

TEXAS AGRICULTURAL EXPERIMENT STATIONS

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Division of Animal Husbandry

A Test of the Relative Values of Cotton Seed Meal and Silage, and Cotton Seed Meal and Cotton Seed Hulls for Fattening Cattle.

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A TEST OF THE RELATIVE VALUES OF COTTON SEED MEAL AND SILAGE, AND COTTON SEED MEAL AND COTTON SEED HULLS FOR FATTENING CATTLE.

BY JOHN C. BURNS.
ASSISTED BY T. P. METCALFE.

INTRODUCTION.

The experiment reported in this bulletin was conducted during the past winter and spring in cooperation with Col. T. S. Bugbee of Clarendon, Texas, who furnished the cattle, the feeds, the scales, and, in fact, everything connected with the work except the man who did the feeding and collected the data.

The purpose of the experiment was to ascertain whether cotton seed meal and silage may be used more profitably for fattening cattle than cotton seed meal and cotton seed hulls, the two feeds which compose the ration that is used much more than any other for fattening cattle throughout the South. The high price of cotton seed hulls during recent years emphasizes the importance of finding, if possible, a more economical feed to take its place, either partially or altogether. Because of the low nutritive value of this feed and the relatively large amount necessary to use, it is this portion of the ration rather than the meal that makes the feeding of meal and hulls so expensive at current prices.

The feeding of silage to dairy cattle has been practiced extensively and with a high degree of success for many years, but only recently has it been looked upon with much favor for beef production. The experiment herein reported is the first one that has been conducted by this Station for the purpose of testing the value of silage in a ration for beef cattle. The results should be of considerable practical value from the fact that the experiment was conducted entirely under actual farm conditions. Since these are the results of only one experiment, they should not be taken as absolutely conclusive and for this reason the Station will conduct other experiments along the same line during the coming fall, winter, and spring.

CATTLE USED.

The cattle used in the experiment were 40 head of range bred three- and four-year-old, grade Shorthorn and Hereford steers all of which were dehorned. Though not highly graded they showed a preponderance of improved blood and represented about the average of the cattle of the Panhandle section of the State. They were the "tops" of a bunch of about 200 head and were fairly uniform as to conformation, quality, and condition. Their average weight when the experiment began was 904 pounds, and the value placed on them was \$42.50 a head.

