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FEEDING FOR BEEF.

E. R. LLOYD AND J. S. MOORE.

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Feeding for Beef.

On November 21, 1895, the Station began a series of experiments in feeding steers for the production of beef, the special features of the work being the testing of the feeding values of shredded corn fodder, and of the "Jack Bean" (*Canavalia ensiformis*), and for comparing them with rations of ordinary hays and cottonseed meal.

Thirty of the steers used in the work were three and four-year-old "Texans," which had been shipped here in September and which had been in pasture, with an additional ration of two pounds of cottonseed meal daily, during the month preceding the beginning of our work. Like most Texas steers, these were very wild and pugnacious, and on October 21 and 22 all of them were dishorned. This work was quickly and easily performed by the use of a "Leavitt" clipper, which cut the horns smoothly and close to the head, except in a few instances where the horn was too large, and from half an inch to an inch was left. Pine tar was applied to the cut surfaces and the wounds on nearly all of the animals bled but little and began to heal at once. Four of the animals bled somewhat profusely, and the wounds became quite offensive within a few days, but in those cases a second application of tar a week after the cutting was the only treatment needed to induce prompt and thorough healing. The effect of removing the horns was all that was necessary to render the animals quiet and to prevent any fighting or crowding while in the

feeding pens. The average weight of these steers at the beginning of the feeding tests was 704.8 pounds, and they were in fair condition as to flesh.

The remaining twenty-eight steers were "natives," nearly all of them having more or less Jersey blood, and as they had been accustomed to pen feeding they were not dishorned. They were two and three years old, and their average weight was 445.4 pounds. The weights given for both lots are the averages of two weighings, made on the two days before commencing the tests. Weights given for other dates are the averages of the weighings made on the dates named and on the previous day.

The feeding was conducted in a stable having stanchions for fifty-eight animals. The building was divided into twelve sections and each section opened into an adjoining yard where there was an abundant supply of water and room for exercise. The stanchions were not used during the test, and the animals were allowed to go in and out of the stable at will.

The shredded corn fodder was made from a crop of "Mosby" corn which was cut and shocked in the field on August 26. At that time it was riper than it should have been to make the best of fodder, nearly all of the grain being hard, and many of the leaves dry. On September 23 the corn was husked and the shocks were again tied and were allowed to stand until September 30 when the fodder was run through a "St. Albans" shredder, which cut and tore the stalks in pieces so thoroughly as to put them into excellent mechanical condition, the shredded mass being as fine and soft as ordinary hay. The shredded material was run into a shed where it made a pile twenty feet wide and twelve feet high and where it was allowed to lie a month before baling. None of it was injured by heating or moulding.

The silage was from corn on which the lower leaves were somewhat yellowed when put into the silo, on July 30. The crabgrass hay was from a volunteer growth on land

from which oats and vetches had been cut, and contained very little of any other grass. It was cut on July 25. The red clover was from a field cut May 20, and had been well cured without rain. The peavine hay was cut October 1, the vines being of the "Speckled" variety. The Jack Bean used in the work is an East Indian bean which has been cultivated in the southern part of the state for some years, principally as a curiosity. The plant has something the appearance of an ordinary Lima bean, growing from two to three feet high, quite bushy, and yielding thirty to forty bushels per acre of large white beans. The Station has had the bean in cultivation five years, and as its yield has been very heavy, and its chemical analysis showed it to be very rich in protein and carbohydrates, it was hoped that it might prove to be of value for feeding purposes. Air dry samples of all the feeding stuffs were taken at the beginning and at frequent intervals during the work, and the average analyses of these samples, made by W. R. Perkins, Assistant Chemist of the Station, were as follows:

ANALYSES OF FEEDING STUFFS.

