

TEXAS AGRICULTURAL EXPERIMENT STATION

A. B. CONNER, DIRECTOR
College Station, Texas

BULLETIN NO. 622

OCTOBER 1942

**SILAGE AND COTTONSEED MEAL FOR
FATTENING YEARLING STEERS**

**J. H. JONES, R. E. DICKSON,
J. K. RIGGS, AND J. M. JONES**

Division of Range Animal Husbandry



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Feeding experiments conducted at Substation No. 7, Spur, Texas, have shown that heavy yearling feeder steers of about 700 pounds initial weight can be reasonably well fattened on rations of cottonseed meal and sumac silage without additional grain in about 200 days.

The feeding of silage with cottonseed meal may afford a profitable means of marketing large amounts of silage per steer when grains are scarce and high in price and silage is abundant.

It was more profitable to feed approximately 5.5 pounds of 43 percent protein cottonseed meal per head daily in addition to a full feed of silage than either 4 or 7 pounds. The smaller amount did not produce adequate finish. The larger amount increased both gain and finish, but these advantages were expensive.

Cottonseed oil, fed for experimental purposes, was not laxative to yearling steers, when fed in amounts up to 1 pound per head daily. It had high energy value as shown by the gains resulting from its inclusion in the ration, but its cost prohibits its use in cattle fattening.

In one trial, cottonseed fed at the rate of 6.4 pounds per head daily, with cottonseed meal and silage to yearling steers did not have laxative effect. Its protein and fat was nearly as efficient in the production of gain as the protein and fat supplied by cottonseed meal and cottonseed oil.

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SILAGE AND COTTONSEED MEAL FOR FATTENING YEARLING STEERS

J. H. Jones¹, R. E. Dickson², J. K. Riggs³, J. M. Jones⁴

It became evident during the course of feeding trials conducted at Substation No. 7 from 1931 to 1934 that the trench silo affords a practicable means of storing sorghum roughages in the Spur area. The quality of the sorghum roughages stored in the trench silo was maintained to a degree not possible with stacking in the open. Rodent damage and the hazards of fire were eliminated. The low cost of the trench silos provided not only economical storage but permitted the saving of surpluses of roughages for use in following years.

Texas cattle feeders often have supplies of roughages, silage and bundle feeds, when fattening grains are comparatively scarce and high in price. The protein supplements such as cottonseed meal and peanut meal are usually available at a fair price. This situation often results in the use of fattening rations consisting of cottonseed meal and silage. In these instances the main question has had to do with the amount of cottonseed meal which should be fed per head daily in addition to the full feed of silage.

In feeding rations high in roughage feeds, very good results in gain and finish and gloss of hair coat have been noted when limited amounts of cottonseed were included in the rations. It has been suggested that the high fat content of cottonseed, approximately 18 percent, may be responsible for such favorable results. A laxative effect which has been reported from the feeding of large amounts of cottonseed has also been ascribed to the high oil or fat content of the cottonseed.

Most of the feeds used in West Texas are comparatively low in fat. Milo heads contain approximately 2.5 percent, threshed milo 2.9 percent, sumac silage .8 percent, and cottonseed meal the most readily available protein supplement has a guaranteed analysis of 6 percent minimum fat content (5). Cottonseed meal, however, may contain 7 percent to 9 percent fat, but such meals, usually ground from screenings, may fall slightly below 43 percent protein content.

The situation in regard to the fat content of West Texas fattening rations and the fat content of cottonseed and cottonseed meal has prompted questions concerning the value of fat in the common feeds. With reference to the slightly variable fat and protein content of cottonseed meal

¹Animal Husbandman.

²Supt. Substation No. 7, Spur, Texas.

³Assoc. Prof. An. Husb. (formerly Asst. An. Husb., Substa. 7, Spur).

⁴Chief Division Range Animal Husbandry.

it is reasonable for the silage feeder to ask, "Is a cottonseed meal containing 41 percent protein and 8 percent fat as valuable for fattening with silage as one containing 43 percent protein and 6 percent fat, the total percentage of protein and fat being equal in each case?" The feeder has also asked whether cottonseed are laxative and if the protein and fat in cottonseed will give the same results in fattening as the protein and fat supplied in the form of cottonseed meal and cottonseed oil.

With the situation of an abundance of silage feeds, limited amounts of grain feeds, available cottonseed meal and in instances cheap cottonseed, work was undertaken to gain additional information in regard to the place of silage in fattening rations and to determine (1) the relative value of different amounts of cottonseed meal when fed as the only concentrate with silage for fattening, and (2) the value of different amounts of fat (fed as crude cottonseed oil) in rations of silage and cottonseed meal for fattening yearling steers. (The cottonseed oil was fed for experimental purposes and not with the idea that it would be profitable.)

The use of silage and cottonseed meal rations for fattening yearling steers is something of a departure from usual procedure for most yearling steers placed in dry lot for fattening are fed some grain. Armsby (1), wrote in 1917 as a general conclusion that under ordinary conditions mature or nearly mature fattening animals should be fed about as heavily as the capacity of the animals and the skill of the feeder will permit. He further stated that such intensive feeding can be accomplished only by the free use of concentrates and that unless concentrates are very expensive as compared to roughages they should be used to the largest practicable extent. Morrison (2) has also stated that it is ordinarily profitable to feed grain liberally throughout the entire fattening period unless the price of grain is unusually high in comparison to the roughage or unless the local market pays no premium for well fattened cattle.

Such cautions were understood in planning the work at Spur and it was realized that gains necessarily would not be as high as could be obtained with rations high in concentrates. The literature, however, affords many instances in which reasonably good gains have been secured in feeding rations limited in concentrates. Smith (3) found that 2-year-old steers fed cottonseed meal and corn silage averaged 2.18 pounds daily gain for a period of 102 days. Curtis (4) reported gains of 1.23 to 1.69 pounds per head daily for 2-year-old steers fed corn silage with 6.77 to 8.14 pounds of cottonseed meal for 112 to 122 days. Burns (5) (6) secured gains of about 2 pounds per head daily in feeding rations of cottonseed meal, cottonseed hulls and silage to aged steers during feeding periods of about 140 days. Jones et al (7) also secured reasonably good gains and satisfactory finish in feeding rations high in roughage to yearling steers in periods of about 200 days.

