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DIVISION OF RANGE ANIMAL HUSBANDRY

(In cooperation with Bureau of Animal Industry,  
United States Department of Agriculture)

## STEER FATTENING INVESTIGATIONS



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The use of good quality feeder steer calves in the fall to clean up field aftermath; winter feeding with silage, cottonseed meal, and a limited allowance of grain; grazing Sudan grass during the spring and summer; and finishing in drylot during the following fall with grain ration resulted in the utilization of large amounts of roughage and relatively small amounts of grain in the production of finished yearling beef steers.

Ground ear corn had much greater value than ground hegari heads for fattening steer calves and yearlings. Ground ear corn produced more gain and a quicker and higher finish than ground hegari heads.

Ground hegari stover and ground Sumac fodder were practically equal in feeding value when used in fattening rations. The ground hegari stover produced slightly more gain but less finish than the ground Sumac fodder.

Supplementing Sudan grazing with liberal amounts of cottonseed cake increased the rate of gain about one-third pound per head daily and added finish so that the time required for fattening in drylot to good grade slaughter steers was lessened about thirty days.

Calcium supplements fed in wintering rations and during periods of Sudan grazing did not increase gain or finish. The feeding of 0.10 pound pulverized limestone per head daily with fattening rations in drylot increased gain nine per cent in each of two tests.

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## STEER FATTENING INVESTIGATIONS

by

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(Texas Agricultural Experiment Station, Division of Range Animal Husbandry, in Cooperation with Bureau of Animal Industry, United States Department of Agriculture)

Substation No. 1, where these experiments were conducted, is located in the upper coast prairie of Texas and is adjacent to the Rio Grande Plain and the Corpus Christi farming area. The great bulk of land in the Rio Grande Plain is used for cattle grazing while in the Corpus Christi area there is a very heavy concentration of cotton acreage and considerable acreages of various feed crops. In the upper coast prairie cotton and corn predominate in the cropping systems but much of the land is untilled, and livestock and livestock products make up a large part of the farm income, with cattle mostly of beef type being the most important. Grain sorghums are grown in addition to corn and with the sweet sorghums provide most of the farm supply of dry roughages and silage. Sudan grass is widely grown for temporary pasturage. Because of the wide interest in cattle and feed crops throughout both areas, the Beeville Station began work in 1930 to develop information on problems related to farm beef cattle production. The field of study has been limited largely to feeding for fattening which has been of such type as to take advantage of the feed resources of the small farm in the area. Roughage feeds and Sudan grazing have been extensively used in the program of developing and finishing a group of steers on the Station farm each year.

In developing and fattening steer calves and yearlings, several problems of feeding and management have been studied. This work has included studies of (1) the feeding values of ground ear corn vs. ground hegari heads and of ground Sumac fodder vs. ground hegari stover; (2) the value of calcium supplement in winter maintenance feeding, with Sudan grazing and in drylot fattening; and (3) the value of cottonseed cake as a supplement to Sudan grazing.

### FEEDING EXPERIMENT WITH CORN AND SORGHUMS

The object of the experiment was to determine the relative feeding values of (1) ground hegari heads and ground ear corn (shuck included), and (2) ground Sumac fodder (heads included), and ground hegari stover (heads removed).

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The experiment comprised a series of three feeding trials in which the comparisons were repeated. In the second and third trials a study of the influence of a calcium supplement was carried on in connection with the other comparisons.

**Feeds Used.**—The Sumac fodder and hegari stover were grown on the Station farm, but most of the hegari heads and ear corn were purchased from adjacent farms. Nearly all the corn used was of the white varieties. The analyses of feeds for the 1930-32 feeding trials are shown in Table 1.

Table 1. Analyses\* of feeds used in 1930-32 feeding trials

Feeds	Chemical Composition						Mineral Content		
	Protein	Fat	Crude Fiber	N. F. E.	Water	Ash	Insol. Ash	Calcium	Phosphorus
	%	%	%	%	%	%	%	%	%
<b>1930-31:</b>									
Ear corn.....	8.68	3.63	10.13	65.66	10.05	1.84	.49	.029	.262
Hegari heads.....	8.91	1.91	11.49	63.61	10.01	4.07	1.94	.129	.218
Cottonseed meal.....	44.99	7.13	9.94	26.60	6.10	5.24	.13	.164	1.018
Hegari stover.....	4.60	2.18	27.96	48.13	9.12	8.02	5.06	.357	.096
Sumac fodder.....	4.20	2.52	28.08	47.94	10.12	7.14	4.57	.343	.079
<b>1931-32:</b>									
Ear corn.....	9.25	3.22	9.62	66.29	10.25	1.37	.33	.021	.188
Hegari heads.....	9.46	2.04	8.10	66.51	10.69	3.20	1.84	.064	.188
Cottonseed meal.....	43.63	6.54	11.17	26.20	7.33	5.13	.04	.150	.891
Hegari stover.....	5.74	1.97	28.78	45.31	8.25	9.96	5.25	.407	.083
Sumac fodder.....	4.88	2.07	24.57	45.55	15.67	7.26	3.93	.300	.087

\*Supplied by Division of Chemistry, Texas Agricultural Experiment Station.

It is noted in Table 1 that the ear corn and hegari heads fed during the 1930-31 experiments were similar in composition except that the ear corn contained about 1.75 times as much fat as the hegari heads. The hegari stover and Sumac fodder were also quite similar in composition except that the Sumac fodder was appreciably higher in water.

**Method of Feeding.**—The ground ear corn or hegari heads, ground roughages, and cottonseed meal were mixed together and fed in open feed troughs twice daily. The steers were fed as much of the whole mixed ration as they would eat. The percentage of the grain in the ration was gradually increased as they continued on feed according to their condition. The 43% protein cottonseed meal was fed at an approximate rate of 3 pounds daily per 1,000 pounds liveweight. Perhaps larger gains would have resulted had the cottonseed meal been fed in greater amounts, since the rations were bulky and much of the roughages fed were of poor quality.

Granulated stock salt was fed free-choice. The pulverized limestone was mixed in the ration.

**Feed Prices Per Ton.**—The feeds used were charged to the steers at the average of current farm prices for the period of feeding. Table 2 lists the prices charged for feeds for each feeding trial.

It is observed that farmers valued ear corn higher than hegari heads, and Sumac fodder higher than hegari stover. The average rated percentage values of hegari heads to ear corn and of hegari stover to Sumac



Table 2. Feed prices per ton

	Year			Average
	1930-31	1931-32	1932	
Ground ear corn.....	\$ 17.11	\$ 9.56	\$ 9.00	\$ 11.89
Ground hegari heads.....	13.00	7.25	8.00	9.42
Ground Sumac fodder.....	11.00	6.00	5.25	7.42
Ground hegari stover.....	9.00	4.50	4.50	6.00
Cottonseed meal.....	31.00	20.00	17.00	22.67
Salt.....	20.00	20.00	20.00	20.00
Pulverized limestone.....	12.00	12.00	20.00	14.67

fodder for the three feeding trials were 79 per cent and 81 per cent, respectively.

### First Feeding Trial

Thirty good quality Hereford steer calves, average weight 428 pounds, were purchased in the vicinity of Beeville, Texas, at 8.4 cents per pound, and were delivered to the Station October 25, 1930. The calves gained an average of 54 pounds per head during a 32-day period of grazing on field aftermath with some supplemental feeding. After this time they were divided into three uniform groups of ten each and placed on feed in drylot. Table 3 is a record of the rations fed.

Table 3. Average daily rations\* and gains in pounds per head

Lot No.	Rations	1st 28 days	2nd 28 days	3rd 28 days	4th 28 days	5th 28 days	6th 14 days	Average 154 days
1	Ground ear corn.....	8.45	10.05	10.09	11.34	13.15	12.99	10.83
	Cottonseed meal.....	1.54	2.19	1.91	1.79	2.00	2.00	1.90
	Ground Simac fodder.....	7.52	7.01	6.36	6.08	4.87	4.85	6.21
	Total gain.....	74.60	54.89	58.89	66.33	53.89	8.22	316.82
	Average daily gain.....	2.66	1.96	2.10	2.37	1.92	0.59	2.06
2	Ground ear corn.....	8.45	10.05	10.10	11.34	13.15	13.41	10.87
	Cottonseed meal.....	1.45	2.19	1.91	1.79	2.00	2.00	1.90
	Ground hegari stover.....	7.38	6.83	6.50	6.15	5.57	5.34	6.39
	Total gain.....	76.84	56.30	59.00	54.40	57.80	18.74	323.08
	Average daily gain.....	2.74	2.01	2.11	1.94	2.06	1.34	2.10
3	Ground hegari heads.....	8.45	10.43	10.85	12.29	14.28	14.57	11.56
	Cottonseed meal.....	1.54	2.19	1.91	1.79	2.00	2.00	1.90
	Ground hegari stover.....	7.52	7.02	6.65	6.36	6.21	6.60	6.73
	Total gain.....	73.90	38.60	51.90	55.10	61.30	23.00	303.60
	Average daily gain.....	2.64	1.38	1.85	1.97	2.19	1.64	1.97

\*Based on feeds consumed. Each lot received .10 lbs. pulverized limestone per head daily.

The steer calves were started on feed quickly because they were accustomed to feed and were in good flesh when placed in the feedlot.

Representative samples of ear corn and hegari heads contained 78.3 per cent and 74.7 per cent of grain, respectively. Table 4 is a summary of the feeding trial.

**Discussion.**—Lot 2, which was fed ground ear corn, made 6 per cent and 15 per cent more gain on the basis of feedlot and market weights, respec-



FIGURE 1. Second growth kafir after being pastured by steer calves, 1930.



FIGURE 2. Feeder calves after 32 days of pasturage and supplemental feeding, at start of drylot fattening period, 1930-31. Average wt. 476 lbs.

tively, than Lot 3, which received ground hegari heads. Dressed yields of the two lots were practically equal but finish favored ground ear corn, as indicated by 5.2 per cent greater selling price, 1.8 pounds more internal fat per head, and higher carcass grades for Lot 2.

It required 13 per cent and 22 per cent more ground hegari heads than ground ear corn to produce a hundred weight of gain on the basis of feedlot and market weights, respectively.

Table 4. Summary first feeding trial, Nov. 26, 1930 to April 29, 1931—154 days

Lot number.....	1 9**	2 10	3 10
Number of steers.....			
Feeds.....	Ear corn Cottonseed meal Sumac fodder	Ear corn Cottonseed meal Hegari stover	Hegari heads Cottonseed meal Hegari stover
<b>Averages in pounds per steer:</b>			
Initial weight at feedlot.....	476	483	482
Final weight at feedlot.....	793	806	786
Market weight.....	757	757	720
Gain, basis feedlot weights.....	317	323	304
Gain, basis market weights.....	281	274	238
Daily gain, basis feedlot weights.....	2.06	2.10	1.97
Daily gain, basis market weights.....	1.82	1.78	1.54
Shrinkage enroute market, pounds.....	36	49	66
Shrinkage enroute market, per cent.....	4.85	6.03	8.43
Carcass weight, cold*.....	431	431	409
Dressing per cent, basis market weights.....	57.0	56.9	56.8
Carcass grades: (top medium to good).....	3	2	1
(medium).....	5	8	7
(fair).....	1		3
<b>Total feed consumed:</b>			
Ground ear corn.....	1668	1674	1780
Ground hegari heads.....			292
Cottonseed meal.....	292	292	
Ground Sumac fodder.....	957		
Ground hegari stover.....		984	1037
Salt.....	6.54	9.00	6.6
Pulverized limestone.....	15.9	14.9	14.9
<b>Feed required per cwt. gain, feedlot weights:</b>			
Ground ear corn.....	526	518	
Ground hegari heads.....			586
Cottonseed meal.....	92	90	96
Ground Sumac fodder.....	302		
Ground hegari stover.....		305	342
<b>Cost of feed per cwt. gain, feedlot weights.....</b>			
	\$ 7.59	\$ 7.20	\$ 6.84
<b>Cost of feed per cwt. gain, market weights.....</b>			
	8.57	8.47	8.76
<b>Financial Statement:</b>			
Cost into feedlot.....	\$ 39.99	\$ 40.53	\$ 40.50
Feed cost.....	24.23	23.46	20.93
Marketing cost.....	3.88	3.88	3.88
Total cost.....	68.10	67.87	65.31
Selling price per cwt.....	7.75	7.75	7.35
Amount received.....	58.64	58.67	52.88
Loss.....	9.46	9.20	12.43

\*Hot weight less 2%.

\*\*One steer died as a result of urinary calculi.

Feed prices per ton: Ground ear corn, \$17.11; ground hegari heads, \$13; ground Sumac fodder, \$11; ground hegari stover, \$9; cottonseed meal, \$31; salt, \$20; pulverized limestone, \$12.

The Lot 3 steers consumed 0.69 pound more hegari heads per head daily than Lot 2 consumed of ground ear corn. On the basis of 78.3 per cent and 74.7 per cent grain in ear corn and hegari heads, respectively, the

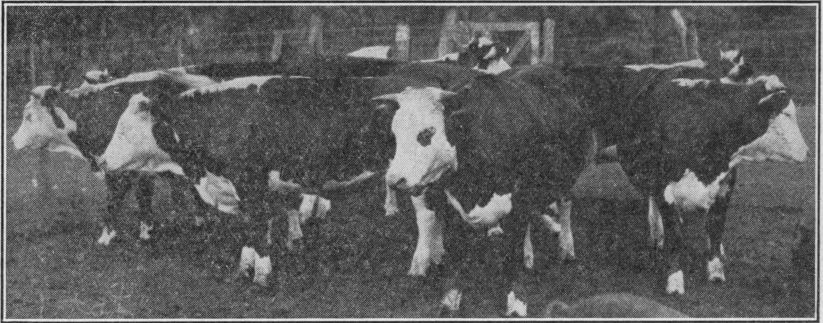


FIGURE 3. Lot 1 at close of drylot feeding, 1930-31. Average wt. 793 lbs. Compare with steers fattened in 1934-35.



FIGURE 4. Lot 2 at close of drylot feeding, 1930-31. Average wt. 806 lbs.

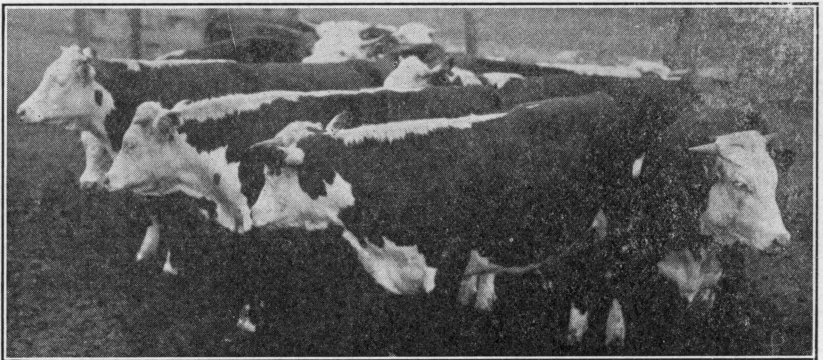


FIGURE 5. Lot 3 at close of drylot feeding, 1930-31. Average wt. 786 lbs.