	Moisture.	Crude Fiber.	Crude Protein.	Ether Extr't	Nitro'n Free Ext.	Ash
Shredded Corn	8.40	36.09	3.97	1.00	46.00	4.54
Silage	83.51	4.67	1.19	0.47	9.05	1.31
Crabgrass Hay	10.70	26.77	8.59	3.66	41.49	8.79
Peavine Hay	8.71	18.90	21.56	6.34	34.85	9.64
Red Clover Hay	8.20	20.90	17.13	5.41	40.07	8.29
Cottonseed Meal	9.33	6.39	41.48	9.29	26.35	7.16
Jack Bean Meal	11.48	8.75	23.75	2.65	50.37	3.00

In the feeding, the hay for each lot was weighed out separately every morning and divided between the morning and evening feedings, each lot being given all it would eat. The grain ration was weighed separately for each feeding. Waste of both hay and grain was collected and weighed separately, daily, and the weight of the waste was deducted from the gross amount of feed given before making the following tables. Lots marked 1, 2, 3, 4, 5, and 6 were the Texas steers, while those marked 1a, 2a, 3a, 4a, 5a, and 6a were the natives, the proportions of the feeds given the two lots having corresponding numbers being the same.

Lots 5a and 6a had four steers each, all other lots having five each.

Feeding was commenced on the morning of November 21, and was continued until the morning of January 3, a period of 44 days. After feeding for a short time it was found that the shredded corn fodder was so dry that none of the lots was eating it well, and after the morning of December 11 a small amount of ensilage was mixed with the feed for each lot during the remainder of the test. The figures given below represent the actual amounts of food consumed, but all of the ensilage was fed during the last 23 days of the tests. Results were as follows:

Lot 1.	lbs.
Av'ge amount food consumed	{ Shredded corn fodder, 229.8
	{ Silage.....194.6
	{ Cottonseed Meal.....260.8
Average weight at beginning.....	726.0 lbs.
“ “ “ close.....	768.4 “
“ gain.....	42.4 “

Lot 1a.	
Av'ge amount food consumed	{ Shredded corn fodder, 183.8
	{ Silage.....186.8
	{ Cottonseed Meal.....222.7
Average weight at beginning.....	423.4 lbs.
“ “ “ close.....	475.0 “
“ gain.....	51.6 “

Lot 2.	
Av'ge amount food consumed	{ Shredded corn fodder, 291.8
	{ Silage.....194.6
	{ Cottonseed meal..... 82.2
	{ Jack bean meal.....137.8
Average weight at beginning.....	712.0 lbs.
“ “ “ close.....	744.8 “
“ gain.....	32.8 “

Lot 2a.	
Av'ge amount food consumed	{ Shredded corn fodder, 193.0
	{ Silage.....170.8
	{ Cottonseed meal..... 67.7
	{ Jack bean meal.....116.2
Average weight at beginning.....	410.2 lbs.
“ “ “ close.....	423.6 “
“ gain.....	13.4 “

Lot 3.

Av'ge amount food consumed	{	Crabgrass hay.....	494.4
		Cottonseed meal.....	238.1
Average weight at beginning.....			681.0 lbs.
“ “ “ close.....			738.8 “
“ gain.....			57.8 “

Lot 3a.

Av'ge amount food consumed	{	Crabgrass hay.....	442.5
		Cottonseed meal.....	215.2
Average weight at beginning.....			418.0 lbs.
“ “ “ close.....			498.6 “
“ gain.....			80.6 “

Lot 4.

Av'ge amount food consumed	{	Crabgrass hay.....	431.5
		Cottonseed meal.....	73.2
		Jack bean meal.....	71.6
Average weight at beginning.....			703.6 lbs.
“ “ “ close.....			725.2 “
“ gain.....			21.6 “

Lot 4a.

Av'ge amount food consumed	{	Crabgrass hay.....	455.4
		Cottonseed meal.....	71.4
		Jack bean meal.....	92.7
Average weight at beginning.....			485.6 lbs.
“ “ “ close.....			531.4 “
“ gain.....			45.8 “

Lot 5.

Av'ge amount food consumed	{	Peavine hay.....	425.2
		Cottonseed meal.....	253.9
Average weight at beginning.....			681.6 lbs.
“ “ “ close.....			734.0 “
“ gain.....			52.4 “

Lot 5a.