GENERAL PLAN OF EXPERIMENT

The feeding trials were conducted during three consecutive feeding seasons, 1935-36, 1936-37, and 1937-38. The results are discussed separately by years and are then summarized.

Cattle Used

Lots of 10 head each of well bred Hereford steer yearlings were used in each of the three tests. Those used in 1935-36 were of good to choice quality and were in good grass flesh when received. They were fed an average of 17 pounds cottonseed hulls and 2 pounds cottonseed meal for a period of 30 days, after which they were divided into 5 lots and entered the test weighing 676 pounds valued at \$6.32 per hundred. The steers used in 1936-37 were of lower quality and were purchased on May 29, 1936, at a weight of 525 pounds. They were maintained on the station farm on pasturage and various feeds for a period of 194 days during which time they gained 217 pounds per head, and entered the feedlot weighing 742 pounds valued at \$6.50 per cwt. The steers used in 1937-38 were good choice in quality. They weighed an average of 679 pounds when received October 7, 1937 at \$50.00 per head. They were fed various farm feeds on the station for 42 days and entered the test November 17 at an average weight of 754 pounds valued at \$6.85 per cwt.

Feeds Used

The feeds used were of good quality and were representative of the feeds available in the region. The silage was of sumac sorghum produced on the station farm, and the cottonseed meal was purchased under a guarantee of 43 per cent protein and 6 per cent fat. The silage was as uniform in composition from year to year as could be expected under the varying conditions of growth, harvesting and storage which were encountered. The available analyses of the feeds which were used are shown in Table 1.

Table 1. *Composition of feeds used

Kind of feed	No. of samples analyzed	Protein	Fat	Crude fiber	Nitrogen free extract	Water	Ash
COTTONSEED MEAL							
1935-36-----	2	45.01	7.51	11.96	23.21	7.12	5.18
1936-37-----	1	41.70	8.52	11.75	24.87	7.65	5.51
1937-38-----	1	43.05	8.02	10.75	25.07	7.64	5.47
Average-----	4	43.25	8.02	11.49	24.38	7.47	5.39
SUMAC SILAGE							
1936-37-----	1	1.56	.36	3.39	11.36	81.21	2.12
1937-38-----	1	2.62	.83	7.04	17.35	69.72	2.44
Average-----	2	2.09	.59	5.12	14.35	75.46	2.28

*Analyzed by Division of Chemistry, Texas Agricultural Experiment Station.

Prices charged for the feeds used in each of the years were the estimated farm prices for the region and are shown in Table 2.

Table 2. Feed prices per ton

Feeds	1935-36	1936-37	1937-38
Cottonseed meal.....	\$ 26.80	\$ 35.00	\$ 27.00
Cottonseed hulls.....	6.50	10.00	7.00
Cottonseed oil.....	190.00	200.00	130.00
Sudan hay.....	5.00	-----	-----
Sumac silage.....	2.00	4.00	4.00
Sorghum fodder.....	-----	10.00	-----
Salt.....	17.50	25.00	17.00
Cottonseed.....	-----	-----	18.00

Plan of Rations

The plan of feeding was as follows:

- Lot 1—Cottonseed meal, 4 pounds; cottonseed oil, .18 pound; silage
 Lot 2— “ “ , 5.5 “ ; “ “ , .09 “ ; “
 Lot 3— “ “ , 7 “ ; “ “
 Lot 4— “ “ , 4 “ ; cottonseed oil, .58 pound; “
 Lot 5— “ “ , 4 “ ; “ “ , .98 “ ; “

The plan was designed to make direct comparison of 4, 5.5, and 7 pounds of cottonseed meal in Lots 1, 2, and 3, and of .18, .58, and .98 pound of cottonseed oil in Lots 1, 4, and 5, or, in short, to split the cottonseed into its two major constituents, protein in form of cottonseed meal and fat as cottonseed oil, to study the feeding value of each.

Table 3 shows the percentage composition of the mixtures as fed to each lot during the three feeding trials. These mixtures were made up daily and sacked for morning and evening feeds, at which time they

Table 3. Concentrate mixtures used, 1935-1938

Feed	Lot 1, %	Lot 2, %	Lot 3, %	Lot 4, %	Lot 5, %	Lot 6,* %
Cottonseed meal.....	77.22	82.20	87.72	71.68	66.89	13.5
Cottonseed oil.....	3.47	1.36	-----	10.39	16.39	-----
Cottonseed hulls.....	19.31	16.44	12.28	17.92	16.72	-----
Cottonseed*.....	-----	-----	-----	-----	-----	86.5

*Fed in 1937-38 only

were spread over the silage and mixed in. A small amount of cottonseed hulls was used in the mixtures as a carrier for the cottonseed oil in order to get it more evenly distributed through the feed mixture. In the 1936-37 trial some additional cottonseed hulls were fed as roughage.

EXPERIMENTAL RESULTS

Results 1935-36

A summary of the first feeding trial is shown in Table 4.