Lot 3 steers received 18.3 pounds more grain per head in the 154 days of feeding.

The steers fed hegari heads (Lot 3) lost \$3.23 per head more than Lot 2, fed ground ear corn. The current farm feed prices rated hegari heads as of 24 per cent less value than ear corn, but with corn at \$17.11 per ton the two lots would have made the same financial return only if hegari heads had been charged at \$9.37 per ton, or 54.8 per cent of the price of the corn.

Ground Sumac fodder and ground hegari stover produced practically the same gain and finish. Prevailing farm prices rated Sumac fodder as 22 per cent more valuable. In this trial Sumac fodder could have been charged at 16 per cent higher price than hegari stover for the two compared lots, Lots 1 and 2, to make equal financial return, since more hegari stover than Sumac fodder was required in the production of 100 pounds of gain.

### Second Feeding Trial

Forty high-grade Hereford steer calves purchased in the vicinity of Alice, Texas, average weight 418 pounds, were divided into four uniform lots of ten each and placed on feed December 2, 1931. A record of their feeding is shown in Table 5.

Table 5. Average daily rations\* and gains in pounds per head

Lot No.	Ration	1st 28 days	2nd 28 days	3rd 28 days	4th 28 days	5th 28 days	6th 28 days	7th 14 days	Av. for 152 days
1	Ground ear corn.....	4.14	4.69	7.04	10.17	13.19	14.06	14.58	9.32
	Cottonseed meal.....	1.32	1.50	1.55	1.56	1.75	1.75	1.75	1.59
	Ground Sumac fodder.....	8.30	7.06	5.40	5.40	3.35	2.83	3.00	5.29
	Pulverized limestone.....	.10	.10	.10	.10	.10	.10	.10	.10
	Salt, oz.....	.40	.61	.48	.48	.46	.64	.38	.50
	Total gain.....	45.76	41.33	53.22	56.55	59.90	41.00	29.70	327.46
Average daily gain.....	1.63	1.48	1.90	2.02	2.14	1.46	2.12	1.80	
2	Ground ear corn.....	4.14	4.98	7.31	10.42	13.42	14.07	14.59	9.48
	Cottonseed meal.....	1.32	1.50	1.55	1.75	1.75	1.75	1.75	1.61
	Ground hegari stover.....	8.10	7.49	6.32	5.81	4.88	4.47	4.50	6.05
	Pulverized limestone.....	.10	.10	.10	.10	.10	.10	.10	.10
	Salt, oz.....	.19	.58	.32	.64	.72	.80	.32	.54
	Total gain.....	48.14	38.80	46.10	68.90	62.70	62.00	22.30	348.99
Average daily gain.....	1.72	1.39	1.65	2.46	2.24	2.21	1.60	1.92	
3	Ground hegari and kafir heads.....	3.95	4.67	7.30	10.42	13.43	14.34	15.09	9.49
	Cottonseed meal.....	1.32	1.50	1.55	1.75	1.75	1.75	1.75	1.61
	Ground hegari stover.....	8.91	8.37	7.64	6.48	5.50	5.50	5.20	6.92
	Pulverized limestone.....	.10	.10	.10	.10	.10	.10	.10	.10
	Salt, oz.....	.48	.74	.80	.96	.88	1.28	.46	.78
	Total gain.....	51.50	44.70	36.80	70.10	64.10	60.60	22.18	349.98
Average daily gain.....	1.84	1.60	1.31	2.50	2.29	2.16	1.58	1.92	
4	Ground hegari and kafir heads.....	3.95	4.67	7.30	10.42	13.43	14.34	15.09	9.49
	Cottonseed meal.....	1.32	1.50	1.55	1.75	1.75	1.75	1.75	1.61
	Ground hegari stover.....	8.00	8.25	7.83	6.48	5.50	5.50	5.20	6.79
	Salt, oz.....	.62	.98	.80	.80	.74	.48	.77	.74
	Total gain.....	46.40	39.60	37.40	64.00	53.20	52.90	26.68	320.18
	Average daily gain.....	1.66	1.41	1.34	2.29	1.90	1.89	1.91	1.76

\*Based on feeds consumed.

The supply of hegari heads was exhausted after the first 140 days of feeding, having been replaced by red kafir heads during the final 42 days of feeding.

Shelling and threshing percentages of representative samples of ear corn and heads (hegari and kafir) were 75 and 82.4, respectively. On this basis the groups fed ground heads received an average of .75 pound more grain per head daily than the groups fed ground ear corn. Table 6 is a summary of the feeding trial.

Table 6. Summary second feeding trial, Dec. 2, 1931, to June 1, 1932—182 days

Lot number.....	1	2	3	4
Number of steers.....	9**	10	10	10
Feeds.....	Ear corn	Ear corn	Hegari heads	Hegari heads
	Cottonseed meal	Cottonseed meal	Cottonseed meal	Cottonseed meal
	Sumac fodder	Hegari stover	Hegari stover	Hegari stover
	Limestone	Limestone	Limestone	.....
Averages in pounds per steer:				
Initial weight at feedlot.....	423	417	417	417
Final weight at feedlot.....	751	766	767	737
Market weight at Ft. Worth.....	709	715	719	686
Gain, basis feedlot weights.....	328	349	350	320
Gain, basis market weights.....	286	298	302	269
Daily gain, basis feedlot weights.....	1.80	1.92	1.92	1.76
Daily gain, basis market weights.....	1.57	1.64	1.66	1.48
Shrinkage enroute market, pounds.....	42	51	48	51
Shrinkage enroute market, per cent.....	5.57	6.69	6.30	6.97
Carcass weight, cold*.....	407	412	402	388
Dressing percentage, basis market wts.....	57.5	57.6	55.9	56.6
Carcass grades: Medium.....	2	3	1	.....
Low medium.....	5	5	7	9
Fair.....	2	2	2	1
Total feed consumed:				
Ground ear corn.....	1697	1726	.....	.....
Ground hegari and kafir heads.....	.....	.....	1726	1726
Cottonseed meal.....	289	294	294	294
Ground Sumac fodder.....	962	.....	.....	.....
Ground hegari stover.....	.....	1101	1260	1236
Pulverized limestone.....	18.2	18.2	18.2	.....
Salt.....	5.6	6.25	9.0	8.4
Feed required per cwt. gain, feedlot wts:				
Ground ear corn.....	518	495	.....	.....
Ground hegari and kafir heads.....	.....	.....	493	539
Cottonseed meal.....	88	84	84	82
Ground Sumac fodder.....	294	.....	.....	.....
Ground hegari stover.....	.....	316	360	386
Cost of feed per cwt. gain, basis feedlot weights.....				
.....	\$ 4.29	\$ 3.96	\$ 3.50	\$ 3.77
Cost of feed per cwt. gain, basis market weights.....				
.....	4.92	4.65	4.05	4.48
Financial Statement:				
Cots into feedlot at \$5.64 per cwt.....	\$ 23.87	\$ 23.51	\$ 23.54	\$ 23.53
Feed cost.....	14.06	13.84	12.24	12.06
Marketing cost.....	3.34	3.34	3.34	3.34
Total cost per steer.....	41.27	40.69	39.12	38.93
Receipts at \$5.50 per cwt.....	38.99	39.30	39.54	37.73
Profit or loss.....	-2.28	-1.39	0.42	-1.00

\*Hot weight less 2%.

\*\*One unthrifty steer removed.

Feed prices per ton: Ground ear corn, \$9.56; ground hegari and kafir heads, \$7.25; cottonseed meal, \$20; ground Sumac fodder, \$6; ground hegari stover, \$4.50; pulverized limestone, \$12; salt, \$20.



FIGURE 6. Lot 1 at close of feeding trial, 1931-32. Average wt. 751 lbs.

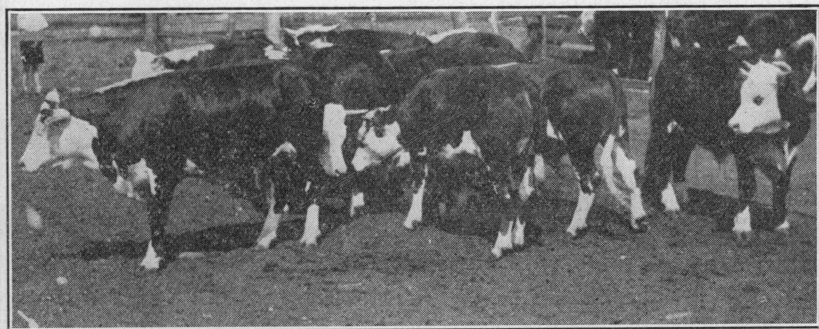


FIGURE 7. Lot 2 at close of feeding trial, 1931-32. Average wt. 766 lbs.

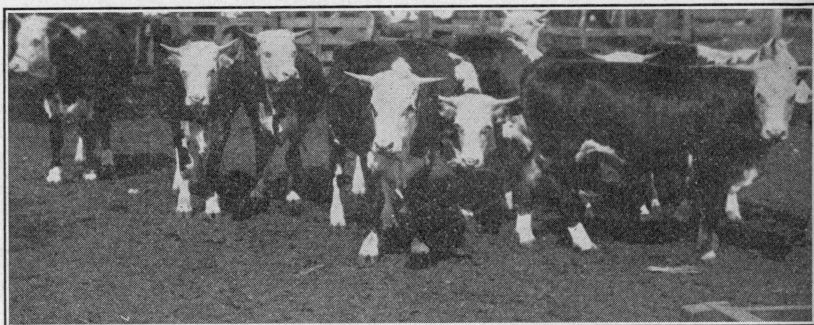


FIGURE 8. Lot 3 at close of feeding trial, 1931-32. Average wt. 767 lbs.

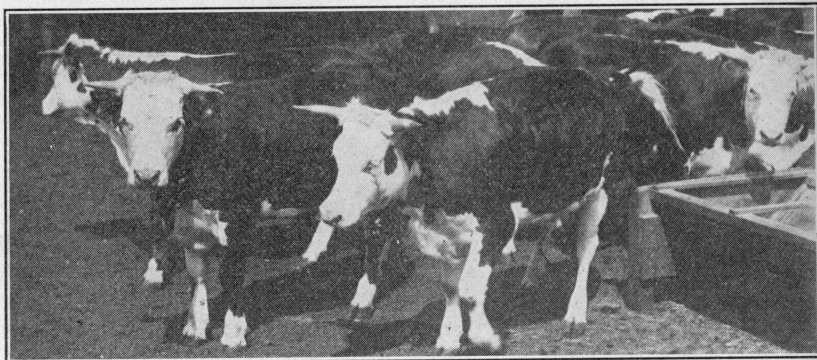


FIGURE 9. Lot 4 at close of feeding trial 1931-32. Average wt. 737 lbs.



**Discussion.**—As shown in Table 6, gains of Lots 2 and 3, fed ground ear corn and ground hegari heads respectively, were practically equal on the basis of feedlot and market weights; but Lot 2 carcasses averaged 10 pounds heavier and were of higher grade. The steers in the two lots were fed the same amounts of ear corn and hegari heads, 1726 pounds, but with 75 and 82.4 per cent grain in the respective feeds, Lot 3 received 128 pounds more grain per head than Lot 2. Both lots sold at the same price and with corn charged at 31 per cent higher price than the hegari heads, Lot 3 returned \$1.81 more per head. Had equal prices been charged for the two feeds, a slight advantage would have resulted for Lot 2 because of a lower consumption of roughage.

In the comparison between Lots 1 and 2, ground hegari stover produced slightly more gain and was more palatable than the ground Sumac fodder. It was charged at 25 per cent lower price than the Sumac fodder but at the same price for both roughages, financial return would have been practically equal for the two lots.

In the test with the calcium supplement (Lots 3 and 4), Lot 3, fed 0.10 pound pulverized limestone per head daily, gained an average of 30 pounds, or 9 per cent, more on the basis of feedlot weights, and 33 pounds, or 12 per cent, more on the basis of market weights.

### Third Feeding Trial

Thirty-six Medium grade Hereford steers, average weight 726 pounds, were used. At time of division into feedlot groups, 12 steers were in rather thin flesh and 24\* were in good flesh. The four feedlot groups were selected so that 6 fleshy steers and 3 thin steers were in each group. The thin steers did not finish with the fleshy steers and were fed for an additional 56 days. Table 7 presents a record of the feeding by periods for the 36 steers for the first 112 days.

Twenty-four of the thirty-six head used in the feeding trial had made large gains on Sudan pasturage. These gains probably reduced the rate of gain in the feedlot.

Table 8 gives a summary of this feeding trial for 112 days, but does not include the 12 thin steers, 3 steers in each lot, which required 56 days' additional feeding for fattening, except that the total feed consumed per head is given as an average for 9 steers instead of 6 steers.

The number of steers, 6 head per lot, and the length of feeding period, 112 days, were both insufficient for the results to be considered significant; however, the results were in general agreement with those of the two previous tests.

Lots 2 and 3, Table 8, are compared with respect to the feeding value of ground ear corn and ground hegari heads. Lot 2, fed ground ear corn and hegari stover, made a larger gain than any other lot and a much larger gain than Lot 3, fed ground hegari heads and hegari stover. Gain

\*Used in the first test of Sudan grazing with and without cottonseed cake.

Table 7. Average daily rations\* and gains in pounds per head

Lot No.	Ration	1st 28 days	2nd 28 days	3rd 28 days	4th 28 days	Av. for 112 days
1	Ground ear corn.....	9.04	12.64	16.11	19.47	14.32
	Cottonseed meal.....	2.13	2.49	2.56	2.51	2.42
	Ground Sumac fodder.....	14.51	9.98	8.05	6.69	9.81
	Pulverized oyster shell.....	.10	.10	.10	.10	.10
	Salt, oz.....	.26	.45	.32	.26	.32
	Total gain.....	46.40	56.00	64.80	58.00	225.20
	Average daily gain.....	1.66	2.00	2.31	2.07	2.01
2	Ground ear corn.....	9.04	12.64	16.11	19.47	14.32
	Cottonseed meal.....	2.13	2.49	2.56	2.51	2.42
	Ground hegari stover.....	13.86	9.42	8.01	7.75	9.76
	Pulverized oyster shell.....	.10	.10	.10	.10	.10
	Salt, oz.....	.26	.45	.32	.32	.34
	Total gain.....	50.00	63.70	56.80	67.30	238.70
	Average daily gain.....	1.82	2.27	2.03	2.40	2.13
3	Ground hegari heads.....	9.04	12.64	16.85	20.64	14.79
	Cottonseed meal.....	2.13	2.49	2.56	2.51	2.42
	Ground hegari stover.....	14.24	9.71	7.94	7.91	9.95
	Pulverized oyster shell.....	.10	.10	.10	.10	.10
	Salt, oz.....	.26	.45	.32	.38	.35
	Total gain.....	48.50	53.60	43.00	55.00	200.10
	Average daily gain.....	1.73	1.91	1.54	1.97	1.79
4	Ground hegari heads.....	9.04	12.64	16.85	20.66	14.80
	Cottonseed meal.....	2.13	2.49	2.56	2.51	2.42
	Ground hegari stover.....	14.30	9.93	8.35	8.35	10.23
	Salt, oz.....	.26	.45	.32	.45	.37
	Total gain.....	52.10	34.10	57.70	54.80	198.70
		Average daily gain.....	1.86	1.22	2.06	1.96

\*Based on feeds consumed.

for Lot 2 exceeded the gain for Lot 3 by 26 per cent on the basis of feedlot weights and 24 per cent on the basis of market weights.

