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# TEXAS AGRICULTURAL EXPERIMENT STATION

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS
W. B. BIZZELL, President

BULLETIN NO. 263 AUGUST, 1920



DIVISION OF ANIMAL INDUSTRY

# RATIONS FOR FATTENING STEERS

(1) Cotton Seed Meal vs. Peanut Meal
(2) Cold Pressed Cotton Seed vs. Ground Whole Pressed Peanuts
(3) Sorghum Silage vs. Cotton Seed Hulls

B. YOUNGBLOOD, DIRECTOR,
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†As of August 30, 1920.
‡Resigned.
*In cooperation with the School of Veterinary Medicine, A. & M. College of Texas.
**In cooperation with the United States Department of Agriculture.

BULLETIN NO. 263. AUGUST, 1920.

# RATIONS FOR FATTENING STEERS

BY

JOHN C. BURNS, B. S., ANIMAL HUSBANDMAN IN CHARGE OF BEEF CATTLE INVESTIGATIONS*

The steer feeding tests reported in this bulletin are those conducted at this Station in 1916-17 and 1919-20. Shortly after the close of each test, the results were published in "The Cattleman," the official monthly publication of the Cattle Raisers' Association of Texas. The Station, on account of lack of funds, conducted no experiments in cattle feeding during 1917-18 and 1918-19.

## PART I

### THE EXPERIMENTS OF 1916-17

#### OBJECTS

1. To compare cotton seed meal and peanut meal for supplementing a basal ration of ground milo, corn or sorghum silage, and bermuda hay for fattening.
2. To compare cold-pressed cotton seed and ground-whole pressed peanuts for supplementing a basal ration of ground milo, corn or sorghum silage, and bermuda hay for fattening.

#### CATTLE USED

The cattle used in the experiment to compare cotton seed meal and peanut meal were thirty-four two-year-old, high grade Aberdeen-Angus steers, purchased from G. O. Cresswell, Oplin, Texas, who raised them on his ranch in Callahan county. They were a choice lot of feeders of good quality, quite uniform in appearance, and at the beginning of the experiment, were in medium grass flesh. They arrived at College Station September 7, 1916, and on the same day were run through the dipping vat in order to rid them of ticks before starting them on feed. From the afternoon of September 7, until the morning of September 11, all were fed alike, the ration being largely composed of sorghum silage and bermuda grass hay, but also containing small quantities of cold-pressed cotton seed and ground milo. They became accustomed to eating this ration without any trouble. They consumed, during this period, 272 pounds of cold-pressed cotton seed at $26.00 per ton, 408 pounds of ground milo at $30.00 per ton, 2,788 pounds of silage at

*Resigned.

$3.50 per ton, and 478 pounds of bermuda hay at $15.00 per ton, making the total cost for feed $18.12 or 53½c per head. They cost, delivered at College Station, $58.08 per head, and they averaged in weight, September 11, 811½ pounds. Therefore, they had cost at the beginning of the test $7.22 per hundred pounds or $58.61 per steer.

The cattle used in the experiment to compare cold-pressed cotton seed and ground-whole pressed peanuts were forty-one high grade Hereford yearling steers, purchased in Llano county, 30 head having been raised by J. D. Slator and 11 head by George Epperson. They averaged in weight, on arrival at College Station, May 19, 1916, after taking a fill, 533.7 pounds. They cost, delivered here, $45.73 per head. Nine of the number had been dehorned and the others were dehorned May 27. These steers were not started on test until September 8, but were fed, from the time they arrived, a light ration daily. They were on native grass pasture from June 6 until August 31, and the remainder of the time they were in the feeding pens. Pasturage was charged at the rate of 50c per head per month, or $1.43 per head for the whole grazing period of 86 days. The 41 head received during the period from May 19, to the morning feed of September 8, inclusive, 9,899 pounds of cold-pressed cotton seed at $26.00 per ton, 1,506.75 pounds of cotton seed meal at $35.00 per ton, 2,050.5 pounds ground milo at $30.00 per ton, 2,038 pounds of bermuda or sudan grass hay at $15.00 per ton and 17,384 pounds silage at $3.50 per ton, making the total cost for feed $231.52 or $5.65 per head. The average weight of these steers September 8, was 616.3 pounds. Therefore, they had cost at the beginning of the experiment, $8.57 per hundred pounds or $52.81 per head. They had gained only 82.6 pounds per head during the period of 112 days prior to this date.

## FEEDS USED

Analyses of average samples of the feeds used were made by the Chemistry Division of the Experiment Station as appear in the following table:

**Table 1.**

| Feeds | Percentage Composition. | | | | | | Analysis Number |
|---|---|---|---|---|---|---|---|
| | Water | Ash | Crude Protein | Crude Fiber | Nitrogen-free extract | Fat | |
| Cotton seed meal..... | 7.14 | 5.95 | 44.84 | 9.68 | 25.18 | 7.21 | 12443–12637 |
| Peanut meal..... | 6.73 | 4.45 | 51.69 | 5.22 | 23.83 | 8.08 | 12636 |
| Cold pressed cotton seed | 7.21 | 3.90 | 26.81 | 21.21 | 26.91 | 13.91 | 12442 |
| Ground whole pressed peanuts..... | 6.78 | 3.65 | 36.13 | 22.38 | 21.61 | 9.45 | 12440 |
| Ground milo..... | 11.05 | 1.68 | 11.68 | 2.17 | 70.56 | 2.83 | 12439–12554–12691 |
| Corn silage..... | 70.34 | 2.08 | 2.41 | 7.36 | 17.05 | .76 | 12553–12606–12715 12753–12942 |
| Sorghum silage..... | 67.71 | 3.20 | 1.64 | 9.20 | 17.20 | 1.05 | 12444 |
| Bermuda hay..... | 6.30 | 6.96 | 6.00 | 27.18 | 51.93 | 1.63 | 12638 |
| Cotton seed hulls..... | 10.15 | 2.88 | 3.75 | 47.09 | 34.24 | 1.89 | 12941 |

Based on the analyses given in Table 1, the digestible nutrients of each feed are presented in Table 2.