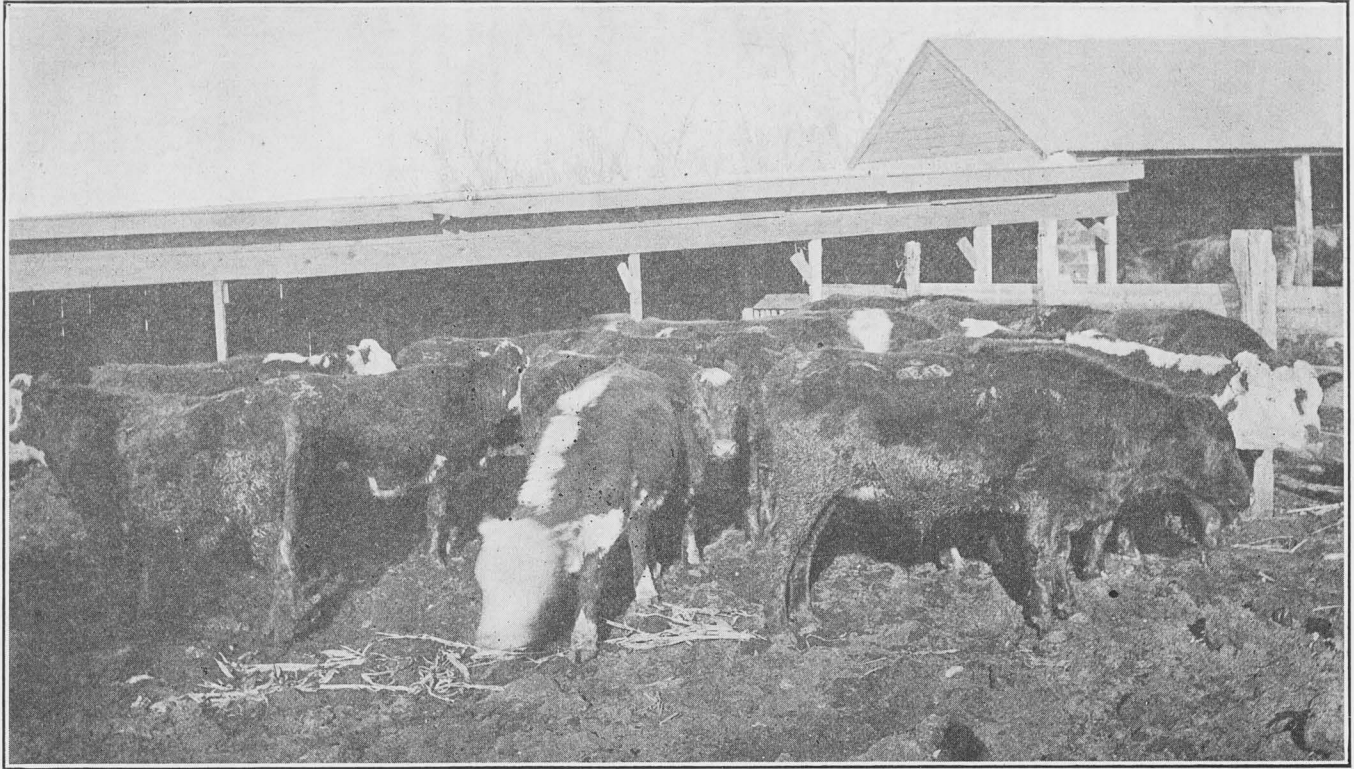


PLATE I. THE STEERS OF LOT I AT THE BEGINNING OF THE EXPERIMENT.



PLATE II. THE STEERS OF LOT II AT THE BEGINNING OF THE EXPERIMENT.

FEEDS USED.

The feeds used, namely, cotton seed meal, cotton seed hulls, silage, and hay, were of average quality.

The silage was composed chiefly of milo maize, which had been harvested when the heads were about mature and the stalks and leaves were still green. The other components of the silage were sorghum and Indian Corn. It was estimated that the larger portion of the silage fed consisted of about 75 per cent milo maize, 15 per cent Indian corn, and 10 per cent sorghum. That which was fed during the last 20 days of the test contained a somewhat higher percentage of Indian corn.

The hay was composed of sorghum and Johnson grass, about half and half.

An average sample of each lot of feed was analyzed by the Chemical Division of the Experiment Station. These analyses are shown in the following table:

TABLE I.

Feeds.	Period used.	Percentage composition.					
		Water.	Ash.	Protein.	Crude Fiber.	Nitrogen Free-extract.	Fat.
Cotton seed meal..	Dec. 8, 1911, to Mar. 13, 1912..	6.42	5.65	45.45	7.39	24.67	10.42
Cotton seed meal..	Mar. 14, 1912, to April 5, 1912..	6.26	5.49	44.05	9.28	25.72	9.20
Cotton seed hulls..	Dec. 8, 1911, to Feb. 26, 1912..	10.91	2.50	5.07	46.05	33.79	1.68
Cotton seed hulls..	Feb. 27, 1912, to Mar. 14, 1912..	10.15	2.58	4.81	43.00	38.33	1.13
Cotton seed hulls..	Mar. 15, 1912, to April 5, 1912..	8.24	2.44	4.50	45.65	37.49	1.68
Silage	Dec. 8, 1911, to Mar. 14, 1912..	66.02	2.82	2.54	8.86	19.15	.61
Silage	Mar. 15, 1912, to April 5, 1912..	60.52	3.05	3.28	10.57	21.70	.88
Hay	Jan. 8, 1912, to April 5, 1912..	8.48	7.21	4.22	30.78	48.02	1.29

The cost of the feeds was as follows:

Cotton seed meal.....	\$27.00 per ton.
Cotton seed hulls.....	8.50 per ton.
Silage	2.50 per ton.
Hay	7.00 per ton.

