. This was to be increased 1 pound per animal at the end of every 4 weeks, but for reasons not quite in consonance with the judgment of the writer, it was increased a little faster than that. On February 10th a pound of oil-cake was added, per animal per day, to the other meal. On March 16th a second pound was added. On May 11th the maximum amounts of meal fed had been reached. These were 10, 12 and 14 pounds respectively, for the steers of the different lots. The meal fed consisted of equal parts by weight of bran, oats, barley and corn. On March 16th the grain food was changed to bran, barley and corn, in the proportions of 1, 1 and 2 parts by weight.

In addition to the grain, each steer was fed 25 pounds of corn ensilage per day throughout the experiment, and in addition they were given all the native hay which they would consume cleanly. The ensilage was medium or a little less than that, but the hay was decidedly inferior in quality. The grain was fed along with the ensilage morning and evening, and the hay was given in three feeds daily. Water was given in pails twice a day, and salt was given in the mangers at least two or three times per week.

The Herefords were dehorned when they entered the experiment. The dehorning interfered with their feeding somewhat seriously at first, and it was more than 14 days thereafter before the effects of the dehorning entirely vanished. This was of course so far unfair to the Herefords in the contest.

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

Bran, per ton.....	\$6.50
Oil-cake, per ton.....	14.00
Oats, per bushel of 32 pounds.....	.14
Barley, per bushel of 48 pounds.....	.16
Corn, per bushel of 56 pounds.....	.18
Native hay, per ton.....	3.00
Corn ensilage, per ton.....	1.00

As the oats, corn and barley were fed in the ground form, the ordinary cost of grinding, viz. 5 cents per sack, was allowed. The price of these grains in the ground form, therefore, was 16½, 20½ and 18½ cents per bushel.

The above estimate for foods to an Easterner may seem almost ridiculously low. But in some instances the food cost less than the prices charged. The bran was bought in the mills of the Twin Cities for \$4.50 per ton. In various parts of the state oats were exchanging hands at 9 to 11 cents per bushel. True, the price of meat was low in the spring of 1896, but, with that exception, the prices paid for

meat were not really low during the term of years in which such low prices for food prevailed. The opportunities therefore to make money from the judicious feeding of live stock during those years were exceptional. But with nearly all our farmers they were not improved. Like the waters that were allowed to pass without grinding the grist, they also have passed for the prices of foods are likely to be higher for years to come.

Food Consumed.—Table LXXIV. gives the amount of hay, ensilage and meal respectively consumed by each steer during the experiment, and the amount of these combined, also the total of each kind of food and of all the food consumed by the steers of each lot.

TABLE LXXIV.—Food Consumed by the Steers.

	HAY.	ENSILAGE.	MEAL.	TOTAL.
Lot No. 1—	Lbs.	Lbs.	Lbs.	Lbs.
Galloway.....	890	3,654	1,283	5,827
Shorthorn.....	1,287	3,650	1,297	6,234
Hereford.....	933	3,066	1,283	5,282
Total.....	3,110	10,370	3,863	17,343
Lot No. 2—				
Galloway.....	904	3,589	1,578	6,071
Shorthorn.....	1,126	3,652	1,587	6,365
Hereford.....	909	2,556	1,549	5,014
Total.....	2,939	9,797	4,714	17,450
Lot No. 3—				
Galloway.....	771	2,353	1,830	4,954
Shorthorn.....	978	3,373	1,763	6,114
Hereford.....	820	2,403	1,782	5,005
TOTAL.....	2,569	8,129	5,375	16,073

Each steer was given the same amount of oilcake, viz. 196 pounds, and it is included in each instance in the aggregate amount of meal fed. It will be observed that the increased quantity of meal fed to the steers in lots 2 and 3 respectively, caused a somewhat decreased consumption of both hay and ensilage, as compared with the amounts of these

consumed by the steers in lot 1, but the decrease was not sufficient to balance the greater cost of the additional grain fed. In fattening animals there is a point at which the respective quantities of fodder and meal fed are in equilibrium. The best results will unquestionably be obtained when that point is reached.

Table LXXV. gives the amount of each kind of food consumed daily by the steers in the different lots, the average amount of the same, and the total daily consumption of food by each individual animal.

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

	Hay	Ensilage	Meal	Total
Lot No. 1—	Lbs.	Lbs.	Lbs.	Lbs.
Galloway.....	5.93	24.36	8.55	38.84
Shorthorn.....	8.58	24.33	8.65	41.56
Hereford.....	6.22	20.44	8.55	35.21
Average.....	6.91	23.04	8.58	38.54
Lot No. 2—				
Galloway.....	6.02	23.93	10.52	40.47
Shorthorn.....	7.51	24.35	10.58	42.44
Hereford.....	6.06	17.04	10.33	33.43
Average.....	6.53	21.77	10.48	38.78
Lot No. 3—				
Galloway.....	5.14	15.69	12.20	33.03
Shorthorn.....	6.52	22.49	11.75	40.76
Hereford.....	5.47	16.02	11.88	33.37
Average.....	5.71	18.07	11.94	35.72

It will be noticed, first, that the averages of meal consumed daily by the steers in the different lots were 8.58, 10.48 and 11.94 pounds respectively; second, that the steers in lot 3 did not consume quite the full proportion of meal intended for them, although at no time of the experiment were they given more than 16 pounds per day, more than once the quantity given to them had to be modified to keep them on their feed; third, that the average quantity of meal fed to the steers in lot 1 was only a little more than

one-third of the average quantity of corn fed by our western feeders. True, there was some corn fed in the ensilage. This fact must not be lost sight of, but the amount of corn thus fed would not amount probably to more than two or three pounds per day, and yet, as will be shown later, the increase made by the steers in lot 1 is more than the increase made by those in lot 3, which consumed so much more grain; and, fourth, that the steers in some of the lots consumed quite the amount of ensilage intended. This was due to its indifferent character, otherwise they would have eaten it clean in preference to the poor hay given. Notably was this the case with the steers in lot 3, which were given so much grain.

Weights of the Animals.—Table LXXVI. gives the weight of the individual animals in each lot at the commencement and at the close of the experiment, and the total individual increase in weight. It also gives the total for each group.

TABLE LXXVI.—Weights of the Animals in the Different Lots.

