

AGRICULTURAL EXPERIMENT STATION

KANSAS STATE AGRICULTURAL COLLEGE
MANHATTAN, KANSAS

DEPARTMENT OF ANIMAL HUSBANDRY



LOT 5 (TABLE III), FED "HEAVY SILAGE NO GRAIN" FOR 120 DAYS; CORN AND SILAGE THE LAST 90 DAYS

CATTLE FEEDING INVESTIGATIONS, 1919-20

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PART I

THE MAXIMUM ECONOMICAL UTILIZATION OF SILAGE IN FATTENING AGED STEERS

During the winter of 1918-19, aged steers fed a "heavy silage no corn" ration made almost as good gains during a 120-day feeding period as aged steers receiving a "heavy corn no silage" ration and the net returns from the cattle receiving the "heavy silage no corn" ration was \$21.39 a head greater than from the cattle receiving the "heavy corn no silage" ration.¹

¹ McCampbell, C. W., Bell, F. W., and Winchester, H. B. Cattle feeding investigations, 1918-19. Kan. Agr. Expt. Sta. Cir. 77:1-11. 1919.

These results raised two questions that have been asked repeatedly during the past year:

1. Would it have paid better to have added corn to the "heavy silage no corn" ration during the latter part of the feeding period?
2. Would blackstrap molasses have been a satisfactory substitute for corn during the latter part of the feeding period?

FEEDING PLAN

Three lots of 10 four-year-old steers each were used to secure data that might help answer these questions. These cattle were rather inferior, plain, nervous, Texas steers which refused to become quiet or gentle throughout the whole feeding period. This explains the comparatively small daily gains. These small gains, however, in no way lessen the value of the comparative results obtained, and the test indicates a fairly reliable answer to the questions stated above.

These cattle were purchased on the Kansas City market, October 30, 1919, and represented about the average quality of cattle that were going into the majority of feed lots at that time. They were run on a dry bluestem grass pasture until November 13. Three successive weights were taken and the average of the three used as the initial weight. The experiment started on November 15 with the evening feed. The cattle were fed twice daily—7 a. m. and 5:30 p. m. and had access to salt and tank water at all times. They also had access at all times to a shed open to the south, the shed space for each group of 10 head being 29.3 feet long and 15.4 feet wide. The lot occupied by each group was 29.3 feet wide and 25 feet long. Hence the total space occupied by each group was 29.3 by 40.4 feet.

The three lots were fed as follows:

Lot 1—All the cane silage they would eat; 2.5 pounds linseed oilmeal per steer per day; all the alfalfa hay they would eat; and all the corn they would eat during the last 45 days of the feeding period.

Lot 2—This lot was fed exactly the same as lot 1 except that blackstrap molasses was substituted for corn during the last 45 days. The molasses was diluted with water at the rate of 2 parts water to 1 part molasses and mixed with the silage.

Lot 3—This lot was fed exactly the same as lot 1 except that no corn was added during the last 46 days.

CATTLE FEEDING INVESTIGATIONS

One hundred thirty days elapsed from the time this experiment started until the cattle were marketed in Kansas City.

RESULTS

Detailed results are given in Table I.

TABLE I.—RESULTS OBTAINED IN A 130-DAY FEEDING EXPERIMENT WITH AGED STEERS

Lot No. (a)	1	2	3
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Av. initial weight at feedlot	988.43	988.27	986.60
Av. selling weight at Kansas City	1,156.00	1,129.00	1,131.00
Av. gain	167.57	140.73	144.40
Av. daily gain	1.29	1.08	1.11
Av. daily ration per steer:			
Shelled corn	3.09		
Cane molasses		1.90	
Linseed oilmeal	2.51	2.50	2.51
Alfalfa hay	2.98	2.95	2.98
Cane silage	42.51	45.98	48.21
Feed consumed per 100 pounds gain:			
Shelled corn	239.5		
Cane molasses		175.9	
Linseed oilmeal	194.6	231.5	226.1
Alfalfa hay	231.0	274.1	269.0
Cane silage	3,295.3	4,257.4	4,348.2
Feed cost per 100 pounds gain	\$30.85	\$33.87	\$30.23
Av. initial cost per steer	112.68	112.66	112.47
Feed cost per steer	51.69	47.67	43.65
Labor cost per steer	4.56	5.31	4.56
Int. per steer on investment at 8 percent	4.27	4.16	4.06
Int. per steer on equipment at 6 percent	1.00	1.00	1.00
Shipping expense per steer	3.68	3.68	3.68
Total cost per steer	177.88	174.48	165.74
Amount received per steer at Kansas City	135.83	132.66	127.24
Loss per steer (steer only)	42.05	41.82	42.18
Hog profit per steer	1.82		
Steer loss plus hog profit	40.23	41.82	42.18
Necessary selling price per cwt. at Kansas City to break even	15.23	15.33	14.65
Selling price per cwt. at Kansas City	11.75	11.75	11.25
Initial cost per cwt. at feedlot	11.40	11.40	11.40
Percent of shrinkage	4.6	5.9	6.0
Dressing percent	57.52	58.35	57.45