**Table 4. Summary first feeding trial, November 14, 1935 to May 8, 1936
176 days**

Lot number.....	1	2	3	4	5
Number of steers.....	10	10	10	10	10
Variables when on full feed					
All lots fed silage and cottonseed hulls					
1. Amount cottonseed meal fed daily.....	4.0	5.5	7.0	4.0	4.0
2. Amount cottonseed oil fed daily.....	.13	.09	---	.58	.98
Averages in pounds per steer					
Initial weight.....	675	677	676	676	676
Final weight at feedlot.....	988	1005	1013	1015	1040
Final weight at Ft. Worth market.....	927	944	956	958	990
Gain basis feedlot weight.....	313	328	337	339	364
Gain basis market weight.....	252	267	280	282	314
Daily gain basis feedlot weight.....	1.78	1.86	1.91	1.93	2.07
Daily gain basis market weight.....	1.43	1.52	1.59	1.60	1.78
Shrinkage enroute to market, %.....	6.17	6.07	5.63	5.62	4.81
Carcass weight (hot).....	582	598	614	612	622
Dressing % basis hot carcass and market wt.	62.8	63.3	64.2	63.9	62.8
Dressing % basis hot carcass and fdt. wt.	58.9	59.5	60.6	60.3	59.8
Carcass grades—Swift					
11's—choice.....	1	4	5	1	2
12's—strictly good to choice.....	4	6	3	8	5
13's—top medium to good.....	5	---	2	1	3
Total feeds consumed					
Cottonseed meal.....	683	920	1190	679	679
Cottonseed oil.....	30.4	15	---	98	165
Cottonseed hulls.....	209	223	206	209	209
Silage.....	6563	6563	6563	6563	6563
Sudan hay.....	133	136	113	118	119
Salt.....	7.4	8.0	8.1	6.1	6.8
Average ration consumed					
Cottonseed meal.....	3.88	5.23	6.76	3.86	3.86
Cottonseed oil.....	.173	.086	---	.56	.94
Cottonseed hulls.....	1.19	1.27	1.17	1.19	1.19
Silage.....	37.29	37.29	37.29	37.29	37.29
Sudan hay.....	.755	.77	.64	.67	.67
Salt, ounces.....	.67	.73	.74	.55	.62
Cost of feed per cwt. gain (feed consumed)					
Basis feedlot weight.....	\$ 6.29	\$ 6.54	\$ 6.98	\$ 7.67	\$ 8.89
Basis market weight.....	7.81	8.03	8.40	9.22	10.31
Cost into feedlot at \$6.323 per cwt.....	\$ 42.68	\$ 42.81	\$ 42.74	\$ 42.74	\$ 42.74
Feed cost (feed consumed).....	19.68	21.45	23.53	26.00	32.37
Marketing cost at \$0.41 per cwt.....	4.09	4.16	4.22	4.22	4.37
Total cost.....	66.45	68.42	70.49	72.96	79.48
Selling price per cwt.....	7.50	7.75	7.61	7.75	7.75
Amount received.....	69.53	73.16	72.75	74.25	76.73
Profit (no charge for labor).....	3.08	4.74	2.26	1.29	2.75

Comparison of Different Amounts of Cottonseed Meal

Lot 2, fed 5.23 pounds of cottonseed meal per head daily, made 4.8 percent greater gain and yielded 2.7 percent more dressed beef than Lot 1, fed only 3.88 pounds of cottonseed meal. It also had an advantage of 25 cents per cwt. in selling price, which was warranted by higher finish.

Lot 3, fed 6.76 pounds of cottonseed meal per head daily, made 2.7 percent greater gain and 2.7 percent more dressed beef than Lot 2, fed 5.23 pounds. It made 7.7 percent greater gain and 5.5 percent more dressed beef than Lot 1, fed only 3.88 pounds of cottonseed meal. The greater gain and higher yield of dressed beef indicates that the larger amount of meal was beneficial as a source of energy. It would have been profitable to feed the larger amount of cottonseed meal had it not been that two steers in the lot were of inferior type and reduced the average price of the lot.

Comparison of Different Amounts of Cottonseed Oil

There was a consistent increase in gain with increase in the amount of cottonseed oil fed. Lot 4, with .56 pound of cottonseed oil added to the ration of 3.86 pounds of cottonseed meal and a full feed of silage made 8.3 percent greater gain and 5.2 percent more dressed beef at a saving of 8.25 percent in cottonseed meal required per hundred pounds gain than Lot 1, fed .17 pound of oil.

Lot 5, which received .94 pound of oil per head daily made 16.3 percent greater gain and 6.9 percent more dressed beef at a saving of 14.2 percent in cottonseed meal required per hundred pounds gain than Lot 1, fed only .17 pound of oil. It also gained 7.4 percent more and yielded 1.6 percent more dressed beef at a saving of 6.5 percent in cottonseed meal required per hundred pounds gain than Lot 4, which received .56 pound of cottonseed oil. These two lots sold at the same price and both had a 25 cent advantage per cwt. over Lot 1 fed .17 pound of cottonseed oil.

This feeding trial showed that yearling steers can be fattened on rations of cottonseed meal and silage without added grain, and that about 200 days of such feeding are required to make good finish. It was more profitable to feed the medium amount of cottonseed meal, 5.23 pounds per head daily with silage, as fed in Lot 2 than either 3.88 pounds as fed to Lot 1 or 6.76 pounds as fed to Lot 3.

Results 1936-37

A feeding period of 122 days, which was not long enough to produce high finish, was necessitated by a shortage of roughage feeds. Chopped sorghum fodders were fed with the silage in order to extend the feeding period, but the other feeds were the same as for 1935-36. A summary of the second feeding trial is shown in Table 5.

