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Corn Silage and Alfalfa Hay for Beef Production

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OF
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CORN SILAGE AND ALFALFA HAY FOR BEEF
PRODUCTION.

BY R. K. BLISS AND C. B. LEE.

DISTRIBUTED MAY 15, 1915.

LINCOLN, NEBRASKA
U. S. A.

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SUMMARY.

1. A ration of corn and alfalfa hay produced the cheapest gains of any ration used. Furthermore, the steers fed corn and alfalfa hay made as rapid gains as did the steers on any other ration.

2. Had the alfalfa hay used in the first experiment cost \$20 per ton, the average profit on the three lots receiving alfalfa would have been 15 per cent greater than the profit on the best one of the three lots not receiving alfalfa.

3. Cold pressed cottonseed cake did not give as good results, as regards either rate of gain or economy of gain, as did alfalfa hay in a ration for fattening steers.

4. The addition of cold pressed cottonseed cake to a ration of corn, silage, and alfalfa increased the cost of gain and lowered the profits on the steers.

5. The steers receiving silage without exception shed their coats early in the spring and at all times presented a sleek and sappy appearance.

6. Contrary to preceding experiments, a heavy feed of silage with alfalfa hay and corn gave as rapid gains as did either a medium or a light feed of silage with alfalfa hay and corn. The amount of silage which can best be fed to fattening steers apparently must be regarded as unsettled.

7. The steers fed silage in connection with corn and alfalfa suffered a very light shrinkage when shipped to market. Different amounts of silage seemingly had no effect upon the number of pounds shrinkage.

8. Where prairie hay was used in place of alfalfa, small and expensive gains resulted.

9. The individuality of a steer is a very important factor in the rate of gain. The average difference in gains made between the highest and lowest producing steer in each of fourteen different lots was 120 pounds. In practically all cases there was a greater variation in the daily gains made by steers in the same lot than there was in the average daily gains of the different lots.

10. Usually a considerable difference can be noted between poor and good feeder cattle, but sometimes even a careful study of steers does not reveal their feeding possibilities.

11. An advance of 8 cents per bushel in the price of corn increased the cost of gains \$1 per 100 pounds.

12. In the second experiment, where a ration of corn and alfalfa hay was fed, an increase of 1 cent per bushel in the price of corn had the same effect in increasing the cost of gains as did an increase of \$1 per ton in the price of alfalfa hay.

CORN SILAGE AND ALFALFA HAY FOR BEEF PRODUCTION.

BY R. K. BLISS AND C. B. LEE.

INTRODUCTION.

In previous bulletins attention has been repeatedly called to the value of alfalfa hay in the steer ration. The many tests which have been conducted by the Nebraska Experiment Station, in which alfalfa hay was compared with various other food materials as a supplement to grain in a ration for fattening steers, have produced convincing evidence in regard to the superior qualities of alfalfa. Among the grains, corn has long been considered preeminent as a fattening food. But corn, while a rapid fat producer, does not supply the protein and mineral materials demanded by the animal body. Consequently, when corn is used in a ration, some other feed must be supplied to furnish these materials. Alfalfa contains abundant protein and minerals. It thus corrects the deficiencies of corn. Since the Nebraska cattle feeder is in a position to secure both corn and alfalfa at a small cost, under normal conditions the most economical ration for Nebraska beef producers is one composed of alfalfa and some part or parts of the corn plant. Whether or not the cornstalks can be included in the "most economical" beef producing ration and in what form and quantity they can be fed in order to yield the greatest profit are problems which remain to be definitely settled, and may differ in different localities or in different years.

The economy of silage in the ration of the dairy cow has been proved by many experiments in recent years. In the fattening of steers there are much fewer experimental data, some of which seem to be conflicting. The two experiments recorded in the present bulletin were inaugurated largely for the purpose of securing information on this subject. The first experiment was carried on during the winter of 1912-13, and the second experiment was carried on during the winter of 1913-14.

EXPERIMENT 1.**PLAN.**

For carrying on this test 48 head of two-year-old steers were purchased on the South Omaha market November 1, 1912. These steers classed as "fair feeders" and consisted of grades of the Shorthorn and Hereford breeds, bred and raised in the range country of western Nebraska.

As soon as they arrived at the Experiment Station, the steers were fed alfalfa hay. After being in the yards about a week, a light feed of corn was given in addition to the alfalfa. The corn allowance was gradually increased until each steer was receiving about 9 pounds per day on December 17, when the steers were divided into 6 lots and started on the experimental rations. Great care was taken in selecting the steers for the different lots, in order that the lots would be just as similar as possible in regard to weight and quality.

Shortly after the experiment began, one steer in Lot 6 was taken out of the experiment because of his extremely nervous disposition. Later on, one of the steers in Lot 5 went "off feed" so completely that he also had to be dropped from the test. This left 8 steers in each of Lots 1, 2, 3, and 4, and 7 steers in each of Lots 5 and 6.

The feeding was done in a barn equipped with stanchions, so that each steer could be fed individually. By this method of feeding an opportunity was given for a critical study of the individual animals. The steers were fed at 7 a. m. and 5 p. m. In the daytime they were turned into open yards for exercise. Water and salt were provided in the yards, so that the steers had free access to both at all times. It should be kept clearly in mind that the object of feeding inside in stanchions was in order to study the variation in individual steers in making gains. The Nebraska Experiment Station is fully convinced that the most economical method of feeding two-year-old cattle in eastern Nebraska, so far as shelter is concerned, is to feed in the open with a windbreak or shed on the north, east, and west. It would be impossible, however, to feed outside and at the same time keep individual records.

Individual weights were taken on three consecutive days at the beginning and close of the experiment and at 28-day periods intervening. The experiment closed on May 22, 1913, at which time the steers had been on feed 157 days.

RATIONS USED.

The following rations were fed the different lots:

Lot 1.—Ground corn, cold pressed cottonseed cake, and prairie hay.

Lot 2.—Ground corn, corn silage, and cold pressed cottonseed cake.

Lot 3.—Ground corn, corn silage, and prairie hay.

Lot 4.—Ground corn, a heavy feed of corn silage, and alfalfa hay.

Lot 5.—Ground corn, a medium feed of corn silage, and alfalfa hay.

Lot 6.—Corn and alfalfa hay.

In addition to the feeds mentioned, each steer in the test received 1 pound of oat straw per day. The straw was fed in order to furnish more variety in the rations.

When the experiment started, each steer in Lot 4 was receiving 30 pounds of silage per day, while each steer in Lot 5 was receiving 20 pounds of silage per day. After being on feed 8 weeks the daily silage allowance for both lots was reduced 5 pounds per steer. The steers in Lot 2 were given all of the silage that they would eat. The average amount eaten by each steer in the lot thruout the experiment was 28.6 pounds per day. Lot 3 was fed the same amount of silage as Lot 5. All of the lots received an equal amount of corn, the grain contained in the silage being taken into consideration in adjusting the corn rations.

Ground corn was fed because it was practically impossible to allow hogs to follow stanchion fed cattle. The Nebraska Experiment Station believes that the most economical method of feeding corn to cattle is to feed it in the ear or shelled, and provide sufficient hogs to clean up all droppings thoroly. Where hogs in sufficient numbers to pick up the corn cannot be had because either of scarcity or danger of disease, it pays to grind the corn. The plan of studying individual steers made it necessary to eliminate the hogs and grind the corn.

PRICES OF FEEDS.

The feeds used were valued as nearly as possible at prices prevailing on Nebraska farms at the time the experiment was in progress. Since these prices fluctuate widely from time to time, the financial returns are of importance only for matters of comparison. The feed valuations follow:

Ground corn, per bushel	\$0.42
Cold pressed cottonseed cake, per ton.....	24.00
Alfalfa hay, per ton	8.00
Prairie hay, per ton	7.00
Corn silage, per ton	3.00
Oat straw, per ton	3.00

The following table gives the general facts of the experiment:

Corn Silage and Alfalfa for Beef Production.

TABLE 1.—Record of each lot, December 17, 1912, to May 22, 1913—157 days.