(a) There were 10 four-year-old steers in each lot.
Price of feeds: Corn, \$1.55 per bushel; molasses, \$42 per ton; linseed oilmeal, \$84 per ton; alfalfa hay, \$25 per ton; cane silage, \$8 per ton.

CONCLUSIONS

Some of the more important deductions that may be made from the results of this test are as follows:

1. It was impossible to feed heavy cattle profitably during the winter of 1919-20, at prevailing prices of feeders, feed, and fat cattle.
2. Temperament has a very decided influence on gains made by fattening cattle. Wild nervous cattle will not make satisfactory gains. Such cattle will require a margin of 60 percent to 75 percent greater to break even than will quiet gentle cattle.
3. Considerable inconvenience was experienced in handling

molasses during the cold weather due to the fact that it thickened to such an extent that it would not run from a barrel. It was also impossible to get the cattle in lot 2 to eat as many pounds of molasses daily as the cattle in lot 1 consumed of corn. However, it required 30 percent more corn to produce 100 pounds of gain in lot 1 than it did blackstrap molasses in lot 2.

4. When one considers the scarcity of labor and the inconvenience of handling molasses in cold weather, it will not pay to substitute molasses for corn when corn is priced at \$1.55 a bushel and molasses \$42 a ton.

5. If no hogs had been following the steers the apparent margin in favor of corn was only 13 cents a head. By allowing hogs to follow these cattle and utilize the waste, the apparent margin in favor of adding corn during the last 45 days amounted to \$1.93 a head. In both instances feeds consumed were figured at prevailing selling prices. When corn was added during the last 45 days, 225 pounds of corn valued at \$6.21 replaced 1,000 pounds of silage, which when charged at prevailing prices would represent a value of only \$4. It should be remembered also, that the price at which the silage is charged to these cattle was \$3.50 a ton above the cost of production. This being true it would not have paid the man who produced the silage fed to have added corn during the last 45 days of the feeding period.

6. The fact that the cattle receiving the "heavy silage no corn" ration dressed out as well as the cattle receiving a corn finish during the latter end of the feeding period is one of considerable importance because of the statement so often made by buyers that silage-fed cattle always show a low dressing sheet. It is quite evident that cattle fed on silage should sell for as much money as cattle carrying no more quality or finish that have been fed other kinds of feed.

PART II

THE MAXIMUM ECONOMICAL UTILIZATION OF SILAGE IN FATTENING CATTLE OF DIFFERENT AGES

Since such splendid results were secured last year from feeding the "heavy silage no corn" ration to aged steers, many persons have asked the question, "Will yearlings and calves respond to this ration as well as aged steers?"

FEEDING PLAN

One lot of yearlings and one lot of calves were fed this ration for 120 days in comparison with the aged steers (Part I, lot 3) receiving this same ration. The yearlings were the tail-ends of the 1918 steer calves produced at the Fort Hays Branch Experiment Station. The calves were the second-cut of the 1919 steer calves produced on Alex Philip's Big Creek Ranch at Hays, Kan. The aged steers, yearlings, and calves were fed all the silage they would eat; all the alfalfa hay they would eat; and approximately 2½ pounds of linseed oilmeal per day per steer. They were fed twice daily and had free access to salt and tank water at all times. Feeding quarters were the same as described in Part I. This test covered a period of 120 days. Financial deductions are based on buyers' bids rather than actual selling values as it was intended to carry the yearlings and calves on to a riper finish.

RESULTS

Detailed results of this test for the 120-day feeding period are shown in Table II.