	Weight at the Beginning of the Ex- periment	Weight at the Close of the Experi- ment.	Total Increase in Weight.
Lot No. 1—			
Galloway.....	Lbs. 1,000	Lbs. 1,247	Lbs. 247
Shorthorn.....	1,080	1,342	262
Hereford.....	1,030	1,262	232
Total.....	3,110	3,851	741
Lot No. 2—			
Galloway.....	1,050	1,317	267
Shorthorn.....	1,180	1,422	242
Hereford.....	935	1,202	267
Total.....	3,165	3,941	776
Lot No. 3—			
Galloway.....	985	1,247	262
Shorthorn.....	1,160	1,375	215
Hereford.....	995	1,210	215
Total.....	3,140	3,832	692

The aggregate gain made by the steers in lot 1 was 35 pounds less than that made by the steers in lot 2, but it was 49 pounds more than that made by the steers in lot 3, notwithstanding the much greater consumption of meal by the latter, and meal is usually the most costly food. These results would tend to show that gain can't be forced in a somewhat prolonged period of feeding by giving concentrated food beyond a certain limit.

Table LXXVII. gives the average daily gains made by the individual animals in the several lots and also the daily average made by those of each lot.

TABLE LXXVII.—Average Daily Increase Made.

	Lot 1	Lot 2	Lot 3
	Lbs.	Lbs.	Lbs.
Galloway.....	1.65	1.78	1.75
Shorthorn.....	1.75	1.61	1.43
Hereford.....	1.55	1.78	1.43
Average.....	1.65	1.72	1.54

The average daily gain made by all the steers was 1.64 pounds. This is only a moderate increase, but it is probably about as good as may usually be looked for from prolonged feeding in the absence of ensilage first-class in quality. The fact is significant that the extra amounts of meal fed to the steers in lot 3 did not produce the greatest gains.

Cost of Food.—Table LXXVIII. gives the cost of each food factor fed to the individual animals in the different lots, the total cost of the several food factors fed to each, and the total cost of the food fed to the animals of the respective lots.

TABLE LXXVIII.—Cost of Food Consumed.

	HAY.	ENSILAGE.	MEAL.	Total
Lot No. 1—				
Galloway.....	\$1.34	\$1.83	\$5.53	\$8.70
Shorthorn.....	1.93	1.82	6.49	9.24
Hereford.....	1.40	1.53	5.43	8.36
Total.....	4.67	5.18	16.45	26.30
Lot No. 2—				
Galloway.....	1.36	1.80	6.45	9.61
Shorthorn.....	1.69	1.83	6.58	10.10
Hereford.....	1.36	1.28	6.44	9.08
Total.....	4.41	4.91	19.47	28.79
Lot No. 3—				
Galloway.....	1.16	1.18	7.49	9.83
Shorthorn.....	1.47	1.68	7.24	10.39
Hereford.....	1.23	1.20	7.31	9.74
Total.....	3.86	4.06	22.04	29.96

The food fed to the steers in lot 1 cost \$2.49 less than that given to those in lots 2 and \$3.66 less than that given to the steers of lot 3, while the increase in the weight of those in lot 2 as previously stated was only 35 pounds more than with those in lot 1, and with the steers in lot 3 it was 49 pounds less. With food at normal prices the difference in the cost of food could have been much greater. It is also worthy of notice, that the shorthorn steers of lots 2 and 3 respectively did not make the greatest increase in weight, although they cost the most for food.

Table LXXIX. gives the average daily cost of the food consumed by the individual animals in the several lots, and also the daily average cost of the same by lots.

TABLE LXXIX. Average Daily Cost of Food Consumed.

	LOT 1.	LOT 2.	LOT 3.
	Cents	Cents	Cents
Galloway.....	5.80	6.41	6.55
Shorthorn.....	6.16	6.73	6.93
Hereford.....	5.58	6.05	6.49
Average.....	5.85	6.40	6.66

The average cost of feeding each steer per day for the 150 days of the experiment was but 6.3 cents. Such a result seems scarcely credible to one used to the more costly feeding of the East. In the winters of 1890, '91 and '92 the writer fed steers in Ontario with a daily average outlay for food of 17.59 cents, and with a fair profit. Of course the relative buying and selling prices were different. Had the prices of meat been normal when the steers fed in this experiment were sold, the profit made would have been satisfactory, even at the high price paid for them.

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

TABLE LXXX.—Average Cost of 100 Pounds of Increase.

	Lot 1	Lot 2	Lot 3
Galloway.....	\$3.52	\$3.60	\$3.75
Shorthorn.....	3.53	4.17	4.83
Hereford.....	3.60	3.40	4.53
Average.....	\$3.55	3.72	4.37

The average cost of producing 100 pounds of increase by the steers in all the lots was \$3.88. They were sold at the abnormally low price of 4.10 cents per pound when finished, but even at that low price each average pound of increase was made at a figure less than the cost of making it; with four of the animals only was it greater, and it is significant that three of the four were in lot 3, and that one of them was in lot 1.

Profit Made.—Table LXXXI. gives: 1, the value of the steers in each lot when the experiment began; 2, the cost of the food fed; 3, the total outlay; 4, the value when the experiment closed, and, 5, the profit. The totals in each instance are also given.

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

	LOT 1	LOT 2	LOT 3	TOTALS
Value when the Experiment began Jan. 6, '96..	\$115.07	\$117.11	\$116.18	\$348.36
Cost of Food.....	26.30	28.79	29.96	85.05
Total Cost.....	141.37	145.90	146.14	433.41
Value when the Experiment closed June 4.....	157.89	161.58	157.11	476.58
Profit.....	\$16.52	\$15.68	\$10.97	\$43.17

No allowance is made for shrink in the above computation. Nor should it be in such a statement, without also shrinking the animals at the beginning of the feeding. The above profit is of course greater than the net profit shown later. Nor should the fact be overlooked that the profit during the feeding period was \$5.55 more from the steers in lot 1 than from those in lot 3, although each of the latter consumed daily 3.36 pounds more meal.

Table LXXXII. gives the value of the food fed during the experiment, the value of the increase made, and the profit or otherwise of the said increase.

TABLE LXXXII.—Profit from the Increase Made During the Experiment.

	Value of Food Fed	Value of Increase in Weight	Profit on the Increase in Weight
Lot 1.....	\$26.30	\$30.38	- \$4.08
Lot 2.....	28.79	31.82	- 3.03
Lot 3.....	29.96	28.37	— 1.59
Totals.....	\$85.05	\$90.57	- \$5.52

The net profit, \$5.52, on the increase in weight was not large, but under the circumstances it was very satisfactory to have any profit at all on the increase in weight.

Disposal of the Steers.—The steers were sold by Col. W. M. Ligget, the director, to W. E. McCormick, of St. Paul, through whom they were in turn sold to the retail trade of the city. The price paid was \$4.10 per 100 pounds, with a

shrink of 4 per cent. They were sent to the block on June 4th, when the experiment closed.