In the comparison between Sumac fodder and hegari stover, Lots 1 and 2 respectively, Lot 2 had an advantage in gain of 10 per cent on basis of feedlot weights and 15 per cent on basis of market weights. Both lots sold at the same price but Lot 1 had slightly higher dressing percentage and was more desirable in carcass grade. This is a wider difference than shown in either of the previous trials.

In the test with calcium supplement, Lot 3, fed 0.10 pound pulverized oyster shell per head daily, made 3 per cent greater gain, basis feedlot weights, and 9.6 per cent on basis of market weights. There was little difference in finish as shown by carcass grades and dressed yields; however Lot 3 sold for slightly higher price so that financial return favored feeding the supplement by \$1.41 per head.

**Discussion and Results.**—The 26 steers fed ground ear corn in the three trials made an average of 6 per cent and 9 per cent more gain on the basis of feedlot and market weights respectively than the 26 steers fed the ground hegari heads. The average carcass weights were 21 pounds or 5 per cent greater for the steers fed corn, being 10 pounds greater even in the second

Table 8. Summary, third feeding trial, Aug. 19 to Dec. 9, 1932—112 days

Lot number.....	1	2	3	4
Number of steers.....	6	6	6	6
Feeds.....	Ear corn Cottonseed meal Sumac fodder Oyster shell	Ear corn Cottonseed meal Hegari stover Oyster shell	Hegari heads Cottonseed meal Hegari stover Oyster shell	Hegari heads Cottonseed meal Hegari stover
<b>Averages in pounds per steer:</b>				
Initial weight at feedlot.....	782	788	782	787
Final weight at feedlot.....	1009	1037	980	979
Market weight at Ft. Worth.....	943	973	931	923
Gain, basis feedlot weights.....	227	249	198	192
Gain, basis market weights.....	161	185	149	136
Daily gain, basis feedlot weights.....	2.03	2.22	1.77	1.71
Daily gain, basis market weights.....	1.44	1.66	1.33	1.21
Shrinkage enroute market, pounds.....	66	64	49	56
Shrinkage enroute market, per cent.....	6.54	6.13	4.97	5.74
Carcass weight, cold*.....	555	570	535	531
Dressed yield, basis market weights.....	58.8	58.6	57.5	57.6
Carcass grades: Medium to good.....	2	3	1	3
Medium.....	3	3	3	3
Fair.....	1	3	2	3
<b>Total feed consumed:</b>				
Ground ear corn.....	1603	1603	.....	.....
Ground hegari heads.....	.....	.....	1657	1657
Cottonseed meal.....	271	271	271	271
Ground Sumac fodder.....	1098	.....	.....	.....
Ground hegari stover.....	.....	1093	1114	1146
Pulverized oyster shell.....	11.2	11.2	11.2	.....
Salt.....	2.2	2.3	2.4	2.6
<b>Feed required per cwt. gain, feedlot wts:</b>				
Ground ear corn.....	704.6	643.8	.....	.....
Ground hegari heads.....	.....	.....	837.3	863.9
Cottonseed meal.....	119.1	108.8	136.9	140.8
Ground Sumac fodder.....	482.6	.....	.....	.....
Ground hegari stover.....	.....	439	562.9	597.5
Cost of feed per cwt. gain, feedlot weights \$	5.51	4.86	5.85	6.02
Cost of feed per cwt. gain, market weights	7.76	6.53	7.75	8.51
<b>Financial Statement:</b>				
Cost into feed lot at \$2.9545.....	\$ 23.10	\$ 23.28	\$ 23.09	\$ 23.25
Feed cost.....	12.53	12.11	11.57	11.54
Marketing cost at \$0.472 per cwt.....	4.45	4.50	4.39	4.35
Total cost.....	40.08	39.88	39.05	39.14
Selling price per cwt.....	4.75	4.75	4.625	4.50
Amount received.....	44.81	46.23	43.05	41.51
Profit.....	4.73	6.25	4.00	2.37

\*Hot weight less 2% shrinkage.

Feed prices per ton: Ground ear corn, \$9.00; ground hegari heads, \$8; cottonseed meal, \$17; ground Sumac fodder, \$5.25; ground hegari stover, \$4.50; pulverized oyster shell, \$20; salt, \$20.

feeding trial when hegari-fed steers showed equal gain on basis of both feedlot and market weights.

The ground ear corn produced quicker finish and more finish as shown by higher dressing percentages, higher grades of carcasses, and slightly higher selling price.

In the three feeding trials it required an average of 13 per cent more ground hegari heads than ground ear corn to produce 100 pounds of gain on basis of feedlot weights and 16 per cent more on basis of market weights.

For the three feeding trials, on basis of market weights and prices, hegari heads needed to be priced an average of 28 per cent less than ear

corn to make equal financial return. During the period in which these tests were conducted the average farm price per ton of ear corn was 26 per cent greater than that of hegari heads.

The average farm price for Sumac fodder was 24 per cent greater than that of hegari stover during the three tests. Results show that the two roughages were practically equal in value. Hegari stover was more palatable and produced slightly more gain, but not quite as much finish as Sumac fodder.

The feeding of 0.10 pound pulverized limestone or pulverized oyster shell per head daily increased gain approximately 9 per cent in each of the two tests, one with fattening calves 184 days and the other with long-aged yearling steers fed 112 days, but made no appreciable increase in finish.

Financial results were decidedly unfavorable for the first two years of feeding when feeder steer calves were purchased and fattened in drylot. The steer yearlings fed after a period of Sudan grazing in 1932 returned a profit.

#### SUDAN GRAZING WITH AND WITHOUT COTTONSEED CAKE IN FATTENING YEARLING STEERS

The grazing trials herein reported were planned to determine (1) whether Sudan grazing should be supplemented with cottonseed cake when grazed by yearling steers, and (2) whether calcium supplements should be included in rations during the development of calves into fattened yearlings.



FIGURE 10. Sudan grass of desirable growth for grazing.

Large amounts of roughage have been used in producing fattened steer yearlings at this Station. High grade feeder steer calves are purchased in the fall. They are used to clean up crop aftermath and are winter fed on silage and dry roughages supplemented by cottonseed meal and a limited amount of grain. Sudan grazing becomes available in April and provides pasturage until late summer. When the Sudan grazing is exhausted the yearling feeders are finished in drylot.



In order to complete the information gained by feeding the calcium supplement during winter maintenance, grazing, and drylot fattening periods, samples of harvested feeds, Sudan grass, and native grasses were analyzed for chemical composition including mineral content. The soils from which the samples were collected were of the Goliad series under which caliche is found at depths of 1 to 4 feet. However, neither the soils nor subsoils, as a rule, are calcareous in their reaction to hydrochloric acid above the caliche.

### First Trial (May 12 to July 7, 1932—56 days)

This study began in the spring of 1932 with the purchase of a group of Medium grade, thin-fleshed Hereford steers. Twenty-four steers used in the test out of 36 purchased averaged 581.5 pounds per head when started on Sudan grazing. They were divided as equally as possible into two groups of 12 head each, one group receiving an average of 1.52 pounds of cottonseed cake per head daily for the 56-day grazing period. Each steer had approximately one acre of Sudan grazing. Table 9 is a record of the Sudan grazing period.

The large gain made the first 28 days included much fill since the steers were quite thin when started on grazing.

Table 9. Sudan grazing test: Average daily rations and gains in pounds per head, May 12 to July 7, 1932

Ration	5/12—6/9 28 days	6/9—7/7 28 days	Average 56 days
<b>Lot 1, 12 Head:</b>			
Sudan grazing.....			
Salt, oz.....	.43	.78	.605
Pulverized oyster shell, oz.....	.11	.14	.125
Total gain.....	83.1	38.6	121.7
Average daily gain.....	2.97	1.38	2.18
<b>Lot 2, 12 Head:</b>			
Sudan grazing—alternating weekly on same Sudan pastures as Lot 1..			
Cottonseed cake (43% protein).....	1.16	1.86	1.51
Salt, oz.....	.35	.82	.58
Pulverized oyster shell, oz.....	.06	.03	.04
Total gain.....	84.1	43.0	127.1
Average daily gain.....	3.0	1.54	2.25

The steers receiving cottonseed cake gained 127 pounds per head in 56 days; those with Sudan grazing alone 121.7 pounds. The cottonseed caked steers received 85 pounds of cake per head and made only 6.4 pounds more gain per steer. There was no visible difference in finish. On basis of gain, it did not pay to feed such an amount of cottonseed cake during this short grazing period. In an ensuing 112-day drylot fattening period, both lots made the same approximate gain and yielded carcasses of practically identical grade.

This test was inconclusive as to the value of feeding cottonseed cake with Sudan grazing, but indicated in connection with the analyses of sam-

ples of Sudan grass collected during the grazing season that larger amounts of cottonseed cake would be required to effect any appreciable difference in gains.

### Second Trial

In the second Sudan grazing trial cottonseed cake was nearly full-fed for a 108-day period, April 27 to August 13. During this period the Sudan grazing was sufficient to produce gains without the supplement of cottonseed cake. The cottonseed cake was fed in large amount because in the first grazing trial (1932) no advantage resulted from feeding 1.51 pounds of cottonseed cake per head daily during a 56-day period.

**Cattle.**—Thirty-four good grade Hereford steer calves were purchased in August 1932 in the vicinity of Beeville, Texas. These 416-pound calves were grazed on the Sudan fields from September 2 to November 28, 1932. Except for the first 28 days of this period, they were fed a small amount of supplementary feed.

The calves were started on a fattening test but, following treatment for stomach worm infestation, the test was abandoned February 3, 1933 and a maintenance ration was fed until the beginning of the Sudan grazing trial, April 27. During the 237 days, September 2 to April 27, the calves were fed an average of 1.6 pounds ground ear corn and ground hegari heads mixed, 1.4 pounds cottonseed meal, and 8.2 pounds roughage per head daily. They gained 236 pounds per head and entered the grazing test at an average weight of 652 pounds.



FIGURE 11. Feeder steer calves, fall 1932. Average wt. 416 lbs., used in second Sudan grazing trial, April 27 to December 13, 1933.



FIGURE 12. Calves heavily infested with stomach worms before treatment, February 1933. From group of calves shown in FIGURE 11.



FIGURE 13. Feeders as shown in FIGURE 11, close of wintering period and after treatment for stomach worms, ready to start on Sudan grazing. Average wt. 652 lbs. Compare with FIGURE 12.

**Treatment Given for Internal Parasites.\***—Scouring and losses in weight were noted among a number of the calves soon after they were received. The trouble was not definitely recognized until in February when post-mortem examination of one calf revealed an infestation of stomach worms. The calves, then averaging 550 pounds, were given 300 cc per head of a solution containing 1.75% copper sulphate and 0.8% nicotine sulphate. This treatment was repeated 2 weeks later. During the period August 14 to September 7, as 800- to 850-pound yearlings, they were drenched three times at 10-day intervals with 500 cc per head of the same solution. The steers improved rapidly after the treatments in February. No stomach worms were found when the steers were slaughtered in December.

#### Grazing Period (April 27 to August 13, 1933—108 days)

The 34 steer yearlings, average weight 652 pounds, were divided into two equal groups and started on Sudan grazing April 27, 1933. Lot 2 steers were fed nearly as much 43% protein cottonseed cake as they would eat. Beginning with 2 pounds per head daily, gradual increases were made to 6 pounds daily, the average daily consumption being 4.64 pounds per head for the 108-day grazing period. Lot 1 received Sudan grazing only. Table 10 is a record of the feeding and gains during the period.

**Table 10. Sudan grazing period: Average daily rations and gains in pounds per head**

Ration	4/27- 5/25 28 days	5/25- 6/22 28 days	6/22- 7/20 28 days	7/20- 8/13 24 days	Av. for 108 days
<b>Lot 1, 17 head:</b>					
Sudan grazing.....					
Salt, oz.....	.27	.42	.30	.34	.33
Pulverized oyster shell, oz.....	.034	.13	.04	.03	.06
Total gain.....	14.3	61.2	32.4	39.9	147.7
Average daily gain.....	.51	2.18	1.16	1.66	1.37
<b>Lot 2, 17 head:</b>					
Sudan grazing—alternating weekly on same Sudan pastures as Lot 1.....					
Cottonseed cake†.....	2.96	4.21	5.57	6.0	4.64
Salt, oz.....	.18	.43	.13	.21	.24
Pulverized oyster shell, oz.....	.014	.10	.03	.12	.06
Total gain.....	35.7	60.5	70.6	26.4	193.1
Average daily gain.....	1.28	2.16	2.52	1.10	1.79

The granulated salt and pulverized oyster shell were supplied free choice in separate small troughs. The steers had little desire for the oyster shell at any time and consumed very little of it. The Sudan grazing became scant toward the close of the grazing period but was sufficient for the steers to obtain good fills. Weights, gains, and a financial statement based on current feed prices and costs are presented in Table 11.

\*Under the direction of the Division of Veterinary Science, Texas Agricultural Experiment Station

†Consumed.



Table 11. Summary of Sudan grazing period, April 27 to Aug. 13, 1933—108 days

Lot number.....	1	2
Number of steers.....	17	17
Treatment.....	Sudan grazing only	Cottonseed cake and Sudan grazing
Averages in pounds per steer:		
Initial weight.....	654	651
Final weight.....	802	844
Gain.....	148	193
Daily gain.....	1.37	1.79
Total feeds fed:		
Sudan grazing, acres.....	1.12	1.12
Cottonseed cake.....		500.7
Salt, granulated.....	2.25	1.62
Pulverized oyster shell.....	.41	.43
Cost per cwt. gain.....	\$ 3.47	\$ 4.72
Financial Statement:		
Initial cost.....	\$ 28.07	\$ 27.91
Initial cost per cwt.....	4.29	4.29
Total feed cost.....	5.12	9.12
Total cost close of grazing period.....	33.19	37.03
Total cost close of grazing period, per cwt.....	4.14	4.39

Feed prices per ton: Cottonseed cake, \$16; salt, \$17; pulverized oyster shell, \$12.50; Sudan grazing per acre, \$4.55

Two separate fenced areas were used and the two groups were alternated on these pastures at weekly intervals.

The cost of \$4.55 per acre for Sudan grazing includes land rent at \$3.00 per acre and \$1.55 per acre for labor and seed. Each steer had 1.12 acres of Sudan grazing which was sufficient to produce gains throughout the 108-day grazing period. The gains made on the Sudan grazing charged at then current prices for stocker steers more than paid the grazing charge of \$4.55 per acre.

The steers that received cottonseed cake on Sudan grazing made 45.1 pounds more gain per head and showed more finish than the steers on Sudan alone. The cost of gain produced by Sudan grazing alone was \$3.47 per cwt. as compared with \$4.72 per cwt. for the gain produced by Sudan grazing with cottonseed cake.