TABLE II.—COMPARATIVE RESULTS OF FEEDING SILAGE TO AGED STEERS, YEARLING STEERS, AND STEER CALVES

Lot No.	3	4	5
Age of steers	Aged	Yearlings	Calves
Number of steers in lot	10	10	1
	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
Av. initial weight per steer	986.60	637.87	397.60
Av. final weight per steer	1,208.67	855.47	586.13
Av. gain per steer	222.07	218.60	188.53
Av. daily gain per steer	1.85	1.82	1.57
Av. daily ration per steer:			
Linseed oilmeal	2.51	2.43	2.46
Alfalfa hay	2.98	2.95	2.86
Cane silage	48.21	33.57	19.51
Feed consumed per 100 pounds gain:			
Linseed oilmeal	135.77	133.35	156.63
Alfalfa hay	169.76	161.73	181.82
Cane silage	2,605.29	1,842.68	1,241.96
Feed cost per 100 pounds gain	\$18.13	\$15.00	\$13.82
Av. initial cost per steer	112.47	66.87	41.75
Feed cost per steer	40.27	32.77	26.05
Labor cost per steer	4.56	4.56	4.56
Int. per steer on investment at 8 percent	4.06	2.52	1.92
Int. per steer on equipment at 6 percent	1.00	1.00	1.00
Total cost per steer ready for shipment	162.36	106.72	75.28
Net value per steer at feedlot	131.14	91.96	60.96
Loss per steer	31.22	14.76	14.32
Initial cost per cwt.	11.40	10.50	10.50
Buyer's bid minus freight, shrink, commission, yardage based on last year's shipment	10.85	10.75	10.40
Necessary selling price per cwt. at feedlot to break even	14.33	13.40	13.74

Price of feeds: Linseed oilmeal, \$84 per ton; alfalfa hay, \$25 per ton; cane silage, \$8 per ton.

SUMMARY AND CONCLUSIONS

1. The aged steers put on considerable finish, the yearlings a limited amount, and the calves practically none.
2. The aged steers had made their growth; hence the feed they consumed was used for maintenance and the production of fat. This coupled with their ability to consume very large quantities of silage enabled them to develop a certain amount of fat or finish on a "heavy silage no corn" ration.
3. The calf is inclined to grow; hence it must be fed a ration that will enable it to consume enough feed to meet the demands for growth as well as for maintenance and the production of fat. The limited feeding capacity of a calf makes it impossible for him to consume enough of a "heavy silage no corn" ration to supply a sufficient amount of nutrients to meet the requirements of maintenance, growth, and the production of fat. Hence the calves fed this ration grew, but laid on very little fat.
4. The requirements of the yearling lie between those of the aged steer and the calf. Its growth requirements are less than those of the calf but greater than those of the aged steer. Its feeding capacity is greater than that of the calf but less than that of the aged steer. For these reasons the yearlings fed the "heavy silage no corn" ration put on less finish than the aged steers but more than the calves. They did not put on enough fat, however, to sell well as fat animals.
5. The aged steers were classed as killers, the yearlings as feeders, and the calves as stockers at the end of 120 days' feeding on a "heavy silage no corn" ration.
6. It is possible to fatten aged steers on a "heavy silage no corn" ration, but it is not possible to produce enough finish (fat) on yearlings and calves to enable them to sell as fat cattle. It is quite evident that the younger cattle require a grain finish to make them fat.
7. In spite of the fact that the younger cattle do not have as great feeding capacity as the aged steers, they produce gains cheaper due to the greater efficiency of younger cattle in handling feed. It cost 17 percent less to produce 100 pounds of gain on yearlings than it did on the aged steers; and 24 percent less with calves than with aged steers.

PART III

THE MAXIMUM ECONOMICAL UTILIZATION OF SILAGE IN FATTENING BABY BEEF

The maximum utilization of roughage, especially silage, is necessary in all beef-production activities. The opinion is quite prevalent that since calves must be fat and prime to sell as baby beef it is impossible to utilize very much roughage in fattening this class of cattle for market.

FEEDING PLAN

Previous tests have shown that when a full feed of corn is fed from the beginning of the feeding period only a limited amount of silage will be consumed. This being true, it was planned to feed one lot (lot 5, Part II) on, a "heavy silage no corn" ration for 120 days and add corn to this ration for another 90 days. Another lot (lot 6) was fed all the silage and all the corn it would eat for the entire 210 days. Both lots also received limited amounts of alfalfa hay and linseed oilmeal. The yearlings in lot 4 (Part II) that were fed a "heavy silage no corn" ration for 120 days had corn added to their ration for an additional 90-day period and are included in the table (Table III) giving results of "The Maximum Economical Utilization of Silage in Fattening Baby Beef," for the purpose of furnishing a ready comparison between yearlings and calves as regards the manner in which they respond to similar methods of feeding. Inability to secure linseed oilmeal necessitated substituting cottonseed meal for linseed oilmeal during the latter part of the feeding period. Protection, lot space, and method of feeding were the same as in Parts I and II.