Table 2.

| Feeds | Dry matter in 100 lbs. | Digestible nutrients in 100 lbs. | | |
|---|---|---|---|---|
| | | Crude protein | Carbo-hydrates | Fat |
| Cotton seed meal | 92.86 | 37.67 | 22.47 | 6.85 |
| Peanut meal | 93.27 | 46.52 | 20.49 | 7.27 |
| Cold pressed cotton seed | 92.74 | 21.72 | 29.56 | 13.35 |
| Ground whole pressed peanuts | 93.22 | 25.65 | 13.27 | 8.50 |
| Ground milo | 88.95 | 7.71 | 62.15 | 2.55 |
| Corn silage | 29.66 | 1.23 | 16.89 | .62 |
| Sorghum silage | 32.29 | .15 | 16.34 | .59 |
| Bermuda hay | 93.70 | 3.12 | 40.62 | .68 |
| Cotton seed hulls | 89.85 | .53 | 39.41 | 1.30 |

The financial results of the tests are based on the prices paid for feeds as follows:

Cotton seed meal.....$40.35 per ton
Peanut meal.....$40.00 per ton
Cold-pressed cotton seed.....$26.00 per ton
Ground-whole pressed peanuts.....$28.00 per ton
Ground milo.....$44.80 per ton
Corn silage.....$ 3.50 per ton
Sorghum silage.....$ 3.50 per ton
Bermuda hay.....$15.00 per ton
Cotton seed hulls.....$15.00 per ton

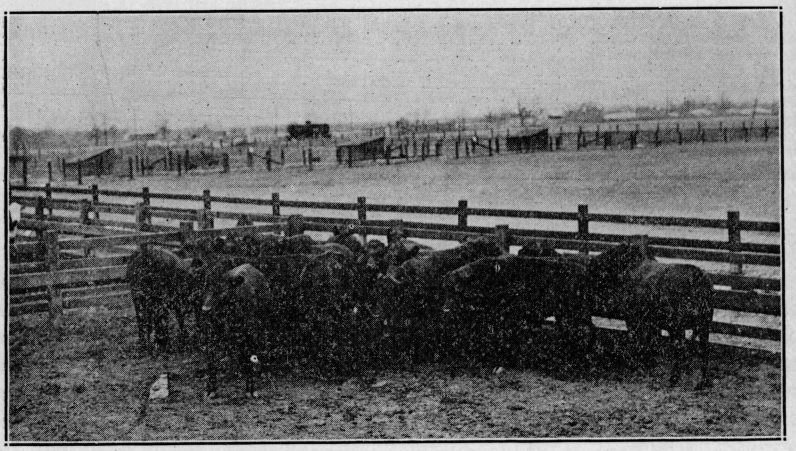
The peanut meal used was of choice grade, according to the definition and standard adopted by the Division of Feed Control Service, which reads as follows: "Choice peanut meal is the product from the kernels of sound peanuts, free from excess of hulls and other foreign materials. Standard: It must be finely ground and of sweet odor, and must contain not less than 48 per cent. of protein, not less than 7 per cent. of fat, and not more than 9 per cent. of crude fiber."

The definition and standard adopted by the Division of Feed Control Service for choice whole-pressed peanuts is: "This is the product resulting from subjecting the whole, sound, mature, clean peanuts, free from sticks, stems and dirt, to pressure for the extraction of oil, and includes the entire peanut less the oil extracted. Standard: It must contain not less than 36 per cent. of protein and not more than 22 per cent. of crude fiber." The ground-whole pressed peanuts which were used practically fulfilled the requirements for this grade, with the exception that they contained a slightly higher percentage of crude fiber.

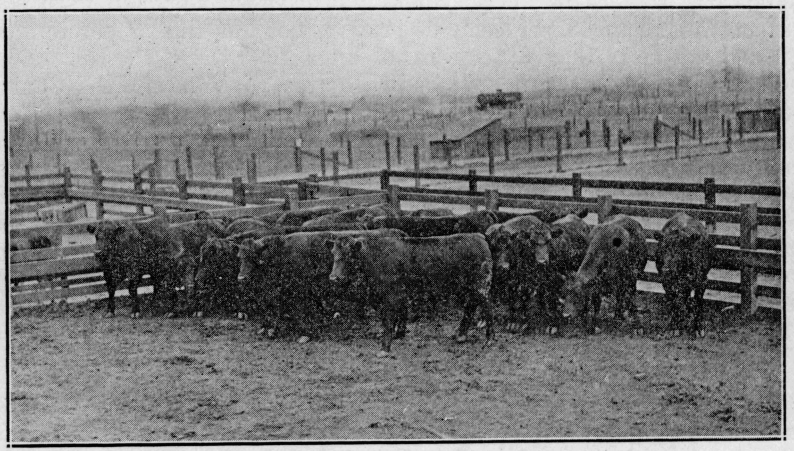
## PLAN OF EXPERIMENTS

The two-year-old steers were divided into two lots of 17 each, designated as Lot 1 and Lot 2. The yearling steers, likewise, were divided into two lots, designated as Lot 1 and Lot 2, the former containing 21 steers and the latter 20 steers. In each case the division was made as nearly equal as practicable with respect to type, quality, condition, and weight.

Weights of each lot were obtained every day for three successive days, both at the beginning and at the end of each experiment; and the initial and final weights, herein recorded, are the averages of the three



Lot 1. Aberdeen-Angus steers, at the close of the experiment.



Lot 2. Aberdeen-Angus steers, at the close of the experiment.

initial and the three final weights, respectively. Each lot was weighed once every thirty days during the experiments, and all weights were taken between 10:00 and 11:00 a. m.

Each lot occupied a pen 60x100 feet and had access to a shed open on the south side. Water from a deep well was supplied in galvanized iron troughs in the open pens, and granular salt in small troughs under the shed, so that the cattle had free access to both salt and water. The hay was supplied daily in racks under the shed and the other feeds used were mixed together and fed in troughs in the open. Except the hay, which was supplied only once a day, the rations were equally divided, one portion being fed early in the morning and the other late in the afternoon.

Five shotes followed each lot of steers from September 15, 1916, to March 7, 1917,—a period of 173 days,—to clean up any grain in the droppings and any waste of grain from the troughs. They received no other feed.