Both groups of steers could have been marketed as grass fat yearlings or as fleshy feeders but in order to realize some advantage from the finish already obtained and to further measure the effect of feeding cottonseed cake on Sudan grazing it was considered desirable to add finish by grain feeding in drylot.

#### Finishing Period in Drylot (Aug. 14 to Dec. 13, 1933—122 days)

The close of the Sudan grazing period was the beginning of the feedlot fattening period. The steers were fed in drylot to obtain marketable finish as grain-fed yearlings. During the preliminary feedlot period, August 14 to September 7 (Table 12), the steers were treated for stomach worm infestation manifested during the latter part of the grazing period which accounts for the low gains for this period.

Table 12. Finishing period: Average daily rations\* and gains in pounds per head

Ration	8/14- 9/7 24 days	9/7- 10/5 28 days	10/5- 11/2 28 days	11/2- 11/21 19 days	11/21- 12/13 23 days	Av. 99 days	Av. 122 days
<b>Lot 1, Sudan only:</b>							
Ground ear corn.....			12.8	19.4	19.5	7.3	10.0
Ground hehari heads.....	4.5	16.8	10.5			8.8	7.2
Cottonseed meal.....	1.9	3.0	3.0	3.0	3.0	2.7	2.8
Chopped hehari stover.....	9.7	10.6	2.2	9.3	5.7	7.8	7.5
Salt, oz.....	.8	.6	.58	.24	.2		.5
Total gain.....	37.8	43.7	37.0	61.9	23.1	181.4	204.5
Average daily gain.....	1.58	1.56	1.35	3.26	1.0	1.83	1.68
<b>Lot 2, Cottonseed Cake and Sudan:</b>							
Ground ear corn.....			13.4	19.4		7.5	
Ground hehari heads.....	4.5	16.8	10.5			8.8	
Cottonseed meal.....	2.3	3.0	3.0	3.0		2.8	
Chopped hehari stover.....	9.4	10.8	2.7	9.1		7.8	
Salt, oz.....	.75	.65	.53	.10		.53	
Total gain.....	22.1	61.4	24.7	55.9		174.1	
Average daily gain.....	.92	2.19	1.24	2.94		1.76	

\*Based on feeds consumed.

It will be noted from Table 12 that the steers on Sudan grazing only were fed in drylot 23 days longer than the steers which received cottonseed cake with Sudan grazing. This was done in order to obtain approximately the same amount of finish for both groups. A summary of the drylot fattening period is given in Table 13.

Slaughter data were not obtained for Lot 1. The dressed yield of 58.7 per cent for Lot 2, on the basis of cold carcass and market weights, indicates Medium grade slaughter steers. The feed cost and cost per cwt. of gain were less for Lot 2 because of the shorter drylot finishing period, 99 days as compared with 122 days, and because their grain feed consisted of a larger percentage of the lower costing hehari heads. The ground ear corn was fed in the latter part of the feeding period.

With a slight advantage in total gain (Sudan grazing and drylot feeding periods combined), a shorter feeding period in drylot, lower feed cost, and a slightly higher selling price, the steers fed cottonseed cake with Sudan grazing returned \$1.93 per head more than the steers which had Sudan only.

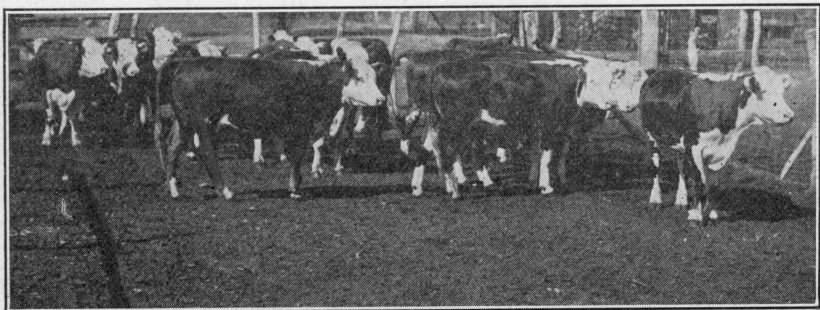


FIGURE 14. Lot 1. Feeder yearlings at close of 108-day Sudan grazing period with no supplementary feed, going into drylot fattening period. Average wt. 802 lbs. (Shown as feeder calves in FIGURE 11.)

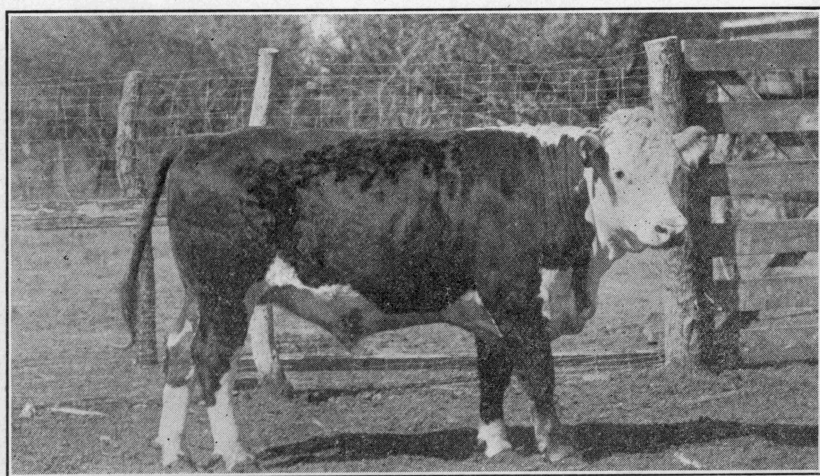


FIGURE 15. The fattest steer in Lot 1 (FIGURE 14). A few steers had good finish.

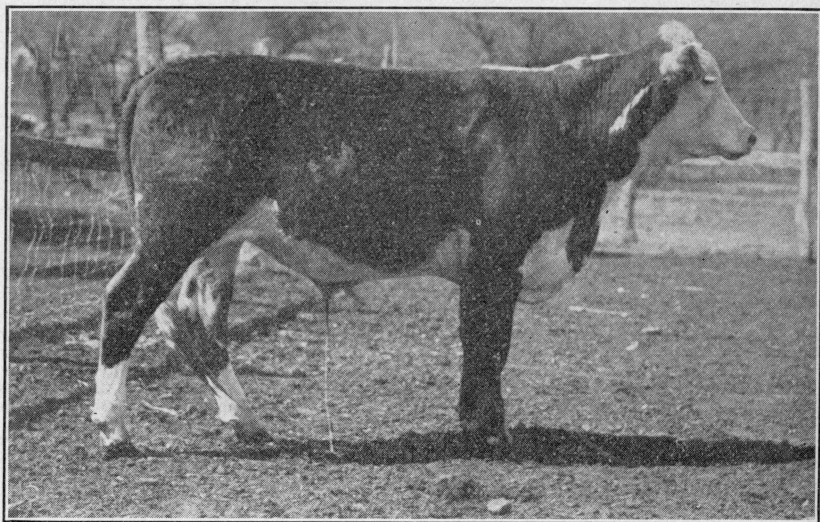


FIGURE 16. The thinnest steer in Lot 1 (FIGURE 14).

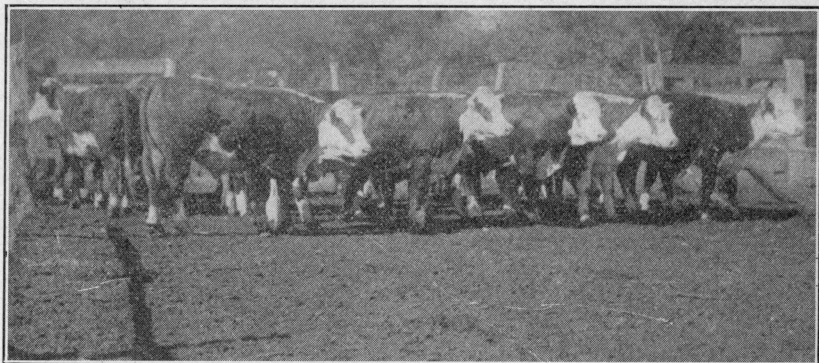


FIGURE 17. Lot 2. Feeder yearlings at close of 108-day Sudan grazing period with 4.65 lbs. cottonseed cake per head daily as a supplement, going into drylot fattening period. average wt. 844 lbs. (Shown as feeder calves FIGURE 11.) This lot was uniform in finish.



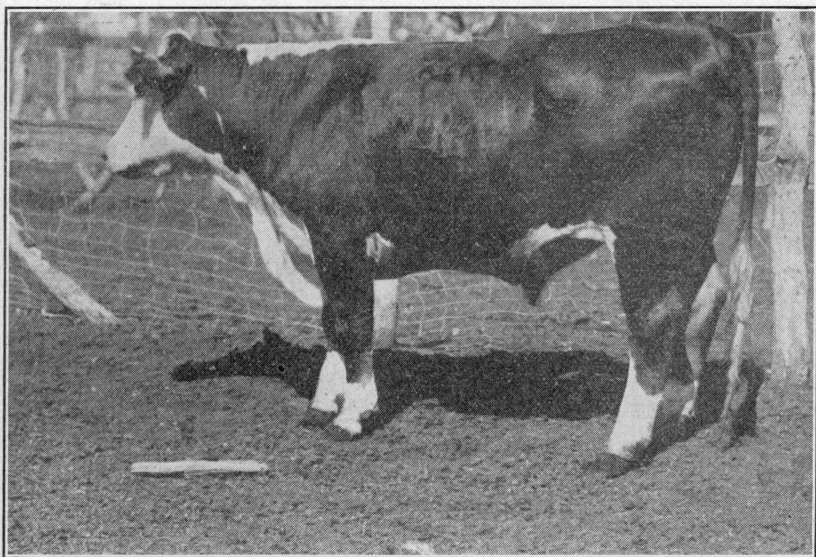


FIGURE 18. The fattest steer in Lot 2 (FIGURE 17).

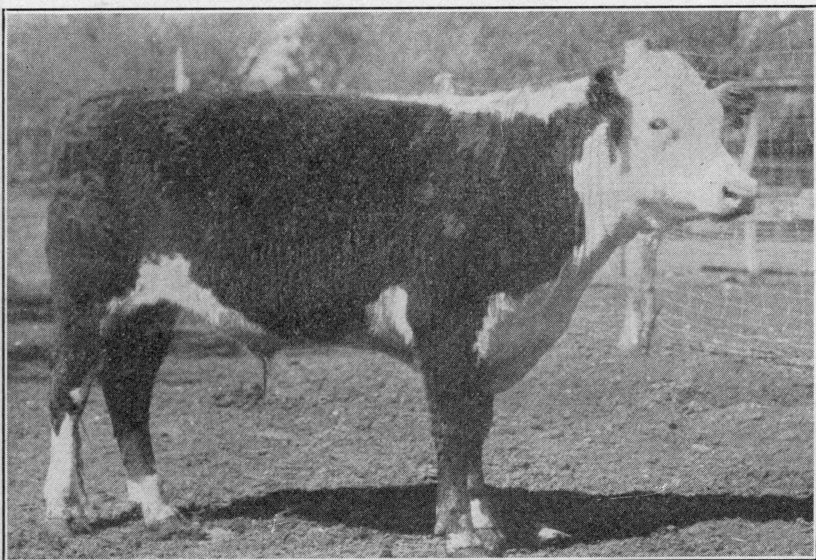


FIGURE 19. The thinnest steer in Lot 2 (FIGURE 17).



FIGURE 20. Lot 1 at close of 122-day drylot feeding period, ready for market. (Shown in FIGURE 11 as feeder calves, in FIGURE 13 as started on Sudan grazing, in FIGURE 14 at close of Sudan grazing.)

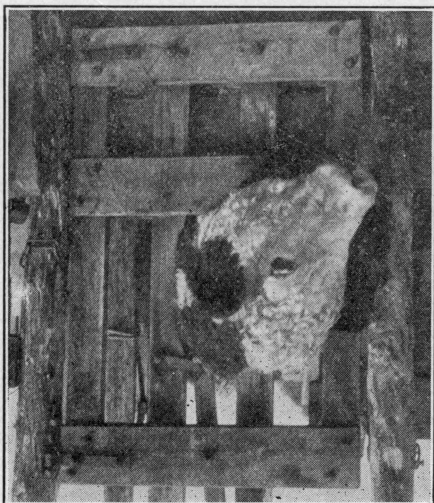


FIGURE 21. Head squeeze designed by Grover Impson, Beeville, Texas, used in measuring, drenching, or other handling of steers at Beeville Station.

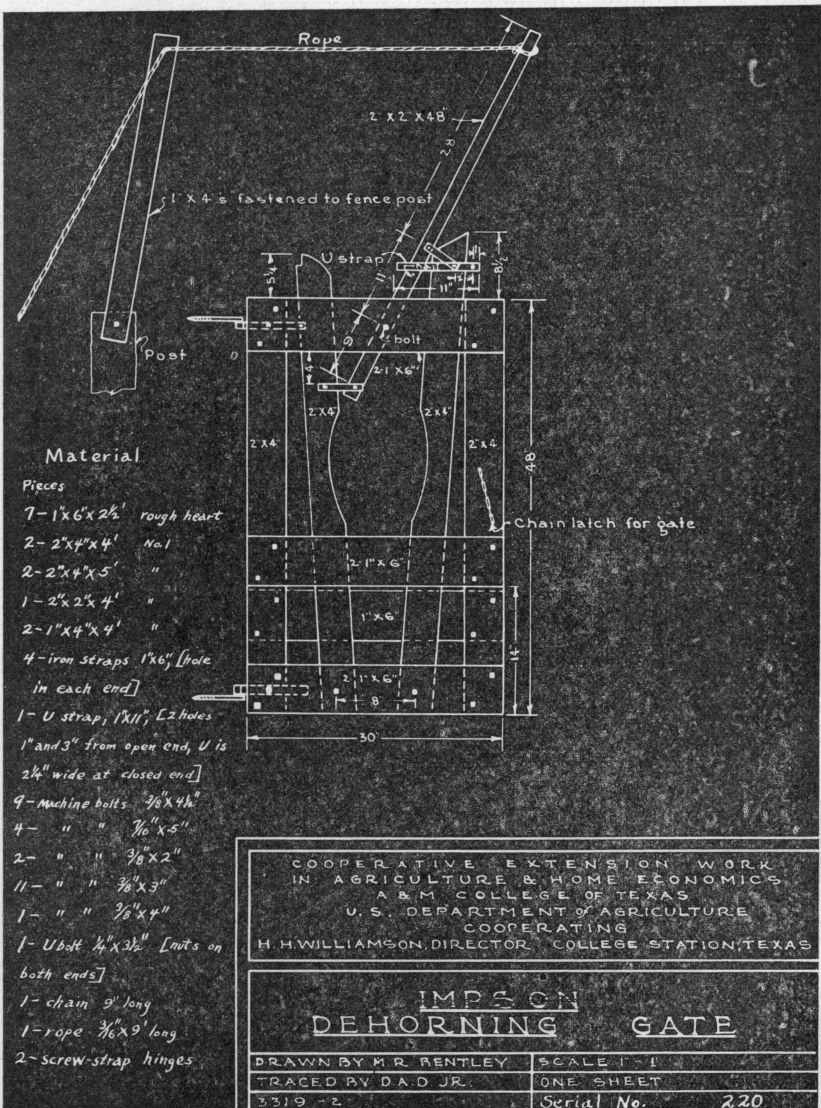


FIGURE 21-A. Drawing and specifications of dehorning gate.

