

AGRICULTURAL EXPERIMENT STATION

KANSAS STATE AGRICULTURAL COLLEGE

DEPARTMENT OF ANIMAL HUSBANDRY



BABY BEEVES

These calves were full-fed, silage, grain, and alfalfa hay for 150 days. The silage was made from crops that were injured by the drouth of August, 1918, and did not mature grain.

CATTLE FEEDING INVESTIGATIONS, 1918-19

C. W. McCAMPBELL, F. W. BELL, H. B. WINCHESTER

PART I

THE MAXIMUM ECONOMICAL UTILIZATION OF SILAGE IN FATTENING TWO-YEAR-OLD STEERS

C. W. McCAMPBELL, H. B. WINCHESTER

The question most often asked the Animal Husbandry Department of the Kansas Agricultural Experiment Station during the past few years has been, "How can the cost of producing beef be reduced?"

A careful analysis of the present economic situation indicates that any material reduction in the cost of pro-

ducing beef will necessitate a more extensive and efficient utilization of roughage, not only in the maintenance of cattle but also in the fattening of cattle for market. The value of roughage, particularly silage, in reducing maintenance costs has been well demonstrated by the Kansas Agricultural Experiment Station in years past, and the work done in 1918-19 demonstrates its value in reducing fattening costs.

Since either corn or sorghum silage can be produced over such a large area of Kansas it seemed that a more thorough study of its maximum economical utilization in fattening cattle should be made. Part I of this circular gives the results of a 120-day feeding test on two-year-old steers fed rations containing different amounts of ground corn and sorghum silage.

FEEDING PLAN

Average commercial two-year-old steers were used since the great majority of Kansas feeders handle heavy cattle rather than baby beeves. These steers were purchased on the Kansas City market January 14, 1919, at a cost of \$14.60 per hundred. They were given three days' rest and feed after arriving at Manhattan, and divided into four lots of 10 head each. Every possible care was observed to insure uniformity of quality, type, and size in each lot. The steers of each lot were weighed individually three days in succession and the average of these three days' weights taken as the average weight of the steers of each lot at the beginning of the experiment.

Each group of 10 steers had access to a shed 14 by 29 feet and an outside lot 25 by 29 feet. The portion of the quarters not covered by the shed is paved with concrete.

The steers in lot 1 received all the corn and alfalfa hay they would eat, three pounds per steer of linseed meal daily, and no silage. Lot 2 was fed in the same manner except that they were also fed all the sorghum silage they would eat. Lot 3 was fed in the same manner as lot 2 except that they received only half as much corn. Lot 4 received no corn, all the sorghum silage and alfalfa hay they would eat and three pounds per steer of linseed meal daily.

The plan provided for a 120-day feeding period but the cattle were appraised by the market men from Kansas City at the end of 60 and 90 days feeding and results are also given on a basis of these feeding periods. The cattle were fed twice daily in the following order—grain, silage, hay. They had free access to salt and water at all times.

RESULTS

The results for the 120-day feeding period are given in Table I.