### THE TEST COMPARING COTTON SEED MEAL AND PEANUT MEAL

This test began with the evening feed of September 11, 1916, and closed with the morning feed of March 9, 1917, covering a period of 179 days. The feeds that were given to both lots of steers in this test were ground milo, corn or sorghum silage, and bermuda hay. In addition to these feeds, Lot 1 received cotton seed meal and Lot 2 peanut meal. On account of the shortage of bermuda hay, cotton seed hulls was partially substituted for it during the latter part of the feeding period. The average rations fed and the gains made during each period are presented in the following table:

**Table 3.**

| Lot No. | Average rations per steer | Total gain per steer pounds | Average daily gain pounds |
|---|---|---|---|
| | First Period—30 Days. | | |
| 1 | 2.55 lbs. cotton seed meal, 21.17 lbs. silage, 6.07 lbs. ground milo, 2.43 lbs. bermuda hay | 83.80 | 2.790 |
| 2 | 2.13 lbs. peanut meal, 21.17 lbs. silage, 6.5 lbs. ground milo, 2.43 lbs. bermuda hay | 83.40 | 2.780 |
| | Second Period—30 Days. | | |
| 1 | 3 lbs. cotton seed meal, 22 lbs. silage, 8 lbs. ground milo, 3 lbs. bermuda hay | 63.80 | 2.120 |
| 2 | 2.5 lbs. peanut meal, 22 lbs. silage, 8.5 lbs. ground milo, 3 lbs. Bermuda hay | 65.40 | 2.180 |
| | Third Period—30 Days. | | |
| 1 | 3.48 lbs. cotton seed meal, 22 lbs. silage, 9.6 lbs. ground milo, 3.7 lbs. bermuda hay | 66.20 | 2.200 |
| 2 | 2.89 lbs. peanut meal, 22 lbs. silage, 10.18 lbs. ground milo, 3.7 lbs. bermuda hay | 57.60 | 1.920 |
| | Fourth Period—30 Days. | | |
| 1 | 9.98 lbs. cotton seed meal, 19.33 lbs. silage, 12.55 lbs. ground milo, 3.33 lbs. bermuda hay | 73.00 | 2.430 |
| 2 | 3.3 lbs. peanut meal, 19.33 lbs. silage, 13.2 lbs. ground milo, 3.33 lbs. bermuda hay | 86.80 | 2.890 |
| | Fifth Period—30 Days. | | |
| 1 | 3.33 lbs. cotton seed meal, 17.16 lbs. silage, 14.33 lbs. ground milo, 2.1 lbs. bermuda hay, 1.9 lbs. cotton seed hulls | 63.50 | 2.120 |
| 2 | 2.77 lbs. peanut meal, 17.16 lbs. silage, 14.89 lbs. ground milo, 2.1 lbs. bermuda hay, 1.9 lbs. cotton seed hulls | 65.30 | 2.180 |
| | Sixth Period—29 Days. | | |
| 1 | 3.18 lbs. cotton seed meal, 12.82 lbs. silage, 15.91 lbs. ground milo, .72 lbs. bermuda hay, 3.31 lbs. cotton seed hulls | 23.70 | 0.810 |
| 2 | 2.65 lbs. peanut meal, 12.82 lbs. silage, 16.45 lbs. ground milo, .72 lbs. bermuda hay, 3.31 lbs. cotton seed hulls | 27.00 | 0.930 |

It will be noted that both lots received the same amounts of silage, hay, and cotton seed hulls and that both received the same amounts of concentrates (combined milo and cotton seed meal or peanut meal) throughout the test. Since the peanut meal was richer in protein than the cotton seed meal, the amount of the former fed was only 83⅓ per cent. of the amount of the latter, but enough milo was fed with the peanut meal to make the total concentrates for each lot the same; therefore, both rations were similarly balanced. It was noticed throughout the test, particularly during the latter part, that Lot 2 took longer to clean up their feed than Lot 1, indicating that the ration containing peanut meal was not so palatable as the one containing cotton seed meal. It was noticed, also, that Lot 2 consumed less salt than Lot 1, a fact of some interest, though of little practical importance.

The five hogs which followed Lot 1, weighed 383 pounds at the start and cost, at 7½ cents per pound, $28.72. They weighed 676 pounds on the Fort Worth market March 9, 1917, and sold for $13.60 per hundred pounds, bringing, after deducting marketing expenses, $88.54. Therefore, the net profit on the five head was $59.82, which credited to the steers, was $3.52 per steer. The five hogs which followed Lot 2 also weighed 383 pounds at the start and cost the same as those of Lot 1. They weighed 740 pounds on the Fort Worth market March 9, and sold for $13.60 per hundred pounds, bringing, after deducting marketing expenses, $97.12. Therefore, the net profit on these five hogs was $68.40, which credited to the steers, was $4.02 per steer. The total gain made by the hogs of Lot 1 was 293 pounds, and by those of Lot 2 was 357 pounds. The difference in gain of 64 pounds was, therefore, in favor of the hogs that followed the steers that received peanut meal.

On the evening of March 9 both lots of steers received prairie hay only, in preparation for shipment to Fort Worth the following day. They were shipped from College Station at 2:30 p. m., March 10, and arrived at the Fort Worth stock yards early the following morning. It was decided to exhibit two car lots of them, which required 15 head each, at the National Feeders' and Breeders' Show. The fifteen top steers were selected from the 34 head, regardless of how they had been fed, to constitute the best show lot; then the next best fifteen steers were selected in like manner to constitute the next best show lot. There were left, four steers that were sold at $11.50 per hundred pounds on the open market, Monday, March 12. As it turned out, the best car lot was composed of 7 steers from Lot 1 and 8 steers from Lot 2; the next best car lot was composed of 8 steers from Lot 1 and 7 steers from Lot 2; and, therefore, of the 4 steers sold on the open market, there were two from each lot. The cattle that were exhibited were fed a ration of cotton seed meal, ground corn or milo, cotton seed hulls, and prairie or alfalfa hay during the show. A little silage was fed during the first two days. The two car lots were shown in the two-year-old class, one winning second premium of $125.00 and the other third premium of $75.00. Both were sold at public auction to the highest bidder at 10:00 a. m., Thursday, March 15. Armour & Company purchased them, paying $12.95 per hundred pounds for the lot that had won second premium and $11.90 per hundred pounds for the third prize lot. Feed and water were withheld for twenty-four hours

following sale and at the end of this period, the steers were weighed to the packers as Lot 1 and Lot 2, according to the way they had been divided and fed during the test. The 17 steers of Lot 1 averaged 1,097 pounds and sold for the average price of $12.29 per hundred pounds; the 17 steers of Lot 2 averaged 1,100 pounds ond sold for the average price of $12.35 per hundred pounds.