**Table 5. Summary second feeding trial, December 9, 1936 to April 10, 1937
122 days**

Lot number-----	1	2	3	4	5
Number of steers-----	10	10	10	10	10
Variables when on full feed All lots fed silage, cottonseed hulls and sorghum fodder					
1. Amount of cottonseed meal fed daily---	4.0	5.5	7.0	4.0	4.0
2. Amount of cottonseed oil fed daily-----	.18	.09	---	.58	.98
Average in pounds per steer					
Initial weight-----	743	742	743	742	742
Final weight at feedlot-----	976	990	1006	973	995
Final weight at Ft. Worth market-----	885	899	907	880	901
Gain basis feedlot weight-----	233	248	263	231	253
Gain basis market weight-----	142	157	164	138	159
Daily gain basis feedlot weight-----	1.91	2.03	2.16	1.89	2.07
Daily gain basis market weight-----	1.16	1.29	1.34	1.13	1.30
Shrinkage enroute market, %-----	9.32	9.19	9.84	9.56	9.45
Carcass weight (hot)-----	535	545	561	547	552
Dressing % basis hot carcass and market weight-----	60.5	60.6	61.9	62.2	61.3
Dressing % basis hot carcass and feedlot weight-----	54.8	55.1	55.8	56.2	55.5
Carcass grades—Swift					
13's—top medium to good-----	7	8	8	5	5
14's—medium-----	3	2	2	5	5
Total feeds consumed					
Cottonseed meal-----	484	646.6	529.6	481	476
Cottonseed oil-----	21.6	10.7	---	69	116
Cottonseed hulls-----	261	270	257	200	260
Silage-----	4219	4209	4197	4202	4167
Sorghum fodder-----	568	565	561	562	555
Salt-----	4.77	3.74	3.61	3.55	3.95
Average ration consumed					
Cottonseed meal-----	3.97	5.30	6.80	3.94	3.90
Cottonseed oil-----	.177	.088	---	.57	.95
Cottonseed hulls-----	2.14	2.21	2.11	2.13	2.13
Silage-----	34.58	34.50	34.40	34.44	34.16
Sorghum fodder-----	4.66	4.63	4.60	4.61	4.55
Salt, ounces-----	.63	.49	.47	.47	.52
Cost of feed per cwt. gain (feed consumed)					
Basis feedlot weight-----	\$ 9.99	\$ 10.09	\$ 10.29	\$ 12.07	\$ 12.80
Basis market weight-----	16.39	15.94	16.49	20.20	20.37
Cost into feedlot at \$6.50 per cwt.-----	\$ 48.30	\$ 48.23	\$ 48.30	\$ 48.23	\$ 48.23
Feed cost (feed consumed)-----	23.27	25.03	27.05	27.88	32.39
Marketing cost at \$0.434 per cwt.-----	3.84	3.90	3.93	3.82	3.91
Total cost-----	75.41	77.16	79.28	79.93	84.53
Selling price per cwt.-----	9.25	9.06	9.25	9.41	9.27
Amount received-----	81.86	81.45	83.90	82.81	83.52
Profit or loss (no charge for labor)-----	6.45	4.29	4.62	2.88	-1.01

Comparison of Different Amounts of Cottonseed Meal

Lot 2, fed 5.3 pounds of cottonseed meal per head daily made 6.4 percent greater gain and yielded carcasses 1.9 percent heavier than Lot 1.

which received 3.97 pounds of cottonseed meal. Lot 3, fed 6.80 pounds cottonseed meal per head daily made 12.9 percent more gain and 4.9 percent heavier carcasses than Lot 1, fed 3.97 pounds of cottonseed meal. It also made 6.0 percent greater gain and returned 2.9 percent heavier carcasses than Lot 2, fed 5.3 pounds of cottonseed meal.

The steers used were of lower quality than those used in the first trial, and the feeding period was too short for any of the lots to become well finished. Lots 1 and 3 fed 3.97 pounds and 6.8 pounds cottonseed respectively sold at \$9.25 per cwt. with Lot 2, fed 5.3 pounds, selling at \$9.06. The selling prices tend to confuse interpretations based on net returns per steer, for with cottonseed meal at a high price and with no difference in selling price, the net return favors the lot fed the least cottonseed meal. On the basis of carcass weight and carcass grade, however, the lot fed the two larger amounts of cottonseed meal were worth more per cwt. than Lot 1 fed only 3.97 pounds, and had they sold that way, Lot 2, fed 5.3 pounds would have made the greatest return.

Comparison of Different Amounts of Cottonseed Oil

Lot 4, fed .57 pound of cottonseed oil per head daily made practically the same gain based on both feedlot and market weights as Lot 1, fed .18 pound of oil, but the beneficial effect of the larger amount of oil was reflected in glossier hair coats and somewhat heavier carcasses. Lot 5, fed .95 pound of oil, however, gained 8.6 percent more than Lot 1, fed .18 pound and 9.5 percent more than Lot 4, fed .57 pound with corresponding increases of 3.2 percent and .9 percent in yield of dressed beef. For some reason the lot fed the mid-amount of oil had an advantage in uniformity and apparent finish which resulted in an advantage in selling price; however, this price was not justified on the basis of the comparative carcass weights and grades.

Lack of finish as a result of the short feeding period decreased the value of this trial. The results were clearly much more favorable to the addition of cottonseed oil in the first trial, but the results from feeding different amounts of cottonseed meal were about the same for both trials.

Results 1937-38

Whereas cottonseed meal and cottonseed oil were fed as the only supplemental feeds in the first two trials, cottonseed was fed to one lot in this trial because it provided energy at low cost and enabled a comparison between the cottonseed and cottonseed meal plus cottonseed oil, as sources of protein and fat. The supplements for Lot 6, cottonseed and cottonseed meal, were calculated to supply the same amount of protein and fat as was fed to Lot 5 in cottonseed meal and cottonseed oil. This, the third feeding trial, is summarized in Table 6.

