

BULLETIN No. 128.

JUNE, 1904.

ALABAMA.

Agricultural Experiment Station

OF THE

Alabama Polytechnic Institute.

AUBURN.

Feeding and Grazing Experiments with Beef Cattle.

By

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MONTGOMERY, ALA..

THE BROWN PRINTING CO., PRINTERS AND BINDERS.
1904.

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FEEDING AND GRAZING EXPERIMENTS WITH BEEF CATTLE.

By J. F. DUGGAR, R. W. CLARKE, and JESSE M. JONES.*

Summary.

Using twenty young grade steers of the beef breeds, the following comparisons of foods were made: Cotton seed with cotton seed meal (Lots II and I); sorghum hay with a mixture of cowpea and sorghum hay, (Lots III and II); sorghum hay with shredded corn stover (Lots III and IV).

The feeding period covered 84 days, in addition to preliminary feeding. In all rations a small proportion of corn chop was used. As much grain was fed as the appetites and health of the steers permitted. As much roughness was fed as the steers would eat.

The average daily gain per steer was as follows:

With cotton seed and cotton seed meal.....	2.23 lbs.
With cotton seed and mixed cowpea and sorghum hay	1.93 lbs.
With cotton seed and sorghum hay.....	1.19 lbs.
With cotton seed and shredded corn stover....	.98 lbs.

*R. W. Clark was Assistant in Animal Industry from September, 1899, to January, 1903, when he was promoted to a professorship in the Utah A. & M. College. Jesse M. Jones occupied the same position from January, 1903, to April, 1904, when he resigned to engage in farming in Alabama. These gentlemen had immediate charge of the experiments during the periods indicated. The Director is responsible for the plans of the experiments and the preparation of this Bulletin.

To produce one pound of increase in live weight there was required of concentrated food, "grain," with the cotton seed meal rations and sorghum hay, 4.82 lbs.; with the mixed hay and cotton seed ration, 5.41 lbs.; with the sorghum hay and cotton seed ration, 8.12 lbs.; with the corn stover and cotton seed ration, 9.41 lbs.

The amounts of roughness required to produce one pound of gain were, respectively, 6.56, 6.85, 11.09, and 10.23 pounds. The cotton seed meal ration afforded the largest per cent. of dressed meat.

A decline in the price of cattle while the experiment was in progress reduced the margin between the buying and selling prices to less than six-tenths of a cent a pound, a margin usually too narrow for profitable feeding. On the basis of the very high prices of foodstuffs prevailing in the winter of 1903-4, there was with all cotton seed lots a profit during the first 56 days of the experiment, but a loss after this time with all lots, if no account be taken of the manure.

On the basis of moderate prices of feed, Lot II was fed at a profit for 84 days. With low prices of food, Lots I, II, and III afforded a profit, in addition to the manure.

The profit in feeding beef cattle is made, not by producing new growth at less cost per pound than it sells for, but in the increased value of the original weight, due to fattening. A margin of one cent per pound between purchase price and selling price is desirable.

About 7 pounds of raw cotton seed was fed in the daily ration without injury to the health of the average steer.

Account was kept of the cost of food consumed by three grade or crossbred steers. Up to the average age of 24.3 months the average steer consumed \$18.39 worth of skim milk, grain, hay, and pasturage, of which

amount the first year's food cost \$10.45, and that of the second year \$7.94. At 24.3 months, the average weight was 867 pounds, worth at 3 cents per pound, \$26.01. The average cost of food per pound of gain up to this age was 2.12 cents.

In feeding calves rice meal proved decidedly inferior to corn meal. When inferior shredded corn stover was fed to calves, 37 per cent. of it was refused, and when good shredded corn stover was fed freely to steers, 44 per cent. of it was rejected. The waste in feeding coarse sorghum hay, slightly moulded, to steers, averaged 20 per cent.

A Jersey calf, kept stabled until 6½ months old, produced manure (with accompanying bedding) at the rate of 9.4 pounds per day.