	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6
Number of steers in lot.	8	8	8	8	7	7
Rations fed	Corn, prairie hay, cold pressed cottonseed cake	Corn, corn silage, cold pressed cottonseed cake	Corn, corn silage, prairie hay	Corn, heavy feed of corn silage, alfalfa	Corn, medium feed of corn silage, alfalfa	Corn, alfalfa
Av. first wt. per steer, lbs.	944.00	939.00	919.00	975.00	985.00	945.00
Av. last wt. per steer, lbs.	1,247.00	1,254.00	1,194.00	1,327.00	1,306.00	1,305.00
Total gain per steer, lbs.	303.00	315.00	275.00	352.00	321.00	360.00
Av. daily gain, lbs.	1.93	2.01	1.75	2.24	2.04	2.29
Total feed consumed, lbs.—						
Corn	22,643.26	18,351.05	20,276.75	19,091.45	17,408.00	19,477.06
Prairie hay	5,079.50		4,101.75			
Cold pressed cottonseed cake	3,409.57	3,387.36				
Straw	1,256.00	1,256.00	1,256.00	1,256.00	1,099.00	1,099.00
Corn silage		35,934.50	20,746.50	32,755.50	18,290.00	
Alfalfa				6,331.00	6,798.50	8,498.50
Feed required for 100 lbs. gain—						
Corn	934.12	728.00	922.00	677.96	774.72	772.90
Prairie hay	209.55		186.30			
Cold pressed cottonseed cake	140.66	134.40				
Straw	51.82	49.85	57.10	44.60	48.91	43.61
Corn silage		1,426.00	944.00	1,163.21	813.97	
Alfalfa				224.82	302.56	337.24
Cost of 100 lbs. gain.	\$9.51	\$9.29	\$9.08	\$7.79	\$8.31	\$7.22
Av. cost per steer—						
Initial cost	59.00	58.69	57.44	60.94	61.56	59.06
Cost of feed	28.82	29.26	24.97	27.42	26.68	25.99
Cost of marketing	3.12	3.14	3.29	3.32	3.27	3.26
Total	90.94	91.09	85.40	91.68	91.51	88.31
Price necessary to pay for food consumed.	7.29	7.26	7.15	6.91	7.01	6.78
Av. price received per steer	100.36	98.40	94.33	106.18	104.98	108.90
Net profit per steer	9.42	7.31	8.93	14.50	13.47	20.59

In computing the financial returns the customary practice was followed of letting the manure produced by the steers offset the interest on the investment and the cost of labor involved in feeding. Eight per cent interest on the money paid for the steers would amount to approximately \$2.70 per head for the 200 days that the steers were in the feed yards. Cooperative experiments conducted by the Agronomy Department of the University of Nebraska with various farmers in the State indicate that, on the average Nebraska farm, manure has a valuation of about \$2.50 per ton. This being true, the manure produced by the steers on experiment would more than pay the cost of feeding and the interest on the investment.

It will be noted that Lot 1, fed corn, prairie hay, and cold pressed cottonseed cake, made less gains than Lot 2, fed corn, silage, and cold pressed cottonseed cake. The steers in Lot 1, however, yielded the greater profit, owing to the fact that they sold at a higher price.

Lot 3, fed corn, silage, and prairie hay, made less gains than either Lots 1 or 2. In cost of 100 pounds gain, however, Lot 3 was the cheapest of the 3 lots, and more profit was made on the steers in Lot 3 than was made on the steers in Lot 2. When the steers were sold, it was noted that the animals in Lots 2 and 3 were in the poorest condition of any in the experiment. A number of the steers in Lot 3 did not shed their coats when warm weather came and consequently made a rough appearance. In this connection, it might be stated that the steers receiving silage, without exception, shed their coats early in the spring and at all times presented a sleek and sappy appearance. The same was true to a less degree with the steers in Lot 6, getting a ration of alfalfa hay and corn.

Lot 5, fed a ration of alfalfa hay, a medium feed of silage, and corn, made faster and cheaper gains than Lot 3, fed the same amount of silage and corn as Lot 5, but getting prairie hay instead of alfalfa. The results from these two lots give additional proof of the superiority of alfalfa hay as a roughage for fattening steers. Lots 4, 5, and 6, receiving alfalfa hay, made faster and cheaper gains than did Lots 1, 2, and 3, which did not receive alfalfa. In this test, if the alfalfa hay had cost \$20 per ton, the lots receiving alfalfa would still have returned a larger average profit per steer than the average profit per steer of the best one of the other lots.

Where a heavy ration of silage, alfalfa hay, and corn was compared with a medium ration of silage, alfalfa hay, and corn in Lots 4 and 5, the steers fed the heavy ration of silage made faster

gains and returned more profit. This is somewhat contrary to results secured in a previous test,* and for that reason the question of how much silage should be fed to secure the greatest profit apparently must be considered as far from being settled. It would seem that the amount of silage which can best be used in the fattening steer ration may vary with different animals and different feeding conditions.

Ten days after the experiment closed, the steers were sold on the South Omaha market. Since it is interesting to compare the shrinkages of the different lots in marketing, the average shrinkage per steer for each lot is here given, assuming that the steers gained at the average rate during the 10 days:

	Pounds
Lot 1	27
Lot 2	44
Lot 3	17
Lot 4	30
Lot 5	30
Lot 6	8

It is observed that with the exception of Lot 2 the silage-fed steers suffered a light shrink. All of the steers in the test were fed an exclusive prairie hay ration for 24 hours before they were shipped. If some such practice as this is adopted, it is probable that silage-fed steers will not lose any more weight in marketing than will steers not fed silage.

Lot 2, which suffered the heaviest shrinkage of any lot in the experiment, was the only lot not fed hay. Each of Lots 4 and 5, fed corn, silage, and alfalfa hay, lost practically the same number of pounds. The different amounts of silage which these 2 lots were fed seemingly had no effect upon the number of pounds of shrinkage which they sustained in marketing. Lot 3 shrunk 17 pounds and Lot 6 shrunk 8 pounds. There is little doubt but that Lots 3 and 6 had a better fill after reaching the stockyards than did the other lots. The dressing percentages of the different lots would seem to bear out such a conclusion.

Owing to the courtesy of Morris & Co., who bought the steers, the dressing percentages of the various lots were obtained. These percentages as given below are based on the shrunk weights of the steers, the shrunk weights being calculated by taking 98 per cent of the weights of the warm carcasses. This calculation gives the approximate weights of the carcasses when cold. Lot 1 dressed 61.65 per cent; Lot 2 dressed 61.28 per cent; Lot 3 dressed 60.52

* See Bul. 132, p. 33, Agr. Exp. Station of Nebr.

per cent; Lot 4 dressed 60.94 per cent; Lot 5 dressed 61.52 per cent; and Lot 6 dressed 60.71 per cent.

These figures show that the steers in Lot 3 were poorer killers than the steers in any other lot. By referring to the table giving the feeding records, it will also be noted that Lot 3 made the smallest gain of any lot in the experiment. It does not follow, however, that the lot which dressed the highest percentage of carcass made the fastest gain. On the contrary it will be observed that Lot 1, which made the second poorest gain of any lot in the experiment, dressed out the best of any lot. Furthermore, Lot 6, which made the largest gain of any lot, ranked next to Lot 3 (the one making the poorest gain) in dressing percentage. As has been stated previously, the comparatively low dressing percentage of Lot 6 can probably be largely traced to the fill which this lot took after reaching the market. Other things being equal, the percentage of carcass that an animal will dress should vary directly with the condition of flesh of the animal.

In order to show something regarding the differences which exist between various steers in their abilities to make economical gains, tables showing the records of the individual steers in the different lots follow:

Corn Silage and Alfalfa for Beef Production.

TABLE 2.—Record of each steer in Lot 1, December 17, 1912, to May 22, 1913.
Ration—Corn, prairie hay, and cold pressed cottonseed cake.