TABLE I. — RESULTS OBTAINED IN FEEDING EXPERIMENT WITH AVERAGE TWO-YEAR-OLD STEERS

Lot No.....	1	2	3	4
Number of steers in lot.....	9	10	10	10
Av. initial weight per steer at feed lot	914.92 lbs.	949.60 lbs.	960.20 lbs.	963.10 lbs.
Av. final weight per steer at feed lot	1332.97 lbs.	1318.00 lbs.	1276.17 lbs.	1334.00 lbs.
Average daily gain per steer.....	3.23 lbs.	3.07 lbs.	2.63 lbs.	3.09 lbs.
Selling weight per steer at Kansas City	1291.00 lbs.	1277.00 lbs.	1231.00 lbs.	1262.00 lbs.
Percent of shrinkage in marketing.....	3.18	3.11	3.54	5.40
Ranking of carcasses in cooler.....	2	1	3	4
Dressing percent.....	59.74	61.05	60.37	58.80
Average daily ration per steer:				
Ground corn.....	15.45 lbs.	15.11 lbs.	7.69 lbs.	.....
Linseed meal.....	2.74 lbs.	2.68 lbs.	2.72 lbs.	2.70 lbs.
Alfalfa hay.....	13.14 lbs.	2.94 lbs.	2.97 lbs.	2.95 lbs.
Sorghum silage.....	.....	25.26 lbs.	41.84 lbs.	60.26 lbs.
required to make 100 pounds gain:				
Ground corn.....	477.84 lbs.	492.34 lbs.	292.08 lbs.	.....
Linseed meal.....	84.72 lbs.	87.38 lbs.	103.33 lbs.	87.42 lbs.
Alfalfa hay.....	406.91 lbs.	95.68 lbs.	112.67 lbs.	95.31 lbs.
Sorghum silage.....	.....	822.74 lbs.	1589.00 lbs.	1949.51 lbs.
Cost of feed per 100 pounds of gain....	\$ 22.23	\$ 21.34	\$ 19.57	\$ 19.07
Av. initial cost per steer at feed lot....	144.19	144.81	146.53	146.97
Average cost of labor per steer.....	5.17	5.17	5.17	5.17
Average cost of feed per steer.....	86.29	78.66	61.88	44.77
Interest per steer on investment at 8 percent.....	6.13	5.95	5.55	5.12
Interest per steer on equipment at 6 percent.....	1.03	1.03	1.03	1.03
Shipping and selling expense per steer	3.68	3.68	3.68	3.68
Total cost per steer at Kansas City....	246.49	239.40	223.84	208.74
Selling price per steer at Kansas City..	203.33	201.13	193.88	189.50
Net returns per steer.....	-43.16	-38.27	-29.96	-17.44
Hog returns per steer.....	3.91	3.17	1.81	-0.42
Net steer returns plus hog returns.....	-39.25	-35.10	-28.15	-17.86
Necessary selling price per cwt. at Kansas City to break even.....	18.79	18.50	18.01	16.43
Selling price per cwt. at Kansas City....	15.75	15.75	15.75	15.00
Initial cost per cwt. at lots that would have permitted an even break....	10.69	11.23	12.14	13.45

The feed prices used in arriving at these results are as follows: Ground corn, \$1.58 per bushel; linseed meal, \$66 per ton; alfalfa hay, \$30 per ton; and silage, \$8 per ton.

Since the handling of the manure under the conditions of the experiment cost approximately \$3 per ton, its cost practically equalled its value.

The hogs following the steers depended entirely upon steer droppings and waste for their subsistence.

The labor costs given represent the actual amounts paid in conducting this particular experiment. Feeding under farm conditions would require less labor as the feeder would not be obliged to devote so much time to weights, records, and other details.

No attempt was made to give these steers special preparation for shipping. They were fed their usual ration up to the time they left the feed lot for the station—three miles away. This was done for the purpose of securing comparative information relative to absolute shrinkage from the four methods of feeding on a 120-mile ship to market. The shrinkage in lot 4 probably could have been lessened materially by 24 hours dry-feed ration before shipping.

A comparison of the efficiency of a full corn-fed ration without and with silage (lots 1 and 2) shows a decrease of \$0.89 per hundredweight in the cost of gains and an increase of \$4.15 per steer in net returns, including hog profits, when silage was fed.

The cost of gains in lot 3, receiving a half grain ration with silage, was less than that of either lot 1 or lot 2, and that in spite of a lower rate of gain. The net returns in lot 3 were \$6.95 per steer more than in lot 2, receiving a full grain ration, and \$11.10 per steer more than was received for lot 1, receiving a full grain ration but no silage. Hog profits are included in each case. Lot 3 also sold for as much per hundredweight as did lots 1 and 2.

The cost of 100 pounds of gain in lot 4, receiving no corn, was so much lower than in lots 1, 2, and 3, and the daily gains so nearly the same as in lots 1 and 2 and greater than in lot 3, that by far the greatest net returns were received from this lot. Each steer in lot 4 returned \$21.39 more than each steer in lot 1; \$17.24 more than each steer in lot 2; and \$10.29 more than each steer in lot 3, including hog profits in each case. Lot 4, receiving no corn, sold only \$0.75 per hundredweight below lot 1, receiving no silage.

A comparison of the results in lots 1 and 4 shows that, in this particular test, 1,949.51 pounds of sorghum silage fed in lot 4 replaced 477.84 pounds of corn and 311.6 pounds of alfalfa hay fed in lot 1 in producing 100 pounds of gain. In other words, a ton of sorghum silage practically replaced 8.5 bushels of corn.