Table 13. Summary of finishing period in drylot, Aug. 19 to Dec. 13, 1933—122 days

	1 17 Sudan grazing only	2 17 Cottonseed cake and Sudan grazing 99
Lot number.....		
Number of steers.....		
Previous treatment.....		
Number of days fed in drylot.....	122	
Averages in pounds per steer:		
Initial weight at feedlot.....	802	844
Final weight at feedlot.....	1006	1018
Market weight at San Antonio.....	966	971
Gain, basis feedlot weights.....	204	174
Gain, basis market weights.....	164	127
Daily gain, basis feedlot weights.....	1.68	1.76
Daily gain, basis market weights.....	1.34	1.29
Shrinkage enroute market, lbs.....	40.6	46.7
Shrinkage enroute market, per cent.....	4.03	4.59
Carcass weight, cold*.....		570
Dressed yield, basis market weights.....		58.7
Total feeds consumed:		
Ground hegari heads.....	87	79
Ground ear corn.....	1219	744
Cottonseed meal.....	347	281
Ground hegari stover.....	917	773
Salt, granulated.....	3.8	3.3
Rejected feed (hegari stover).....	86	60
Feeds required per cwt. gain, feedlot weights:		
Ground hegari heads.....	427	501
Ground ear corn.....	596	427
Cottonseed meal.....	170	161
Ground hegari stover.....	448	444
Cost of feed per cwt. gain, basis feedlot weights.....	\$ 10.43	\$ 9.39
Cost of feed per cwt. gain, basis market weights.....	13.02	12.83
Financial Statement:		
Cost into feedlot.....	\$ 33.19	\$ 37.03
Feed cost, including rejected feed.....	21.35	16.36
Marketing cost.....	2.50	2.50
Total cost.....	57.04	55.89
Selling price per cwt.....	5.30	5.35
Amount received.....	51.19	51.96
Loss.....	5.85	3.93

Feed prices per ton: Ground hegari heads, \$13; ground ear corn, \$17; cottonseed meal, \$16; chopped hegari stover \$5; salt, \$17.

\*Hot weight less 2% shrinkage.

### Third Trial—Using Limestone Supplement

In this test, the amount of cottonseed cake fed was limited only by the appetites of the steers. The steers used in the Sudan grazing test were also used in a study of calcium supplement in rations during the development of feeder calves into fattened yearlings. This phase of the test included (1) a wintering period, December 14, 1933 to April 26, 1934, 133 days; (2) the Sudan grazing period, April 26 to August 25, 1934, 121 days; and (3) a finishing period in drylot, August 25 to December 22, 1934, 118 days.

**Cattle.**—Forty-two Medium to Choice grade Hereford steer calves were purchased in November 1933 in the Beeville area. During the preliminary feeding period, November 15 to December 14, 1933, the calves were vaccinated with blackleg aggrassin, and dehorned. They had practically recov-



ered from the dehorning when divided into two equal groups of 21 head each and placed on test December 14, 1933, at an average weight of 485 pounds.

### Winter Feeding Period (December 14 to April 26)

**Pulverized Limestone in Wintering Rations.**—All steers were fed alike on a mixture of roughages consisting of ground hegari and kafir stover, Sumac fodder, ground cotton stalks, and hegari and Sumac silage. Some of the dry roughages had been weather damaged. Some of the silage was overmature and some was from an immature fall grown crop, but it was chopped into 6- to 8-inch lengths when fed. The cotton stalks contained some opened and unopened bolls but had very few leaves. Two pounds of 43% protein cottonseed meal and 2 pounds ground ear corn per head daily were fed in addition to a full feed of the mixed roughages. Granulated salt was supplied free choice. Table 14 is a record of the feeding and gains during the winter feeding period.

Table 14. Wintering period: Average daily rations\* and gains in pounds per head

Ration	Prelim. Feeding 11/14 12/14	12/14- 1/11 28 days	1/11- 2/8 28 days	2/8- 3/8 28 days	3/8- 4/5 28 days	4/5- 4/26 21 days	Total Steer days, 158
<b>Lot A, pulverized limestone:</b>							
Ground ear corn.....	2.01	3.21	1.70	1.55	2.48	1.74	2.13
Cottonseed meal.....	1.91	2.00	2.00	2.00	2.00	1.71	1.95
Ground sorgo stovers.....	9.40	9.18	6.50	4.76	4.76	4.73	6.58
Ground cotton stalks.....		.50	2.00	2.77	2.86	2.87	1.82
Sorgo silage.....			6.60	14.10	16.03	13.60	8.32
Salt, oz.....	.11	.32	.38	.27	.69	.54	.38
Pulverized limestone.....		.10	.10	.10	.10	.10	.10
Rejected roughage.....	.57	.40	.76	.83	1.21	.29	.70
Total gain.....	29.05	28.60	24.80	30.50	38.30	2.22	153.50
Average daily gain.....	1.17	1.02	.88	1.09	1.37	.11	.97
<b>Lot B, fed exactly as Lot A but not fed pulverized limestone:</b>							
Salt, oz.....	.11	.32	.43	.27	.74	.77	.43
Rejected roughage.....	.57	.37	.74	.86	1.64	.30	.77
Total gain.....	35.88	32.00	27.60	17.90	47.60	1.43	162.40
Average daily gain.....	1.44	1.14	.99	.64	1.70	.07	1.03

\*Amounts fed.

Thirty calves were fed 30 days and 12 calves were fed 12 days before the division into groups was made, December 14, 1933. The average steer days of feeding in the period November 14 to December 14 was 25 days for the 21 head constituting each lot. The feeding of pulverized limestone did not begin until December 14, and as shown in Table 14, prior to that time the steers which made up Lot B made slightly more gain. The gains were the same in the ensuing 133 days of winter feeding.

**Treatment Given for Internal Parasites.**—During the fifth wintering period the steers, then 610-pound yearlings, were treated for stomach and tapeworm infestation. The dosage given April 13 was 625 cc per head

of a solution containing 1.75% copper sulphate and 1% nicotine sulphate. The second dosage, 10 days later, was 525 cc per head of the same solution for steers above 525 pounds weight, the dosage being reduced 1 cc per pound under that weight. Feed and water were withheld for 24 hours before and 5 hours after each drenching. Two or three head showed some intoxication after the first dosage but soon recovered. One steer became sick soon after the second dosage and died three days later and two others showed ill-effects but recovered.

The small gain obtained during the fifth and last wintering period (see Table 14) is ascribed to the two treatments for parasite infestation given April 13 and 23. Table 15 is a summary of the winter feeding period and does not include the preliminary feeding prior to start of test December 14, 1933.

Table 15. Summary winter feeding period, Dec. 14, 1933 to April 26, 1934—133 days

Lot.....	A 21	B 21
Number of steers.....		
Treatment.....	Wintering ration and pulverized limestone	Wintering ration
Averages in pounds per steer:		
Initial weight.....	485	485
Final weight.....	609	612
Gain.....	124	127
Daily gain.....	.94	.95
Total feeds fed:		
Ground ear corn.....	288	288
Cottonseed meal.....	260	260
Ground sorgo stovers (mixed).....	804	804
Ground cotton stalks.....	288	286
Sorgo silage.....	1316	1316
Salt, granulated.....	3.5	4.1
Pulverized limestone.....	13.04	
Rejected roughage (mixed).....	96	107
Feeds consumed per cwt. gain:		
Ground ear corn.....	232	223
Cottonseed meal.....	209	202
Sorgo stovers (mixed).....	646	636
Sorgo silage.....	1058	1040
Cost of feed per cwt. of gain.....	\$ 8.71	\$ 8.54
Financial Statement:		
Initial cost.....	\$ 21.73	\$ 21.75
Initial cost per cwt.....	4.48	4.48
Feed cost.....	10.93	10.80
Final cost.....	32.68	32.55
Final cost per cwt.....	5.36	5.32

Feed prices per ton: Ground ear corn, \$17.66; cottonseed meal, \$20; sorgo silage, \$2.75; dry roughage, \$7; salt, \$15; pulverized limestone, \$20.

Lot A, which received 0.10 pound pulverized limestone per head daily, made 4.5 pounds less gain per head during the 133-day winter feeding period and were not as desirable in appearance as Lot B, which were fed similarly but did not receive the calcium supplement. The difference in gain between the two groups was not significant, but the lack of any response from feeding the calcium supplements indicates that there is

small need for such supplements in rations composed mostly of roughages, in the Beeville area.

The initial cost of the calves to the feeding test includes the cost of the calves delivered to the Station and feed costs during the preliminary feeding period. The final cost, or cost after wintering, is the cost of the steers into the Sudan grazing period of the experiment.

Poor quality roughage, considerable rain, muddy pens (although the steers had access to well-bedded sheds), and treatment for stomach worm infestation resulted in comparatively low gains for most of the steers during the winter feeding period. At the close of the period and at the start of Sudan grazing, the steers were somewhat rough but were in medium flesh and strong.

#### Grazing Period (April 26 to Aug. 25, 1934—121 days)

Lots A and B, 21 steers each, as fed during the wintering period, were divided into three lots of 14 head so that in each of the three lots there were 7 steers which had received pulverized limestone in their wintering ration.

Three separate Sudan fields were grazed and the three lots of steers were rotated on the different fields each week. Water, salt, and shade were accessible in each field. In addition to Sudan grazing, Lot 1 was full-fed 43% protein cottonseed cake and 0.14 pound per head of pulverized limestone; Lot 2 was full-fed cottonseed cake.

The cottonseed cake was fed in late afternoon. The pulverized limestone was sprinkled over the cottonseed cake when the cottonseed cake was placed in the feed trough. Beginning at 2 pounds per head daily, the allowance of cottonseed cake was increased according to appetite. Table 16 is a record of the feeding and the gains for the Sudan grazing period.

It is probable that the steers would have eaten slightly more cottonseed cake than they were fed during the first 56 days when they received 2.5 pounds per head daily. Afterwards the allowance was increased rapidly and during the last 37 days of the grazing period they were fed 7.5 pounds per head daily with a maximum daily feed of 9.6 pounds. During the last period the Sudan grazing was barely sufficient for the steers to obtain good fills and, as necessary, some Sudan hay was fed in addition to the Sudan grazing.

These 700- to 800-pound steer yearlings consumed large amounts of cottonseed cake with the Sudan grazing without ill effect, and had considerable finish when lack of grazing brought the period to a close. Table 17 is a summary of this period.

The cost charge of \$4.55 per acre for Sudan grazing includes land rent @ \$3.00 per acre and \$1.55 per acre for labor and seed. Each steer had 1.26 acres of Sudan grazing for 121 days. Gains made on Sudan grazing at current prices for stocker steers paid the charges for grazing.

Lot 2, which did not receive pulverized limestone in addition to cottonseed cake and Sudan grazing, had keener appetite for their allowance of

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Table 16. Sudan grazing period: Average daily ration\* and gains in pounds per head

Ration	4/26 to 5/24 28 days	5/24 to 6/21 28 days	6/21 to 7/19 28 days	7/19 to 8/16 28 days	8/16 to 8/24 9 days	Average 4/26 to 8/24 121 days
<b>Lot 1:</b>						
Sudan grazing.....						
Cottonseed cake.....	2.24	2.77	4.36	6.99	9.18	4.47
Sudan hay.....					.78	
Salt, oz.....	.98	.91	.93	.82	.51	.88
Pulverized limestone, lbs.....	.14	.14	.14	.14	.14	.14
Total gain.....	42.80	50.00	39.60	58.60	-14.50	176.50
Average daily gain.....	1.53	1.79	1.42	2.09	-1.61	1.46
<b>Lot 2:</b>						
Sudan grazing.....						
Cottonseed cake.....	2.24	2.77	4.36	6.99	9.18	4.47
Sudan hay.....					2.56	
Salt, oz.....	1.42	1.31	.93	.82	.86	1.10
Total gain.....	63.10	23.20	69.60	23.60	23.10	202.60
Average daily gain.....	2.25	.83	2.49	.84	2.57	1.67
<b>Lot 3:</b>						
Sudan grazing.....						
Salt, oz.....	1.23	1.39	1.25	.88	.64	1.15
Total gain.....	30.90	56.70	29.00	34.60	-4.80	146.40
Average daily gain.....	1.10	2.03	1.03	1.24	-.53	1.21

\*Based on feeds consumed.

Table 17. Summary of Sudan grazing period, April 26 to Aug. 24, 1934—121 days

Lot number.....	1	2	3
Number of steers.....	14	14	14
Treatment.....	Cottonseed cake and pulverized limestone	Cottonseed cake	Sudan grazing only
<b>Averages in pounds per steer:</b>			
Initial weight.....	611	610	610
Final weight.....	788	813	756
Gain.....	177	203	146
Daily gain.....	1.46	1.67	1.21
<b>Total feeds fed:</b>			
Sudan grazing, acres.....	1.26	1.26	1.26
Cottonseed cake.....	540.6	540.6	
Salt.....	6.64	8.34	8.69
Pulverized limestone.....	17.14		
Cost of hundred weight of gain.....	\$ 6.43	\$ 5.53	\$ 3.96
<b>Financial Statement:</b>			
Initial cost.....	\$ 32.63	\$ 32.60	\$ 32.55
Initial cost per hundred weight.....	5.34	5.34	5.34
Total feed cost.....	11.36	11.20	5.80
Total cost close of grazing period.....	43.99	43.80	38.35
Total cost close of grazing period, cwt.....	5.59	5.39	5.07

Feed costs per ton: Cottonseed cake, \$20; salt, \$15; pulverized limestone, \$20; Sudan grazing per acre, \$4.55.

cottonseed cake throughout the grazing period, made 26 pounds more gain per head, and had higher and more uniform finish than Lot 1, which received 0.14 pound pulverized limestone per head daily.

As compared to Lot 3, Sudan grazing only, Lot 2, cottonseed cake and



Sudan grazing (neither lot fed pulverized limestone), made an average of 56 pounds more gain per head and had considerably more finish. The cost of gain for Lot 3 was \$3.96 per cwt. The combined cost of gain, Sudan grazing plus cottonseed cake, for Lot 2 was \$5.53 per cwt. so that at the close of the period Lot 3 cost \$0.32 per cwt. less than Lot 2. The value of the finish obtained from feeding cottonseed cake was measured in the subsequent drylot fattening period as in the previous test.

There was apparently little relation between the supply of the calcium supplement in the wintering period and the subsequent gains of the steers during the Sudan grazing period. On the average, the steers not fed the calcium supplement during the winter made slightly more gain.

The high content of calcium in Sudan grazing as shown by analyses of Sudan samples may explain the lack of benefit from the addition of the calcium supplement.