RESULTS

Detailed results are shown in Table III.

TABLE III.—RESULTS OF 210-DAY FEEDING EXPERIMENT IN THE UTILIZATION OF SILAGE IN FATTENING BABY BEEF

Lot No.	4	5	6
Number of steers in lot	10	10	10
Age of cattle	Yearlings	Calves	Calves
Av. initial weight at feedlot	<i>Pounds</i> 636.87	<i>Pounds</i> 397.60	<i>Pounds</i> 398.80
Av. selling weight at Kansas City	961.00	745.00	814.00
Av. gain	324.13	347.40	415.20
Av. daily gain	1.54	1.65	1.98
Feed consumed per 100 pounds gain:			
Shelled corn (a)	283.42	240.57	458.65
Linseed oilmeal	89.98	85.00	67.08
Cottonseed meal	70.56	68.70	60.38
Alfalfa hay	184.80	171.42	145.79
Cane silage	1,624.69	842.00	452.58
Feed cost per 100 pounds gain	\$22.47	\$17.71	\$21.00
Av. initial cost per steer	66.87	41.75	41.87
Feed cost per steer	72.30	61.48	87.22
Int. per steer on investment at 8 percent	6.40	4.75	5.48
Int. per steer on equipment at 6 percent	1.73	1.73	1.73
Labor cost per steer	6.30	6.30	6.30
Shipping expense per steer	2.38	2.38	2.38
Total cost per steer	155.98	118.39	144.98
Amount received per steer at Kansas City	156.16	121.06	136.35
Profit or loss (steers only)	0.18	2.67	-8.63
Hog profit per steer (b)	4.04	2.96	10.22
Steer profit or loss plus hog profit	4.22	5.63	1.59
Necessary selling price per cwt. at Kansas City to break even, excluding hog profit	16.23	15.89	17.81
Necessary selling price per cwt. at Kansas City to break even, including hog profit	15.81	15.14	16.56
Selling price per cwt. at Kansas City	16.25	16.25	16.75
Initial cost per cwt. at feedlot	10.50	10.50	10.50
Percent of shrinkage	2.94	4.53	3.58
Dressing percent	55.3	55.1	57.5

(a) Lots 4 and 5 received corn only during the last 90 days of the 210-day feeding period.

(b) Hogs in lot 6 for the first 120 days were valued in at \$13.32 per cwt., out and sold at \$14.20; while for last 90 days in lots 4, 5, and 6 they were valued in at \$14 and out at \$14.50 per cwt.

Price of feeds: Shelled corn, \$1.60 per bushel; linseed oilmeal, \$70 per ton; cottonseed meal, \$68 per ton; alfalfa hay, \$25 per ton; cane silage, \$8 per ton.

SUMMARY AND CONCLUSIONS

1. The cheapest gains in fattening baby beef for market with the present high prices of feed can be secured only by the maximum utilization of silage, and the results in this experiment indicate that it is more profitable at present prices of cattle and feed to feed baby beeves a "heavy silage no corn" ration for 120 days and then finish on corn, than it is to feed a heavy corn ration from the beginning of the feeding period together with all the silage they will consume.

2. The fact should be emphasized that it cost \$3.29 a hundred less to produce gains in lot 5 where the "heavy silage no corn" ration was fed for 120 days before adding corn to the ration, than it did in lot 6 where corn was fed from the be-

ginning of the test. Moreover, the calves in lot 5 sold for only 50 cents a hundred less than those in lot 6.

3. Had no hogs been following the calves in either lot, those receiving no corn for 120 days would have made a profit of \$11.30 a head more than those fed corn for the entire period. Even when hogs followed the calves in lot 5 they made a profit of \$4.04 a head greater than those in lot 6. Even though baby beeves are more efficient than older cattle in utilizing grain, the fact remains that they are not so efficient that it is not necessary to have hogs following to utilize the undigested grain.