Furthermore, after each steer in lot 4 had paid all costs involved in finishing and marketing except the silage consumed, there was left \$11.49 to pay for the silage.

This means a rate of \$3.18 per ton for silage, or \$28.62 per acre for the crop produced in 1918, in spite of drouth, hot winds, and high-priced feeders. In other words, had the silage been charged at the rate of \$3.18 per ton, lot 4 would have broken even on all expenses but lot 1 would still have suffered a loss of \$39.25 per head, hog gains included.

The necessary margin to break even in each lot is as follows: Lot 1, \$4.19; lot 2, \$3.90; lot 3, \$3.44; and lot 4, \$1.83. The necessary margin in lot 1 where no silage was fed, was \$2.36 per hundredweight greater than in lot 4 where the maximum amount of silage and no corn was fed.

At the end of 60 days lot 1 had made a daily gain of 3.53 pounds, at a cost of \$19.03 per hundredweight. These cattle were appraised at \$14.60 per hundredweight at the feed lot and lost \$20.02 per steer. Lot 2 had made a daily gain of 3.62 pounds, at a cost of \$17.56 per hundredweight. They were appraised at \$14.75 per hundredweight at the feed lot and lost \$15.59 per steer. Lot 3 had made a daily gain of 2.94 pounds, at a cost of \$16.78 per hundredweight. They were appraised at \$14.74 per hundredweight at the feed lot and lost \$13.42 per steer. Lot 4 had made a daily gain of 3.56 pounds, at a cost of \$10.13 per hundredweight. They were appraised at \$14.25 per hundredweight at the feed lot and lost \$7.52 per steer.

At the end of 90 days the results were as follows: Lot 1, gain, 3.25 pounds per day; cost, \$21.53 per hundredweight; appraised value, \$16 per hundredweight; loss, \$17.04 per steer. Lot 2, gain, 3.61 pounds per day;, cost, \$18.35 per hundredweight; appraised value, \$16.25 per hundredweight; loss, \$5.35 per steer. Lot 3, gain, 2.89 pounds per day; cost, \$17.76 per hundredweight; appraised value, \$16.25 per hundredweight; loss, \$3.47 per steer. Lot 4, gain, 3.29 pounds per day; cost, \$11.38 per hundredweight; appraised value, \$15.75 per hundredweight; profit, \$7.49 per steer.

SUMMARY

Under conditions prevailing during the winter of

1918-19, net returns in feeding two-year-old steers 60 to 90 or 120 days increased in direct proportion to the amount of sorghum silage fed.

The net returns were \$21.39 greater in lot 4 where the maximum amount of sorghum silage was fed than in lot 1 where no sorghum silage was fed, in spite of the fact that the cattle in lot 1 sold for \$0.75 per hundredweight more than those in lot 4, and shrank only 3.18 percent compared with 5.4 percent in lot 4.

A ton of sorghum silage fed in lot 4 replaced 8.5 bushels of corn fed in lot 1 in making a 100-pound gain.

The cost of 100 pounds of gain was \$10.18 less in lot 4 where the maximum amount of sorghum silage was fed than in lot 1 where no sorghum silage was fed.

The difficulties of getting steers on feed and keeping them on feed was greatest where no silage was fed and least where the largest amount was fed. One steer in lot 1 got off his feed so badly that it was necessary to eliminate him from the experiment.

The result of this test emphasizes the importance of silage in fattening cattle for market and indicates the necessity of using it more extensively in feeding operations in Kansas.

The initial cost of feeders has an important bearing upon the profits of feeding operations. Paying unusually high prices for feeders usually handicaps the undertaking at the outset.

PART II

CORN SILAGE VERSUS SORGHUM SILAGE FOR FATTENING BABY BEEF

F. W. BELL

The Kansas Agricultural Experiment Station has shown by a series of tests extending over a period of three years that, under normal conditions, cane, sweet sorghum, kafir, and corn silage have practically the same feeding value, pound for pound; but during these years the sorghums made a yield of 35 percent more silage per acre than did the corn.

Many seasons are so unfavorable that corn does not mature grain and some are so unfavorable that even the sorghum crops do not mature grain. These conditions have prompted many inquiries regarding the relative value of silage made from corn and cane that have been injured by drouth.