#### Finishing Period in Drylot (August 25 to December 21)

The close of the Sudan grazing period was the beginning of the drylot fattening period. The three lots were fed alike except that Lot 1, only, received pulverized limestone in their fattening ration. Lots 1 and 2, which had received cottonseed cake during the grazing period, were fed an average of 88 and 88.5 days respectively. Lot 3, on Sudan grazing only and lacking the flesh of Lots 1 and 2, was fed an average of 118 days.

During the first 27 days the steers were fed some cottonseed, cottonseed cake, grain sorghum heads, and various roughages; part of the time they were allowed access to the Sudan fields. Granulated salt was supplied free choice. Pulverized limestone was not fed to Lot 1 until the latter part of the first 27-day period. Table 18 is a record of the average daily rations and gains for the fattening period.

The steers were fed relatively small amounts of grain and large amounts of roughage. The roughages were somewhat poor in quality and the ground ear corn was light and mostly of white varieties. More rapid gain and higher finish should have been obtained with heavier grain feeding and higher quality feeds, especially in Lots 1 and 2 which had been fed cottonseed cake with Sudan grazing, for these steers were in condition to finish quickly when started on feed in drylot.

Lot 2, not fed pulverized limestone, consumed slightly more feed and had keener appetite for feeds than Lot 1, which received pulverized limestone, but made slightly less gain in the drylot fattening period. A summary of results for the drylot finishing period is given in Table 19.

Lots 2 and 3 are compared (Lot 1 being excepted because of having received pulverized limestone) in regard to feeding or not feeding cottonseed cake with Sudan grazing. At the outset, steers in Lot 2 had greater finish and averaged 57 pounds per head heavier than steers in Lot 3. They attained a desirable finish about three weeks earlier than steers in Lot 3, being marketed after 88 days in drylot, while Lot 3 steers were fed for 118 days. Lot 3 made 86 pounds greater gain per head while in

Table 18. Average daily rations\* and gains in pounds

Lot No.	Ration	1st 27 days	2d 56 days	3rd 84 days	4th 112 days	5th 140 days	Average for test
1	Pulverized limestone.....	.06	.14	.14	.10	.....	.11
	Ground ear corn.....	.....	6.20	15.60	17.10	.....	7.91
	Ground hegari and unground kafir heads..	3.12	5.99	.....	.....	.....	2.86
	Protein supplements.....	4.25	3.00	3.00	3.20	.....	3.39
	Dry roughages.....	7.86	6.47	2.68	3.70	.....	5.53
	Silage (corn and broom corn).....	3.00	17.20	12.10	14.00	.....	11.00
	Salt, oz.....	1.06	.26	.30	.46	.....	.53
	Rejected roughages (mixed).....	.11	1.35	.71	.10	.....	.69
	Total gain.....	79.50	35.00	49.50	6.10	.....	170.10
Average daily gain.....	2.94	1.25	1.77	1.22	.....	1.93	
2	No pulverized limestone. Fed exactly as Lot 1 except as shown below:	.....	.....	.....	.....	.....	.....
	Silage (corn and broom corn).....	3.00	17.90	12.80	16.80	.....	11.70
	Salt, oz.....	1.55	.45	.45	.21	.....	.77
	Rejected roughages (mixed).....	.....	.21	.08	.....	.....	.09
	Total gain.....	60.80	44.60	48.20	8.20	.....	161.90
Average daily gain.....	2.25	1.59	1.72	1.49	.....	1.83	
3	No pulverized limestone. Fed for a longer period than Lots 1 and 2:	.....	.....	.....	.....	.....	.....
	Ground ear corn.....	.....	6.20	15.60	16.50	16.90	10.09
	Ground hegari and unground kafir heads..	3.12	5.99	.....	.....	.....	1.89
	Protein supplements.....	3.97	3.00	3.00	3.00	3.00	3.22
	Dry roughages.....	7.86	6.70	2.70	2.10	2.10	3.60
	Silage (broom corn and corn).....	3.00	17.90	12.80	16.00	16.60	12.74
	Salt, oz.....	1.17	.54	.53	.86	.32	.80
	Rejected roughages (mixed).....	.08	.51	.15	.11	.09	.20
	Total gain.....	59.10	44.60	53.40	68.40	22.10	247.50
Average daily gain.....	2.19	1.59	1.91	2.44	3.15	2.10	

\*Based on feeds fed.

\*\*The lots were fed 5, 5.5, and 28 days respectively.

drylot than Lot 2; however, there had not been a large difference in rate of gain between the lots during the 88 days which Lot 2 was fed.

Although Lot 3 made greater gain at a lower cost per hundredweight of gain in the drylot than Lot 2, the net returns at current prices favored Lot 2. Cost of gain was less with Sudan grazing only, than with Sudan grazing and cottonseed cake, and less with the Sudan and cottonseed cake than in the drylot. Net returns favored the feeding of cottonseed cake with Sudan grazing, because less time was required for finishing in drylot with consequent saving in total cost of feeds.

Lots 1 and 2 were fed alike in drylot except that Lot 1 received an average of 0.11 pound of pulverized limestone per head daily. Seven steers were marketed from each lot after 83 days of feeding, the remainder being marketed at intervals within the following two weeks. The method of marketing a few head at a time gave Lot 1 an average of 88 days on feed and Lot 2 an average of 88.5 days.

Lot 1 made slightly more gain (8 pounds per head) during the drylot finishing period, but with the drylot finishing and Sudan grazing periods combined Lot 2 made 18 pounds more gain per head. The Lot 2 carcasses had more uniformity in finish and were an average of 6.7 pounds heavier than those of Lot 1. During both periods of feeding, the Lot 2 steers

Table 19. Summary of finishing period in drylot, Aug. 25 to Dec. 21, 1934

Lot number.....	1 14	2 14	3 14
Number of steers.....			
Previous treatment on Sudan grazing.....	Cottonseed cake and pulverized limestone 88	Cottonseed cake 88.5	Sudan grazing only 118
Number of days fed.....			
Averages in pounds per steer:			
Initial weight at feedlot.....	788	813	756
Final weight at feedlot.....	958	975	1004
Market weight at San Antonio.....	903	930	949
Gain, basis feedlot weights.....	170	162	248
Gain, basis market weights.....	115	117	193
Daily gain, basis feedlot weights.....	1.93	1.83	2.10
Daily gain, basis market weights.....	1.31	1.33	1.63
Shrinkage enroute market, pounds.....	54.8	44.6	54.9
Shrinkage enroute market, per cent.....	5.72	4.57	5.47
Carcass weight (cold).....	532	539	554*
Dressed yield, basis market weights.....	58.9	57.9	58.4
Total feeds fed:			
Ground ear corn.....	696	705	1191
Ground hegari and unground kafir heads**.....	252	252	252
Protein supplements***.....	299	300	380
Dry roughages****.....	487	491	550
Silage (corn and broom corn).....	971	1031	1503
Pulverized limestone.....	10.1		
Salt.....	2.92	4.25	5.51
Rejected roughage.....	61	8.3	24
Feeds fed per cwt. gain, feedlot weights:			
Grains*****.....	418	443	437
Protein supplements***.....	176	185	154
Dry roughages****.....	426	451	368
Silage.....	571	637	607
Feed cost per cwt. gain (feeds fed):			
Basis feedlot weights.....	\$ 12.03	\$ 12.74	\$ 11.72
Basis market weights.....	17.75	17.58	15.06
Financial Statement:			
Cost into feedlot.....	\$ 43.99	\$ 43.80	\$ 38.35
Feed cost.....	20.47	20.62	29.00
Marketing cost.....	2.15	2.15	2.15
Total cost.....	66.61	66.57	69.50
Receipts at \$7.00 per cwt.....	63.20	65.13	66.40
Loss.....	3.41	1.44	3.10

\*Calculated from slaughter record of only 7 head.

\*\*88.5% ground hegari heads and 11.5% unground kafir heads.

\*\*\*Cottonseed 15.9% in Lots 1 and 2 and 12.5% in Lot 3.

\*\*\*\*58% chopped Sumac fodder, 25% Sudan hay, 17% ground kafir stover.

\*\*\*\*\*Calculated on shelled or threshed basis 25% roughage and 75% grain. Roughage portion included as dry roughage.

had better appetites, for they rejected less roughage while in drylot and consumed their ration of cottonseed cake in less time during the grazing period.

The small differences which obtained in this trial did not favor the inclusion of pulverized limestone as a supplement in wintering rations or during a Sudan grazing period for beef calves being developed into fattened yearlings, but indicated that the supplement should be fed during the fattening period in drylot.

**Individual Initial Weights and Gains of Steers by Groups.**—Table 20 is a record of individual gains of the steers by groups. The 6 minor groups

of 7 steers each were formed out of the two large groups which were used during the wintering period. The division was made at the time the steers were turned on Sudan grazing, April 27, 1934, and on the basis of equality in weight, grade, and general appearance. The initial weights given in the table are the weights of the calves taken when they started on the wintering ration December 14, 1933. These weights show that the division made after the wintering period was probably as fair as could have been made had the 6 groups been chosen at the beginning of the wintering period.

The two major groups of 21 head each designated as Lot A and Lot B in Table 20 are exactly comparable only for the wintering period but are shown for the three periods of treatment so that any differences which might result from the feeding of a calcium supplement during the wintering period could be observed. The three major groups of 14 head each, designated as Lots 1, 2, and 3, are comparable with each other according to their separate treatments.

Variations in gains between individuals may be noted in Table 20. The 7 steers in Lot 2, which did not receive pulverized limestone in their wintering ration, made the outstanding gains on Sudan grazing but made the lowest gains in the drylot feeding period. High gains made one period were compensated to some extent by low gains in the following period. The data reveal no significant differences resulting from the inclusion of pulverized limestone in the rations. The uniformity of gains in Lot 2 indicates that this lot was composed of slightly superior and more uniform steers than the other lots.

#### Fourth Trial—Using Calcium Supplement

This test was a replication of the 1933-34 test including (1) a winter feeding period, December 8, 1934 to April 11, 1935, 125 days; (2) a Sudan grazing period, April 11 to October 3, 1935, 175 days; and (3) a finishing period in drylot, October 3 to February 6, 1936, 125 days. The Sudan grazing period began earlier and lasted much longer than in previous years because of favorable growing conditions.

**Cattle.**—Forty-five Medium to Choice grade Hereford steer calves were purchased in the vicinity of Beeville, Texas. They were very thin when delivered to the Station, December 8, 1934, and had symptoms of stomach worm infestation. They weighed an average of 395 pounds and cost \$5.09 per hundredweight. They were dehorned during a preliminary feeding period and after recovery were divided on January 10, 1935 into two lots of 21 head each for winter feeding.

#### Winter Feeding Period (January 10 to April 11)

Both lots were fed alike on a mixture of silage and dry roughage with supplements of ground ear corn and 43% protein cottonseed meal except that Lot A received 0.10 pound pulverized limestone per head daily.



Lot A. Calcium Supplement During Winter

Lot B. No Calcium Supplement During Winter

Steer No.	Initial Weight	Gains				Steer No.	Initial Weight	Gains			
		Winter Period	Grazing Period	Drylot Period	*Total			Winter Period	Grazing Period	Drylot Period	*Total
<b>Lot 1. Sudan Grazing, Cottonseed Cake, and Pulverized Limestone</b>											
9.....	452	107	178	171	456	6.....	512	152	167	185	503
17.....	460	113	142	142	398	8.....	582	180	141	174	496
25.....	537	162	183	196	541	15.....	470	122	175	156	452
33.....	402	135	198	132	466	16.....	473	163	175	178	517
34.....	665	157	185	166	508	20.....	470	82	170	168	420
39.....	432	60	190	171	421	29.....	452	95	162	167	423
40.....	442	158	188	177	523	41.....	437	87	217	112	416
Average...	484	127	181	165	473		485	126	172	163	461
Average of 14 head..							485	127	176	164	467
<b>Lot 2. Sudan Grazing and Cottonseed Cake</b>											
2.....	468	102	220	175	497	4.....	463	117	252	148	517
5.....	452	128	227	156	511	18.....	593	118	215	156	489
13.....	550	117	188	135	440	21.....	452	73	233	157	463
14.....	480	153	148	188	490	22.....	575	113	197	145	455
27.....	563	133	212	132	477	30.....	495	163	213	151	528
35.....	403	103	175	153	432	31.....	405	123	193	161	478
37.....	452	148	145	165	458	42.....	437	165	218	130	513
Average...	481	126	188	158	472		489	125	217	150	492
Average of 14 head..							485	126	203	154	482
<b>Lot 3. Sudan Grazing Only</b>											
1.....	543	160	103	181	444	3.....	642	172	112	180	463
12.....	460	115	137	161	412	7.....	412	132	90	142	363
23.....	463	145	192	120	457	10.....	422	160	148	138	446
24.....	502	135	140	148	423	11.....	425	82	147	154	382
26.....	513	140	140	164	444	36.....	462	92	193	126	411
28.....	502	42	182	150	373	38.....	448	210	155	202	567
32.....	445	98	170	159	428	43.....	505	108	142	175	425
Average...	490	119	152	155	426		474	136	141	159	437
Average of 14 head..							482	128	146	157	431
Average of 21 head..	485	124	174	159	457		482	129	177	157	463

\*Drylot fattening period, Aug. 25 to Nov. 16, inclusive, first 84 days.

The silage fed up to February 2 was mixed corn, grain sorghum, and broom corn stalks from the 1933 crop, while that fed for the remainder of the period consisted of better quality 1934 crop broom corn stalks and hegari stover. The hegari stover fed had 5% heads and was of good quality. Table 21 is a record of the feeding and gains during the winter feeding period.

Table 21. Winter feeding period: Average daily rations and gains in pounds per head

Ration	Prelim. period 12/8-1/10	1/10-2/7 28 days	2/7-3/7 28 days	3/7-4/11 35 days	Average for 125 days
<b>Lot A. Pulverized Limestone:</b>					
Ground ear corn.....	1.12	2.81	1.00	.....	1.16
Cottonseed meal.....	1.09	1.89	2.28	3.00	2.07
Ground hegari fodder.....	6.99	3.37	2.50	3.10	4.08
Silage.....	15.92	19.50	17.40	25.00	19.60
Salt, oz.....	.07	.06	.16	.16	.11
Pulverized limestone.....	.....	.10	.10	.10	.10
Total gain.....	45.70	41.00	10.20	45.30	142.20
Average daily gain.....	1.34	1.46	0.36	1.29	1.14
<b>Lot B. No Pulverized Limestone:</b>					
Ground ear corn.....	1.12	2.81	1.00	.....	1.16
Cottonseed meal.....	1.09	1.89	2.28	3.00	2.07
Ground hegari fodder.....	6.99	3.37	2.50	3.10	4.08
Silage.....	15.92	19.50	17.40	25.00	19.60
Salt, oz.....	.07	.10	0.13	.32	.16
Total gain.....	44.10	37.80	13.10	48.90	143.90
Average daily gain.....	1.30	1.35	0.47	1.40	1.15

The preliminary feeding period is included in the averages, except for limestone flour which was not fed to Lot A until January 10.