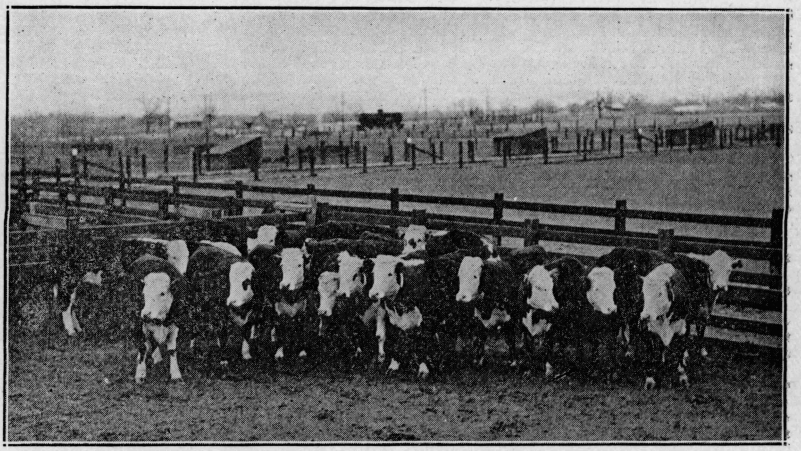
A report furnished by Armour & Company showed that Lot 1 dressed 64.76 per cent. and Lot 2 dressed 64.30 per cent. Both lots were pronounced exceptionally good in quality of carcasses, and in this respect there was practically no difference.

The results of the experiment in detail are presented in the following table:

**Table 4—Feeding period, 179 days—September 11, 1916, to March 9, 1917.**

| | Lot 1. Cotton seed meal, ground milo, silage, hay, cotton seed hulls. | Lot 2. Peanut meal, ground milo, silage, hay, cotton seed hulls. |
|---|---|---|
| Number of steers | 17 | 17 |
| Average initial weight, pounds, September 11, 1916 | 815.00 | 808.00 |
| Average final weight at College Station, pounds, May 9, 1917 | 1189.00 | 1193.00 |
| Total gain per steer, pounds | 374.00 | 385.00 |
| Average daily gain per steer, pounds | 2.09 | 2.15 |
| Average final weight, pounds, Fort Worth | 1097.00 | 1100.00 |
| Net shrinkage per steer, pounds | 92.00 | 93.50 |
| Net shrinkage, per cent | 7.70 | 7.80 |
| Average Daily Ration, Pounds. | | |
| Cotton seed meal or peanut meal | 3.25 | 2.71 |
| Ground milo | 11.05 | 11.59 |
| Silage | 19.11 | 19.11 |
| Bermuda hay | 2.55 | 2.55 |
| Cotton seed hulls | 0.85 | 0.85 |
| Pounds of Feed Required for 100 Pounds of Gain. | | |
| Cotton seed meal or peanut meal | 155.80 | 125.80 |
| Ground milo | 528.90 | 538.40 |
| Silage | 914.90 | 887.70 |
| Bermuda hay | 122.50 | 118.80 |
| Cotton seed hulls | 40.90 | 39.60 |
| Cost of feed for 100 pounds of gain | $17.82 | $17.32 |
| Total feed consumed in pounds per steer during test, from September 11, 1916, to March 9, 1917. | | |
| Cotton seed meal or peanut meal | 582.70 | 485.00 |
| Ground milo | 1978.10 | 2075.60 |
| Silage | 3422.00 | 3422.00 |
| Bermuda hay | 458.00 | 458.00 |
| Cotton seed hulls | 153.00 | 153.00 |
| Cost of feed per steer during test | $66.64 | $66.77 |
| Cost of feed per steer preparatory to shipment and during show (including straw for bedding) | $ 2.75 | $ 2.75 |
| Cost of salt per steer during test. | | |
| Lot 1—8.7 pounds at 50c per cwt | $ 0.04 | ..... |
| Lot 2—5.3 pounds at 50c per cwt | ..... | $0.026 |
| Labor cost per steer, September 11, 1916, to March 15, 1917 | $ 4.93 | $ 4.93 |
| Interest per steer on investment in cattle and feed at 8 per cent, September 11, 1916, to March 15, 1917 | $ 5.20 | $ 5.18 |
| Interest and depreciation, per steer, on equipment at 7 per cent | $ 1.00 | $ 1.00 |
| Marketing expenses per steer (freight, yardage, commission) | $ 3.86 | $ 3.86 |
| Initial cost per steer at $7.22 per 100 pounds | $58.84 | $58.34 |
| Total cost of each steer when sold | $143.26 | $142.86 |
| Average price per 100 pounds received at Fort Worth | $12.29 | $12.36 |
| Price received per steer | $134.82 | $135.96 |
| Returns per steer through hogs following | $ 3.52 | $ 4.02 |
| Returns per steer in premium money | $ 5.88 | $ 5.88 |
| Loss per steer, premium money not included | $ 4.92 | $ 2.88 |
| Profit per steer, premium money included | $ 0.96 | $ 3.00 |
| Selling price per cwt. necessary to have broken even, premium money not included | $12.74 | $12.62 |

Lot 1. Hereford yearlings, at the close of the experiment.



Lot 2. Hereford yearlings, at the close of the experiment.

It will be noted that Lot 2, which received peanut meal, made slightly the larger gain and required slightly less feed per 100 pounds of gain. The cost of feed per 100 pounds of gain was, also, somewhat less for this lot. There was practically no difference between the two lots as to shrinkage from the time they were last weighed at College Station until they were last weighed at Fort Worth. The financial returns, on both steers and hogs, were in favor of Lot 2, by $2.04 per steer. The results indicate, therefore, that high grade peanut meal is fully equal in feeding value to cotton seed meal. In this test, there was a slight difference in favor of peanut meal.

## THE TEST COMPARING COLD-PRESSED COTTON SEED AND GROUND-WHOLE PRESSED PEANUTS

This test started with the evening feed of September 8, 1916, and closed with the morning feed of March 9, 1917, covering a period of 182 days. The steers of Lot 1 received a ration of cold-pressed cotton seed, ground milo, silage, and bermuda hay and those of Lot 2 received the same feeds except that ground-whole pressed peanuts replaced cold-pressed cotton seed. Cotton seed hulls were partially substituted for bermuda hay in both lots during the latter part of the test, on account of a shortage of the hay. The table following shows the average rations fed and the gains made by periods:

**Table 5.**

| Lot No. | Average Rations Per Steer. | Total gain per steer, pounds. | Average daily gain, pounds. |
|---|---|---|---|
| | First Period—30 Days. | | |
| 1 | 3.64 lbs. cold pressed cotton seed, 18.2 lbs. silage, 5.2 lbs. ground milo, 1.8 lbs. bermuda hay | 94.40 | 3.14 |
| 2 | 2.73 lbs. ground whole pressed peanuts, 18.2 lbs. silage, 6.11 lbs. ground milo, 1.8 lbs. bermuda hay | 78.20 | 2.60 |
| | Second Period—30 Days. | | |
| 1 | 4 lbs. cold pressed cotton seed, 20 lbs. silage, 6 lbs. ground milo, 2.03 lbs. bermuda hay | 62.70 | 2.09 |
| 2 | 3 lbs. ground whole pressed peanuts, 20 lbs. silage, 7 lbs. ground milo, 2.03 lbs. bermuda hay | 56.00 | 1.86 |
| | Third Period—30 Days. | | |
| 1 | 4.96 lbs. cold pressed cotton seed, 20 lbs. silage, 6.9 lbs ground milo, 2.6 lbs. bermuda hay | 67.10 | 2.23 |
| 2 | 3.7 lbs. ground whole pressed peanuts, 20 lbs. silage, 8.14 lbs. ground milo, 2.6 lbs. bermuda hay | 53.50 | 1.78 |
| | Fourth Period—30 Days. | | |
| 1 | 5 lbs. cold pressed cotton seed, 17.73 lbs. silage, 9.5 lbs. ground milo, 2.6 lbs. bermuda hay | 75.20 | 2.50 |
| 2 | 3.75 lbs. ground whole pressed peanuts, 17.73 lbs. silage, 10.75 lbs. ground milo, 2.6 lbs. bermuda hay | 74.00 | 2.46 |
| | Fifth Period—30 Days. | | |
| 1 | 5 lbs. cold pressed cotton seed, 15.36 lbs. silage, 10.63 lbs. ground milo, 1.1 lbs. bermuda hay, 1.8 lbs. cotton seed hulls | 63.20 | 2.10 |
| 2 | 3.75 lbs. ground whole pressed peanuts, 15.36 lbs. silage, 11.88 lbs. ground milo, 1.1 lbs. bermuda hay, 1.8 lbs. cotton seed hulls | 63.20 | 2.10 |
| | Sixth Period—32 Days. | | |
| 1 | 5.34 lbs. cold pressed cotton seed, 10.76 lbs. silage, 12.14 lbs. ground milo, 0.54 lbs. bermuda hay, 2.49 lbs. cotton seed hulls | 46.70 | 1.46 |
| 2 | 4 lbs. ground whole pressed peanuts, 10.76 lbs. silage, 13.47 lbs. ground milo, 0.54 lbs. bermuda hay, 2.49 lbs. cotton seed hulls | 38.80 | 1.21 |

As will be noted from the above rations, both lots received the same quantities of concentrates and roughage, the only difference being in the proportion of ground milo to cold-pressed cotton seed in Lot 1, and to ground-whole pressed peanuts in Lot 2. The amount of ground-whole pressed peanuts fed Lot 2 was only 75 per cent. of the amount of cold-pressed cotton seed fed Lot 1, because of the higher content of protein in the peanut product. Enough ground milo was fed Lot 2 to make the total amounts of concentrates the same for each lot. Lot 1 consumed their feed more readily than did Lot 2, indicating a difference in palatability in favor of cold-pressed cotton seed over ground-whole pressed peanuts. There was a marked difference in the amounts of salt consumed. In this test, Lot 2, which received ground whole-pressed peanuts, consumed over twice as much salt as did Lot 1, which received cold-pressed cotton seed.

The five hogs which followed Lot 1 weighed 396 pounds at the start, September 15, 1916, and 743 pounds March 9, 1917, on the Fort Worth market, making a total gain of 347 pounds. They cost 7½ cents per pound or $29.70 and sold for $13.60 per hundred pounds or $101.04, yielding a net profit, after deducting marketing expenses, of $67.81, which, credited to the steers, was $3.23 per steer. The five hogs which followed Lot 2, weighed 379 pounds at the start, September 15, 1916, and 681 pounds on the Fort Worth market March 9, 1917, making a total gain of 302 pounds. They cost 7½ cents per pound or $28.42 and sold for $13.60 per hundred pounds or $92.61, yielding a net profit, after deducting marketing expenses of $60.79, which, credited to the steers, was $3.04 per steer. The hogs which followed Lot 1 made 45 pounds more gain than did those which followed Lot 2.

Both lots of steers were shipped to Fort Worth, March 10, 1917, leaving College Station at 2:30 p. m., and arriving at Fort Worth, March 11, about 2:00 a. m. Beginning with the evening feed of March 9, they were fed only prairie hay in preparation for shipment. March 12, fifteen head were topped out of the two lots, 8 steers from Lot 1 and 7 steers from Lot 2, for exhibition as a car lot in the National Feeders' and Breeders' Show. These steers were shown in the class for fat yearling steers, and won the third premium of $75.00. They were fed during the show the same as the Angus steers that were exhibited. The twenty-six steers not exhibited were fed and handled as commercial cattle and were sold to the packers, March 13, 1917. The steers that were exhibited were sold at 10:00 a. m., March 15, and weighed to the packers the following day at the same hour, having had feed and water withheld from them for twenty-four hours. The account of the sales is shown as follows:

Lot 1

| | | | | |
|---|---|---|---|---|
| March 13— | 13 steers— | 12,510 pounds | at $10.75 per cwt.... | $1,344.82 |
| March 15— | 8 steers— | 7,800 pounds | at $12.00 per cwt.... | $ 936.00 |
| Total, | 21 steers— | 20,310 pounds | at $11.23 per cwt.... | $2,280.82 |

Lot 2

March 13—13 steers—11,840 pounds at $10.50 per cwt....$1,243.20
March 15— 7 steers— 6,740 pounds at $12.00 per cwt....$ 808.80

Total, 20 steers—18,580 pounds at $11.04 per cwt....$2,052.00

Lot 1 yielded heavier carcasses and of better quality from the standpoint of finish, but otherwise showed no superiority over the carcasses of Lot 2. The packers pronounced both lots very desirable.