**Table 6. Summary third feeding trial, November 17, 1937 to June 1, 1938
196 days**

Lot number-----	1	2	3	4	5	6
Number of steers-----	10	10	10	10	10	10
Variables when on full feed All lots fed silage and cottonseds hulls						
1. Amount of cottonseed meal fed daily-----	4.0	5.5	7.0	4.0	4.0	1.0
2. Amount of cottonseed oil fed daily-----	.18	.09	---	.58	.98	cseed
Averages in pounds per steer						
Initial weight-----	755	755	754	751	753	755
Final weight at feedlot-----	1080	1109	1117	1089	1113	1111
Final weight at Ft. Worth market-----	996	1024	1028	1000	1022	1016
Gain basis feedlot weight-----	325	354	363	338	360	356
Gain basis market weight-----	241	269	274	249	269	261
Daily gain basis feedlot weight-----	1.66	1.81	1.85	1.72	1.84	1.82
Daily gain basis market weight-----	1.23	1.37	1.40	1.27	1.37	1.33
Shrinkage enroute market, %-----	7.78	7.66	7.97	8.17	8.18	8.55
Carcass weight (hot)-----	626	653	666	639	650	645
Dressing % basis hot carcass and market weight-----	62.9	63.8	64.8	63.9	63.6	63.5
Dressing % basis hot carcass and feedlot weight-----	58.0	58.9	59.6	58.7	58.4	58.1
Carcass grades—Armour						
32's—strictly good to choice-----	---	2	2	1	4	2
33's—top medium to good-----	7	7	7	6	5	6
34's—medium-----	3	1	1	3	1	2
Total feeds consumed						
Cottonseed meal-----	784	1062	1364	780	780	196
Cottonseed oil-----	35	17.6	---	113.7	192	---
Cottonseed-----	---	---	---	---	---	1252
Cottonseed hulls-----	196	212	192	196	196	---
Silage-----	9441	9398	9294	8663	8579	7656
Salt-----	12.1	8.56	8.88	9.50	9.06	7.19
Average ration consumed						
Cottonseed meal-----	4.00	5.42	6.96	3.98	3.98	1.00
Cottonseed oil-----	.18	.09	---	.58	.98	---
Cottonseed-----	---	---	---	---	---	6.39
Cottonseed hulls-----	1.00	1.08	.98	1.00	1.00	---
Silage-----	48.17	47.95	47.42	44.20	43.77	39.06
Salt, ounces-----	.99	.70	.72	.78	.74	.59
Cost of feed per cwt. gain (feed consumed)						
Basis feedlot weight-----	\$ 10.01	\$ 9.91	\$ 10.40	\$ 10.65	\$ 11.37	\$ 8.23
Basis market weight-----	13.50	13.04	13.78	14.46	15.22	11.22
Cost into feedlot at \$7.54 per cwt.---	56.93	56.93	56.85	56.63	56.78	56.93
Feed cost (feed consumed)-----	32.53	35.09	37.75	36.01	40.93	29.29
Marketing cost at \$0.43 per cwt.---	4.28	4.40	4.42	4.30	4.39	4.37
Total cost-----	93.74	96.42	99.02	96.94	102.10	90.50
Amount received at \$9.25 per cwt.---	92.13	94.72	95.09	92.50	94.54	93.98
Profit or loss (no charge for labor)	-1.61	-1.70	-3.93	-4.44	-7.56	3.39

Comparison of Different Amounts of Cottonseed Meal

Lot 2, fed 5.42 pounds of cottonseed meal per head daily, made 8.9 percent greater gains and 4.3 percent more dressed beef than Lot 1, fed 4 pounds of cottonseed meal. Lot 3, fed 6.96 pounds of cottonseed meal made gains 11.7 percent greater than Lot 1, fed 4 pounds, and 2.5 percent greater than Lot 2, fed 5.42 pounds, with corresponding increases in dressed beef of 6.4 and 2.0 percent.

The differences in finish among the 6 lots were slight, and in order to avoid possible wide discrepancies in sale price all lots were sold together. The lots which received the more expensive rations and which also had slightly higher finish did not receive credit for their finish; however, Lot 2, fed 5.42 pounds of cottonseed meal made the best financial showing. It was definitely not profitable to feed the larger amount of cottonseed meal, or 6.96 pounds and this was in accord with results of the first 2 trials.

Comparison of Different Amounts of Cottonseed Oil

The addition of cottonseed oil to the ration resulted in increased gain and greater carcass weight. Lot 4, fed .58 pound of oil per head daily, made 4 percent greater gain, 2.1 percent more dressed beef than Lot 4, fed only .18 pound. Lot 5, fed .98 pound of oil made 10.8 percent greater gain than Lot 1, fed .18 pound and 6.51 percent greater gain than Lot 4, fed .58 pound, with attendant increases of 3.8 and 1.7 percent in yield of dressed beef.

Protein and fat supplied to Lot 6 in cottonseed and cottonseed meal as measured by gains and yield of dressed beef were nearly as efficient as the same levels of protein and fat supplied to Lot 5 in cottonseed meal and cottonseed oil. With cottonseed at \$18.00 per ton it was much more economical to feed the fat through the medium of cottonseed than through the medium of cottonseed oil. The use of cottonseed oil at \$130.00 per ton, increased the feed cost and decreased the net return.

General Discussion of Results

The results of the three trials are summarized in Table 7.

Table 7. Summary of results for three trials. Average 164.7 days

Lot number.....	1	2	3	4	5
Number of steers.....	30	30	30	30	30
Variables when on full feed	All lots fed silage and cottonseed hulls				
1. Amount of cottonseed meal fed daily---	4.0	5.5	7.0	4.0	4.0
2. Amount of cottonseed oil fed daily----	.18	.09	---	.58	.98
Averages in pounds per steer					
Initial weight.....	724	725	724	723	724
Final weight at feedlot.....	1015	1035	1045	1026	1049
Final weight at Ft. Worth market.....	936	956	964	946	971
Gain basis feedlot weight.....	291	310	321	303	325
Gain basis market weight.....	212	231	240	222	247
Daily gain basis feedlot weight.....	1.76	1.88	1.95	1.84	1.97
Daily gain basis market weight.....	1.28	1.40	1.45	1.35	1.50
Shrinkage enroute market, %.....	7.78	7.63	7.75	7.80	7.44
Carcass weight (hot).....	581	599	614	599	608
Dressing % basis hot carcass and market weight.....	62.1	62.7	63.7	63.3	62.6
Dressing % basis hot carcass and feedlot weight.....	57.2	57.9	58.8	58.4	58.0
Carcass grades (Swift and Armour)					
Choice.....	1	4	5	1	2
Strictly good to choice.....	4	8	5	12	7
Top medium to good.....	19	14	17	11	14
Medium.....	6	4	3	6	7
Total feeds consumed					
Cottonseed meal.....	650	876	1128	647	645
Cottonseed oil.....	29	14.4	---	93.6	157.7
Cottonseed hulls and dry fodder.....	456	469	443	449	447
Silage.....	6741	6723	6685	6476	6436
Salt.....	8.09	6.77	6.86	6.38	6.60
Average ration consumed					
Cottonseed meal.....	3.95	5.32	6.85	3.93	3.92
Cottonseed oil.....	.176	.087	---	.57	.96
Cottonseed hulls and dry fodder.....	2.77	2.85	2.69	2.73	2.71
Silage.....	40.93	40.82	40.59	39.32	39.08

Fattening on Silage and Cottonseed Meal

The average daily gain of 1.88 pounds for 150 steers fed in the three trials, an average dressed yield of 58 percent on the basis of feedlot weights and the quality of the carcass grades show that rations of cottonseed meal and silage will fatten heavy feeder yearling steers to a reasonably high finish in about 200 days. This method of feeding is considered largely as an emergency method for use when fattening grains are high in price, or for use with low grade cattle which do not warrant a high finish. Such rations are excellent for getting cattle started on feed or for winter maintenance feeding; however, feeding for such purposes does not require the use of as large amounts of cottonseed meal as were fed in these trials. Rations of cottonseed meal and silage alone

are not best adapted to fattening calves because they tend to promote growth rather than finish.