<i>Financial Statement.</i> —Cash received for 9 steers on June 4th, 1896, shrunk weight	
11,159 pounds at \$4.10 per 100 pounds	\$457.52
Value of 9 steers on Jan. 6th, on the basis of cost.....	\$348.36
Cost of Food.....	85.05
	<hr/>
Total outlay.....	433.41
	<hr/>
Total net profit.....	\$24.11
Net Profit on one steer.....	2.68

Observations.—1. Notwithstanding the high price paid for the steers and the low price received for them, some net profit was made on each animal. In lot 1 the net profit was \$10.21; in lot 2, \$9.20; and in lot 3, \$4.70.

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

3. The food was charged at market values, which ordinarily would be against the experiment, but at the figures named it was probably but little above the cost of production.

IMPORTANT FACTS SUMMARIZED.

Values.—

1. Value per 100 pounds on the basis of cost, when the experiment began Jan. 6, 1896.....	\$3.70
2. Value per 100 pounds on the basis of actual receipts, June 4, when the steers were sold.....	4.10
3. Advance in value per 100 pounds.....	.40

Weights.—

1. Average weight of the steers in lot 1 when the experiment began, Jan. 6th, 1896.....	Lbs. 1,037
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Lbs.

2. Average weight of the steers in lot 2 at the same date.....	1,055
3. Average weight of the steers in lot 3 at the same date.....	1,047
4. Average weight of one 'steer in all the lots at the same date.....	1,046
5. Average weight of the steers in lot 1 at the close of the feeding, June 4th, 1896.....	1,284
6. Average weight of the steers in lot 2 at the same date.....	1,314
7. Average weight of the steers in lot 3 at the same date.....	1,277
8. Average weight of one steer in all the lots at the same date.....	1,292

Increase in Weight.—

1. Total increase in weight made by the steers in lot 1 during the experiment.....	741
2. Total increase in weight made by the steers in lot 2 during the same period.....	776
3. Total increase in weight made by the steers in lot 3 during the same period.....	690
4. Average increase per day made by the steers in lot 1 during the experiment	1.65
5. Average increase per day made by the steers in lot 2 during the same period.....	1.72
6. Average increase made by the steers in lot 3 during the same period.....	1.54

Food Consumed—

1. Average amount of meal consumed per day by the steers in lot 1 during the experiment.....	8.58
2. Average amount of meal consumed per day by the steers in lot 2 during the same period.....	10.48
3. Average amount of meal consumed by the steers in lot 3 during the same period	11.94

Cost of Food—

	Cents.
1. Average cost of food per day with the steers in lot 1.....	5.85
2. Average cost of food per day with the steers in lot 2.....	6.40
3. Average cost of food per day with the steers in lot 3.....	6.66

Cost of Increase—

1. Average cost of making 100 pounds of increase with the steers in lot 1.....	\$3.55
2. Average cost of making 100 pounds of increase with the steers in lot 2.....	3.72
3. Average cost of making 100 pounds of increase with the steers in lot 3.....	4.37

Profits.

1. Net profit on the steers in lot 1.....	10.21
2. Net profit on the steers in lot 2.....	9.20
3. Net profit on the steers in lot 3.....	4.70
4. Average net profit on each steer.....	2.68
5. Net profit on the nine steers fed.....	24.11

SUMMARY BASED ON BREED.

1. The average weight of the Galloways, Shorthorns and Herefords respectively at the commencement of the experiment January 6, 1896, was 1,012, 1,140 and 987 pounds.
2. The average increase in weight per animal was 259, 240 and 238 pounds.
3. The average of food consumed per day was 37.45, 41.59 and 34.00 pounds.
4. The average cost of food was \$9.38, \$9.91 and \$9.06.
5. The average cost of 100 pounds of increase was \$3.62, \$4.18 and \$3.84.

6. The average net profit was \$9.58, \$6.62 and \$7.91. In the breed contest therefore the Galloway grades are in the lead in point of gain, in cheapness of production and in the net profit made. Too much must not be made of this, however, as the weight of the Shorthorns at the beginning of the experiment indicated greater age, which if true, would be against them. And the dehorning of the Herefords would be so far against them. The result, however, tends to show the excellence of the hardy Galloway breed for meat production when crossed upon commoner grades.

CONCLUSIONS.

1. That this experiment demonstrates the marked suitability of animals of the Galloway cross for producing beef.

2. That in this experiment feeding meal beyond 10.58 pounds per animal per day with the other adjuncts failed to produce any greater relative increase in weight.

3. That in this experiment the highest net profit was made from the steers which were fed an average of but 8.58 pounds of meal daily with other adjuncts.

4. That in this experiment the cost of production was lowest with the steers which were fed the lowest quantities of meal.

5. That in fattening cattle they will consume more meal if given to them, than they seem able to digest and assimilate properly.

6. That in view of these facts when suitable fodder is fed along with the meal, it is not necessary to feed quantities of the latter so large as are usually fed in the feed lots of the west.

FATTENING RANGE STEERS.

SECTION NO. 2.

THOMAS SHAW.

The fattening of steers grown upon the range has heretofore received almost no attention from the farmers of the state. Something had been done in this line at the stockyards, but rather after a wholesale fashion, hence no exact details could be secured as to the suitability of range steers for being fattened under farm conditions such as are found in our state. Much less could information be gleaned with reference to the financial outcome from such feeding.

As is generally known, cattle have been grown for many years on the western ranges and in numbers very large in the aggregate. The range conditions, though suitable for growing them, are not suitable for fattening them without supplemental food. More especially is this true of the cattle grown on the ranges to the west of Minnesota. If, therefore, they are to be sent to the market in the best of finish, they must needs be fattened somewhere between the ranges and the place of slaughter.

These animals cross our state in thousands and tens of thousands every year while being sent to the market. Minnesota, better than almost any other state in the Union has facilities for fattening these animals. This statement cannot be gainsaid when climate, material to provide shelter and food production are considered, and several of the railroads which transport these cattle to market allow them to be fed in transit, which makes it possible for the feeder to enjoy the benefit of the long haul rates. The Minnesota farmer therefore enjoys exceptional advantages for engaging in such work, and this experiment was undertaken in the hope of gleaning such information as would demonstrate to

him not only its practicability but its advantageous character. It was also decided to so feed them if found practicable that the experiment would be of the same character as the two previously conducted, that is to say, it would prove a further demonstration of the results to be expected from feeding small, intermediate and larger quantities of grain while the animals were being fattened. The details of the first of these experiments are given in Bulletin No. 44, and those of the second form the first division of this bulletin.