4. At prevailing prices of feed it was highly desirable to get cattle to eat all the silage possible since it was being charged to them at \$8 a ton, or approximately \$3.50 a ton or \$35 an acre above the cost of production. This is another decided advantage of feeding the "heavy silage no corn" ration in lot 5.

5. The yearlings proved to be less efficient than the calves in utilizing grain as well as roughage. This is largely the reason it cost \$4.76 a hundred more to make gains on yearlings than it did on calves receiving the same ration. The hogs following the yearlings, however, made greater gains than those following the calves, but with this advantage the yearlings made a profit of \$1.41 per head LESS than the calves, both selling at the same price per hundred.

PART IV

SILAGE VERSUS HAY FOR THE DEVELOPMENT OF STOCK CATTLE

Two pertinent questions are frequently asked relative to the comparative value of silage and hay as feeds for developing and wintering stock cattle: (1) Can a person winter cattle as cheaply and as satisfactorily on silage as he can on alfalfa hay? (2) Will cattle wintered on silage make satisfactory gains on pasture the following season?

An answer to the first question will depend upon whether or not silage crops can be grown satisfactorily where alfalfa is grown and used. It so happens that corn, sorghums, or other good silage crops, can be grown in practically every locality where alfalfa grows.

FEEDING PLAN

Two groups of steer calves, 20 in each group, were used in making this study. Group B was divided into 4 lots. Lot 1 received alfalfa hay cut in the bud stage; lot 2, alfalfa haycut in the one-tenth bloom stage; lot 3, alfalfa hay cut in the full bloom stage; and lot 4, that cut in the seed stage.

Group A was divided into two lots. Lot 1 was fed corn silage carrying about 10 bushels of corn per acre, and lot 2 cane silage. Both lots received one pound of cottonseed meal per day per calf.

Comparisons were made on a basis of the average of the alfalfa and the silage groups. The experiment covered a period of 90 days.

RESULTS

Detailed results are shown in Table IV.

TABLE IV.—SILAGE VERSUS ALFALFA HAY FOR WINTERING STEER CALVES

Group	A	B
	<i>Pounds</i>	<i>Pounds</i>
Av. initial weight per steer	486.17	440.37
Av. final weight per steer	530.15	506.40
Av. total growth per steer	93.98	66.03
Av. daily growth per steer	1.05	.73
Av. daily ration per steer:		
Cottonseed meal	1.00	
Silage	25.89	
Alfalfa hay		10.29
Feed consumed per 100 pounds growth:		
Cottonseed meal	97.25	
Silage	2,511.22	
Alfalfa hay		1,789.56
Feed cost per 100 pounds growth	\$13.54	\$22.37

Price of feeds: Silage, \$8 per ton; cottonseed meal, \$72 per ton; alfalfa hay, \$25 per ton.

SUMMARY

The calves fed silage and cottonseed meal made 44 percent greater daily growth and each 100 pounds of growth cost 40 percent less than in the case of the alfalfa hay fed calves.

PLANS FOR COMPLETION OF EXPERIMENT

These two groups of cattle were turned together on good bluestem pasture April 29, 1920, and at this time a complete report on the manner in which they handle the grass cannot be made. However, in spite of the fact that the silage-fed calves made a daily winter gain 30 percent greater than the hay-fed calves, they have made during the first 90 days of the

present grazing season only 7 percent less gain than the calves fed alfalfa hay during the past winter. The first 90-day pasture gains for the calves receiving a winter ration of silage was 1.99 pounds a day; for the calves receiving a winter ration of alfalfa hay, 2.14 pounds a day.

These results indicate very strikingly the value of silage when supplemented with cottonseed meal (or cake) as a wintering ration for stock cattle.

These same cattle will be continued on the test for two more winters and summers, each steer receiving the same ration each winter. They will all graze together during the next two summers and be fed out during the winter of 1921-22. This will provide data showing the behavior on pasture and later in the feedlot of cattle that have been developed on hay alone and cattle that have been developed on silage and cottonseed meal (or cake).

LABOR AND MANURE CREDITS

The labor costs given represent the actual amounts paid in conducting these tests. Feeding under farm and commercial conditions would require somewhat less labor, as the average feeder would not be obliged to devote so much time to weights, records, and other experimental details.

No credit has been allowed in any of the preceding discussions for manure produced. This is because of the fact that the cost of bedding and the labor required in handling the manure has been practically as great as the value of the manure.