Number of each steer	1	2	3	4	5	6	7	8	Av. of lot
First wt. of each steer, lbs.	960.00	871.00	976.00	930.00	962.00	981.00	882.00	991.00	944.10
Final wt. of each steer, lbs.	1,250.00	1,175.00	1,306.00	1,193.00	1,230.00	1,361.00	1,189.00	1,270.00	1,246.80
Total gain of each steer, lbs.	290.00	304.00	330.00	263.00	268.00	380.00	307.00	279.00	302.60
Av. daily gain, lbs.	1.85	1.94	2.10	1.67	1.71	2.42	1.96	1.78	1.93
Av. amt. corn consumed daily, lbs.	18.29	17.91	18.32	17.77	17.84	18.22	17.96	17.92	18.03
Av. amt. prairie hay consumed daily, lbs.	4.08	4.11	4.18	4.08	4.03	4.08	3.96	3.81	4.04
Av. amt. cottonseed cake consumed daily, lbs.	2.77	2.74	2.73	2.70	2.57	2.77	2.74	2.69	2.71
Av. amt. straw consumed daily, lbs.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Corn consumed for 100 lbs. gain, lbs.	988.65	923.71	872.33	1,064.07	1,043.27	752.89	916.33	1,006.74	934.12
Prairie hay consumed for 100 lbs. gain, lbs.	220.54	211.86	199.05	244.31	235.67	168.60	202.04	214.04	209.55
Cottonseed cake for 100 lbs. gain, lbs.	149.73	141.24	130.00	161.68	150.29	114.46	139.80	151.12	140.66
Straw consumed for 100 lbs. gain, lbs.	54.05	51.55	47.62	59.88	58.45	41.32	51.02	56.18	51.82
Cost of food for 100 lbs. gain	\$10.06	\$9.44	\$8.87	\$10.87	\$10.54	\$8.23	\$9.33	10.20	\$9.51

TABLE 3.—Record of each steer in Lot 2, December 17, 1912, to May 22, 1913.
Ration—Corn, corn silage, and cold pressed cottonseed cake.

Number of each steer . . .	9	10	11	12	13	14	15	16	Av. of lot
First wt. of each steer, lbs.	888.00	984.00	834.00	984.00	961.00	912.00	951.00	998.00	939.00
Final wt. of each steer, lbs.	1,186.00	1,320.00	1,098.00	1,287.00	1,328.00	1,290.00	1,258.00	1,267.00	1,254.00
Total gain of each steer, lbs.	298.00	336.00	264.00	303.00	367.00	378.00	307.00	269.00	315.00
Av. daily gain each steer, lbs.	1.90	2.14	1.68	1.93	2.34	2.41	1.96	1.71	2.01
Av. amt. of corn consumed daily, lbs.	13.84	15.12	15.04	14.46	15.06	14.20	14.71	14.44	14.61
Av. amt. of silage consumed daily, lbs.	29.38	27.74	28.05	29.17	29.69	29.41	28.29	27.14	28.61
Av. amt. of cottonseed cake consumed daily, lbs.	2.73	2.73	2.67	2.73	2.73	2.73	2.65	2.55	2.69
Av. amt. of straw consumed daily, lbs.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Corn consumed for 100 lbs. gain, lbs.	728.42	706.54	895.24	749.22	643.59	589.25	750.51	844.44	728.00
Silage consumed for 100 lbs. gain, lbs.	1,546.32	1,296.26	1,669.64	1,511.40	1,268.80	1,220.33	1,443.37	1,587.13	1,426.00
Cottonseed cake consumed for 100 lbs. gain, lbs.	143.68	127.57	158.93	141.45	116.67	113.28	135.20	149.12	134.40
Straw consumed for 100 lbs. gain, lbs.	52.63	46.73	59.52	51.81	42.74	41.49	51.02	58.48	49.85
Cost of food for 100 lbs. gain	\$9.59	\$8.84	\$11.22	\$9.66	\$8.19	\$7.67	\$9.49	\$10.59	\$9.29

TABLE 4.—Record of each steer in Lot 3, December 17, 1912, to May 22, 1913.
Ration—Corn, corn silage, and prairie hay.

Number of each steer	17	18	19	20	21	22	23	24	Av. of lot
First wt. of each steer, lbs.	928.00	906.00	944.00	928.00	943.00	970.00	841.00	892.00	919.00
Final wt. of each steer, lbs.	1,212.00	1,160.00	1,217.00	1,173.00	1,260.00	1,253.00	1,140.00	1,135.00	1,193.75
Total gain of each steer, lbs.	284.00	254.00	273.00	245.00	317.00	283.00	299.00	243.00	274.75
Av. daily gain each steer, lbs.	1.81	1.62	1.74	1.56	2.02	1.80	1.90	1.55	1.75
Av. amt. of corn consumed daily, lbs.	16.25	16.41	15.93	16.42	16.16	16.38	15.61	15.99	16.14
Av. amt. of silage consumed daily, lbs.	16.96	15.14	17.17	16.93	16.85	16.92	16.45	16.36	16.52
Av. amt. of hay consumed daily, lbs.	3.31	3.41	3.33	3.40	3.18	3.25	3.12	3.11	3.26
Av. amt. of straw consumed daily, lbs.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Corn consumed for 100 lbs. gain, lbs.	898.23	1,012.96	915.52	1,052.56	800.00	910.00	821.58	1,031.61	922.00
Silage consumed for 100 lbs. gain, lbs.	937.00	934.57	986.78	1,085.26	834.15	940.00	865.79	1,055.48	944.00
Prairie hay consumed for 100 lbs. gain, lbs.	182.87	210.49	191.38	217.95	157.43	180.56	164.21	200.65	186.30
Straw consumed for 100 lbs. gain, lbs.	55.25	61.73	57.47	64.11	49.50	55.56	52.63	64.52	57.10
Cost of food for 100 lbs. gain	\$8.87	\$9.83	\$9.10	\$10.38	\$7.88	\$8.95	\$8.11	\$10.12	\$9.08

TABLE 5.—Record of each steer in Lot 4, December 17, 1912, to May 22, 1913.
Ration—Corn, heavy feed of silage, and alfalfa.

Number of each steer.	25	26	27	28	29	30	31	32	Av. of lot
First wt. of each steer, lbs.	964.00	940.00	980.00	866.00	990.00	1,037.00	991.00	1,035.00	975.38
Final wt. of each steer, lbs.	1,347.00	1,363.00	1,262.00	1,225.00	1,328.00	1,368.00	1,365.00	1,357.00	1,326.87
Total gain of each steer, lbs.	383.00	423.00	282.00	359.00	338.00	331.00	374.00	322.00	351.49
Av. daily gain each steer, lbs.	2.44	2.69	1.80	2.29	2.15	2.11	2.38	2.05	2.24
Av. amt. corn consumed daily, lbs.	15.27	15.34	15.16	14.53	15.34	15.31	15.33	15.31	15.20
Av. amt. silage consumed daily, lbs.	26.39	26.63	25.28	26.89	26.57	23.88	27.15	25.91	26.09
Av. amt. alfalfa consumed daily, lbs.	5.07	5.10	4.96	4.95	5.04	5.11	5.10	5.00	5.04
Av. amt. straw consumed daily, lbs.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Corn consumed for 100 lbs. gain, lbs.	625.82	570.26	842.22	634.50	713.49	725.59	644.12	748.29	677.96
Silage consumed for 100 lbs. gain, lbs.	1,081.56	989.96	1,404.44	1,174.24	1,235.81	1,131.75	1,140.76	1,263.90	1,163.21
Alfalfa consumed for 100 lbs. gain, lbs.	207.79	189.59	275.56	216.16	234.42	242.19	214.29	243.90	224.82
Straw consumed for 100 lbs. gain, lbs.	40.98	37.17	55.56	43.67	46.51	47.39	42.02	48.78	44.60
Cost of food for 100 lbs. gain	\$7.20	\$6.58	\$9.61	\$7.45	\$8.21	\$8.18	\$7.46	\$8.56	\$7.79

Corn Silage and Alfalfa for Beef Production.

Corn Silage and Alfalfa for Beef Production.

TABLE 6.—Record of each steer in Lot 5, December 17, 1912, to May 22, 1913.
Ration—Corn, medium feed of silage, and alfalfa.