The crops from which the silage was made were grown on Colonel Bugbee's place. Though the actual cost of production—including the rental value of the land, the preparation of the soil, planting, and cultivating the crops and placing them in the silo—was estimated to be considerably less than \$2.50 a ton, this price is placed on the silage because it is thought that it represents more nearly what the average cost of production would be throughout the State.

PLAN OF EXPERIMENT.

The afternoon of December 7, 1911, the steers were divided into two lots, designated as Lot I and Lot II, the former containing 15

head and the latter 25 head. The division was made as equally as possible with regard to average weight, quality, and breeding. Only 15 head were used in Lot I for the reason that this number was considered sufficient to eliminate any differences in the result that might be attributed to differences in individuality, and because it was not desirable to purchase any more cotton seed hulls than was necessary to conduct the experiment properly.

The pens in which the cattle were fed were practically equal in all conditions that might have had a bearing on the results. Each had a shed open on the south side which afforded protection against the cold north wind to some extent, but which did little more than this as will be explained later. The cattle in both pens had free access to salt and water at all times.

The two lots were fed as follows:

Lot I.—Cotton seed meal and cotton seed hulls.

Lot II.—Cotton seed meal, silage, and, during a part of the experiment, mixed sorghum and Johnson grass hay.

The cattle were fed twice daily, early in the morning and late in the afternoon. The meal and hulls were thoroughly mixed together in the feed trough. The silage was placed in the trough, the meal sprinkled over it, and then the two feeds were thoroughly mixed together with an ordinary hull fork. The hay was supplied in a separate trough, though a rack would have been better.

A preliminary feeding period of a few days would have been desirable in order to get the cattle to eating well before beginning the actual test, but on account of the late date, the experiment proper was begun on the day of the first feeding.

THE FEEDING TEST.

The experiment covered a period of 119 days, from the morning feed of December 8, 1911, to the evening feed of April 4, 1912.

The rations per steer for the first day were as follows:

Lot I.—3 pounds cotton seed meal, $19\frac{1}{3}$ pounds cotton seed hulls.

Lot II.—3 pounds cotton seed meal, $24\frac{1}{5}$ pounds silage.

Hay was added to the ration of Lot II on January 8th. This addition was made because the steers in this lot were not eating a sufficient quantity of the silage, possibly because of its succulent character, to afford them as much dry matter as was being consumed by those in Lot I. It was found, however, that the steers did not take to the hay very readily; indeed, they did not seem to relish it at any time, though they were supplied with it until the end of the experiment. It is doubtful, therefore, whether the addition of hay proved to be of any advantage. The average daily amount consumed per steer was slightly over 3 pounds.

After the first few days as much hulls for Lot I and as much silage for Lot II were supplied as the steers would clean up, the daily amounts for each steer being about $28\frac{2}{3}$ pounds hulls and about 50 pounds silage, respectively.

The cotton seed meal for both lots was gradually increased. On January 6th the amount reached 6 pounds a head daily for each lot, this amount remaining unchanged until February 11th, when 7

pounds a head daily was fed. When, therefore, the steers were on full feed their rations were as follows:

Lot I.—7 pounds cotton seed meal, 30 pounds cotton seed hulls.

Lot II.—7 pounds cotton seed meal, 50 pounds silage, 3 pounds hay.

The writer feels confident that the results would have been more satisfactory if a smaller quantity of meal had been fed. There was one steer, in particular, in Lot I that showed the evil effects of the heavy meal feeding towards the end of the experiment. Though Lot II received the same quantity of meal per steer there were apparently no injurious effects—a fact which would seem to indicate that a larger quantity of meal may be fed successfully in connection with silage than with hulls, or that the injurious effects of the meal may, at least to some extent, be counteracted by the silage.

For a feeding period of 119 days, with cattle of the weight of those used, better results should have been obtained, especially in Lot I and Probably in Lot II also, if the quantity of meal had been increased gradually from 3 pounds at the start to 5 pounds at the end of 40 days; continued on this amount until the end of 80 days and then increased to 6 pounds for the remainder of the period.