Time Covered by the Experiment.—The experiment proper began December 7th, 1896, and ended April 17th, 1897, thus covering a period of 131 days. It was, however, preceded by what may be termed a preparatory period, which began Nov. 19th, and which therefore lasted 18 days. In the case of these steers this preparatory feeding was very necessary, that they might become accustomed to surroundings which to them were new and peculiar, and that they might be enabled to take hold of their food rations with some degree of uniformity when the experiment began. These rations were the same in kind as those fed during the experiment proper, described below. By the end of the preparatory period they were all taking their food fairly well, though in some instances they were not taking a full allowance of ensilage.

The Objects Sought in the Experiment.—Chief among the objects sought were: 1, to ascertain the suitability of range-grown steers for being fattened under farm conditions; 2, to ascertain the relative returns from feeding light, intermediate and heavier quantities of grain, and, 3, to glean information bearing upon the probable financial outcome from conducting such work. The secondary objects sought information: 1, on such points as the relative daily gains made; 2, the relative amounts of food consumed in making them, and, 3, the relative cost of production.

The Animals Used.—Nine steers were used in the experiment. They were part of a carload of 21 animals purchased by the writer on "Shelter Ranch," Montana. Mr. John Manning, the owner of this ranch is located some 12 miles north from Culbertson, on the Great Northern Railroad. They were two-year-olds and were of various grades. In some, Hereford and Aberdeen Polled blood was evidently dominant, but in others, Shorthorn blood prevailed. They were good fair types of beef-making steers, but were a little long of limb and strong of bone to be placed in the very first rank. They were reared under what may be termed semi-range conditions, that is to say, they were grown on range pastures, but under the eye of a herder. They had been suckled by their dams, and in the winter, when necessary, hay had been given to them. They had never been handled otherwise than in branding them, and on all occasions had been driven by the aid of a horse. They were not so wild, therefore, as steers reared on the open range, but were very much wilder than those grown on the arable



Fig. 202.—Range Steers on Arrival at Crookston.

farm. With reference to the absence of handling, they were types of what a majority of the range cattle are soon likely to be, as the era of growing cattle on the semi-range plan rather than on the open range and without a herder is evidently at hand.

The steers were unloaded at the sub-experiment station at Crookston on September 2, 1896. As pasture was abundant there, it was the intention to graze them for a time, and to feed them likewise a supplement of cheap grain, such as screenings. It cannot be said, however, that this part of the experiment was quite successful. The weather turned unusually cold for the season of the year, early frost destroyed the succulence of the grass, and in the absence of shelter the steers made but little increase, as will be apparent on examining the record of weights given below.

On November 18th they were reshipped to St. Paul, and on the 19th of the same 9 of them were weighed, tied up and put under experiment. These 9 were chosen on the basis of uniformity, and they were very little heavier than the average of the whole lot. The 12 animals remaining were divided into small lots of 3 each, and were put into close box stalls, to be fattened loose on certain rations allotted to them. But as one and another of them was slaughtered from time to time for the school of agriculture, comparisons could not be made that would be of any value.

When the steers reached Crookston they were weighed and evidently in a much shrunken condition. The average of the whole lot was 1,097 pounds. The average weight of the 9 animals subsequently put under experiment was 1,109 pounds. The average weight of the latter on November 19th, when the feeding began, was 1,129 pounds, and on December 7th, when the experiment proper began, it was 1,166 pounds. They were also dehorned at the time of the first weighing.

The cost in Montana was \$30.00 per animal. On the basis of the weight taken at Crookston, they cost \$3.10 per

100 pounds laid down at the latter place. The value of pasture was very low at the time at Crookston, as were also the values of hay and screenings. In fact these were simply nominal. From the time of arrival at the central station on November 18th, they were fed the same kinds of food as during the experiment proper. As they were fed together at Crookston, it is impossible to tell the exact cost of keeping each steer while there. But allowing market values for the food and pasture, as nearly as can be ascertained, they were worth on December 7th, when the experiment proper began, on the basis of cost, \$3.13 per 100 pounds. This includes all outlay. The freight on the car from Culbertson, Mont., to St. Paul, 702 miles, was \$83.50, and with food included, \$84.90, practically \$4.04 on each animal.

Conditions Governing the Experiment.—When put under experiment they were tied in stalls side by side. Tying them was no easy task, and some individuals apparently chafed under the confinement for a time, but gradually even these became quite contented with their surroundings. Although they at length became sufficiently tame to admit of being curried occasionally, the attendant had to exercise due caution in a near approach to some of them, even to the end of the experiment. The proper way, of course, to feed such animals on the farm would be at large with access to a shed and yard, but under such conditions some of the objects sought in this experiment would not have been obtained. The steers were weighed every two weeks after having been put under experiment. Under the circumstances it was not practicable to give them any exercise.

They were divided into three lots, three in each lot. The three right hand steers in the several lots taken together are spoken of as lot 1; the three middle steers are spoken of as lot 2, and the three left hand steers as lot 3. The first, second and third steers in each lot are also spoken of as (a), (b) and (c) respectively, when being distinguished in-

dividually. To the first, that is to say to lot 1, was fed the light meal portion, to the second the intermediate quantity, and to the third the heavier meal portion.

Food and Feeding.—The food consisted of bran, barley, corn and oilcake fed in the proportions of 3, 3, 3 and 1 parts by weight, hay and ensilage. The steers in lot 1 were fed 7 pounds per day of the grain when the experiment began, those in lot 2 were given 9 pounds, and those in lot 3, 11 pounds. These respective amounts were increased at the rate of one pound per animal every four weeks. It was intended to give them 25 pounds of corn ensilage per day per animal, but after a time some of them became so indifferent about eating the ensilage, that in order to sustain as nearly as practicable an equilibrium in the amounts of ensilage fed, the average per animal was reduced to 18 pounds per day on February 1st, and from the steer (a) of lot 2, it had to be withheld altogether. They were given all the mixed hay they would consume. The ensilage was fed in two feeds per day and likewise the meal. The hay was fed uncut and in three feeds per day. The contest lay between different quantities of meal fed to the steers of the different lots.

Estimated Value of the Food.—The food given to the steers was charged at what was considered average market values for the same in the state. These were as follows:

Bran, per ton.....	\$6.50
Barley, per bushel of 48 pounds.....	.16
Corn, per bushel of 56 pounds.....	.18
Oilcake, per ton.....	14.00
Hay, per ton.....	3.50
Corn Ensilage.....	1.25

An allowance of 2½ cents per bushel was made for grinding the barley and corn. The ordinary charge for the same in the state is 5 cents per sack. The barley meal, therefore, would be worth 18½ cents per 48 pounds and the corn 20½

cents per 56 pounds. The hay was coarse in character. It consisted of timothy and clover, the former predominating.