	33	34	35	36	38	39	40	Av. of lot
Number of each steer.....								
First wt. of each steer, lbs.....	989.00	963.00	996.00	938.00	971.00	988.00	1,051.00	985.14
Final wt. of each steer, lbs.....	1,340.00	1,300.00	1,345.00	1,285.00	1,238.00	1,347.00	1,285.00	1,305.71
Total gain of each steer, lbs.....	351.00	337.00	349.00	347.00	267.00	359.00	234.00	320.57
Av. daily gain, lbs.....	2.24	2.15	2.22	2.21	1.70	2.29	1.49	2.04
Av. amt. corn consumed daily, lbs..	15.23	15.96	16.39	16.22	15.81	16.41	15.02	15.86
Av. amt. silage consumed daily, lbs..	16.96	17.02	17.24	16.58	16.87	16.40	15.42	16.64
Av. amt. alfalfa consumed daily, lbs..	6.08	6.20	6.26	6.14	6.20	6.19	6.24	6.19
Av. amt. straw consumed daily, lbs..	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Corn consumed for 100 lbs. gain, lbs..	679.91	742.33	738.29	733.94	930.00	716.59	1,008.05	774.72
Silage consumed for 100 lbs. gain, lbs..	757.14	791.63	776.57	750.23	992.35	716.16	1,034.90	813.97
Alfalfa consumed for 100 lbs. gain, lbs..	271.43	288.37	281.98	277.83	364.71	270.31	418.79	302.56
Straw consumed for 100 lbs. gain, lbs..	44.64	46.51	45.05	45.29	58.82	43.67	67.11	48.91
Cost of food for 100 lbs. gain.....	\$7.40	\$7.98	\$7.90	\$7.81	\$10.03	\$7.59	\$10.89	\$8.31

TABLE 7.—Record of each steer in Lot 6, December 17, 1912, to May 22, 1913.
Ration—Corn and alfalfa.

	41	42	43	44	45	46	47	Av. of lot
Number of each steer.....								
First wt. of each steer, lbs.....	899.00	959.00	1,043.00	848.00	832.00	1,067.00	966.00	944.85
Final wt. of each steer, lbs.....	1,268.00	1,243.00	1,358.00	1,258.00	1,215.00	1,457.00	1,335.00	1,304.85
Total gain of each steer, lbs.....	369.00	284.00	315.00	410.00	383.00	390.00	369.00	360.00
Av. daily gain, lbs.....	2.35	1.81	2.01	2.61	2.44	2.48	2.35	2.29
Av. amt. corn consumed daily, lbs.....	17.40	17.08	17.44	18.24	17.38	18.26	18.26	17.72
Av. amt. alfalfa consumed daily, lbs.....	7.71	7.57	7.83	7.79	7.61	7.74	7.88	7.73
Av. amt. straw consumed daily, lbs.....	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Corn consumed for 100 lbs. gain, lbs.....	740.43	943.65	867.66	698.85	712.30	736.29	777.02	772.10
Alfalfa consumed for 100 lbs. gain, lbs.....	328.09	418.23	389.55	298.47	211.89	312.10	335.32	337.24
Straw consumed for 100 lbs. gain, lbs.....	42.55	55.25	49.75	38.31	40.98	40.32	42.55	43.61
Cost of food for 100 lbs. gain.....	\$6.93	\$8.83	\$8.14	\$6.49	\$6.65	\$6.83	\$7.23	\$7.22

It will be observed by studying the individual records that the largest individual gain was made by steer No. 26 in Lot 4, fed a ration of corn, alfalfa, and a heavy feed of silage. The average gain per steer in Lot 4, however, was less than that of Lot 6, where a ration of corn and alfalfa hay was fed.

Steer No. 40 in Lot 5, given a ration of corn, alfalfa, and a medium feed of silage, made the smallest gain of any steer in the test. In spite of this fact, in the average gain per steer, Lot 5 ranked higher than three other lots in the test.

That the individuality of a steer is a very important factor in feeding operations is indicated by the fact that the highest gaining steer was not in the lot showing the highest average gain. Neither was the steer showing the lowest gain in the lot having the lowest average gain. The steers in each separate lot were fed and cared for in exactly the same way and yet a study of the individual records for the different lots will show a variation between the highest and lowest gaining steers in Lot 4 of 141 pounds and an average difference between the highest and lowest gaining steers in each of the six lots of 118 pounds. The probability that several of these naturally high gaining steers will be gathered together in one lot is worth consideration by any experimenter who attempts to draw conclusions from feeding experiments which contain small numbers of cattle.

Lot 3, fed a ration of corn, silage, and prairie hay, made the least average gain of any lot. If all of the steers in Lot 3 had made as large individual gains as did No. 21, the steer which made the best gain of any steer in this lot, the average gain for the lot would still have been less than the average gain of any one of Lots 4, 5, and 6.

Two steers in Lot 6 made smaller individual gains than did the best steer in Lot 3. Yet the average gain per steer in Lot 6 was greater than the gain made by the best steer in Lot 3, while the average gain per steer in Lot 3 was less than the gain made by the poorest steer in Lot 6.

If steers Nos. 38 and 40 had been removed from Lot 5, the average daily gain per steer for this lot would have been 2.22 pounds instead of 2.04 pounds. In other words, the effect of two individuals in this lot was sufficient to lower the average daily gain 0.18 of a pound. This shows that the average feeding results from a group made up of a few animals cannot be regarded as definite, owing to the widely differing characteristics of the individuals in the group. On this account, unless a large number of animals is used in a feeding experiment, individual records of the animals are very valuable. In the case of Lot 5, even had

steers Nos. 38 and 40 been removed, the relative ranking of the lots, according to their average daily gains, would have remained unchanged.

If the best gaining steer in all of the lots had been removed, the average daily gains for the lots would have been 2.24 pounds for Lot 6; 2.18 pounds for Lot 4; 2 pounds for Lot 5; 1.95 pounds for Lot 2; 1.86 pounds for Lot 1; and 1.71 pounds for Lot 3. In this case the ranking of the lots for average daily gain would be the same as it was with all steers included in the test.

EXPERIMENT 2.

In order to secure additional evidence concerning the value of corn silage in a ration for fattening steers and to get more information on the feeding of alfalfa hay, a second experiment was conducted during the winter of 1913-14.

In this experiment, 64 head of two-year-old steers were used. These steers, like the ones used in the 1912-13 tests, were grades of the Hereford and Shorthorn breeds, raised on the ranges of western Nebraska. They were purchased on the South Omaha market during the latter part of October. Until December 11, when they were started on their experimental rations, they were handled in the same manner as were the steers used in the previous test.

RATIONS USED.

On December 11 the steers were divided into eight lots and given the following rations:

Lot 1.—Ground corn and alfalfa hay.

Lot 2.—Ground corn, alfalfa hay, and wheat straw.

Lot 3.—Ground corn, alfalfa hay, and a light feed of silage.

Lot 4.—Ground corn, a medium feed of silage, and alfalfa hay.

Lot 5.—Ground corn, a heavy feed of silage, and alfalfa hay.

Lot 6.—Ground corn, alfalfa hay, and a heavy feed of silage at the beginning which gradually decreased to a light feed at the close of the feeding period.

Lot 7.—Ground corn, alfalfa hay, a medium feed of silage, and cold pressed cottonseed cake.

Lot 8.—Ground corn, a heavy feed of silage, cold pressed cottonseed cake, and alfalfa hay during the first five weeks.

As in the preceding test, all of the steers, excepting those in Lot 2, received 1 pound of straw daily in addition to the feeds stated above. Since wheat straw is much more abundant on Nebraska farms than is oat straw, wheat straw was used in this experiment.

The amounts of silage fed daily at the beginning and close of the test to each steer in Lots 3, 4, 5, 6, 7, and 8 were as follows: Lot 3 received 10 pounds thruout the test, Lot 4 received 20 pounds at the beginning and 16 pounds at the close, Lot 5 received 30 pounds (all the steers would eat) at the beginning and 19 pounds at the close, Lot 6 received 28 pounds (all the steers would eat) at the beginning and 13 pounds at the close, Lot 7 received 20 pounds at the beginning and 16 pounds at the close, Lot 8 received 28 pounds (all the steers would eat) at the beginning and 20 pounds (all the steers would eat) at the close.