Insofar as fattening is concerned, rations high in roughage do not permit high rate of gain or quick finish because the animals cannot consume enough nutrients to make high gains, particularly when silages of low nutrient content are fed. Low gains in dry lot feeding are also accompanied by high cost of gain unless the feeds are low in price. Under West Texas conditions, however, where the problem is one of marketing large amounts of roughage feeds to advantage, this system merits consideration in the farm feeding program especially when fattening grains are scarce. Comparative gains made by cattle fed high concentrate and high roughage rations are shown in Figure 1.

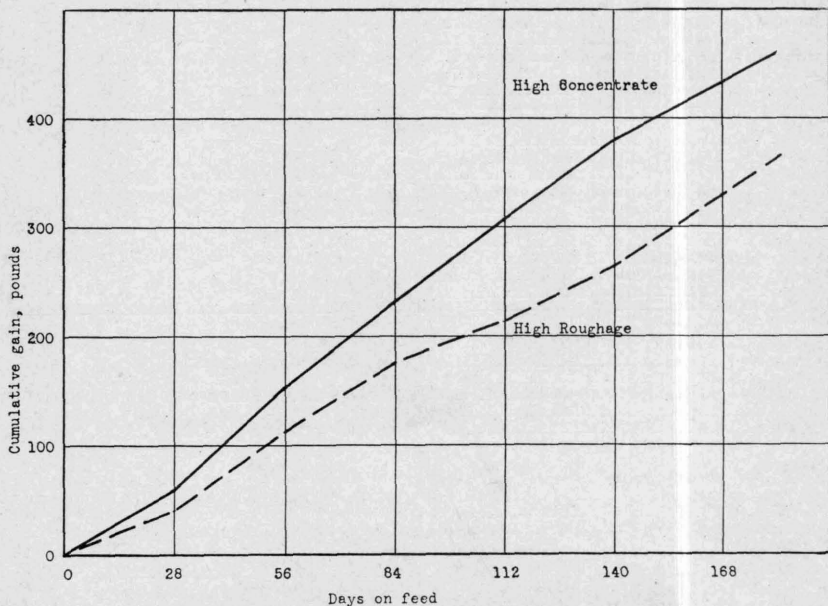


Figure 1. Comparative gains of cattle fed high concentrate and high roughage rations. Because of the lower daily gains, a longer period of time is required for fattening on high roughage rations.

Comparison of Different Amounts of Cottonseed Meal

As an average of the 3 trials, Lot 2 (Table 7) fed approximately 5.5 pounds of cottonseed meal per head daily with silage made 6.5 percent greater gain and yielded carcasses 3.1 percent heavier than Lot 1, fed approximately 4 pounds of cottonseed meal. Lot 3, fed approximately 7 pounds made 10.3 percent greater gain than those fed 4 pounds and 3.5 percent greater gain than those fed 5.5 pounds with corresponding increases in dressed beef of 5.7 and 2.5 percent. Slightly higher carcass grades in Lots 2 and 3, fed the larger amounts of cottonseed meal were a measure of higher finish.

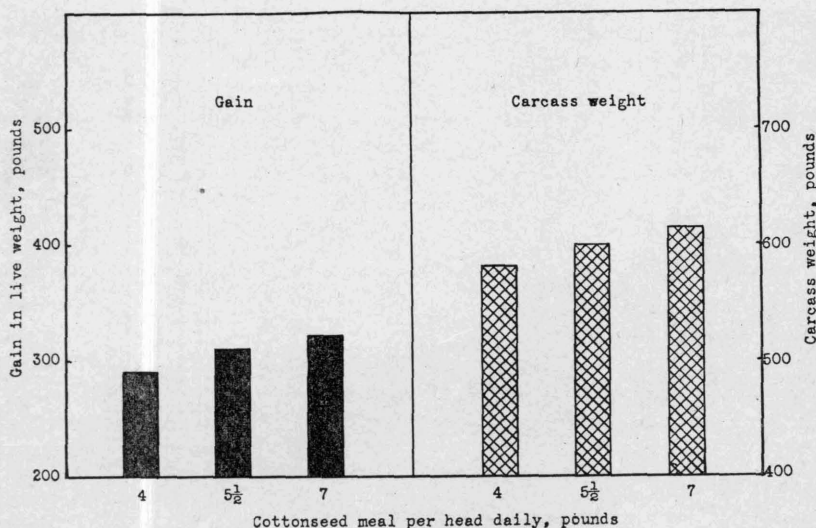


Figure 2. Gains and carcass weights of cattle fed 4, 5.5 and 7 pounds of cottonseed meal in addition to a full feed of sumac silage.

Beyond supplying the protein needed to balance the rations, cottonseed meal fed beyond protein needs served as a source of energy in these trials. Under such circumstances, the question of how much can be fed economically depends entirely upon the price of cottonseed meal as compared to grains or other concentrates (8). When cottonseed meal will supply energy at a cost no higher than grain sorghums or corn it may be used in excess of amounts needed to meet the protein requirements.