**Treatment Given for Internal Parasites.**—The calves were drenched twice for stomach and tapeworm infestation after they had been fed long enough to gain some strength. On February 18 they were given 1 cc per pound liveweight of a solution containing 1.75% copper sulphate and 0.8% nicotine sulphate. One-fourth cc was given in addition for each pound weight above 500 pounds. The same dosage was given on March 1. The calves were kept off feed and water for 24 hours before and 5 hours after each drenching. Three calves died as a direct or indirect result of the treatments.

The average gains made during the wintering period were small considering the amount of concentrates fed. Dehorning, an infestation of internal parasites, and subsequent treatments all served to limit gains; however the calves put on some flesh and were strong at the close of the period. Table 22 is a summary of gains and costs for the winter feeding period.

Lot A, which received 0.10 pound pulverized limestone per head daily for 91 days beginning January 10, had no advantage in gain over Lot B, which did not receive the calcium supplement.

Table 22. Summary winter feeding period, Dec. 8, 1934 to April 11, 1935—125 days

Lot number.....	A	B
Number of steers.....	21	21
Treatment.....	Wintering ration and pulverized limestone	Wintering ration
Averages in pounds per steer:		
Initial weight.....	396	395
Final weight.....	536	538
Gain.....	140	143
Daily gain.....	1.12	1.14
Total feeds fed:		
Ground ear corn.....	147.5	147.5
Cottonseed meal.....	261	261
Ground hegari fodder.....	528.5	528.5
Silage.....	2487	2487
Salt.....	.86	1.25
Pulverized limestone.....	9.13	.....
Rejected feed.....	49.1	50.3
Cost of feed per cwt. gain.....	\$ 9.77	\$ 9.59
Financial Statement:		
Initial cost.....	\$ 20.15	\$ 20.11
Initial cost per cwt.....	5.09	5.09
Feed cost.....	13.71	13.71
Total cost.....	33.86	33.82
Total cost per cwt.....	6.31	6.29

Feed prices per ton: Ground ear corn, \$25; cottonseed meal, \$41; ground hegari fodder, \$8; silage, \$3.50; salt, \$17; pulverized limestone, \$10.

### Grazing Period (April 11 to October 3)

Lots A and B, 21 steers each, as fed during the wintering period, were divided into three lots of 14 head each, so that in each of the three lots there were 7 steers which had received pulverized limestone during the wintering period.

Three separate Sudan fields were grazed and the three lots of steers were rotated on the different fields each week. Water, salt, and shade were accessible in each field. In addition to Sudan grazing, Lot 1 was fed cottonseed cake and pulverized limestone, and Lot 2 was fed cottonseed cake. The cottonseed cake was fed in troughs in late afternoon and the pulverized limestone was sprinkled over the cottonseed cake. Beginning at 1.5 pounds per head daily, the cottonseed cake was increased to 2.5 pounds daily in ten days and was fed at that rate for the first 84 days of the grazing period. Afterward the allowance was increased to a maximum of 4.5 pounds per head daily. Table 23 is a record of the gains and feeding for the Sudan grazing period.

The steers had little appetite for cottonseed cake from April to July, or during the period of abundant lush growth of Sudan grass. As may be noted in Table 23, 2.31 pounds of cottonseed cake was fed per head daily in April, 2.5 pounds in May and June, 3.12 pounds in July, 4 pounds in August, and 4.5 pounds in September.

Each steer had 1.43 acres of Sudan grass which furnished grazing for 175 days. Grazing was abundant and analyses showed no decline in

Table 23. Sudan grazing period: Average daily rations and gains in pounds per head

Ration	1st 28 days	2nd 28 days	3rd 28 days	4th 28 days	5th 28 days	6th 35 days	Average for 175 days
<b>Lot 1:</b>							
Cottonseed cake.....	2.31	2.51	2.50	3.12	4.00	4.49	3.21
Pulverized limestone.....	.12	.136	.136	.078	.12	.12	.12
Salt, oz.....	.74	.82	.61	.61	.42	.43	.59
Total gain.....	55.20	73.50	44.40	45.80	44.60	10.80	274.30
Average daily gain.....	1.97	2.63	1.59	1.64	1.59	.31	1.57
<b>Lot 2:</b>							
Cottonseed cake.....	2.31	2.50	2.50	3.12	4.00	4.49	3.21
Salt, oz.....	.74	.82	.61	.61	.42	.66	.64
Total gain.....	54.40	55.10	62.40	39.90	31.90	24.60	268.30
Average daily gain.....	1.94	1.97	2.23	1.42	1.14	.70	1.53
<b>Lot 3:</b>							
Salt, oz.....	.94	1.02	.61	.82	.42	.59	.72
Total gain.....	46.70	71.60	54.50	22.40	48.30	-12.70	230.80
Average daily gain.....	1.67	2.56	1.95	.80	1.72	-.36	1.32

nutrients even during the last 35-day grazing period when both Lots 1 and 2 made small gains and Lot 3 lost weight. The steers evidently reached their limit of efficient gains from Sudan grazing about September 1, but just why is not known although it is a common observation that cattle make small gains from fall grazing. Table 24 is a summary of the Sudan grazing period.

Table 24. Summary Sudan grazing period, April 11 to Oct. 3, 1935—175 days

Lot number.....	1	2	3
Number of steers.....	14	14	14
Treatment.....	Cottonseed cake and pulverized limestone	Cottonseed cake	Sudan grazing only
Averages in pounds per head:			
Initial weight.....	538	537	538
Final weight.....	812	805	768
Gain.....	274	268	230
Daily gain.....	1.57	1.53	1.32
Average daily ration:			
Cottonseed cake.....	3.21	3.21	.....
Pulverized limestone.....	.12	.....	.....
Total feeds fed:			
Cottonseed cake.....	561	561	.....
Pulverized limestone.....	20.7	.....	.....
Salt.....	6.5	7.0	7.9
Sudan grazing, acres.....	1.43	1.43	1.43
Cost of feed per cwt. gain.....	\$ 5.81	\$ 5.99	\$ 2.85
Financial Statement:			
Cost onto Sudan grazing at \$6.29 per cwt.....	\$ 33.87	\$ 33.81	\$ 33.87
Cost of cottonseed cake.....	9.26	9.26	.....
Cost of pulverized limestone and salt.....	.16	.06	.07
Cost of Sudan grazing.....	6.51	6.51	6.51
Total feed cost.....	15.93	15.83	6.58
Total cost.....	49.80	49.64	40.05
Total cost per cwt.....	6.13	6.17	5.26

Feed prices per ton: Cottonseed cake, \$30; salt, \$17; pulverized limestone, \$10; Sudan grazing per acre, \$4.55.



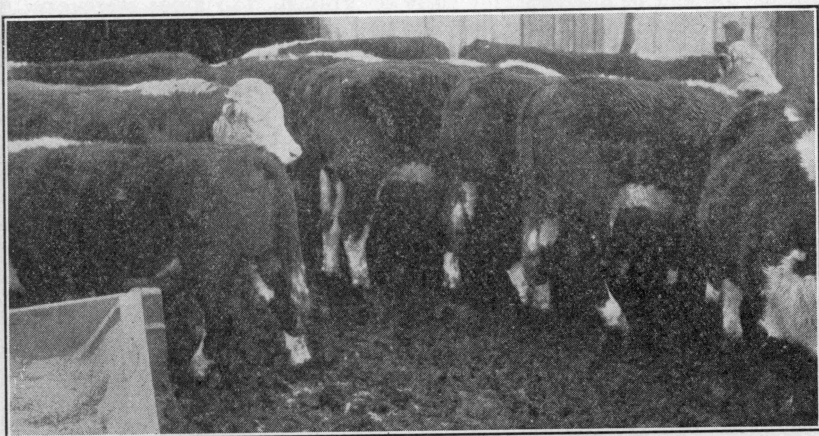


FIGURE 22. Lot 1 at close of drylot finishing period, 1935-36 test. Average wt. 1075 lbs.

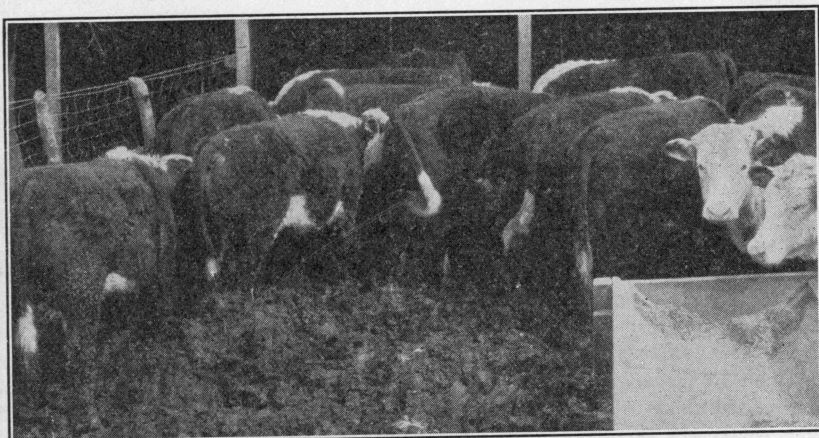


FIGURE 23. Lot 2 at close of drylot finishing period, 1935-36 test. Average wt. 1042 lbs.

Lots 2 and 3 are compared with reference to the use of Sudan grazing with and without cottonseed cake. Lot 2, fed cottonseed cake, made 38 pounds more gain and had more finish than Lot 3 on Sudan grazing only, but at the end of the first 140 days of grazing, the gains were exactly equal, 243 pounds per head, for the two lots. Lot 2 was fed 561 pounds of cottonseed cake per head which cost, with cottonseed cake at \$30.00 per ton, \$8.42 per head. This expense for cottonseed cake resulted in Lot 2 steers' costing \$0.79 per cwt. more than the Lot 3 steers at the close of the grazing period.

Lot 1 made an average of 6 pounds more gain per head than Lot 2, which was similarly handled but did not receive pulverized limestone. Although there was no visible difference in finish, Lot 2 had more attractive appearance because of uniformity.

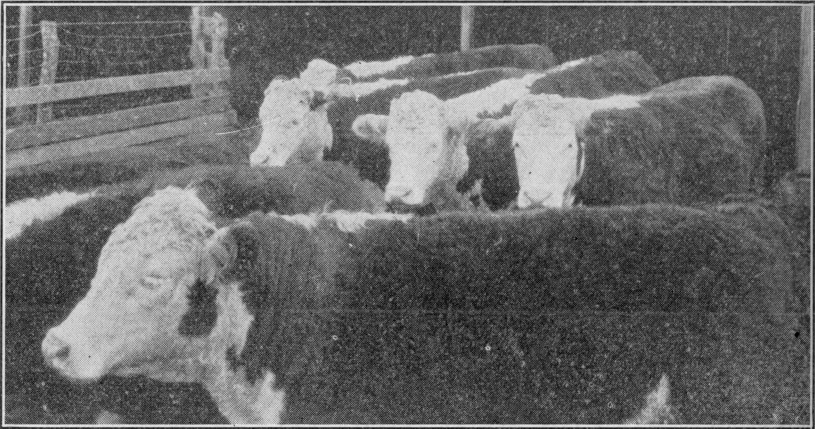


FIGURE 24. Lot 3 at close of drylot finishing period, 1935-36 test. Average wt. 1058 lbs.

Most of the steers in Lots 1 and 2 and a few in Lot 3 were grass fat at the close of the Sudan grazing period, but all of them needed considerable feed for finish despite the long period, 175 days, of grazing and supplementary feeding with cottonseed cake. There was less response for feeding cottonseed cake on Sudan grass in this trial than in any previous trial except for the 56-day grazing period in 1932. This was partially ascribed to the smaller average allowance of cottonseed cake, 3.21 pounds, and maximum of 4.5 pounds fed per head daily. It is rather clearly indicated that relatively large amounts of cottonseed cake are required to produce appreciable increase in gain and finish over that produced by Sudan grazing alone.

## Finishing Period in Drylot (Oct. 3, 1935 to Feb. 7, 1936—127 days)

The close of the Sudan grazing period was the beginning of the drylot fattening period. The three lots were kept intact and were fed alike except that Lot 1 only received pulverized limestone in the fattening ration. Unlike the two previous trials, all lots were fed the same number of days, the number of days, 127, being approximately the same as required in previous trials for finishing the steers which had not been fed cottonseed cake on Sudan grazing. Table 25 is a record of the average daily rations and gains for the fattening period.

The feeds were of higher quality than those fed in the two previous feeding trials. The ear corn was mostly good heavy yellow corn. The silage—mixed broom corn, hegari, and Sumac—was of good quality. The gains were somewhat higher and more uniform than were obtained in the fattening periods of previous tests. Table 26 is a summary of the fattening period in drylot.

The average daily gain for all steers from feeder calves to fattened yearlings during the 427 days they were kept at the Station was 1.55 pounds, or 662 pounds, per head. On the basis of final feedlot weights the Sudan steers, Lot 3, gained the same amount as the average of the two groups which were fed 561 pounds of cottonseed cake per head during the Sudan grazing period. The total concentrate feeds required per hundred-

Table 25. Average daily rations and gains in pounds per head, Oct. 3, 1935 to Feb. 7, 1936—127 days

Ration	10/3- 10/31 28 days	10/31- 11/28 28 days	11/28- 12/26 28 days	12/26- 1/23 28 days	1/23- 2/7 15 days	Average for 127 days
<b>Lot 1:</b>						
Ground ear corn	9.04	11.62	14.80	17.30	19.60	13.94
Cottonseed meal	2.83	3.00	3.00	3.40	3.50	3.10
Silage	22.04	15.84	14.20	12.30	9.80	15.34
Ground kafir fodder	1.34	4.64	2.30	1.00		2.06
Pulverized limestone	.13	.13	.13	.13	.11	.12
Salt, oz.	.16	.16	.16	.08	.30	.16
Total gain	63.10	80.70	26.80	57.50	35.20	263.30
Average daily gain	2.25	2.88	0.96	2.05	2.35	2.07
<b>Lot 2:</b>						
Ground ear corn	9.04	11.62	14.80	17.30	19.60	13.94
Cottonseed meal	2.83	3.00	3.00	3.40	3.50	3.10
Silage	22.04	15.84	14.20	12.30	9.80	15.34
Ground kafir fodder	1.34	4.64	2.30	1.00		2.06
Salt, oz.	.24	.16	.08	.08	.16	.14
Total gain	63.90	60.00	46.80	44.30	21.80	236.80
Average daily gain	2.28	2.14	1.67	1.58	1.45	1.86
<b>Lot 3:</b>						
Ground ear corn	9.04	11.62	14.80	17.30	19.60	13.94
Cottonseed meal	2.83	3.00	3.00	3.40	3.50	3.10
Silage	22.04	15.84	14.20	12.30	9.80	15.34
Ground kafir fodder	1.34	4.64	2.30	1.00		2.06
Salt, oz.	.29	.24	.16	.08	.16	.19
Total gain	74.20	62.50	55.40	56.80	40.60	289.50
Average daily gain	2.65	2.23	1.98	2.03	2.71	2.28

Table 26. Summary of finishing period in drylot, Oct. 3, 1935 to Feb. 7, 1936—127 days

Lot number.....	1	2	3
Number of steers.....	14	14	14
Previous treatment.....	Cottonseed cake and pulverized limestone	Cottonseed cake	Sudan grazing only
Averages in pounds per steer:			
Initial weight.....	812	805	768
Final weight.....	1075	1042	1058
Final weight at market.....	1015	990	988
Gain, basis feedlot weights.....	263	237	290
Gain, basis market weights.....	203	185	220
Daily gain, basis feedlot weights.....	2.07	1.86	2.28
Daily gain, basis market weights.....	1.60	1.45	1.73
Shrinkage enroute market.....	60.2	52.2	60.5
Shrinkage enroute market, per cent.....	5.60	5.01	6.57
Carcass weight, cold*.....	622	607	592
Dressed yield, basis market weights.....	61.3	61.3	59.9
Carcass grades: Strickly good to choice.....	4	1	2
Top medium to good.....	6	10	7
Medium.....	1	3	3
Low medium.....	2		2
Fair.....	1		
Total feeds fed:			
Ground ear corn.....	1770	1770	1770
Cottonseed meal.....	394	394	394
Silage.....	1948	1948	1948
Fodder.....	261	261	261
Pulverized limestone.....	15.7		
Salt.....	1.32	1.14	1.15
Feeds fed per cwt. gain, feedlot weights:			
Ground ear corn.....	673	747	610
Cottonseed meal.....	150	166	136
Silage.....	741	822	672
Fodder.....	99	110	90
Cost of feed per cwt. of gain:			
Basis feedlot weights.....	\$ 7.10	\$ 7.84	\$ 6.41
Basis market weights.....	9.19	10.06	8.44
Financial Statement:			
Initial cost into feedlot.....	\$ 49.80	\$ 49.64	\$ 40.45
Cost of feeds.....	18.70	18.57	18.57
Marketing cost at \$0.47 per cwt.....	4.77	4.65	4.65
Total cost.....	73.27	72.86	63.67
Price received per cwt.....	8.45	8.50	7.85
Amount received per steer.....	85.77	84.12	77.57
Profit.....	12.50	11.26	13.90

Feed prices per ton: Ground ear corn, \$12; cottonseed meal, \$24; ground hegari fodder, \$6; silage, \$2.50; pulverized limestone, \$17; salt, \$16.