The feeds used in the experiment were of good quality excepting the silage. On account of an extended period of dry weather during the year 1913, the corn crop in Nebraska was seriously injured. Consequently many fields of corn grew little or no grain. The corn put into the silos at the Experiment Station contained just a trace of grain. Undoubtedly such silage would not make as valuable feed as would normal silage. The silage, however, contained normal amounts of water and acids and the live stock ate it with considerable relish.

Soon after the experiment began, two steers were taken out of each of Lots 1 and 2, and one steer taken out of Lot 8. This left but 6 steers in each of the first two lots and 7 steers in Lot 8.

The management of the steers while on feed was essentially the same as that of the steers in the first experiment. The experiment closed on May 15, when the steers had been on feed 154 days.

PRICES OF FEEDS.

The prices of the feeds used in the experiment were based, as in the previous test, upon the prices prevailing on the average Nebraska farm at the time the experiment was in progress—

Ground corn, per bushel.....	\$0.65
Alfalfa hay, per ton.....	10.00
Corn silage, per ton	3.50
Cold pressed cottonseed cake, per ton.....	26.00
Wheat straw, per ton	2.00

As compared with the prices of feeds used in the 1912-13 experiment, it will be noted that the prices given here are much higher. This is particularly true of corn, which has a valuation of 23 cents per bushel above the valuation of the corn used in the 1912-13 test.

Corn Silage and Alfalfa for Beef Production.

TABLE 8.—Record of each lot, December 11, 1913, to May 15, 1914—154 days.

	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6	Lot 7	Lot 8
Number of steers in lot	6	6	8	8	8	8	8	7
Rations fed	Corn, alfalfa	Corn, alfalfa, straw	Corn, alfalfa, light feed of silage	Corn, alfalfa, medium feed of silage	Corn, alfalfa, heavy feed of silage	Corn, alfalfa, silage heavy feed at beginning, light feed at close	Corn, alfalfa, medium feed of silage, cold pressed cottonseed cake	Corn, silage, cold pressed cottonseed cake, alfalfa, first five weeks
Av. first wt. per steer, lbs.	896.00	941.00	921.00	910.00	932.00	940.00	945.00	927.00
Av. last wt. per steer, lbs.	1,220.00	1,227.00	1,244.00	1,234.00	1,255.00	1,259.00	1,260.00	1,246.00
Total gain per steer, lbs.	324.00	286.00	323.00	324.00	323.00	319.00	315.00	319.00
Av. daily gain, lbs.	2.10	1.86	2.10	2.10	2.10	2.07	2.05	2.07
Total feed consumed—								
Corn	15,552.00	15,502.00	20,889.00	20,736.00	20,184.00	20,242.50	18,902.50	17,819.00
Alfalfa	5,793.00	5,618.00	5,460.00	4,754.00	3,956.00	4,111.00	4,337.00	982.50
Straw	929.00	2,016.00	1,238.00	1,239.00	1,238.00	1,238.00	1,240.00	1,072.00
Silage			12,072.50	22,566.00	27,429.00	20,901.00	21,407.00	20,655.00
Cottonseed cake							1,722.00	2,769.00
Feed required for 100 lbs. gain—								
Corn	800.00	903.40	808.40	800.00	781.10	793.20	750.10	798.00
Alfalfa	298.00	327.40	211.30	183.40	153.10	161.10	172.10	44.00
Straw	47.80	117.50	47.90	47.80	47.90	48.50	49.20	48.00
Silage			467.20	870.60	1,061.50	819.00	849.50	925.00
Cottonseed cake							72.30	124.00
Cost of 100 lbs. gain	10.82	12.23	11.31	11.77	11.74	11.49	12.04	12.76
Av. cost per steer—								
Initial cost	\$65.41	\$68.69	\$67.23	\$66.43	\$68.04	\$68.62	\$68.98	\$67.67
Cost of feed	35.05	34.98	36.34	38.14	37.90	36.65	37.92	40.69
Cost of marketing	3.05	3.07	3.11	3.08	3.14	3.15	3.15	3.11
Total	103.51	106.74	106.68	107.65	109.08	108.42	110.05	111.47
Price necessary in order to break even	8.48	8.70	8.58	8.72	8.69	8.61	8.73	8.95
Av. price received per steer	103.36	102.52	107.10	103.54	106.73	105.00	104.16	105.17
Net profit per steer	.15	4.22	.42	Loss 4.11	Loss 2.35	Loss 3.42	Loss 5.89	Loss 6.30

In making up the financial tables the method of calculation was the same as in the preceding experiment.

Perhaps the most striking thing about the results of this test is the fact that Lots 1, 3, 4, and 5 made almost identical gains, while Lots 6, 7, and 8 also made practically the same gains. The differences in rates of gain between any two of the seven lots mentioned were not sufficient to warrant conclusions as to the relative nutritive values of the rations. However, there was a considerable difference in the costs of 100 pounds gain.

It will be noted that Lot 1, fed a ration of corn and alfalfa hay, made the cheapest gains, while Lot 8, fed a ration of corn, silage, and cold pressed cottonseed cake, made the most expensive gains. Comparing Lot 8 with Lot 7, it will be observed that the feeding of alfalfa hay in Lot 7, while not increasing the rate of gain, lowered the cost of gain 72 cents per hundred pounds. Lot 7 made more expensive gains than Lot 4 which was fed similar to Lot 7 except that Lot 4 did not receive cottonseed cake. From the results of this test, it would appear that it is doubtful if cold pressed cottonseed cake can be profitably added to a ration of corn and alfalfa hay for fattening steers.

Lot 1, fed a ration of corn and alfalfa hay, made cheaper gains than any other lot in the test. This substantiates results which were secured in the test conducted during the winter of 1912-13. In the present case, however, it will be noted that Lot 1 did not show up financially quite so well as did Lot 3. This was due to the fact that Lot 3 sold for 20 cents per 100 pounds more than did Lot 1. Despite this fact, the steers in Lot 1 dressed out a higher percentage of beef than did the steers in Lot 3.

In contrast to the results obtained in the 1912-13 experiment, all of the steers except those in Lot 3 were fed at a loss. In the case of Lot 1 the loss was slight, but in the other lots it was quite heavy. This loss can largely be traced to two causes, first to the rather small margin between the buying and selling prices of the steers and second to the high price paid for corn.

Lots 1, 4, and 5 respectively were fed the same rations as Lots 6, 5, and 4 in the first experiment. In feed required for 100 pounds gain, Lot 1 of the 1913-14 experiment used 27 pounds more corn and 39 pounds less alfalfa hay than did Lot 6 of the 1912-13 experiment. Lot 4 of the 1913-14 experiment used 26 pounds more corn, 56 pounds more silage, and 119 pounds less alfalfa for 100 pounds gain than did Lot 5 in the 1912-13 experiment. Lot 5 of the 1913-14 experiment used 115 pounds more corn, 344 pounds less silage, and 63 pounds less alfalfa hay for 100 pounds gain than did Lot 4 of the 1912-13 experiment. Without excep-

tion, the steers in the 1913-14 test used more corn and less alfalfa hay for 100 pounds gain than did the steers in the 1912-13 test. This may have been due partly to weather conditions inasmuch as there was much more stormy and disagreeable weather during the time the 1913-14 experiment was in progress than there was during the previous test. It, however, suggests the variability from year to year that may be expected in cattle feeding operations.

TABLE 9.—Record of each steer in Lot 1, December 11, 1913, to May 15, 1914.
Ration—Corn and alfalfa.