Yearling steers, kept in a barn, averaged a daily production of 20 pounds of manure per day, exclusive of bedding.

Yearling steers on rye pasture alone gained 1.67 lbs. daily per head.

Grade calves made on pasture alone an average daily gain of .72 of a pound, or 151 pounds per season. Grade yearling steers made an average daily gain of 1.43 lbs. per day, or 307 pounds per season, on native pasturage alone, or 91 pounds of live weight per acre. This was equivalent to a rental of \$2.73 per acre for the land.

In a co-operative experiment made on an unimproved sandy-land pasture, in Macon county, Alabama, a study was made of the rate of growth of scrub cattle that received no food, even during winter, subsisting entirely on native pasturage and the winter range, and otherwise managed in the most primitive manner.

During a pasturage season of 7 months the average gains in live weight and percentage of increase as compared with weight in the spring, were as follows:

Mature cow, nursing calves, 59 lbs., or 8 per cent.

Heifers (2 years old, etc.), 172 lbs., or 39 per cent.

Yearlings, male and female, 103 lbs., or 38 per cent.

Sucking calves, 141 lbs., or 51 per cent.

Young steers and bulls, 149 lbs., or 35 per cent.

Young steers weighed for two pasturage seasons in succession increased in weight 42 per cent. as yearlings, and 44 per cent. as two-year-olds.

On the winter range, cattle of all ages became very thin, and in the opinion of the writers, it would have been highly profitable for the owner to have supplied them with hay and other food during the winter.

The principal essentials to the profitable production of beef cattle in Alabama are the use of pure-bred bulls of the beef breeds, the economical production of hay, especially from the leguminous plants, the substitution of this hay for a part of the grain ration, and an increased study of the best methods of handling and marketing cattle.

FEEDING EXPERIMENT WITH GRADE STEERS.

The steers used in this experiment consisted of seventeen head, bought at Starkville, Mississippi; and of three head raised on the Station Farm at Auburn. The Mississippi steers were sired by a Shorthorn bull weighing 1700 pounds, and were out of native cows, about one-fourth of the steers showing strong evidence of Jersey blood. These steers were between two and three years old when bought. They reached Auburn November 5, 1903. The three steers raised on the Station Farm consisted of a Red Poll grade, an Angus grade, and a cross-bred Holstein-Shorthorn.

From November 5 to November 20 the entire lot of twenty steers subsisted on a pasture where frost had killed most of the grass on October 24. November 20 they were placed on a bare lot and the feeding of grain, (chiefly cotton seed), and sorghum hay was begun. For the first week they received only two pounds of grain per head daily, which was evidently insufficient. This amount was gradually increased. Throughout this time as much sorghum hay was fed as they would eat.

Our experience with these steers confirms conclusions previously drawn that the feeding of grain to animals intended for slaughter the same winter should begin earlier in the fall than is usual or as soon as the pastures begin to fail. November and December are months in which cattle on pasture shrink rapidly, and doubtless a little grain at this time, even while the cattle are on pasture, will avoid this source of loss.

During the entire time of the experiment each lot of cattle received as much forage as it would consume. The kinds of forage fed to each lot are stated below. An effort was made to make each lot of steers consume approximately the same amount of grain or concentrated food. However, this was found impracticable, but the amounts for the different lots were kept as nearly identical as the appetites and health of the animals would permit.

The forage was fed in racks above the grain trough and was not cut, nor was any of it mixed with the grain ration except such as dropped into the grain trough from the rack above.

It is believed that there would have been an advantage in cutting a small part of the hay and mixing it with the grain. Feeding of both grain and hay was done twice a day. Salt was accessible constantly, and twice a day the steers were driven to a pond for water. The water

supply was not satisfactory, and during cold weather the steers would not drink sufficient water. The feeding was done under a rough shed covered with boards and battens, and boarded up on the north side. The south side was left open and each lot of steers had at all times the choice between remaining under shelter or staying in the small lots located on the south side of the feeding pen. The lots were on a steep, dry, sandy and stony hillside, well drained, and never became deep with mud. Even in wet weather the steers seemed to prefer the lot to the shed.