A great mistake made by many feeders in Texas is that they do not feed their cattle sufficiently long to finish them. As a general rule the higher price received for finished cattle will more than pay for the 30 to 60 days of extra feeding necessary to finish them. It is rarely the case that cattle are in proper condition to be marketed at the end of 120 days of feeding. Three and four-year-old steers should generally be fed 150 days and younger cattle a still longer period, two-year-olds requiring about 180 days. It is, however, less practicable to carry cattle on straight meal and hulls for longer than 120 days than on many other kinds of rations.

The cattle that were used in this experiment were not finished when they were marketed, and it is believed that had they been fed 30 days longer the results would have been more profitable, provided the quantity of meal previously fed had been such as to permit of further feeding, which, however, was not the case. Though, apparently, the silage-fed steers could have been fed longer without injurious effects, it would probably have been better for them as well as for the hulls-fed steers, if the feeding was to have lasted 150 days, for the allowance of meal to have been about as follows: 2 to 2½ pounds of meal for the first thirty days; 3 to 3½ pounds for the second 30 days; 4 to 4½ pounds for the third 30 days; and 5 pounds for the last 60 days; the increases to have been made gradually or not at a greater rate than about ¼ pound per day.

There was no trouble in getting either lot of steers to eating well, but it was very noticeable from the beginning to the end of the experiment that the steers of Lot II relished their ration of meal and silage much more than the steers of Lot I relished their ration of meal and hulls. The steers in Lot II would eat the silage about as readily before the meal was mixed with it as afterwards, whereas those in Lot I did not care for the hulls until after the meal was mixed with it.

The droppings from the steers of both lots were in good condition throughout the experiment, no scouring or digestive disorders being indicated.

The weather conditions were unusually severe during the greater portion of the period that the experiment was in progress. A few days after the cattle were started on feed a heavy snow fell and, in melting, placed the pens and the space under the sheds in very bad condition. This was followed by alternate freezing and thawing, so that when the ground was not frozen the mud was knee deep. The steers' feet became very sore and for several days it seemed to be an effort for them to get to the feed troughs. These conditions began about December 19th, and with the snows that fell in February, the pens and sheds were kept in such a bad condition until near the close of the experiment that there was no dry place for the cattle to lie down. Neither lot, therefore, made the gains that they should have made had the conditions been normal.

The final results of the experiment are shown in the following table:

TABLE II.

Lot No.	Average weight at start. Lbs.	No. of steers.	Total feed: Eaten per head. Lbs.	Total gain per head. Lbs.	Average daily gain per head. Lbs.	Pounds feed per 100 lbs. Gain.	Cost of feed per 100 lbs. Gain.
One	895	15	712.5 cotton seed meal 3316.8 cotton seed hulls	236	1.98	301.9 cotton seed meal 1405.4 cotton seed hulls	\$10.04
Two	909	25	716.1 cotton seed meal 5661.0 Silage 278.7 Hay	242	2.03	295.9 cotton seed meal 2339.0 silage 115.0 hay	7.32

The table shows the results to be considerably in favor of the cotton seed meal, silage, and hay ration. The steers of Lot II made a slightly greater gain at a much lower cost. Since the amount of cotton seed meal fed to each steer was practically the same in both lots, the difference in favor of Lot II must be attributed to the silage and the small amount of hay. This is certainly a favorable showing for silage, to say the least. It is apparent that at current prices silage can be utilized to much better advantage than cotton seed hulls for fattening cattle.

Though the silage used in this experiment was composed chiefly of milo maize, it is reasonable to believe that silage made of Indian corn, kafir corn, or even sorghum would, at least, give equally as good results. It remains, however, for other experiments to determine definitely the relative values of the various kinds of silage for fattening cattle.



PLATE III. THE STEERS OF LOT I AT THE END OF THE EXPERIMENT.



PLATE IV. THE STEERS OF LOT II AT THE END OF THE EXPERIMENT.

MARKETING.

As previously stated, the ration test ended with the afternoon feed of April 4th. The final weights were taken early in the morning on April 5th, before the cattle were given anything to eat. On that day and until noon of the following day the steers in both lots were fed corn husks (shucks) in liberal quantity, preparatory to shipping, no other feed being given. On the afternoon of April 6th they were shipped to the Kansas City market, and were unloaded there about 6:00 p. m., April 8th. In order to ascertain the shrinkage that had occurred since the morning of April 5th, the steers of each lot were run across the scales immediately after being unloaded, before they were fed or watered.