The results of the experiment for the whole period are shown in detail in the following table:

**Table 6—Feeding period, 182 days—September 8, 1916, to March 9, 1917.**

| | Lot 1, Cold pressed cotton seed etc. | Lot 2, Ground whole pressed peanuts, etc. |
|---|---|---|
| Number of steers | 21 | 20 |
| Average initial weight, pounds, September 8, 1916 | 617.20 | 615.30 |
| Average final weight at College Station, pounds, March 9, 1917 | 1026.40 | 979.00 |
| Total gain per steer, pounds | 409.20 | 363.70 |
| Average daily gain per steer, pounds | 2.24 | 2.00 |
| Average final weight, pounds, Fort Worth | 967.00 | 929.00 |
| Net shrinkage per steer, pounds | 59.40 | 50.00 |
| Net shrinkage, per cent | 5.79 | 5.11 |
| Average Daily Rations, Pounds. | | |
| Cold pressed cotton seed or ground whole pressed peanuts | 4.67 | 3.50 |
| Ground milo | 8.44 | 9.60 |
| Silage | 16.94 | 16.94 |
| Bermuda hay | 1.77 | 1.77 |
| Cotton seed hulls | 0.73 | 0.73 |
| Pounds of Feed Required for 100 Pounds of Gain. | | |
| Cold pressed cotton seed or ground whole pressed peanuts | 207.50 | 175.10 |
| Ground milo | 375.20 | 480.60 |
| Silage | 753.50 | 847.80 |
| Bermuda hay | 78.60 | 88.40 |
| Cotton seed hulls | 32.70 | 36.80 |
| Cost of feed for 100 pounds of gain | $13.25 | $15.63 |
| Total feed consumed in pounds per steer during test from September 8, 1916, to March 9, 1917. | | |
| Cold pressed cotton seed or ground whole pressed peanuts | 849.30 | 636.90 |
| Ground milo | 1535.50 | 1747.80 |
| Silage | 3083.50 | 3083.50 |
| Bermuda hay | 321.50 | 321.50 |
| Cotton seed hulls | 133.70 | 133.70 |
| Cost of feed per steer during test | $54.25 | $56.88 |
| Cost of feed per steer preparatory to shipment and during show (including straw for bedding) | $ 0.77 | $ 0.77 |
| Cost of salt per steer during test. | | |
| Lot 1—4.3 pounds at 50c per cwt | $ 0.02 | ..... |
| Lot 2—9.8 pounds at 50c per cwt | ..... | $ 0.05 |
| Labor cost per steer, September 8, 1916, to March 15, 1917 | $ 5.01 | $ 5.01 |
| Interest per steer on investment in cattle and feed at 8 per cent September 8, 1916, to March 15, 1917 | $ 4.44 | $ 4.55 |
| Interest and depreciation, per steer, on equipment at 7 per cent | $ 0.85 | $ 0.85 |
| Marketing expenses per steer (freight, yardage and commission) | $ 2.73 | $ 2.66 |
| Initial cost per steer at $8.57 per 100 pounds | $52.87 | $52.70 |
| Total cost of each steer when sold | $120.94 | $123.47 |
| Average price per 100 pounds received at Fort Worth | $11.23 | $11.04 |
| Price received per steer | $108.61 | $102.60 |
| Returns per steer through hogs following | $ 3.23 | $ 3.04 |
| Returns per steer in premium money | $ 1.83 | $ 1.83 |
| Loss per steer, premium money not included | $ 9.10 | $17.83 |
| Loss per steer, premium money included | $ 7.27 | $16.00 |
| Selling price per cwt. necessary to have broken even, premium money not included | $12.17 | $12.96 |

It will be noted that Lot 2, which received ground-whole pressed peanuts, made less gain, and required larger amounts of both concentrates and roughage to produce 100 pounds of gain. It is possible that, had this lot received the same quantity of ground-whole pressed peanuts as Lot 1 received of cold-pressed cotton seed, the results from the two lots would have been more nearly equal. The results actually obtained show that ground-whole pressed peanuts did not compare so favorably with cold-pressed cotton seed in this test as peanut meal with cotton seed meal in the test previously described.

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## PART II

### THE EXPERIMENT OF 1919-20

#### OBJECT

The object of this experiment was to determine whether there would be any advantage in substituting silage for a part of the cotton seed hulls in a ration composed of cotton seed meal, ground corn or milo, black strap molasses, and cotton seed hulls, for fattening cattle.

#### CATTLE USED

The steers used in this test were sixty high grade Hereford yearlings purchased from the King Ranch, Kingsville, Texas. They had been well grown, but were in just fair feeder flesh when they arrived at College Station, October 28, 1919. On arrival they were divided into two lots of thirty head each and started on feed. The period from October 28, 1919, to the morning of November 4, 1919, was used as a preliminary feeding period to get the steers accustomed to their rations. The cost of feeding during this period of seven days, amounting to $1.86 per head, the freight charges from Kingsville to College Station, amounting to $1.78 per head, and the original cost of the steers, which was $70.00 per head, are figured together as the price of the steers at the beginning of the test, November 4. On this date, the sixty steers averaged in weight 670.3 pounds. They had cost $73.64 per head. Therefore, the average cost per hundred pounds figured $10.98.

#### FEEDS USED

Average samples of the feeds used were analyzed by the Chemistry Division of the Experiment Station, and the average results of the analyses appear in the following table:

Table 7.

| Feeds | Percentage Composition. | | | | | | Analysis Number |
|---|---|---|---|---|---|---|---|
| | Water | Ash | Crude protein | Crude fiber | Nitrogen-free extract | Fat | |
| Cotton seed meal | 8.07 | 6.12 | 48.19 | 7.10 | 22.91 | 7.61 | 17454 |
| Ground corn* | 5.05 | 1.50 | 10.10 | 2.00 | 70.90 | 5.00 | ..... |
| Ground milo | 13.52 | 1.61 | 10.86 | 2.61 | 68.81 | 2.59 | 17453 |
| Black strap molasses | 24.77 | 5.52 | 3.45 | ..... | 66.26 | ..... | 17456 |
| | | | | | | | 17486 |
| | | | | | | | 17713 |
| Cotton seed hulls | 10.55 | 2.71 | 3.22 | 49.03 | 34.03 | 0.34 | 17455 |
| Sorghum silage | 70.12 | 1.87 | 1.54 | 8.87 | 16.84 | 0.76 | 17452 |
| | | | | | | | 17487 |
| | | | | | | | 17711 |

*Average composition taken from Feeds and Feeding, by Henry and Morrison.

Based on the composition given in Table 7, the digestible nutrients of each feed are presented in Table 8.