The figures, which are not all on the same scale, show the steers as they appeared at the end of the experiment.

The steers were charged with all of the forage put into the rack, and what they failed to eat was used as bedding. The amount of this refused material was determined at several times and the average results are stated elsewhere.

RATIONS FED.

The object of this experiment was to compare,

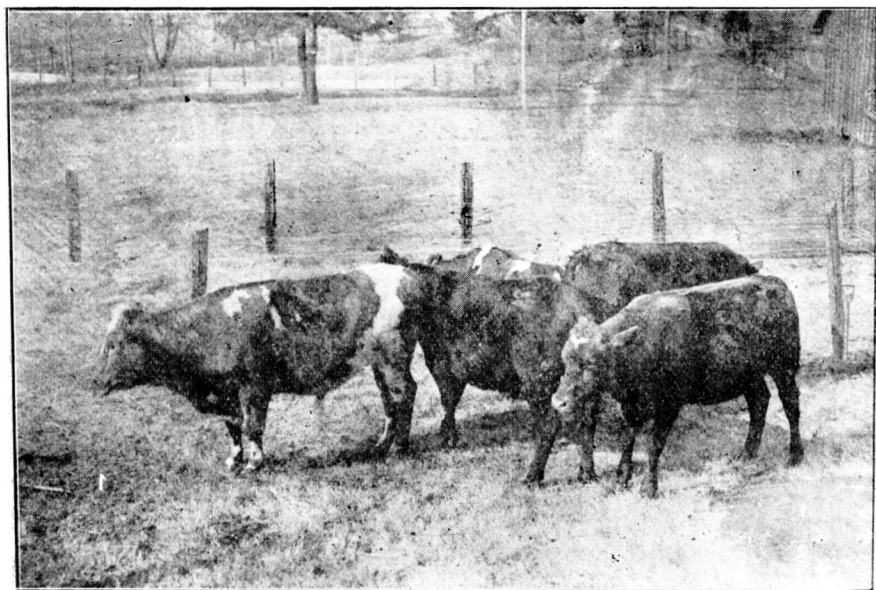
(1) Cotton seed with cotton seed meal. (Lot III and Lot I.)

(2) Sorghum hay with a mixture of cowpea hay and sorghum hay. (Lots III and II.)

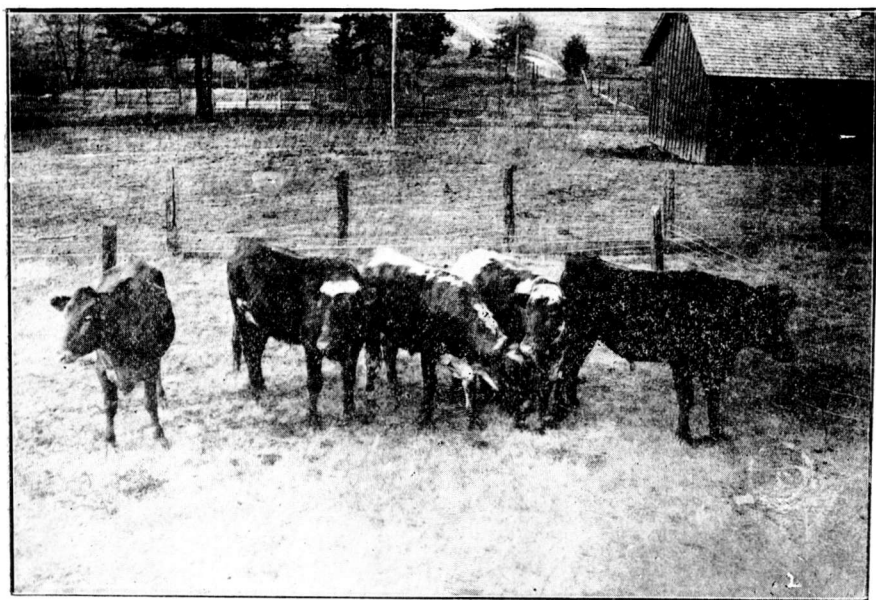
(3) Sorghum hay with shredded corn stover. (Lots III and IV.)