Av'ge amount food consumed	{	Peavine hay.....	427.1
		Cottonseed meal.....	231.5
Average weight at beginning.....			480.2 lbs.
“ “ “ close.....			548.2 “
“ gain.....			68.0 “

Lot 6.

Av'ge amount food consumed	}	Red clover hay.....	402.8
		Cottonseed meal.....	253.7
Average weight at beginning.....		724.4 lbs.	
“ “ “ close.....		800.0	“
“ gain.....		75.6	“

Lot 6a.

Av'ge amount food consumed	}	Red clover hay.....	438.9
		Cottonseed meal.....	222.4
Average weight at beginning.....		455.2 lbs.	
“ “ “ close.....		523.0	“
“ gain.....		67.8	“

Lots 2 and 2a, fed with shredded corn and silage for hay and with bean and cottonseed meal for grain, made an average gain of only 46.2 pounds, while the check lots, 1 and 1a, having the same hay ration, but with pure cottonseed meal instead of part bean meal, made a gain of 92.0 pounds.

Lots 4 and 4a, fed with the mixed meal, gained only 67.4 pounds, while 3 and 3a, with the same hay and pure cottonseed meal, gained 138.4 pounds.

Lots 2, 2a, 4 and 4a, receiving bean meal, made an average gain of only 113.6 pounds, while the check lots, 1, 1a, 3 and 3a, with the same hays but with cottonseed meal, made a gain of 230.4 pounds. Three of the lots fed with bean meal made a smaller gain than did any of the lots receiving cottonseed meal, and the best of the bean meal lots, No. 4a, gained only 3.4 pounds more than did the poorest of the lots receiving cottonseed meal. It should be noted that the lots receiving bean meal were also fed cottonseed meal amounting to about one-third of their grain ration, and a large part of their small gain should doubtless be credited to the cottonseed meal and not to the bean meal.

The complete failure to secure profitable results from the use of the bean meal was a surprise and disappointment. Various methods of feeding were tried, both coarse and fine meal being used, and during a portion of the time the meal was cooked until it was thoroughly softened. At first very few of the steers would eat any of the meal, but were finally induced to do so by mixing it with salt and cottonseed meal, so that when the trial feedings began all

ate it fairly well, though not with much apparent relish. The meal which was eaten appeared to be very indigestible for all the animals, and the same was found to be the case when it was fed to milch cows, as will be shown in another bulletin, soon to be published.*

When tried on the table of one of our Station staff the beans were of fair quality, though rather coarse, and no one of the six persons who ate them experienced any ill effects from them.

Lots 1, 1a, 3 and 3a are comparable with 2, 2a, 4 and 4a to show the relative values of shredded corn fodder and silage as against crabgrass hay. Lots 1 and 1a, receiving shredded corn and silage, made a gain of 94 pounds, while lots 3 and 3a, with the same grain ration but with crabgrass hay in the place of the shredded corn and silage, made a gain of 138.4 pounds. Lots 2 and 2a, receiving shredded corn and silage, made a gain of 84.4 pounds, while lots 4 and 4a, with the same grain ration but with crabgrass in the place of shredded corn and silage, made a gain of only 67.4 pounds, which is the reverse of the results with the other lots. The whole of the four lots receiving shredded corn and silage made a gain of 178.4 pounds, while the four lots receiving crabgrass hay, with the same grain rations, made a gain of 205.8 pounds. The gross gain in this case is in favor of the crabgrass, but the lower cost of the shredded corn is an apparent compensation for this, though their actual relative values cannot be determined without further work.

Lots 5, 5a, 6 and 6a had the same grain rations, but different hays, 5 and 5a being fed with peavine, while 6 and 6a received red clover. The two lots receiving peavines made a gain of 120.4 pounds, while those receiving red clover gained 143.4 pounds, showing a decided advantage for the red clover hay.

If the different feeds are considered with reference to only single ingredients of the several rations, the average gains per steer were as follows:

Shredded corn and silage.....	35.1 lbs.
Crabgrass hay.....	51.5 "
Peavine hay.....	60.2 "
Red clover hay.....	71.7 "
Cottonseed meal.....	62.0 "
Bean meal.....	28.4 "

At the expiration of 44 days the hay feeds of lots 1, 2, 3 and 4, with their duplicates, was changed, the grain part of the ration remaining the same. This second period continued 12 days with the native steers and 32 days with the Texans, each lot being pronounced ready for market at the close of their terms of feeding.