In 1918 the hot winds did such serious damage to Kansas crops in early August that corn had to be made into silage at that time. The sorghums persisted but seed development was prevented. They were put into the silo about two weeks later. An experiment was planned to test the feeding value of these two kinds of silage.

FEEDING PLAN

Thirty calves, fifteen steers and fifteen spayed heifers, purchased from the Hays branch of the Kansas Agricultural Experiment Station, were used. They were divided into two lots of 15 each. Each lot was full fed on corn, alfalfa hay, and silage with approximately 1.5 pounds of linseed meal per calf daily. Lot 1, consisting of eight steers and seven spayed heifers, received corn silage and lot 2, consisting of seven steers and eight spayed heifers, sorghum silage. Each lot received the same amount of each kind of feed used in this test. Initial and final weights were based upon an average of three days' weighing. The calves were fed twice daily in the follow-

ing order—grain, silage, hay. They had free access to salt and water at all times. The fifteen calves in each lot had the same shed and lot space as each lot of ten two-year-old steers mentioned in Part I of this circular.

RESULTS

The results in detail obtained in a feeding period of 150 days are given in Table II.

TABLE II.—RESULTS OBTAINED IN FEEDING EXPERIMENT WITH BABY BEEVES

Lot No.....	1	
Number of calves in lot.....	15	15
Average initial weight per calf at feed lot.....	461.00 lbs.	457.10 lbs.
Average final weight per calf at feed lot.....	842.33 lbs.	850.11 lbs.
Average daily gain per calf.....	2.54 lbs.	2.62 lbs.
Selling weight per calf at Kansas City.....	803.33 lbs.	809.33 lbs.
Percent of shrinkage in marketing.....	4.63 lbs.	4.80
Ranking of carcasses in cooler.....	2	1
Dressing percent.....	59.14	60.35
Average daily ration per calf:		
Ground corn.....	9.65 lbs.	9.63 lbs.
Linseed meal.....	1.68 lbs.	1.68 lbs.
Alfalfa hay.....	3.08 lbs.	3.08 lbs.
Corn silage.....	17.80 lbs.	
Sorghum silage.....		17.81 lbs.
Feed required to make 100 pounds of gain:		
Ground corn.....	379.67 lbs.	367.76 lbs.
Linseed meal.....	66.10 lbs.	64.14 lbs.
Alfalfa hay.....	121.10 lbs.	117.51 lbs.
Corn silage.....	700.00 lbs.	
Sorghum silage.....		679.77 lbs.
Cost of feed per 100 pounds of gain.....	\$ 17.40	\$ 16.86
Average initial cost per calf at feed lot.....	42.64	42.28
Average cost of labor per calf.....	5.16	5.16
Average cost of feed per calf.....	66.34	66.28
Interest per calf on investment at 8 percent.....	3.76	3.74
Interest per calf on equipment at 6 percent.....	0.82	0.82
Shipping and selling expense per calf.....	3.35	3.35
Total cost per calf at Kansas City market.....	122.07	121.63
Selling price per calf at Kansas City.....	122.51	123.42
Net returns per calf..... Kansas City.....	0.44	1.79
Hog returns per calf.....	4.55	3.36
Net calf returns plus hog returns.....	4.99	5.15
Necessary selling price per cwt. at K. C. to break even.....	15.20	15.03
Selling price per cwt. at Kansas City.....	15.25	15.25
Initial cost per cwt. at lots that would have permitted an even break.....	10.43	10.77

Feed prices used in arriving at these results are as follows: Ground corn, \$1.58 per bushel; linseed meal, \$65 per ton; alfalfa hay, \$30 per ton; and silage, \$8 per ton.

The calves in lot 2, fed sorghum silage, made slightly greater and cheaper gains, dressed a higher percent, and showed carcasses of better quality than did the calves in lot 1.

The packer's report included the following interesting facts: Lot 1 was judged to be second in quality and

other all around points as shown in the table. "The tops of the heifers showed a very fine quality and texture of meat together with a very fine color." Lot 2 was judged to be first in quality and other all around points, "They cut down a very good color, good texture, and well grained. The heifers were better than the steers although the steers in this lot cut down very much better than the steers in lot 1."