Incidents of the Experiment.—On February 17th the grain ration was increased one pound per animal per day over and above the original intended ratio of increase. This increase was not quite in consonance with the judgment of the writer. By March 1st the respective amounts fed to each animal per day was, to the steers in lot 1, 11 pounds; in lot 2, 13 pounds, and in lot 3, 15 pounds. The meal was not further increased. On the other hand it was found necessary in some instances to decrease it. For instance, the steer (a) in lot 2, was off his feed for several days subsequent to March 18th, although he was being given but 11 pounds of meal daily. The meal fed to steer (c) in lot 2 must needs be reduced from 15 to 13 pounds daily for a few days subsequently to April 5th, and a similar reduction was found necessary with the steer (c) in lot 3, at least for a time, subsequently to April 5th. The meal fed to this steer after that date was never raised again to exceed 14 pounds daily. None of the steers consumed the full amount of ensilage intended. No ensilage was fed to the steer (b) in lot 1 after March 16th, as he refused to eat it, and steer (b) in lot 3 had also but little relish for the ensilage at any period of the feeding. On March 29th the barley was omitted from the ration and the proportions of the bran, corn and oil cake were made to consist of 3, 6 and 1 parts respectively. The change was made with a view to hasten the finishing process.

Food Consumed.—Table LXXXIII. gives the amount of hay, ensilage and meal respectively consumed by each steer during the experiment, and the sum of these taken together, also the total of each kind of food and of all the food consumed by the steers of each lot during the experiment.

TABLE LXXXIII. —Food Consumed by the Steers.

	Hay	Ensilage	Meal	Total
Lot No. 1—	Lbs.	Lbs.	Lbs.	Lbs.
(a)	1,536	2,788	1,200	5,524
(b)	1,254	1,745	1,162	4,161
(c)	1,368	2,610	1,206	5,184
Total.....	4,158	7,143	3,568	14,869
Lot No. 2—				
(a)	1,075	2,620	1,462	5,157
(b)	1,208	2,678	1,463	5,349
(c)	1,251	2,683	1,463	5,397
Total.....	3,534	7,981	4,388	15,903
Lot No. 3—				
(a)	1,227	2,753	1,727	5,707
(b)	1,332	1,433	1,709	4,474
(c)	1,001	2,668	1,710	5,379
Total.....	3,560	6,854	5,146	15,560

The steers in lot 2 consumed more fodder, that is to say, hay and ensilage, than those in lot 1. But for the capricious appetite of the steer (b) in lot 1, however, the steers in the latter lot would have consumed more than those in either of the other lots. This experiment, like those preceding it, similar in character, confirms the view that increase in the quantity of meal fed does tend to decrease the consumption in fodder, but not to the extent of making the food ration equally dear.

Table LXXXIV. gives the amount of each kind of food consumed daily by the steers in the different lots, the average amount of the same, and the total daily consumption of food by each individual animal.

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

	Hay	Ensilage	Meal	Total
Lot No. 1—	Lbs.	Lbs.	Lbs.	Lbs.
(a)	11.73	21.28	9.16	42.17
(b)	9.57	13.32	8.87	31.70
(c)	10.44	19.92	9.21	39.57
Average.....	10.58	18.17	9.08	37.81
Lot No. 2—				
(a)	8.21	20.00	11.16	39.37
(b)	9.22	20.44	11.17	40.83
(c)	9.55	20.48	11.17	41.20
Average.....	8.99	20.31	11.17	40.47
Lot No. 3—				
(a)	9.37	21.01	13.18	43.56
(b)	10.17	10.94	13.05	34.16
(c)	7.64	20.37	13.05	41.06
Average.....	9.06	17.44	13.09	39.59

Though the average of meal consumed by the steers in lot 1 was 4.01 pounds per animal per day less than the average consumed by those in lot 3, yet the gains would have probably equaled those made by the latter but for the poor feeding quality of the steer (b) in lot 1. This steer did not take all of the light allowance of meal accorded to him, and to have given more under the circumstances would have certainly affected his gains injuriously. It must be borne in mind, however, that the steer (a) in lot 3 was also an indifferent feeder, but not to nearly the same extent as steer (b) in lot 1.

Weights of the Animals.—Table LXXXV. gives the weight of the individual animals in each lot at the commencement and at the close of the experiment, and the total individual increase in weight. It also gives the totals for each group.

TABLE LXXXV.—Weights of Animals in the Different Lots.

	Weight at the Beginning of the Ex- periment	Weight at the Close of the Ex- periment	Total Increase in Weight
Lot No. 1—			
(a).....	Lbs. 1,215	Lbs. 1,497	Lbs. 282
(b).....	1,150	1,292	142
(c).....	1,255	1,540	285
Total.....	3,620	4,329	709
Lot No. 2.—			
(a).....	1,078	1,343	265
(b).....	1,105	1,320	215
(c).....	1,230	1,535	305
Total.....	3,413	4,198	785
Lot No. 3—			
(a).....	1,190	1,498	308
(b).....	1,055	1,240	185
(c).....	1,220	1,485	265
Total.....	3,465	4,223	758

Although the steers in lot 1 aggregated 155 pounds more than the steers in lot 3 when the feeding began, and would, therefore, naturally require somewhat larger quantities of food, they gained together but 49 pounds less on a consumption of 40.2 per cent less meal. The close relation between regular consumption of food suitable in kind and at least approximately so in quality is well brought out in the behavior of the steers in lot 2. Throughout the experiment, with the one exception pointed out, they took the food regularly and with avidity, and they came out first in the aggregate gains made.

Table LXXXVI. gives the aggregate daily gains made by the individual animals in the several lots, and also the daily average made by those of each lot.

The daily average increase made was 1.91 pounds. This on the whole is a good average, notwithstanding that two of the steers made very poor gains. And judging by the behavior of the steers in lot 3 these gains would have been

TABLE LXXXVI.—Average Daily Increase Made.

	Lot 1	Lot 2	Lot 3
	Lbs.	Lbs.	Lbs.
(a).....	2.15	2.02	2.35
(b).....	1.09	1.64	1.41
(c).....	2.18	2.33	2.02
Average.....	1.81	2.00	1.93

more had all the steers been fed meal as heavily as those in lot 3. The evidence rather points to the conclusion that the gains would have been less than they actually proved.

Cost of Food.—Table LXXXVII. gives the cost of each food factor fed to the individual animals in the different lots, the total cost of the several food factors fed to each, and the totals of cost in the food fed to the animals of the respective lots.