Table 8.

| Feeds | Dry matter in 100 pounds. | Digestible Nutrients in 100 lbs. | | |
|---|---|---|---|---|
| | | Crude protein | Carbohydrates | Fat |
| Cotton seed meal | 91.93 | 40.48 | 19.81 | 7.23 |
| Ground corn | 89.50 | 7.50 | 67.80 | 4.60 |
| Ground milo | 86.48 | 7.17 | 61.10 | 2.33 |
| Blackstrap molasses | 75.23 | 1.10 | 59.63 | ..... |
| Cotton seed hulls | 89.45 | 0.19 | 34.65 | 0.27 |
| Sorghum silage | 29.88 | 0.14 | 15.92 | 0.43 |

The cost of the feeds was as follows:

Cotton seed meal.....$73.50 per ton
Ground corn.....$65.00 per ton
Ground milo.....$43.80 per ton
Black strap molasses at 20½ cents per gallon.....$34.16 per ton
Cotton seed hulls.....$ 9.00 per ton
Sorghum silage.....$ 8.00 per ton

## PLAN OF EXPERIMENT

The two lots of steers of thirty each were designated as Lot 1 and Lot 2. They were quite equally divided with respect to type, quality and condition, though Lot 2 was somewhat heavier. Both lots were weighed every 30 days from the beginning to the end of the experiment, the weights being taken between 2:00 and 3:00 p. m. They were confined to pens 100x160 feet, and had access to a shed open on the south side. They had free access to water and granular salt, supplied in each pen, the salt being under shelter.

It was planned that both lots should receive the same kinds and amounts of concentrates, but that cotton seed hulls should constitute the roughage for Lot 1 and cotton seed hulls and silage together, the roughage for Lot 2, the idea being to determine whether there would be any advantage in substituting silage for a part of the hulls. The feeding was done regularly, twice daily, morning and evening, and the

concentrates and roughage, thoroughly mixed together, were supplied.

Ten shotes followed each lot of steers from November 5, 1919, to March 3, 1920. From November 11, 1919, to the end of the test, each lot of hogs received, in addition to the droppings, one pound of concentrates per head daily, composed of 90 per cent. of ground corn or milo and 10 per cent. of tankage.

## THE EXPERIMENT

The experiment covered a period of 120 days, from November 4, 1919, to March 3, 1920. It was conducted as originally planned until February 11, 1920, when Lot 1 began to get "off feed" and silage was substituted for a part of the cotton seed hulls for this lot, also. This change caused the steers of this lot to eat better and they continued to receive silage until the end of the test. Lot 2 ate well from start to finish. Ground corn, because milo was not available, was fed until December 13, when ground milo was obtained and substituted for the corn for the remainder of the test.

The average rations fed and the gains made are presented by periods as follows:

**Table 9.**

| Lot No. | Average ration | Total gain per steer, pounds. | Average daily gain, pounds. |
|---|---|---|---|
| | First Period—30 Days. | | |
| 1 | 2.2 lbs. cotton seed meal, 2 lbs. molasses, 5.98 lbs. grain, 12 lbs. cotton seed hulls | 92.50 | 3.08 |
| 2 | 2.2 lbs. cotton seed meal, 8 lbs. cotton seed hulls, 5.98 lbs. grain, 12 lbs. sorghum silage, 2 lbs. molasses | 95.25 | 3.18 |
| | Second Period—30 Days. | | |
| 1 | 2.5 lbs. cotton seed meal, 2 lbs. molasses, 8.43 lbs. grain, 12.85 lbs. cotton seed hulls | 79.50 | 2.65 |
| 2 | 2.5 lbs. cotton seed meal, 8 lbs. cotton seed hulls, 8.43 lbs. grain, 14.55 lbs. sorghum silage, 2 lbs. molasses | 76.60 | 2.55 |
| | Third Period—30 days. | | |
| 1 | 2.56 lbs. cotton seed meal, 2 lbs. molasses, 10.73 lbs. grain, 11.46 lbs. cotton seed hulls | 25.66 | 0.85 |
| 2 | 2.56 lbs. cotton seed meal, 6.46 lbs. cotton seed hulls, 10.73 lbs. grain, 15 lbs. sorghum silage, 2 lbs. molasses | 40.90 | 1.36 |
| | Fourth Period—30 Days. | | |
| 1 | 3 lbs. cotton seed meal, 6.74 lbs. cotton seed hulls, 9.23 lbs. grain, 8.57 lbs. sorghum silage, 3.77 lbs. molasses | 73.84 | 2.46 |
| 2 | 3 lbs. cotton seed meal, 6 lbs. cotton seed hulls, 10.02 lbs. grain, 14.2 lbs. sorghum silage, 3.77 lbs. molasses | 56.83 | 1.89 |

The gains made by both lots during the first, second, and fourth months were very satisfactory; but during the third month, they were very poor, a fact which may be attributed to the excessive rains and very muddy pens through the whole of that period.

At the start, each lot of ten hogs which followed the cattle weighed 1,192 pounds or an average of 119.2 pounds. At the end of the test, the hogs which had followed Lot 1 weighed 1,560 pounds, having gained 368 pounds; and those which had followed Lot 2 weighed 1,575 pounds, having gained 383 pounds. The market value of these hogs, per pound, was about the same at the end as at the beginning of the test, namely,

14 cents. Therefore, the gains are figured at this value and amount to $51.52 for Lot 1 and $53.62 for Lot 2.

Each lot of hogs consumed, during the test, 113.5 pounds of tankage, which, at $110.00 per ton, amounted to $6.24; 297 pounds of ground corn, which, at $65.00 per ton, amounted to $9.65; and 724.5 pounds ground milo, which, at $43.80 per ton, amounted to $15.86, thus making the total cost of supplementary feed $31.75 per lot. Deducting this amount from the value of the gains, the net returns from the hogs of Lot 1 amounted to $19.77 and from those of Lot 2, $21.87. Credited to the steers, the returns from the hogs of Lot 1 amounted to 66 cents per steer and the returns from the hogs of Lot 2 amounted to 73 cents per steer.

Though the feeding test proper closed March 3, the cattle were not shipped to Fort Worth, where they were marketed, until March 6. They received, the evening of March 5, only half the regular allowance of concentrates and silage, but were fed the regular allowance of cotton seed hulls and also as much sorghum hay as they wanted. The next morning they received one pound of cotton seed meal per head and again, as much cotton seed hulls and sorghum hay as they would eat. Leaving College Station at 7:20 p. m., March 6, they were unloaded at the Stock Yards, Fort Worth, at 4:00 a. m., March 8, having made a run in 33 hours that ordinarily requires 12 hours or less to make. They shipped without any scouring and arrived in good shape.

From the two lots, 30 steers were topped out for exhibition in the Southwestern Exposition and Fat Stock Show, about an equal number being taken from each lot. These were immediately put back on the same feeds, with the exception of silage, that they had received during the test at home, and, in addition, they were given free access to prairie hay. They ate fairly well, but did not get back to full feed again. These thirty steers comprised two carload entries in the show in the class for fat steers under two years old. The top load of fifteen won the second prize of $200.00 and the other load the third prize of $100.00. While carrying fairly good finish for commercial cattle, they did not possess sufficient finish for show, and should have been fed at least sixty days longer.