Number of each steer	1	2	3	4	5	7	Av. of lot
First wt. of each steer, lbs.....	1,028.00	759.00	912.00	852.00	897.00	928.00	896.00
Final wt. of each steer, lbs.....	1,425.00	1,020.00	1,228.00	1,202.00	1,180.00	1,265.00	1,220.00
Total gain of each steer, lbs.....	397.00	261.00	316.00	350.00	283.00	337.00	324.00
Av. daily gain each steer, lbs.....	2.58	1.69	2.05	2.27	1.84	2.19	2.10
Av. amt. of corn consumed daily, lbs.....	1.84	14.30	17.10	16.80	15.90	18.40	16.80
Av. amt. of alfalfa consumed daily, lbs.....	7.00	6.10	5.80	6.10	6.00	6.60	6.27
Av. amt. of straw consumed daily, lbs.....	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Corn consumed for 100 lbs. gain, lbs.....	714.10	846.40	835.30	737.30	867.30	841.00	800.00
Alfalfa consumed for 100 lbs. gain, lbs.....	272.50	360.90	280.70	269.00	325.60	302.60	298.00
Straw consumed for 100 lbs. gain, lbs.....	39.00	59.40	49.00	44.30	54.80	46.00	47.80
Cost of food for 100 lbs. gain	\$9.70	\$11.70	\$11.16	\$9.96	\$11.77	\$11.34	\$10.72



Fig. 1.—No. 1, best gaining steer in Lot 1.



Fig. 2.—No. 5, poorest gaining steer in Lot 1.

TABLE 10.—Record of each steer in Lot 2, December 11, 1913, to May 15, 1914.
Ration—Corn, alfalfa, and straw.

Number of each steer	Ration—Corn, alfalfa, and straw.					Av. of lot	
	9	11	12	13	14		15
First wt. of each steer, lbs.	878.00	946.00	864.00	1,022.00	1,021.00	917.00	941.00
Final wt. of each steer, lbs.	1,203.00	1,255.00	1,113.00	1,258.00	1,280.00	1,250.00	1,227.00
Total gain of each steer, lbs.	325.00	309.00	249.00	236.00	259.00	333.00	286.00
Av. daily gain each steer, lbs.	2.11	2.01	1.62	1.53	1.68	2.16	1.86
Av. amt. of corn consumed daily, lbs.	17.70	16.63	14.47	16.53	17.21	18.04	16.77
Av. amt. of alfalfa consumed daily, lbs.	6.28	6.00	5.81	6.03	6.11	6.24	6.08
Av. amt. of straw consumed daily, lbs.	2.50	1.48	2.02	2.61	2.13	2.34	2.18
Corn consumed for 100 lbs. gain, lbs.	840.70	829.00	895.80	1,079.20	1,023.60	834.50	903.40
Alfalfa consumed for 100 lbs. gain, lbs.	297.40	299.00	359.80	393.60	363.30	288.90	327.40
Straw consumed for 100 lbs. gain, lbs.	118.80	74.10	124.70	170.30	126.60	108.20	117.50
Cost of food for 100 lbs. gain	\$42.38	\$11.21	\$42.34	\$14.68	\$13.84	\$11.27	\$12.23



Fig. 3.—No. 15, best gaining steer in Lot 2.



Fig. 4.—No. 13, poorest gaining steer in Lot 2.

Corn Silage and Alfalfa for Beef Production.

TABLE 11.—Record of each steer in Lot 3, December 11, 1913, to May 15, 1914.
Ration—Corn, alfalfa, and light feed of silage.

Number of each steer. . . .	17	18	19	20	21	22	23	24	Av. of lot
First wt. of each steer, lbs.	975.00	710.00	884.00	886.00	920.00	951.00	1,008.00	1,035.00	921.00
Final wt. of each steer, lbs.	1,310.00	1,035.00	1,255.00	1,213.00	1,210.00	1,213.00	1,335.00	1,377.00	1,244.00
Total gain of each steer, lbs.	335.00	325.00	371.00	327.00	290.00	262.00	327.00	342.00	323.00
Av. daily gain, lbs.	2.17	2.11	2.41	2.12	1.88	1.70	2.12	2.22	2.10
Av. amt. corn consumed daily, lbs.	17.43	16.29	17.27	16.94	17.15	16.03	17.09	17.41	16.90
Av. amt. alfalfa consumed daily, lbs.	4.49	3.91	4.43	4.35	4.57	4.26	4.99	4.43	4.40
Av. amt. silage consumed daily, lbs.	10.01	9.35	9.68	9.81	9.78	9.93	9.82	9.98	9.80
Av. amt. straw consumed daily, lbs.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Corn consumed for 100 lbs. gain, lbs.	801.30	772.30	716.90	797.90	911.10	942.70	805.00	784.70	808.40
Alfalfa consumed for 100 lbs. gain, lbs.	206.70	185.40	184.30	205.20	242.40	250.80	235.10	199.60	211.30
Silage consumed for 100 lbs. gain, lbs.	460.30	443.20	401.90	461.80	519.80	584.20	462.50	449.40	467.20
Straw consumed for 100 lbs. gain, lbs.	46.30	47.70	41.80	47.40	53.40	59.20	47.40	45.30	47.90
Cost of food for 100 lbs. gain	\$11.20	\$10.73	\$10.00	\$11.16	\$12.77	\$13.29	\$11.39	\$10.95	\$11.30



Fig. 5.—No. 19, best gaining steer in Lot 3.



Fig. 6.—No. 22, poorest gaining steer in Lot 3.

Corn Silage and Alfalfa for Beef Production.

TABLE 12.—Record of each steer in Lot 4, December 11, 1913, to May 15, 1914.
Ration—Corn, alfalfa, and medium feed of silage.

Number of each steer.....	25	26	27	28	29	30	31	32	Average of lot
First wt. of each steer, lbs.	974.00	1,055.00	842.00	864.00	823.00	911.00	966.00	847.00	910.00
Final wt. of each steer, lbs.	1,302.00	1,453.00	1,162.00	1,205.00	1,102.00	1,143.00	1,337.00	1,170.00	1,234.00
Total gain of each steer, lbs.	328.00	398.00	320.00	341.00	279.00	232.00	371.00	323.00	324.00
Av. daily gain each steer, lbs.	2.13	2.58	2.08	2.21	1.81	1.51	2.41	2.09	2.10
Av. amt. corn consumed daily, lbs.....	17.28	17.72	16.75	15.87	16.29	16.60	17.20	16.94	16.80
Av. amt. alfalfa consumed daily, lbs.....	3.90	4.00	3.69	4.22	4.02	3.52	4.00	3.47	3.85
Av. amt. silage consumed daily, lbs.....	18.17	19.24	17.76	19.38	17.63	17.73	19.24	17.33	18.30
Av. amt. straw consumed daily, lbs.....	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Corn consumed for 100 lbs. gain, lbs.	811.40	686.10	806.50	717.10	896.00	1,102.00	714.00	808.00	800.00
Alfalfa consumed for 100 lbs. gain, lbs.	183.20	155.00	177.70	190.90	222.30	234.10	166.20	165.80	183.40
Silage consumed for 100 lbs. gain, lbs.	853.50	744.70	855.20	875.70	973.70	1,177.40	798.90	826.60	870.60
Straw consumed for 100 lbs. gain, lbs.	47.30	38.90	48.40	45.50	55.60	66.80	41.80	48.00	47.80
Cost of food for 100 lbs. gain	\$11.89	\$10.09	\$11.81	\$10.87	\$13.29	\$16.11	\$10.57	\$11.72	\$11.77



Fig. 7.—No. 26, best gaining steer in Lot 4.



Fig. 8.—No. 30, poorest gaining steer in Lot 4.

TABLE 13.—Record of each steer in Lot 5, December 11, 1913, to May 15, 1914.
Ration—Corn, alfalfa, and heavy feed of silage.