\*Hot weight less 2% shrinkage.

weight of gain was 389 pounds for Lot 3, not fed cottonseed cake during grazing, while the average for Lots 1 and 2 was .473 pounds.

Lot 2, fed cottonseed cake with Sudan grazing, and Lot 3, Sudan grazing only, neither lot being fed the calcium supplement, are compared in regard to the feeding of cottonseed cake with Sudan grazing. At the outset of the fattening period, Lot 2 was in higher condition and averaged 37 pounds per head heavier than Lot 3. During the fattening period Lot 3 made 53 pounds and 35 pounds more gain per head on the basis of feedlot and market weights respectively. The total gains made during the Sudan grazing and fattening periods were practically equal on basis of market weights, but Lot 2 carcasses were an average of 16 pounds heavier.



Financial return favored Lot 3 by \$2.64 per head although they sold for 7.65 per cent less than Lot 2. The slight advantages for Lot 2 in finish, and selling price, were not sufficient to offset the cost of the cottonseed cake fed during the Sudan grazing period. However, cottonseed cake fed during the grazing period could have cost \$20.57 per ton for returns to have been equal between the two lots, other feed prices remaining as charged.

Lots 1 and 2 were fed alike except that Lot 1 received 0.124 pound pulverized limestone per head daily. Lot 1 steers made greater gain than Lot 2 and were more desirable in carcass grade except for three inferior steers. Despite the three inferior steers and one steer which had received an injury and had made a low gain, Lot 1 made \$1.24 per head greater return than Lot 2.

The results in this trial are in agreement with previous trials: Cottonseed cake fed with Sudan grazing produced only a small increase in gain but added considerable finish so that the advisability of feeding cottonseed cake on Sudan grazing can be determined by relative costs of feeds. A calcium supplement was apparently not needed in wintering rations or during the Sudan grazing period, but was fed to advantage during the drylot fattening period in this trial.

**Individual Weights and Gains of Steers by Groups.**—Table 27 is a record of individual gains of the steers by groups. The division of steers into the lots as shown was made at the beginning of the Sudan grazing period April 11, 1935. Weight, individuality, and gains made during the winter were considered in order to divide the steers into equal groups.

Lots A and B are exactly comparable only for the wintering period. The three main groups—Lots 1, 2, and 3—are comparable with respect to their different treatments, beginning with the Sudan grazing period.

There were certain wide variations in gain both above and below the averages, but the data for all steers were used since the general trend of results would not have been changed had certain low gaining steers been removed from the test. High gains made during a single period of feeding are often compensated by low gains in the succeeding period. As in the previous trial the steers comprising Lot 2 were very uniform but this uniformity is ascribed to chance and not to differences in treatment.

**Body Measurements of Steers.**—The steers were measured as calves, January 8, 1935, and as fattened yearlings, February 6, 1936. Thirteen measurements in centimeters were taken for each steer. The average initial and final weights and the average of initial and final measurements are shown for each of Lots 1, 2, and 3, as well as for Lots A and B. As previously shown, only Lot A received pulverized limestone in their wintering ration. Lot 1 had pulverized limestone during the Sudan grazing and drylot fattening periods; Lot 2 did not; and Lot 3 did not receive cottonseed cake with Sudan grazing.

Table 27. Individual initial weights and gains of steers by groups.

Lot A. Calcium Supplement During Winter						Lot B. No Calcium Supplement During Winter					
Steer No.	Initial Weight	Gains				Steer No.	Initial Weight	Gains			
		Winter Period	Grazing Period	Drylot Period	Total			Winter Period	Grazing Period	Drylot Period	Total
<b>Lot 1. Sudan Grazing, Cottonseed Cake, and Pulverized Limestone</b>											
26.....	508	178	272	342	792	7.....	585	108	260	253	622
33.....	397	127	242	332	700	3.....	460	132	282	255	668
2.....	457	105	178	110	393	11.....	375	67	227	243	537
43.....	405	102	265	290	657	35.....	437	65	318	305	688
25.....	423	120	320	298	738	32.....	430	115	307	285	707
1.....	485	45	250	245	540	31.....	423	98	240	273	612
6.....	393	15	338	243	597	39.....	400	72	342	212	625
Average...	438	98	267	273	631		444	98	282	261	637
Average of 14 head...							441	96	274	263	634
<b>Lot 2. Sudan Grazing and Cottonseed Cake</b>											
29.....	435	123	270	225	621	41.....	510	98	257	243	598
28.....	360	97	227	283	607	38.....	408	115	307	285	707
30.....	445	118	205	230	553	19.....	493	125	220	207	552
24.....	450	117	283	245	645	34.....	407	105	275	170	550
8.....	490	113	292	142	547	42.....	437	107	320	265	692
13.....	420	78	238	242	558	15.....	425	77	272	222	570
10.....	447	58	268	257	583	16.....	413	38	323	300	662
Average...	435	101	255	232	588		442	95	282	242	619
Average of 14 head...							439	98	268	237	603
<b>Lot 3. Sudan Grazing Only</b>											
44.....	505	118	167	313	598	27.....	482	98	207	263	568
21.....	473	102	247	342	690	45.....	408	122	245	297	663
18.....	550	97	240	293	630	9.....	427	137	243	295	675
40.....	377	85	173	270	528	12.....	422	102	230	230	562
36.....	353	78	233	297	608	23.....	463	143	197	337	677
17.....	387	118	245	323	687	14.....	328	92	227	275	593
22.....	433	77	292	233	602	37.....	467	82	287	283	652
Average...	440	96	228	296	620		428	111	234	283	627
Average of 14 head...							434	104	231	289	624
Average of 21 head...	438	98	250	267	616		438	100	266	262	628

Lot 1 (Table 28) made slightly greater increase than Lot 2 in height at withers, depth of body, length of body, width at crops, circumference of chest, length of head, width of muzzle, and circumference of cannon. The measurements indicate Lot 1 to be of larger size and with slightly more finish than Lot 2, which was shown by record of gains and slaughter data.

Similarly, in comparing Lots 2 and 3, we note that the measurements show Lot 3 as a taller group of steers with more length of body but lacking the finish of Lot 2. This is also in agreement with slaughter data. It may be assumed that Lot 3, not fed cottonseed cake on Sudan grazing, consumed more Sudan grass than Lot 2 and consequently received slightly more lime in their ration. Both comparisons offer evidence that additional calcium increases bone growth or general size but does not necessarily add to the amount of finish.

The feeding of the calcium supplement during the winter was without effect.

### ACKNOWLEDGMENTS

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### SUMMARY AND DISCUSSION OF RESULTS

There were four trials—1932, 1933, 1934, and 1935—on grazing Sudan grass with and without a supplement of cottonseed cake. Except in the first test, which is not considered in analysis of results, steer calves which had been purchased in the fall and wintered on roughages and cottonseed meal were used, having been started on Sudan grazing in April. The Hereford feeder steers used were of good quality and were comparable in weight each year. They were fed to approximately good grade slaughter steers in 1933 and 1934 but were more highly finished in 1935.

There were two phases of study in each of the four trials on grazing Sudan grass: first, the grazing period and second, a finishing period in drylot. The grazing periods were for 56, 108, 121, and 175 days in order of the respective years. The fattening periods in drylot ranged from 88 to 127 days, an average of 123 days being required for fattening the steers not fed cottonseed cake on grazing and 93 days for the steers which had received the cottonseed cake supplement.

The average daily allowance of cottonseed cake fed in the first trial of 56 days was 1.51 pounds per head; in the second of 108 days, 4.64 pounds; in the third of 121 days, 4.47 pounds; and in the fourth of 175 days, 3.21 pounds. There was no response from feeding cottonseed cake in the first trial, but supplementing the Sudan grazing with more liberal amounts of cake, as in the second, third, and fourth trials, increased gain 0.36 pound per head daily and added sufficient finish to reduce the time required for fattening in drylot about 30 days.

The average daily gain from Sudan grazing only was 1.37 pounds in

Table 28. Average initial and final measurements\* and weights by groups, Dec. 8, 1934 to Feb. 7, 1936

	Weight	Height at Withers	Depth of Body	Chest to Ground	Length of Body	Width at Crops	Width at Hips	Circum. of Chest	Length of Head	Width at Eyes	Circum. of Cannon
<b>Group A. Calcium Supplement During Winter</b>											
Final.....	1053	120.0	67.0	53.0	139.6	44.8	46.2	184.9	48.9	22.7	19.3
Initial.....	438	101.3	50.7	50.5	112.4	29.8	32.8	132.0	39.8	19.3	15.3
Increase.....	615	18.7	16.3	2.5	27.1	15.0	13.4	52.9	9.1	3.4	4.0
<b>Group B. No Calcium Supplement During Winter</b>											
Final.....	1066	120.6	67.6	53.1	140.2	45.2	46.4	186.2	49.2	22.6	19.4
Initial.....	438	101.5	50.6	50.3	110.9	29.0	32.6	132.0	40.0	19.1	15.4
Increase.....	628	19.1	17.0	2.8	29.3	16.2	13.8	54.2	9.2	3.5	4.0
<b>Lot 1. Sudan Grazing, Cottonseed Cake, and Pulverized Limestone</b>											
Final.....	1075	120.5	67.8	52.6	139.8	45.6	46.1	188.1	49.0	22.5	19.4
Initial.....	441	101.0	50.8	50.2	111.4	29.4	32.6	132.4	39.8	19.2	15.4
Increase.....	634	19.5	17.0	2.4	28.4	16.2	13.5	55.7	9.2	3.3	4.0
<b>Lot 2. Sudan Grazing and Cottonseed Cake</b>											
Final.....	1042	119.6	67.4	52.4	139.5	45.2	46.6	185.2	48.9	22.7	19.2
Initial.....	439	102.1	50.7	50.4	111.7	29.8	32.8	132.1	40.0	19.2	15.3
Increase.....	603	17.5	16.7	2.0	27.8	15.4	13.8	53.1	8.9	3.5	3.9
<b>Lot 3. Sudan Grazing Only</b>											
Final.....	1058	121.0	66.8	54.2	140.3	44.2	46.2	183.4	49.2	22.8	19.4
Initial.....	434	101.7	50.6	50.7	111.9	29.0	32.8	131.5	40.0	19.2	15.4
Increase.....	624	19.3	16.2	3.5	28.4	15.2	13.4	51.9	9.2	3.6	4.0

\*Measurements in centimeters and according to Animal Husbandry Form 452.



1933, 1.21 in 1934, and 1.32 in 1935, making an average gain of 1.29 pounds daily for the 15,104 days of steer grazing involved in the three seasons of grazing. The gains produced from Sudan grazing credited at current prices for stocker steers were more than sufficient to pay the costs, rent and labor charged for the Sudan pasturage.

A noteworthy feature in the use of Sudan grazing in fattening yearling steers is the saving in concentrate feeds required per cwt. of gain. It required an average of only 418 pounds of concentrate feeds to produce 100 pounds of gain (finished beef) for the steers which did not receive cottonseed cake with Sudan grazing for 1934 and 1935 trials. It required an average of 478 pounds of concentrate feeds for 100 pounds of gain for the steers which were fed cottonseed cake while on Sudan grazing for the same years. This is approximately 50% less concentrates per cwt. of finished beef than is required in finishing feeder calves into fattened yearlings by ordinary drylot methods of grain feeding for fattening. Thirteen per cent less concentrates were required per cwt. of gain when cottonseed cake was not fed on Sudan grazing; however, the gain produced without cottonseed cake on Sudan grazing did not result in as highly finished beef as when cake was fed.

The study of a calcium supplement in rations of feeder calves developed into fattened steer yearlings included (1) a winter feeding period, (2) a Sudan grazing period, and (3) a fattening period in the drylot. The calcium supplement did not increase gain or finish during the wintering and Sudan grazing periods, but made slight increase in gain during the drylot fattening period. Body measurements taken of the steers as calves and as finished yearlings one year later show increased bone growth for the steers which received the calcium supplement in their rations.

Analyses of Sudan grass samples collected at intervals during each grazing season show high values for protein and minerals, sufficiently high in protein to indicate that a grain feed would be advantageous as a supplement and sufficiently high in calcium to indicate that there is little need for calcium supplements with Sudan grazing.

### CONCLUSION

Sudan grazing permits the production of highly finished beef on farms in the Beeville area with a minimum usage of concentrate feeds.

Ground hegari heads were of approximately 33 per cent less value than ground ear corn in finishing beef steers.

Ground hegari stover (heads removed) and ground Sumac fodder (heads on) were practically equal in feeding value in fattening rations.

Liberal amounts of 43% protein cottonseed cake will increase gain on Sudan grazing approximately one-third pound per head daily and will add sufficient finish, if fed for 100 days or longer, to lessen the time required for finishing in drylot about 30 days. Current feed prices determine whether the practice is advisable.

Calcium supplements fed in wintering rations and during periods of Sudan grazing were without value but increased gain when fed in fattening rations in drylot with the sorghum forages as roughages.