Comparison of Different Amounts of Cottonseed Oil

Lots 1, 4 and 5 (Table 7) are involved in this comparison since they were fed different amounts of cottonseed oil but similar amounts of the other feeds. Lot 4 received approximately .4 pound more cottonseed oil per head daily than Lot 1, and Lot 5 .4 pound more than Lot 4; or .8 pound more than Lot 1. On the basis of feedlot gains adjusted to agree with dressed yields Lot 4 made 32 pounds more gain per head than Lot 1; and Lot 5, 14 pounds more gain per head than Lot 4.

The value of cottonseed oil in the fattening ration is also shown in the comparison between Lots 2 and 4 (Table 7). These lots returned carcasses of the same average weight and there was only slight difference in their average gains on the basis of both feedlot and market weights. Their average rations differed mainly in the amounts of cottonseed meal and cottonseed oil. Lot 2 consumed 1.39 pounds more cottonseed meal per head daily than Lot 4, and therefore received approximately .50 pound more of digestible protein than Lot 4; however, Lot 4 consumed .48 pound more cottonseed oil per head daily than Lot 2. Under the condition of

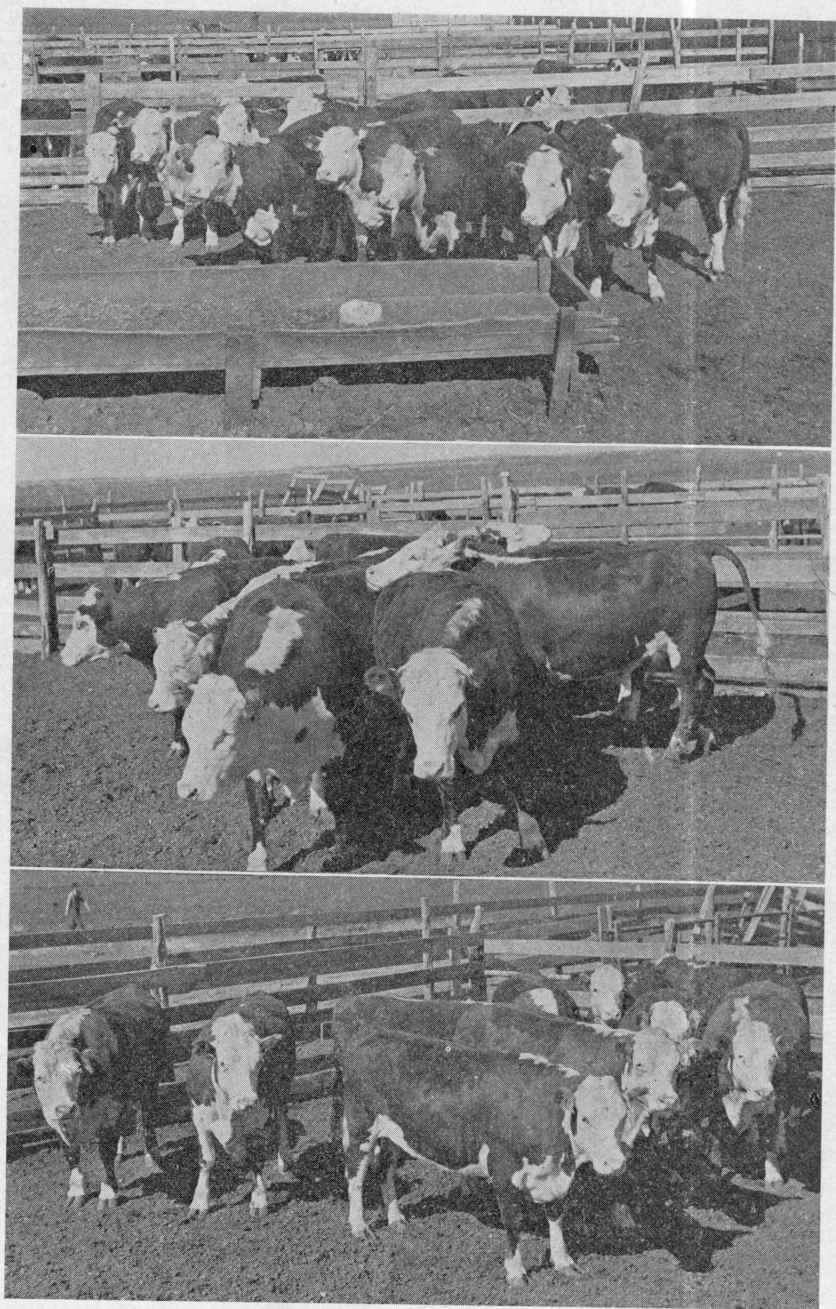


Figure 3. Steers fed 4 pounds (top), 5.5 pounds (center), and 7 pounds (bottom) of cottonseed meal per head daily in addition to a full feed of sumac silage. Those fed 5.5 pounds gave the greatest net return in all years.

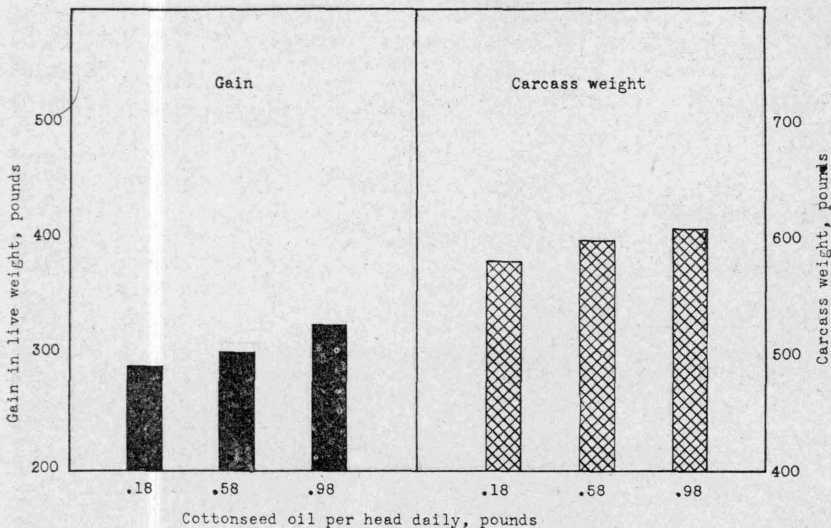


Figure 4. Gains and carcass weights of cattle fed .18, .58 and .98 pounds of cottonseed oil per head added to a daily ration of 4 pounds cottonseed meal and a full feed of sumac silage.

the supply of adequate protein in the ration these amounts of the two nutrients were apparently equal in the production of gain, and this being the case, the feeder could easily afford to use a cottonseed meal of a lower percentage of protein if that percentage were made up with an equal percentage of fat.