All cotton seed was uncooked.

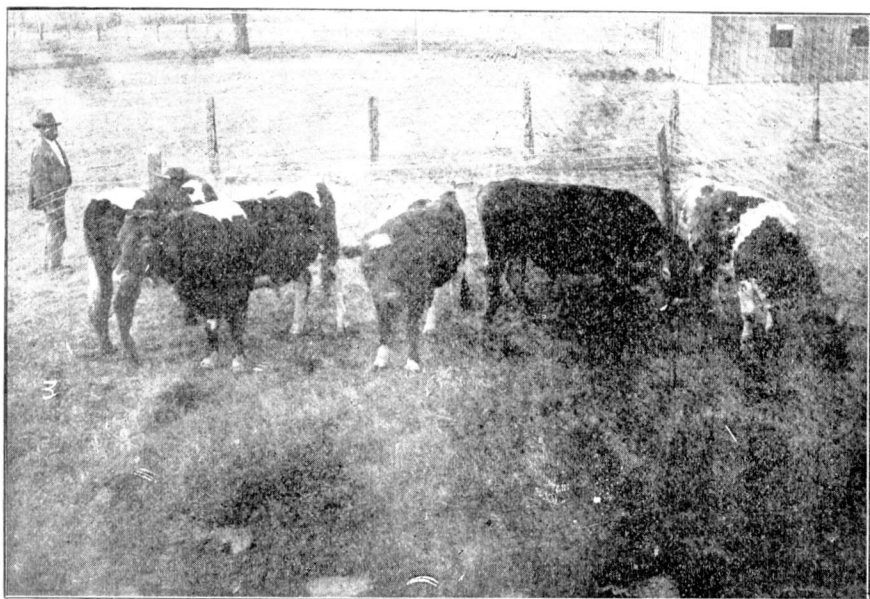
On December 3 the twenty steers were divided into four lots, each containing five steers. In making this division both the weights of the steers and their individual conformation were used as a basis for the division. It is believed that the lots were very much alike in average quality as well as in weight. The weights of Lots I, II, III, and IV on December 9 were respectively, 3878, 3915, 3858, and 3889 pounds.



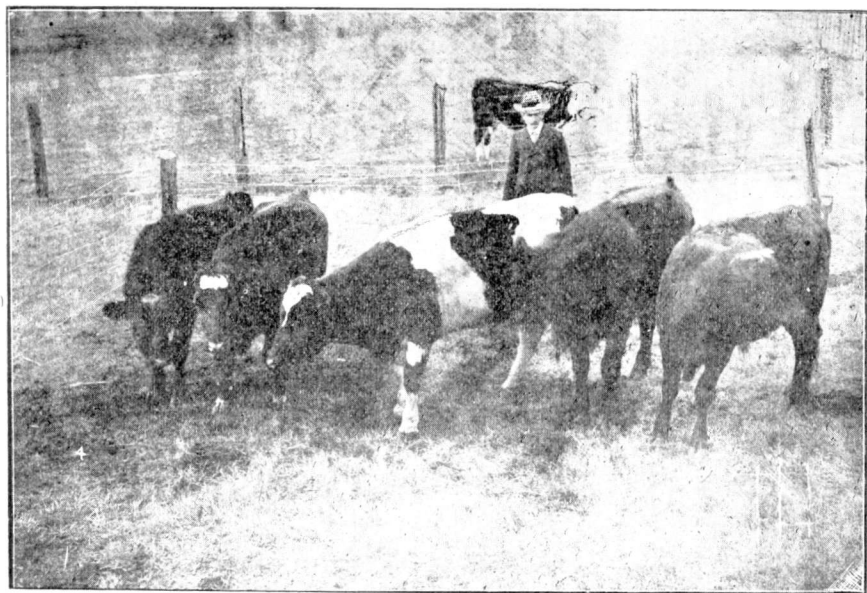
Lot I. Fed cotton seed meal, corn chop, and sorghum hay.