Other interesting facts connected with this test that do not appear in the table are as follows: (1) Sorghum silage was decidedly more palatable than corn silage. At the beginning of the test both lots were gradually increased to 25 pounds of silage per head daily. Lot 2 ate this amount of sorghum silage very quickly and seemed to want more. Lot 1, however, soon refused to eat more than 20 pounds of corn silage per day. Lot 2 was then dropped to 20 pounds per day in order that both lots might receive the same amount of silage. (2) The corn silage averaged more acid than the sorghum silage. (3) The sorghum silage contained more dry matter than the corn silage. (4) The sorghum made a yield of 9 tons of silage per acre as compared with 3.5 tons for the corn.

SUMMARY AND CONCLUSIONS

These tests show very forcibly the value of sorghum as a silage crop in unfavorable seasons. They also emphasize the insurance value, as well as the feeding value, of sorghum as a silage crop. However, the feeder who finishes his cattle at 12 to 16 months of age must have cattle above the average in quality. In other words, calves better bred than the average are necessary for the production of baby beef as calves of only average breeding will not mature and fatten early enough to be marketed profitably as yearlings.

PART III

TWO-YEAR-OLD STEERS VERSUS BABY BEEVES

Since one lot of two-year-olds reported in Part I of this circular, and one lot of baby bees reported in Part II, were fed the same feeds (all the corn, alfalfa hay, and sorghum silage they would eat with approximately 2.5 pounds daily of linseed meal per thousand pounds live-weight), an excellent opportunity is offered to compare the manner in which cattle of these two ages respond to such a ration.

It required 150 days to make the calves as fat as the two-year-olds were at the end of 120 days.

COMPARISON OF RESULTS

Table III gives a detailed comparison of the results obtained in finishing these two classes of cattle on the same ration.

TABLE III.—TWO-YEAR-OLD STEERS VERSUS BABY BEEVES
IN FEEDING EXPERIMENTS

(Ration; Full feed of corn, alfalfa hay, and sorghum silage; approximately 2.5 pounds daily of linseed meal per thousand pounds live weight)

Lot	Two-year-olds	Baby bees
Number of days fed	120	150
Number of animals per lot	10	15
Average initial weight per animal at feed lot	949.60 lbs.	457.10 lbs.
Average final weight per animal at feed lot	1818.00 lbs.	850.11 lbs.
Average daily gain per animal	3.07 lbs.	2.62 lbs.
Selling weight per animal at Kansas City	1277.00 lbs.	809.33 lbs.
Percent of shrinkage in marketing	3.11	4.80
Dressing percent	61.05	60.55
Average daily ration per animal:		
Ground corn	15.11 lbs.	9.63 lbs.
Linseed meal	2.68 lbs.	1.68 lbs.
Alfalfa hay	2.94 lbs.	3.08 lbs.
Sorghum silage	25.26 lbs.	17.81 lbs.
Feed required to make 100 pounds of gain:		
Ground corn	492.34 lbs.	367.76 lbs.
Linseed meal	87.38 lbs.	64.14 lbs.
Alfalfa hay	95.68 lbs.	117.51 lbs.
Sorghum silage	822.74 lbs.	679.77 lbs.
Cost of feed per 100 pounds of gain		
Average initial cost per animal at feed lot	\$ 21.34	\$ 16.86
Average cost of labor per animal	144.91	42.28
Average cost of feed per animal	5.17	5.16
Interest per animal on investment at 8 percent	78.66	68.28
Interest per animal on equipment at 6 percent	5.95	3.74
Shipping and selling expense per animal	1.03	0.82
Total cost per animal at Kansas City market	3.68	3.35
Selling price per animal at Kansas City	289.40	121.63
Net returns per animal	201.13	123.42
Hog returns per animal	-38.27	1.79
Net returns per animal plus hog returns	3.17	3.36
Necessary selling price per cwt. at K. C. to break even	-35.10	5.15
Selling price per cwt. at Kansas City	18.50	15.03
Initial cost per cwt. at lots that would have permitted an even break	15.75	15.25
	11.23	10.77

CONCLUSION

The fact that the two-year-old steers required 33 percent more corn, 36 percent more linseed meal, and 21 percent more silage than the baby beeves to produce a hundred pounds of gain, commends the feeding of baby beeves to the thoughtful consideration of more Kansas feeders.