TABLE LXXXVII.—Cost of Food Consumed.

	Hay.	Ensilage	Meal.	Total.
Lot No. 1—				
(a).....	\$2.69	\$1.74	\$4.70	\$9.13
(b).....	2.19	1.09	4.55	7.83
(c).....	2.39	1.63	4.73	8.75
Total.....	7.27	4.46	13.98	25.71
Lot No. 2—				
(a).....	\$1.88	\$1.64	\$5.72	\$9.24
(b).....	2.11	1.67	5.73	9.51
(c).....	2.19	1.68	5.73	9.60
Total.....	6.18	4.99	17.18	28.35
Lot No. 3—				
(a).....	\$2.15	\$1.72	\$6.78	\$10.65
(b).....	2.33	.90	6.69	9.92
(c).....	1.75	1.67	6.71	10.13
Total.....	6.23	4.29	20.18	30.70

It is interesting to note the relative cost of fodder and meal respectively. With the steers in lot 1 the cost of meal was 19.2 per cent more than that of the hay and ensilage combined. With the steers in lot 3 it was 91.5 per cent greater, and with the steers in all the lots 53.6 per cent

greater. Since meal is usually the more expensive ration, the importance of keeping the relative consumption of meal as low as will be consistent with best results is thus rendered apparent.

Table LXXXVIII. gives the average daily cost of the food consumed by the individual animals in the several lots, and also the daily average cost of the same by lots.

TABLE LXXXVIII.—Average Daily Cost of Food Consumed.

	Lot 1.	Lot 2.	Lot 3.
	Cents	Cents	Cents
(a).....	6.97	7.05	8.13
(b).....	5.98	7.26	7.57
(c).....	6.68	7.33	7.73
Average.....	6.54	7.21	7.81

It is further interesting to note the increase in the daily cost of the food with the increase in the daily consumption of meal. This fact would lose its significance if a corresponding increase was made in the gains. In this experiment, however, and in the two preceding it, viz.: the one narrated in bulletin No. 44, and the one detailed in the first part of this bulletin, such increase was not secured, hence the conclusion that in fattening cattle, the adjustment of the relation between the respective quantities of fodder and meal to be fed is a matter of great significance to the feeder, and its importance increases with the relative advance in the price of meal.

And just here the caution may be given not to confound low cost of food per day and cheap feeding. These are essentially and radically different. The daily cost of food per day in feeding the steer (b) in lot 1 was less than the daily cost of feeding any of the other steers, and yet by reference to the next table given below, it will be noticed that relatively he was the most costly animal of the nine to fatten, because of the low gains made. The great consideration in feeding cattle is to secure not cheap feeding in the

absolute sense, but rather to secure large relative gains in proportion to the food consumed.

Cost of Increase.—Table LXXXIX. gives the average cost of 100 pounds of increase made by the individual animals in the several lots, and also the average cost of the same by lots.

	Lot 1	Lot 2	Lot 3
(a).....	\$3.24	\$3.49	\$3.46
(b).....	5.51	4.42	5.36
(c).....	3.07	3.15	3.82
Average.....	3.94	3.69	4.21

In every instance the cost of making 100 pounds of increase was less than the price for which it was sold. The cheapest gain was made by steer (c) in lot 1. He made 100 pounds of increase for \$3.07, the cheapest increase ever obtained by the writer in feeding cattle. The increase with (b), the poor feeding steer in the same lot, cost over 79 per cent more than the increase made by the steer (c). It should also be noticed that the increase made by the steers in lot 3, which were fed meal in the largest quantities, cost the most.

Profit Made.—Table XC. gives: 1, the value of the steers in each lot when the experiment began; 2, the cost of the food fed; 3, the total outlay; 4, the value when the experiment closed, and 5, the profit made. The totals in each instance are also given.

TABLE XC.—Value and Profit Made During the Experiment.

	Lot 1	Lot 2	Lot 3	Totals
Value on December 7th, 1896, when the experiment began.....	\$113.31	\$106.83	\$108.45	\$328.59
Cost of food.....	25.71	28.35	30.70	84.76
Total cost.....	\$139.02	\$135.18	\$139.15	\$413.35
Value on April 17th, 1897, when the experiment closed.....	200.22	194.16	195.31	589.69
Profit.....	\$61.20	\$58.98	\$56.16	\$176.34

The average profit on each steer in the experiment was \$19.59. In this computation no allowance is made for shrink, nor should it be unless the steers had been made to enter the experiment on shrunk weights. But the net individual profit, given later, will not of course be so much, since in getting it the shrink must be deducted. While the greatest profit arose from feeding the steers in lot 1, this did not arise wholly from the returns they made in proportion to the food fed—the steers in lot 2 made a rather better return for the same—some of it is due to the greater original weight which they had when they went into the experiment, and to the increased value on that greater weight made by the feeding. But for the bad feeding quality of the steer (b) however, the profit from the steers in lot 1 would have been considerably increased.

Table XCI. gives the value of the food fed during the experiment, the value of the increase made, and the profit from the said increase.

TABLE XCI.—Profit from the Increase Made During the Experiment.

	Value of Food Fed	Value of Increase in Weight	Profit on the Increase in Weight
Lot 1.....	\$25.71	\$32.79	\$7.08
Lot 2.....	28.35	35.06	7.96
Lot 3.....	30.70	36.31	4.36
Totals.....	\$84.76	\$104.16	\$19.40

The profit thus made on the increased weight was certainly a handsome one. It was \$2.16 on each animal from a period of feeding which covered 131 days. When such a result can be obtained, the judicious feeding of cattle cannot fail to be greatly remunerative. When cattle are being fattened in the Eastern States, the increase made during the fattening period usually costs considerably more than it is worth, because of the high relative price of the foods fed.