Average cottonseed meal of 43 percent protein content has a productive value of 74.9 therms per hundred pounds (5). The average composition of the cottonseed meal used in this experiment (Table 1) shows it as having a productive value, calculated according to the method of Fraps (8), of 73.91 therms per hundred pounds. On a comparative basis the cottonseed oil as fed to Lot 4 had a productive value of approximately 214 therms per hundred pounds. On this basis one pound of cottonseed oil contains as many therms of productive energy as about 2.5 pounds of milo grain or 2.75 pounds of average 43 percent protein cottonseed meal. A one percent increase in the fat or cottonseed oil content of cottonseed meal is equivalent to 20 pounds of cottonseed oil per ton of cottonseed meal. Consequently a cottonseed meal of 8 to 9 percent fat content is to be preferred to one of only 6 percent fat content—when the cottonseed meal is fed as a source of energy.

Cottonseed oil was not laxative to steers when fed in amounts up to 1 pound per head daily, an amount which would be supplied by about 5.6 pounds of cottonseed. Cottonseed as a feed, contains only about 43 percent as much digestible protein as 43 percent protein cottonseed meal but has approximately the same productive value and is only slightly lower in productive value than milo grain. The question as to when cottonseed



Figure 5. Steers fed .18 (top), .58 (center) and .98 (bottom) pound of cottonseed oil added to a daily ration of 4 pounds cottonseed meal and a full feed of sumac silage. Cottonseed oil had high feed value and improved appearance of the hair coats but is too high in price for practical feeding.

can be fed economically depends upon the prices of cottonseed meal or other protein supplements and grains; however, it can be fed to fattening steers whenever it does not cost more than ground threshed milo and cottonseed meal costs more than either cottonseed or the milo. With such price conditions it may be used to replace part of the cottonseed meal and part of the grain in fattening rations because it is comparatively high in both protein and energy.

Palatability of Rations. Palatability of the rations was measured by observations of the length of time required for the various lots to clean up their morning feed as well as by their apparent likes or dislikes. In general, the lots fed the least total nutrients cleaned up the quickest. Lots 1, 2, and 3, fed cottonseed meal with none, or only a very small amount of cottonseed oil added, cleaned up in an average of 3.4 hours as compared to 4.4 hours for Lots 4 and 5, fed the larger amounts of cottonseed oil. Although the rations containing the larger amounts of oil were consumed more slowly than those containing little oil, they were not particularly unpalatable and all rations were consumed in nearly equal quantities.

Looseness or Scouring. Daily records, kept of the number of loose or scouring steers in each lot, showed that the lots fed the largest amounts of cottonseed meal had the most looseness. The amounts of cottonseed oil and of whole cottonseed which were fed did not appear to have laxative effect. The records also show that silage may be a factor in causing looseness if it is excessively wet and acid. In the instances in which such silage was fed the inclusion of small amounts of dry fodder or cottonseed hulls in the ration was effective in controlling looseness. Just how serious a moderate degree of looseness is in fattening cattle was not determined, but within lots it was evident that gains were not reduced because of it in these trials. As between lots most feeders would have concluded that there was too much looseness in the lots fed approximately 5.5 and 7 pounds of cottonseed meal per head daily.

Effect of Cottonseed Oil on Hair Coats. The steers which were fed 7 pounds of cottonseed meal without added cottonseed oil were somewhat rougher and duller in hair coat than those fed even as little as .09 pound of oil. The lots which were fed .56 and .98 pound of oil daily per head showed glossier hair coat than those fed smaller amounts.

SUMMARY

In these feeding experiments yearling steers were reasonably well fattened on rations of sumac silage and cottonseed meal in periods of about 200 days. The feeding of silage with cottonseed meal, or with cottonseed meal plus cottonseed (when low in price) may afford a profitable means of marketing large amounts of silage per steer when grains are scarce and high in price and silage is abundant. The method has the disadvantage of producing only moderate gains because it is im-

possible for cattle fed limited concentrates to consume enough silage to secure the nutrients required to make high gain. Low gains in dry lot feeding are accompanied by high cost of gain unless the feeds are very low in price.

Considering the factors of gain, costs of gain, degree of finish, selling price, carcass weight and grade, and net return, the feeding of approximately 5.5 pounds of cottonseed meal per head daily in addition to a full feed of silage, gave better results than the feeding of either 4 or 7 pounds. These amounts of cottonseed meal were greater than were necessary to meet the protein requirements of the cattle, and whether such amounts can be fed economically depends upon the price of cottonseed meal as compared to grains. When cottonseed meal will supply energy at a cost no higher than grain sorghums or corn, it may be used in excess of amounts needed to meet the protein requirement (8).

The price of crude cottonseed oil as in this experiment prohibits its use for cattle feeding, but the difference in gain and yield of dressed beef between lots which received different amounts of cottonseed oil show that the oil has high feed value.

The similarity in gain and finish between a lot fed cottonseed and cottonseed meal and a lot fed to receive the same amounts of protein and fat as supplied by cottonseed oil and cottonseed meal in a single test indicates that the protein and fat, respectively, have approximately the same value whether supplied by cottonseed meal and cottonseed oil, or by cottonseed.

Cottonseed oil was not laxative to yearling steers when fed in amounts up to 1 pound per head daily, an amount larger than would ordinarily be fed in cottonseed. Cottonseed was not laxative to yearling steers when fed at the rate of 6.4 pounds (one trial) per head daily for 196 days.

The results also indicate that with adequate protein in the ration, the feeder may feed a cottonseed meal of slightly lower protein content if the loss of protein is compensated by an equal increase in the percentage of fat or oil.

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