They were sold to the packers the morning of March 11, and weighed to them the morning of March 12, after having been kept off feed and water for 24 hours. The steers that were not exhibited were handled as regular commercial cattle and were sold to the packers March 8. The sixty steers sold and weighed as follows:

| | | | | |
|---|---|---|---|---|
| 15 | Steers—13,400 | pounds at | $16.75 | per cwt.....$2,244.50 |
| 15 | Steers—13,290 | pounds at | $16.35 | per cwt.....$2,172.91 |
| 26 | Steers—21,820 | pounds at | $13.50 | per cwt.....$2,945.70 |
| 4 | Steers— 2,910 | pounds at | $12.00 | per cwt.....$ 349.20 |
| 60 | Steers—51,420 | pounds at | $15.00 | per cwt.....$7,712.31 |

The detailed results of the test are covered in the following statement:

**Table 10.**

| | Lot 1 | Lot 2 |
|---|---|---|
| Number of steers | 30 | 30 |
| Average initial weight, pounds, November 4, 1919 | 664.00 | 676.70 |
| Average final weight at College Station, pounds, March 3, 1920 | 935.50 | 946.30 |
| Total gain per steer, pounds | 271.50 | 269.60 |
| Average daily gain per steer, pounds | 2.26 | 2.24 |
| Average final weight at Fort Worth, pounds | 852.00 | 862.00 |
| Net shrinkage per steer, pounds | 83.40 | 84.30 |
| Net shrinkage, per cent | 8.91 | 8.91 |
| Average Daily Ration, Pounds. | | |
| Cotton seed meal | 2.56 | 2.56 |
| Grain | 8.59 | 8.79 |
| Molasses | 2.44 | 2.44 |
| Cotton seed hulls | 10.76 | 7.12 |
| Sorghum silage | 2.14 | 13.93 |
| Pounds of Feed Required for 100 lbs. of Gain. | | |
| Cotton seed meal | 113.44 | 114.25 |
| Grain | 379.92 | 392.50 |
| Blackstrap molasses | 107.89 | 108.68 |
| Cotton seed hulls | 475.78 | 316.60 |
| Sorghum silage | 94.65 | 620.40 |
| Cost of feed for 100 lbs. of gain | $17.75 | $19.44 |
| Total feed consumed in pounds per steer during test from November 4, 1919, to March 3, 1920. | | |
| Cotton seed meal | 308.00 | 308.00 |
| Ground corn | 234.00 | 234.00 |
| Ground milo | 797.50 | 821.00 |
| Blackstrap molasses | 293.00 | 293.00 |
| Cotton seed hulls | 1292.00 | 854.00 |
| Sorghum silage | 257.00 | 1672.50 |
| Total feed consumed in pounds per steer; preparatory to shipment and during the show, March 3 to 11. | | |
| Cotton seed meal | 12.08 | 12.08 |
| Ground milo | 36.95 | 36.95 |
| Blackstrap molasses | 14.78 | 14.78 |
| Cotton seed hulls | 28.67 | 28.67 |
| Sorghum silage | 22.50 | 22.50 |
| Sorghum hay | 4.00 | 4.00 |
| Total cost of feed per steer including 41 cents per head for extra hay and bedding at show | $50.28 | $54.68 |
| Salt per steer during test, 3.7 lbs. at 85 cents per cwt | $ 0.03 | $ 0.03 |
| Labor cost per steer, November 4, 1919, to March 11, 1920 | $ 5.33 | $ 5.33 |
| Interest per steer on investment in cattle and feed at 8 per cent, November 4, 1919, to March 11, 1920 | $ 3.54 | $ 3.61 |
| Interest and depreciation per steer on equipment at 7 per cent | $ 0.75 | $ 0.75 |
| Marketing expenses per steer (freight, yardage, commission, etc.) | $ 4.20 | $ 4.20 |
| Initial cost per steer at $10.98 per cwt | $72.90 | $74.30 |
| Total cost of each steer when sold | $137.03 | $142.91 |
| Price received per steer at $15.00 per cwt | $127.80 | $129.28 |
| Returns per steer through hogs following | $ 0.66 | $ 0.73 |
| Returns per steer in premium money | $ 5.00 | $ 5.00 |
| Loss per steer, premium money not included | $ 8.57 | $12.90 |
| Loss per steer, premium money included | $ 3.57 | $ 7.90 |
| Selling price per cwt. necessary to have broken even, premium money not included | $16.00 | $16.49 |

It will be noted that there was practically no difference in the gains made by the two lots. The results show that, though silage proved an advantage as an appetizer, there was no financial advantage in using it at $8.00 per ton with cotton seed hulls available at $9.00 per ton. In fact, at these prices, the use of silage in the ration for Lot 2, through the whole period of the test, caused a greater loss in that lot than in Lot 1, by $4.33 per steer. It may be stated that previous tests, conducted by the Texas Experiment Station, in which silage was compared with cotton seed hulls in rations for fattening cattle, have shown that it requires approximately $1\frac{2}{3}$ tons of silage to equal 1 ton of cotton seed hulls in feeding value. Therefore, if cotton seed hulls cost $9.00 per ton, silage should not cost over $5.40 per ton.

The financial results of this test have been figured on the basis of actual expenditures and receipts in the case of all items involved. Had the cattle been fed under farm conditions and had access to pasture, the cost of production should have been less and the returns more favorable. Experimental feeding is nearly always more expensive than commercial feeding on the farm. Grain especially would have cost less on the farm which produced it. The labor item would have been less if the weighing of the rations every day had not been necessary. The steers sold well and at a margin that, under ordinary conditions, should have meant fair profit. The actual results simply show the wide margin necessary for profit in fattening cattle with feeds at such high prices.

## SUMMARY

1. Choice peanut meal proved fully equal to cotton seed meal in respect to the production of gain, but apparently was less palatable.
2. Ground-whole pressed peanuts were not so satisfactory as cold-pressed cotton seed either in the production of gain or in the palatability.
3. Neither peanut meal nor ground-whole pressed peanuts caused any bad effects on the quality of the carcass.
4. There was no advantage in substituting sorghum silage at $8.00 per ton for cotton seed hulls at $9.00 per ton, except during the latter part of the feeding period, when silage proved valuable as an appetizer under conditions of forced feeding.