Disposal of the Steers.—The steers were sold to Peter Van Hoven, of New Brighton, Minn. The price paid was

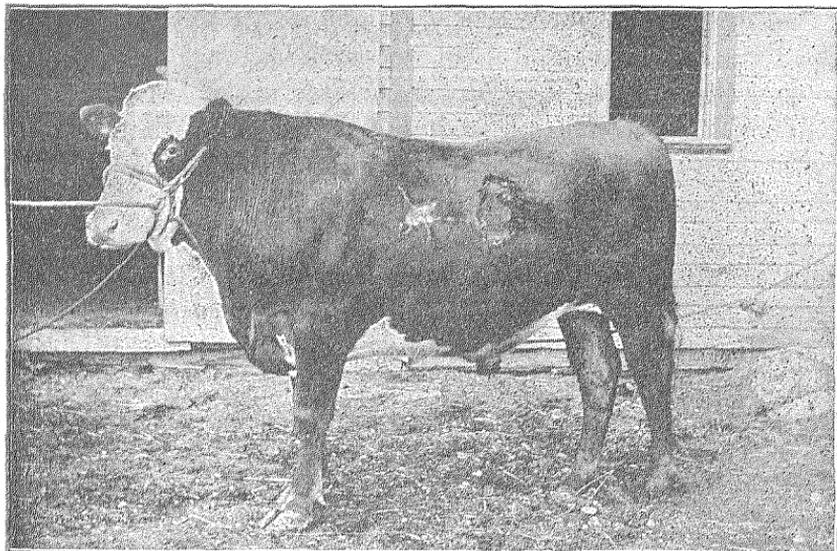


Fig. 203—Typical Range Steer When Finished.

\$4.62½ per 100 pounds, with a shrink of 4 per cent. They were in turn disposed of by Mr. Van Hoven to the retail trade of the Twin Cities. One chief object sought by Col. W. M. Liggett, the Director, in thus selling when possible in the home market, is to disabuse the idea, too deeply rooted in the minds of many, that the best quality of meat must be brought from without the state. Until recent years much of the best meat used in the Twin Cities was brought in from Chicago, Kansas City and Omaha.

<i>Financial Statement.</i> —Cash received for 9 steers on April 17, 1897, shrunk weight, 12,240 pounds @ \$4.62½ per 100 pounds		\$566.10
Value of 9 steers on December 8th, 1896, on the basis of cost.....		\$328.59
Cost of food.....		84.76
Total outlay.....		<u>413.35</u>
Total net profit.....		\$152.75
Net profit on one steer.....		16.97

Observations.—1. The food being charged at market values, was charged at a rate at least something over the cost of production. But too much must not be made of this, since the price of food was low in all the lines fed.

2. The weighing of the steers so frequently would, to some extent, hinder their progress, as they were so wild as to resent such handling.

3. The daily calls of visitors would also tend to hold down the gains. Due allowance should be made for this disturbing factor in all experimental feeding that is thus accessible to the public. Its influence in arresting progress increases with the increasing wildness and nervousness of the animals that are being fattened.

4. In response to a request from the Director the purchaser put a valuation upon the individual steers. The values put upon them were as follows: Nos. 7, 8 and 2 were valued at 5 cents per pound; 3, 1 and 6 at 4½ cents; and 5, 4 and 9 at 4 cents. They are placed in the order of finish and excellence which they possessed, and it is worthy of note that the light fed steer (c) is given first place in the valuations. He was rather the heaviest steer in the experiment when it began, and he maintained this position notwithstanding the lightness of the ration. The steers placed second and third respectively were fed an intermediate ration. Too much however must not be made of this valuation in the absence of block tests.

IMPORTANT FACTS SUMMARIZED.

Values.—

1. Value per 100 pounds on the basis of cost when the experiment began, December 8th, 1896.....\$3.13
2. Value per 100 pounds on the basis of receipts April 17th, 1897, when the steers were sold..... 4.62½
3. Advance in value per 100 pounds..... 1.49½

Weights.

	Lbs.
1. Average weight of the steers in lot 1, when the experiment began, December 8th, 1896.....	1,207
2. Average weight of the steers in lot 2 at the same date.....	1,138
3. Average weight of the steers in lot 3 at the same date.....	1,155
4. Average weight of one steer in all the lots at the same date.....	1,167
5. Average weight of the steers in lot 1 at the close of the feeding, April 17th, 1897.....	1,443
6. Average weight of the steers in lot 2 at the same date.....	1,399
7. Average weight of the steers in lot 3 at the same date.....	1,408
8. Average weight of one steer in all the lots at the same date.....	1,417

Increase in Weight—

1. Total increase in weight made by the steers in lot 1 during the experiment	709
2. Total increase in weight made by the steers in lot 2 during the same period.....	785
3. Total increase in weight made by the steers in lot 3 during the same period.....	758
4. Average increase per day made by the steers in lot 1 during the experiment.....	1.81
5. Average increase per day made by the steers in lot 2 during the same period.....	2.00
6. Average increase per day made by the steers in lot 3 during the same period.....	1.93

Food Consumed.—

1. Average amount of meal consumed per day by the steers in lot 1 during the experiment.....	9.08
2. Average amount of meal consumed by the steers in lot 2 during the same period.....	11.17

3. Average amount of meal consumed by the steers in lot 3 during the same period.....	Lbs. 13.09
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Cost of Food—

	Cents
1. Average cost of food per day with the steers in lot 1.....	6.54
2. Average cost of food per day with the steers in lot 2.....	7.21
3. Average cost of food per day with the steers in lot 3.....	7.81

Cost of Increase—

1. Average cost of making 100 pounds of increase with the steers in lot 1.....	\$3.94
2. Average cost of making 100 pounds of increase with the steers in lot 2.....	3.69
3. Average cost of making 100 pounds of increase with the steers in lot 3.....	4.21

Increase in Value—

1. Average value of each steer without shrink on the basis of cost when the experiment began, December 7th, 1896.....	36.51
2. Average value of each steer without shrink when the experiment closed, April 17th, 1897.....	65.52
3. Average advance in value, from feeding for 131 days.....	29.01

Profit.—

1. Net profit on the steers in lot 1.....	53.20
2. Net profit on the steers in lot 2.....	51.21
3. Net profit on the steers in lot 3.....	48.34
4. Average net profit on each steer.....	16.97
5. Net profit on the nine steers fed.....	152.75

CONCLUSIONS.

The following are among the more important of the conclusions that may be drawn from this experiment:

1. That cattle averaging about 1200 pounds when put under experiment can be brought to a good finish and in a reasonable time, on a daily allowance of meal averaging not more than nine pounds per day, with the adjuncts fed in this experiment, and at a less cost than if larger quantities of meal were fed.

2. That cattle which are being fattened will consume quantities of grain in excess of those which give the best return and without getting "off their feed."

3. That twice in this experiment the animals which produced the most profit were those which consumed the largest relative quantities of hay, hence the relation between the proportions of fodder and meal fed should receive careful attention.

4. That since cattle that are being fattened in the feed lots of the west are usually fed much larger quantities of meal or grain than were given to the steers in the experiment, the conclusion would seem to be legitimate that much of the meal or grain fed is worse than wasted.

5. That under the conditions of the experiment beef can be produced as low as \$3.07 per 100 pounds, and at an average cost of \$3.81 per 100 pounds.