Number of each steer. . . .	33	34	35	36	37	38	39	40	Av. of lot
First wt. of each steer, lbs.	996.00	979.00	813.00	890.00	761.00	999.00	1,066.00	954.00	932.00
Final wt. of each steer, lbs.	1,300.00	1,365.00	1,102.00	1,166.00	1,068.00	1,300.00	1,435.00	1,302.00	1,255.00
Total gain of each steer, lbs.	304.00	386.00	289.00	276.00	307.00	301.00	369.00	348.00	323.00
Av. daily gain each steer, lbs.	1.97	2.51	1.87	1.79	1.99	1.95	2.39	2.26	2.10
Av. amt. of corn consumed daily, lbs.	17.01	17.71	16.96	14.90	16.53	14.57	16.32	16.99	16.38
Av. amt. of alfalfa consumed daily, lbs.	3.26	3.23	3.13	3.17	3.10	3.57	3.45	2.76	3.21
Av. amt. of silage consumed daily, lbs.	23.81	26.03	14.99	22.97	18.23	26.32	26.55	19.19	22.26
Av. amt. of straw consumed daily, lbs.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Corn consumed for 100 lbs. gain, lbs.	862.10	706.60	903.90	831.80	829.20	745.70	681.20	752.20	781.10
Alfalfa consumed for 100 lbs. gain, lbs.	165.60	129.10	167.00	177.00	155.90	182.70	144.20	122.10	153.10
Silage consumed for 100 lbs. gain, lbs.	1,206.40	1,038.70	799.00	1,281.70	914.80	1,346.80	1,108.10	849.30	1,061.50
Straw consumed for 100 lbs. gain, lbs.	51.00	40.20	53.60	56.20	50.50	51.50	42.00	44.50	47.90
Cost of food for 100 lbs. gain	\$13.47	\$10.72	\$12.79	\$12.85	\$12.07	\$11.99	\$10.62	\$10.89	\$11.73



Fig. 9.—No. 39, best gaining steer in Lot 5.

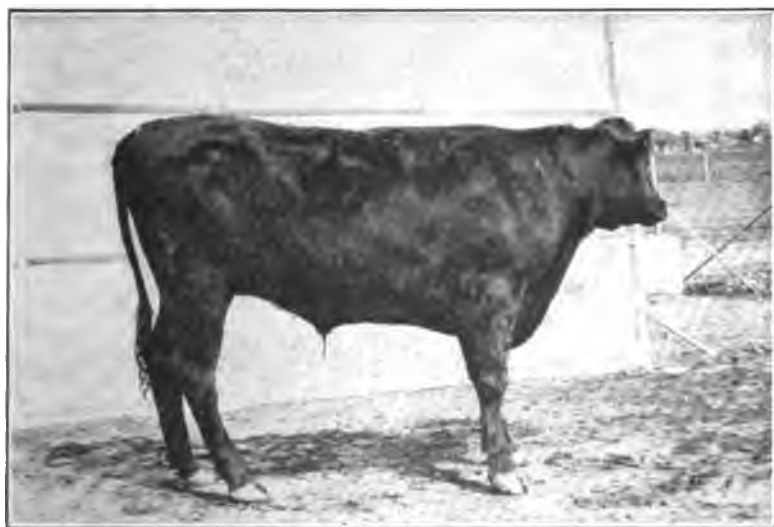


Fig. 10.—No. 36, poorest gaining steer in Lot 5.

Corn Silage and Alfalfa for Beef Production.

TABLE 14.—Record of each steer in Lot 6, December 11, 1913, to May 15, 1914.
Ration—Corn, alfalfa, and tapering silage.

	41	42	43	44	45	46	47	48	Av. of lot
Number of each steer.									
First wt. of each steer, lbs.	935.00	943.00	977.00	943.00	986.00	962.00	840.00	932.00	940.00
Final wt. of each steer, lbs.	1,300.00	1,280.00	1,318.00	1,233.00	1,250.00	1,282.00	1,128.00	1,278.00	1,259.00
Total gain of each steer, lbs.	365.00	337.00	341.00	290.00	264.00	320.00	288.00	346.00	319.00
Av. daily gain each steer, lbs.	2.37	2.19	2.21	1.88	1.71	2.08	1.87	2.24	2.07
Av. amt. of corn consumed daily, lbs.	16.59	17.07	17.51	14.13	16.36	17.35	14.79	17.62	16.43
Av. amt. of alfalfa consumed daily, lbs.	3.34	3.44	3.53	3.32	2.60	3.67	3.16	3.63	3.33
Av. amt. of silage consumed daily, lbs.	18.69	16.44	18.12	18.27	15.74	14.68	15.16	18.62	16.96
Av. amt. of straw consumed daily, lbs.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Corn consumed for 100 lbs. gain, lbs.	700.00	780.40	791.10	750.50	954.30	834.90	791.10	784.50	793.20
Alfalfa consumed for 100 lbs. gain, lbs.	141.10	157.40	159.50	176.40	151.70	176.70	169.10	161.60	161.10
Silage consumed for 100 lbs. gain, lbs.	788.80	751.50	818.80	970.50	917.00	706.70	810.80	828.80	819.00
Straw consumed for 100 lbs. gain, lbs.	42.50	46.00	45.50	53.40	38.70	48.40	53.80	44.80	48.50
Cost of food for 100 lbs. gain	\$10.27	\$11.22	\$11.46	\$11.36	\$13.52	\$11.87	\$11.51	\$11.42	\$11.49



Fig. 11.—No. 41, best gaining steer in Lot 6.



Fig. 12.—No. 45, poorest gaining steer in Lot 6.

Corn Silage and Alfalfa for Beef Production.

TABLE 15.—*Record of each steer in Lot 7, December 11, 1913, to May 15, 1914.*
 Ration—Corn, alfalfa, silage, and cottonseed cake.

	49	50	51	52	53	54	55	56	Av. of lot
Number of each steer.									
First wt. of each steer, lbs.	1,019.00	852.00	986.00	1,016.00	720.00	1,020.00	978.00	966.00	945.00
Final wt. of each steer, lbs.	1,302.00	1,160.00	1,345.00	1,312.00	963.00	1,355.00	1,353.00	1,290.00	1,260.00
Total gain of each steer, lbs.	283.00	308.00	359.00	296.00	243.00	335.00	375.00	324.00	315.00
Av. daily gain each steer, lbs.	1.84	2.00	2.33	1.92	1.58	2.17	2.43	2.10	2.05
Av. amt. of corn consumed daily, lbs.	16.45	15.88	15.58	14.82	13.03	16.32	15.96	14.66	15.34
Av. amt. of alfalfa consumed daily, lbs.	3.62	3.42	3.92	3.89	2.44	3.58	3.78	3.51	3.52
Av. amt. of silage consumed daily, lbs.	16.86	14.42	19.45	19.32	11.82	18.55	19.36	19.20	17.37
Av. amt. of cottonseed cake consumed daily, lbs.	1.48	1.48	1.48	1.48	1.47	1.48	1.47	1.48	1.48
Av. amt. of straw consumed daily, lbs.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Corn consumed for 100 lbs. gain, lbs.	895.50	794.40	668.60	771.20	826.20	750.50	655.80	697.00	750.10
Alfalfa consumed for 100 lbs. gain, lbs.	197.00	171.10	168.10	202.70	154.70	164.50	155.30	167.10	172.10
Silage consumed for 100 lbs. gain, lbs.	917.50	721.40	834.50	1,005.40	749.20	853.00	795.10	912.70	849.50
Cottonseed cake consumed for 100 lbs. gain, lbs.	80.70	74.20	63.60	76.90	93.20	68.20	60.50	70.50	72.30
Straw consumed for 100 lbs. gain, lbs.	54.80	50.30	43.20	52.40	63.80	46.30	41.30	47.90	49.20
Cost of food for 100 lbs. gain	\$14.10	\$12.37	\$10.94	\$12.79	\$12.96	\$11.97	\$10.61	\$11.50	\$12.11



Fig. 13.—No. 55, best gaining steer in Lot 7.



Fig. 14.—No. 53, poorest gaining steer in Lot 7.

TABLE 16.—Record of each steer in Lot 8, December 11, 1913, to May 15, 1914.
Ration—Corn, alfalfa, silage, cottonseed cake, and straw.