A comparison of the weights is shown in the following table:

TABLE III.

Lot No.	Average weight at Clarendon.	Average weight at Kansas City.	Shrinkage.
One -----	1131 lbs.	1047 lbs.	84 lbs.
Two -----	1151 lbs.	1068 lbs.	83 lbs.

It will be observed that there was practically no difference in the shrinkage of the steers of Lot I and those of Lot II.

The two lots of steers were sold separately to Swift & Company on the morning of April 9th, having been supplied in the meantime with hay and water. They were weighed by the buyers at about 11:00 a. m.

A statement of the weights of the steers and the prices received for them is shown in the following table:

TABLE IV.

Lot No.	No. steers.	Average weight.	Price per cwt.	Amount.
One -----	15	1060 lbs.	\$6.75	\$71.55
Two -----	25	1083 lbs.	\$6.95	\$75.27

The table shows that the silage-fed steers sold for 20 cents per hundredweight more than the hulls-fed steers. By comparing this table with Table III it will be seen that the "fill" received by Lot I was 13 pounds per steer and that received by Lot II, 15 pounds per steer.

SLAUGHTER TEST.

Through the kindness of Swift & Company, slaughter records of the two lots were furnished us. Lot I dressed 58.45 per cent and Lot II 58.2 per cent, the difference being too small to be of importance.

The following communication from Swift & Company indicates their estimate of the cattle on the hooks:

SWIFT & COMPANY,
STOCK YARDS STATION,
KANSAS CITY, KANSAS.

April 12, 1912.

Prof. J. C. Burns, A. & M. College, College Station, Texas.

DEAR SIR: We attach herewith statement showing yield, etc., on cattle killed Wednesday, April 10, 1912.

Lot "I," 15 cattle, costing \$6.75 alive, were of a medium grade, 3 in this lot being on the "fair" order.

Lot "II," 25 cattle, costing \$6.95 alive, dressed out considerably better than Lot "I," there being but two slightly below the average flesh and quality of the whole lot.

These two lots of cattle are not what we consider a well finished bunch of cattle, but classify according to our grading as "fair to medium."

Yours respectfully,

SWIFT & COMPANY.

Per H. L. H.

Beef Department.

HLH-ECH.

FINANCIAL OUTCOME.

A statement of the initial cost per steer, the average cost of feed, the average expense in marketing, the average selling price, and the average net profit for each lot is shown in the following table.

TABLE V.

	Lot I.	Lot II.
Number of steers.....	15	25
Cost per steer at beginning of experiment.....	\$42.50	\$42.50
Cost of feed consumed per steer during experiment.....	23.715	17.72
Cost of shucks (\$6 per ton) consumed per steer preparatory to shipping.....	.08	.967
Freight charge per steer in marketing.....	3.46	3.46
Cost of yardage per steer on market.....	.25	.25
Cost of hay per steer on market.....	.375	.375
Commission per steer in selling.....	.50	.50
Total cost per steer.....	70.88	64.87
Selling price per steer.....	71.55	75.27
Net profit per steer.....	.67	10.40

The net profit of \$10.40 a head on the steers of Lot II as compared with the net profit of 67 cents a head on the steers of lot I shows that silage has a high value for beef production.

Neither the labor involved in feeding, on the one hand, nor the value of the manure, on the other, is included in the above statement. As a general rule, however, the value of the manure offsets the cost of labor in most feeding operations, a fact that should be more generally recognized.

SUMMARY.

1. Silage was a much cheaper feed than cotton seed hulls and yielded slightly larger gains.
2. There was practically no difference in the shrinkage of the two lots of steers in shipping.
3. There was practically no difference in the dressing percentage of the two lots.
4. The silage-fed steers showed considerably better finish and brought 20 cents a hundredweight more on the market than the hulls-fed steers.
5. The net profit on the silage-fed steers was \$10.40 a head and the net profit on the hulls-fed steers was 67 cents a head.

The results of this experiment seem to indicate that a ration of cotton seed meal and silage may be used far more profitably than a ration of cotton seed meal and cotton seed hulls for fattening cattle.