With these changes of feeds lots 1 and 1a, which had made a gain of 1.07 pounds, made a daily gain of only .77 pounds when crabgrass hay was substituted for shredded corn and silage.

Lots 2 and 2a, which had made a daily gain of .53 pounds, made a daily gain of .48 pounds when crabgrass hay was substituted for shredded corn and silage.

Lots 3 and 3a, which had made a daily gain of 1.57 pounds, made a daily gain of 1.30 pounds when shredded corn and silage were substituted for crabgrass hay.

Lots 4 and 4a, which had made a daily gain of .77 pounds, made a daily gain of 1.02 pounds when shredded corn and silage were substituted for crabgrass hay.

If lots 1 and 2, with their duplicates, are taken together we find that during the first period, when they were fed with shredded corn and silage, they made an average daily gain of .80 pounds, and that the change to crabgrass hay reduced their gain to .63 pounds daily.

Lots 3 and 4, with their duplicates, which had made an average daily gain of 1.17 pounds when fed on crabgrass hay, made almost the same, 1.16 pounds, when shredded corn and silage were substituted for the hay.

Lots 5 and 6, with their duplicates, 5a and 6a, had no change of ration except that the cottonseed meal was increased to $7\frac{1}{2}$ pounds daily, as it was desired to feed them with the heaviest possible grain ration for their finish. On the increased meal ration lots 5 and 5a which had made a daily gain of 1.37 pounds when receiving 5.5 pounds of meal increased their gain to 2.18 pounds daily. Lots 6 and 6a which had made a daily gain of 2.63 pounds when receiving 5.4 pounds of meal, decreased their gain to .98 pounds when their meal ration was increased to 7.5 pounds. This large increase in the meal ration was evidently greater than the animals were able to assimilate, though none of them showed any indications of scouring or other digestive trouble.

During the entire period of feeding lots 5 and 5a fed with peavine hay and cottonseed meal, made an average gain of 1.64 pounds daily, while lots 6 and 6a, fed with red clover hay and cottonseed meal, made an average gain of only 1.41 pounds daily. These figures seem to indicate that peavine hay is better for feeding purposes than is red clover, but it should be remembered that as long as the smaller meal ration was fed the clover lots made the greater gain, and that only when the grain part of the ration was increased to more than is usually considered safe did those receiving peavine hay make the greater gain. In fact, it is doubtful if the last feeding period should be considered in this connection, and if comparisons are to be made between the gain of the two lots they should be for only the first period, when the clover fed animals made a gain of 1.63 pounds daily, while those fed with peavine hay gained only 1.37 pounds when receiving the same grain ration, or 1.64 pounds if the time when they received the larger grain ration is included.

If the different feeds are considered with reference to only single ingredients of the several rations, the average gains per day were as follows:

Shredded corn and silage.....	.92 lbs.
Crabgrass hay.....	1.20 "
Peavine hay.....	1.64 "
Red clover hay.....	1.41 "
Cottonseed meal.....	1.44 "
Jack bean and cottonseed meal.....	.76 "

SUMMARY.

1. *Shredded corn stalks need to have silage or some similar feed mixed with them to make them palatable.*

2. *Shredded corn stalks are inferior to either crabgrass, peavine, or red clover hay, though its less cost compensates for a part, or all, of the difference in feeding value.*

3. *Peavine hay is superior to either shredded corn or crabgrass, but not equal in feeding value to red clover hay.*

4. *The greatest gain, and the most profitable gain, was from feeding red clover hay.*

5. *Jack bean meal is not eaten with relish, and appears to be so indigestible as to be worthless.*

6. *Cottonseed meal was the cheapest, as well as the most effective grain ration used.*

7. *Five and one half pounds of cottonseed meal per steer per day was fed without injury, while seven and one half pounds was more than the steers could use to advantage.*