6. That range steers, fed under what may be termed average farm conditions, can be made to yield a substantial profit when judiciously bought, fed and sold.

IMPORTANT FACTS SUMMARIZED FROM THREE EXPERIMENTS.

As the experiment narrated above is the third conducted during successive years at our station, on substantially the same lines, a summary of the results of the three is now given. The first of these is detailed in Bulletin No. 44, and

the second and third in this bulletin. These findings ought to be much more valuable than those obtained from a single experiment.

Values—

1. Average value per 100 pounds on the basis of cost when the experiment began.....	\$3.44
2. Average price paid per 100 pounds for the steers when sold.....	4.66
3. Average advance in value per 100 pounds between the cost price and the selling price.....	1.22

Weights—

1. Average weight of the steers in lots 1 when put upon experiment.....	Lbs. 1,048
2. Average weight of the steers in lots 2 at the same period.....	1,045
3. Average weight of the steers in lots 3 at the same period.....	1,028
4. Average weight of all the steers when put upon experiment.....	1,040

Daily Gains—

1. Average daily gains made by the steers in lots 1..	1.78
2. Average daily gains made by the steers in lots 2..	1.86
3. Average daily gains made by the steers in lots 3..	1.84
4. Average daily gains made by the steers in all the lots.....	1.83

Food Consumed—

1. Average of food consumed per day by the steers in lots 1.....	38.86
2. Average of food consumed per day by the steers in lots 2.....	40.74
3. Average of food consumed per day by the steers in lots 3.....	39.02
4. Average of food consumed per day by the steers in all the lots.....	39.54

Meal Consumed.—

1. Average amount of meal consumed per day by the steers in lots 1.....	8.23
2. Average amount of meal consumed per day by the steers in lots 2.....	10.23
3. Average amount of meal consumed per day by the steers in lots 3.....	12.02
4. Average amount of meal consumed per day by the steers in all the lots.....	10.16

Cost of Food.—

1. Average cost of food per day for the steers in lots 1.....	Cents. 7.57
2. Average cost of food per day for the steers in lots 2.....	8.48
3. Average cost of food per day for the steers in lots 3.....	9.03
4. Average cost of food per day by the steers in all the lots.....	8.36

Cost of Increase.—

1. Average cost of making 100 pounds of increase with the steers in lots 1.....	\$4.34
2. Average cost of making 100 pounds of increase with the steers in lots 2.....	4.59
3. Average cost of making 100 pounds of increase with the steers in lots 3.....	4.92
4. Average cost of making 100 pounds of increase with the steers in all the lots.....	4.62

Profit Without Shrink.—

1. Average profit from feeding the steers in lots 1, without shrink.....	\$13.70
2. Average profit from feeding the steers in lots 2, without shrink.....	12.83
3. Average profit from feeding the steers in lots 3, without shrink.....	11.75

4. Average profit from feeding all the steers, without shrink.....	\$12.76
5. Aggregate profit from feeding 27 steers, without shrink.....	344.49

Net Profit.—

1. Average net profit on each steer in lots 1.....	11.29
2. Average net profit on each steer in lots 2.....	10.41
3. Average net profit on each steer in lots 3.....	9.36
4. Average net profit on each steer in all the lots....	10.35
5. Aggregate net profit on the 27 steers fed.....	279.45

Observations.—1. The average period during which the steers in the three experiments were fed was 140 days. This is a longer time than is customary to feed in western feed lots, but it is not too long to enable the feeder to put a fine finish on the animals.

2. The advance in value of the cost price over the selling price, viz., \$1.22, was not large, yet notwithstanding good average profits were realized as has been shown above. These were made possible through the low price of the foods fed. With foods at normal prices the buyer should aim to have \$1.50 per 100 pounds between the buying price and the selling price in order to make a sure and substantial profit.

3. The average daily gains made by the steers of the several lots were not far from uniform, notwithstanding the difference in the quantities of meal fed. But for the poor feeding of one of the light-fed steers in the third experiment, the average daily gains made by the light, intermediate and heavy-fed steers would have been almost exactly equal, hence, feeding meal beyond a certain proportion would not seem to give additional increase in weight.

4. The uniformity in the consumption of food, weight considered, is also markedly noticeable. It did not vary on an average 2 pounds per day with the several lots taken together that were fed different quantities of meal. In other

words, the increase in the quantities of meal fed did **not** result in a decrease in the consumption of fodder to the extent expected.

5. The wonderfully low cost of the food fed should not be overlooked. The average cost of feeding one steer per day in the three experiments was but 8.36 cents. The average cost of feeding one steer in Ontario in three experiments conducted by the writer and ending with 1892, was 17.59 cents, as previously stated in Section No. 1 of this bulletin. The Ontario steers were somewhat heavier, but the contrast in the weights was not anything like so great as the contrast in the daily cost of feeding.

6. The low cost of the increase per 100 pounds is also noteworthy. With the steers in all the lots it was \$4.62, while the average price for which it was sold was \$4.66 per 100 pounds. During the three years of feeding, therefore, the cost of the increase was less than it sold for. In but few countries of the world could this be accomplished with food charged at market values.

7. It will be observed that the average profit made is first stated without shrink being considered, and throughout each experiment the profit is thus calculated. The reason for so stating it lies in the fact that the steers entered the experiment on unshrunk weights, and to take them out of it otherwise would not show in all its features the work accomplished. If the animals were made to enter the experiment on shrunk weights, sundry complications would arise that would render much more complex the statement of certain resultant facts. The net profit is of course the actual profit.

8. The net profit on each of the steers in lots 1 was \$1.93 more than on each of the steers in lots 3. It was \$1.41 per animal more than the average profit from each of the steers in lots 2 and 3 combined, and in each of the three experiments was the profit greatest on the steers fed the light meal ration. It is fair to infer then that had the steers in

these lots been fed as the steers in lots 1, \$25.38 additional would have been added to the net profit on the 18 steers in lots 2 and 3. And it should also be borne in mind that the dearer relatively the price of grain, the greater will the contrast be between feeding meal or grain in moderate or in large quantities.

9. The average quantity of meal fed per day in securing the largest profit was only 8.23 pounds. To this must be added some corn which the ensilage contained. The average amount of ensilage consumed per day throughout the feeding was a little more than 21 pounds and it contained a moderate amount of corn, but how much cannot be stated. In any event it would not increase the meal fed daily to those steers to very much beyond 10 pounds. The writer cannot but conclude, therefore, that, in western feed lots, much grain is oftentimes fed to no purpose, since from 25 to 30 pounds of shelled corn are frequently fed per day to one cattle beast and to one pig that feeds upon its droppings.