Number of each steer.....	Ration—Corn, alfalfa, silage, cottonseed cake, and straw.						Av. of lot	
	57	58	59	60	61	62		63
First wt. of each steer, lbs.	885.00	1,020.00	880.00	790.00	923.00	1,004.00	989.00	927.00
Final wt. of each steer, lbs.	1,225.00	1,390.00	1,213.00	1,110.00	1,175.00	1,317.00	1,293.00	1,246.00
Total gain of each steer, lbs.	340.00	370.00	333.00	320.00	252.00	313.00	304.00	319.00
Av. daily gain each steer, lbs.	2.20	2.40	2.16	2.08	1.64	2.03	1.97	2.07
Av. amt. of corn consumed daily, lbs.	17.30	17.80	15.48	15.64	16.97	17.02	15.50	16.50
Av. amt. of alfalfa consumed daily, lbs.	.94	.98	.88	.78	.88	.95	.91	.90
Av. amt. of silage consumed daily, lbs.	20.03	19.97	18.07	12.31	19.17	22.15	22.43	19.10
Av. amt. of cottonseed cake consumed daily, lbs.	2.46	2.79	2.78	2.74	2.76	2.14	2.32	2.57
Av. amt. of straw consumed daily, lbs.	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Corn consumed for 100 lbs. gain, lbs.	783.60	741.10	715.70	752.90	1,036.80	837.30	785.00	797.90
Alfalfa consumed for 100 lbs. gain, lbs.	42.60	40.90	40.80	37.70	54.00	46.60	46.10	43.70
Silage consumed for 100 lbs. gain, lbs.	907.60	831.40	835.90	592.50	1,171.20	1,089.90	1,136.20	925.10
Cottonseed cake consumed for 100 lbs. gain, lbs.	111.70	116.50	128.60	131.70	168.60	105.20	117.50	124.10
Straw consumed for 100 lbs. gain, lbs.	45.60	41.90	46.50	48.40	61.50	49.50	51.00	48.60
Cost of food for 100 lbs. gain.	\$12.41	\$11.83	\$11.71	\$11.74	\$16.63	\$13.29	\$12.92	\$12.86



Fig. 15.—No. 58, best gaining steer in Lot 8.



Fig. 16.—No. 61, poorest gaining steer in Lot 8.

Steer No. 26 in Lot 4 made the largest gain of any steer in the test, while steer No. 30 in the same lot made the smallest gain. During the 154 days that the steers were on feed, No. 26 gained 166 pounds more than did No. 30. Furthermore, the cost of gains made by No. 26 was \$6 less per 100 pounds than the cost of gains made by No. 30. The average difference between the highest and lowest gaining steer in each of the eight lots was 121 pounds. Here, again, is demonstrated the important part that the individuality of an animal plays in the economy of meat production.

In studying the pictures of the best and the poorest gaining steers in each lot, usually a considerable dissimilarity may be noted. This is particularly true of Nos. 26 and 30. There is a wide difference between the smooth, deep, and blocky form of No. 26 and the rough and lanky appearance of No. 30. However, even a careful study of feeder cattle does not always reveal their feeding possibilities. This fact was well demonstrated by steers Nos. 41 and 45 in Lot 6. When the experiment was started No. 45 was picked as one of the best feeders in the lot and yet No. 45 gained over 100 pounds less than did No. 41. It will be noted that, of the two steers, No. 45 seems to have had more requisites for the good feeder type. The picture shows that this steer was not very deep thru the rear flank, but that he possessed a good middle and a larger heart girth than did No. 41. While depth thru the rear flank must be regarded as important in a feeder steer, yet in this case steer No. 41 did not appear to be sufficiently superior in flank depth to steer No. 45 to offset the other advantages in form which seemed to be possessed by No. 45.

If all the steers in the different lots had made their gains as cheaply as did the best steer in each of the lots, three of the lots, 2, 7, and 8, would still have been fed at a loss.

In comparing the feeding records of the steers in the 1912-13 experiment with the records of the steers in the 1913-14 experiment, it will be noted that while the average gain per lot was higher in the first test, nevertheless the steers in the second test show much more uniform gains. Two steers in the 1912-13 experiment made larger gains than the best steer in the 1913-14 experiment, while one steer in the 1912-13 experiment made less gains than the poorest steer in the 1913-14 experiment.

FINANCIAL TABLES.

The following tables show the costs of producing the 100 pounds gain in the different lots of both experiments with alfalfa hay and corn at various prices:

TABLE 17.—Cost of 100 lbs. gain in the 1912-1913 experiment with corn at 50, 55, 60, and 65 cents per bushel, other feed prices unchanged.

Corn	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6
50 cents	\$10.81	\$10.30	\$10.37	\$8.74	\$9.40	\$6.29
55 cents	11.65	10.95	11.20	9.35	10.09	8.99
60 cents	12.50	11.61	12.03	9.96	10.79	9.69
65 cents	13.34	12.26	12.87	10.57	11.49	10.39

TABLE 18.—Cost of 100 lbs. gain in the 1912-1913 experiment with alfalfa at \$10, \$12, \$14, and \$16 per ton, other feed prices unchanged.

Alfalfa	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6
\$10 per ton	\$8.01	\$8.61	\$7.56
\$12 per ton	8.23	8.91	7.89
\$14 per ton	8.46	9.22	8.23
\$16 per ton	8.69	9.52	8.57

Corn Silage and Alfalfa for Beef Production.

TABLE 19.—*Cost of 100 lbs. gain in the 1913-1914 experiment with corn at 42, 50, 55, and 60 cents per bushel, other feed prices unchanged.*

Corn	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6	Lot 7	Lot 8
42 cents	\$7.54	\$8.54	\$7.99	\$8.49	\$8.54	\$8.24	\$8.97	\$9.49
50 cents	8.66	9.80	9.12	9.61	9.63	9.35	10.02	10.60
55 cents	9.38	10.61	9.85	10.33	10.33	10.06	10.69	11.32
60 cents.....	10.10	11.43	10.58	11.05	11.04	10.78	11.37	12.04

TABLE 20.—*Cost of 100 lbs. gain in the 1913-1914 experiment with alfalfa at \$8, \$12, \$14, and \$16 per ton, other feed prices unchanged.*

Alfalfa	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5	Lot 6	Lot 7	Lot 8
\$8 per ton	\$10.52	\$11.91	\$11.10	\$11.58	\$11.58	\$11.32	\$11.87	\$12.72
\$12 per ton.....	11.12	12.56	11.52	11.95	11.89	11.65	12.21	12.80
\$14 per ton.....	11.42	12.89	11.73	12.13	12.04	11.81	12.38	12.85
\$16 per ton	11.71	13.22	11.94	12.32	12.19	11.97	12.56	12.89

Referring to the tables showing costs of gains with corn at different prices, it will be observed that had the corn used in the 1913-14 test been priced at 42 cents per bushel, as it was in the 1912-13 test, the cost of 100 pounds gain in all of the lots would have been reduced more than \$3. In this case Lot 1, fed a ration of corn and alfalfa hay, would have made its gains at a cost of \$7.54 per 100 pounds. This is but 32 cents more than the cost of 100 pounds gain on the steers in Lot 6 of the 1912-13 test, which were also fed a ration of corn and alfalfa hay. Had the alfalfa hay, used in the 1913-14 test, been valued at \$8 per ton (the valuation given alfalfa in the 1912-13 test) and had corn been valued at 42 cents per bushel, the cost of 100 pounds gain in Lot 1 of the 1913-14 test would have been \$7.24, or almost exactly the same as the cost of 100 pounds gain in Lot 6 of the previous test. On the other hand, if the corn used in the 1912-13 test had cost 65 cents per bushel and the alfalfa hay \$10 per ton, the gains in Lot 6, instead of costing \$7.22 per 100 pounds, would have cost \$10.73, or 9 cents less per 100 pounds than the cost of gains in Lot 1 of the 1913-14 test.

It will be noted that in both experiments the cost of gains on the steers was more than \$1 cheaper per 100 pounds when corn cost 42 cents per bushel than it was when corn cost 50 cents per bushel. In other words, an advance of 8 cents per bushel in the price of corn increased the cost of gains over \$1 per 100 pounds. Had the alfalfa hay used in the 1913-14 test cost \$16 per ton, the cost of 100 pounds gain in Lot 1 would have been \$11.71 instead of \$10.82, as it was with alfalfa hay at \$10 per ton. An increased cost of \$6 per ton for alfalfa hay increased the cost of 100 pounds gain 89 cents. In the same lot it will be noted that an increase of 5 cents per bushel in the price of corn increased the cost of 100 pounds gain 72 cents, that is, in this test an increase of 1 cent per bushel in the price of corn produced approximately the same effect as did an increase of \$1 per ton in the price of alfalfa hay.