Lot II. Fed cotton seed, corn chop, and a mixture of cowpea and sorghum hay.



Lot III. Fed cotton seed, corn chop, and sorghum hay.



Lot IV. Fed cotton seed, corn chop, and shredded corn stover.

The interval from December 3 to December 9 was considered as a preliminary period, and during this time each lot was fed on the kind of food which it was to receive throughout the experiment.

The experiment proper began on December 9, and continued for 84 days, or three periods of 28 days each. During all periods the feed for any given lot was the same in kind and nearly the same in amount, the latter being determined entirely by the health and appetite of the steers.

The weight of each steer was determined at the beginning of the experiment by three weighings made on three successive days. Similarly, the final weight was the average of three daily weighings, March 1, 2, and 3, 1904.

The rations fed were as follows:

Lot I—Cotton seed meal, two-thirds; corn chop, one-third; sorghum hay.

Lot II—Cotton seed, three-fourths; corn chop, one-fourth; sorghum hay, one-half; pea vine hay, one-half.

Lot III—Cotton seed, three-fourths; corn chop, one-fourth; sorghum hay.

Lot IV—Cotton seed, three-fourths; corn chops, one-fourth; shredded corn stover.

As much of each kind of forage was fed as the animals would consume without excessive waste. The average amount of forage wasted was as follows:

Lot I—Sorghum, 17.1 per cent.

Lot II—Sorghum and cowpea hay, 20.7 per cent.

Lot III—Sorghum, 23.5 per cent.

Lot IV—Shredded corn stover, 44.2 per cent.

It will thus be seen that the waste of hay was about one-fifth of the amount fed, while the waste of shredded corn was more than double that of hay. This wasted food, as well as that consumed, was charged against the steers.

A considerable part of the sorghum hay had passed through a heat in the barn, and was somewhat discolored and slightly moulded. It was all coarse, having been grown in drills and cut after the seed had colored. The cow pea hay, which constituted half of the roughness fed to Lot II, was not pure cow pea hay, but consisted of cow pea hay, 61.5 per cent.; crab grass, 24.7 per cent.; weeds, 7.8 per cent.; dirt, (sand, etc. raked up with hay), 6 per cent.

The corn stover was bright and of fairly good quality. It had never been baled. The corn chop was too coarsely ground to serve the principal purpose for which intended, viz., to mix with the cotton seed in order to increase the palatability of the seed. Indeed, the chop used during the last three weeks of the experiment was slightly moulded and not relished, which may partly account for the relatively slow gain made at that time. The foods used were charged at the following prices, which are cost prices for purchased articles, and for home-grown forage a figure somewhat above the cost of production:

Cotton seed, per ton	\$14.00
Cotton seed meal, per ton.....	22.00
Corn chop, per ton	26.00
Cow pea hay, per ton	10.00
Sorghum hay, per ton	6.67
Shredded corn stover, per ton....	4.00

The following table gives by periods the average amount of grain and of roughness consumed by the steers in each pen, the average weight per steer at the beginning of each period, the average gain per steer per day and per 28 days, and most important of all, the amount of grain and of roughness required to make one pound of increase in live weight. It also gives a summary of results for the first two periods (56 days) and for the entire experiment (84 days):

*Average results of feeding experiment with steers,
1903-04.*

Period I—Dec. 9-Jan. 6:

Lot No.	Average daily ration per steer.			Avg. wt. per steer beginning	Avg. gain per steer in 28 days	Avg. daily gain per head	Food per lb. of gain.	
	Grain.	Roughness.	Chief food.				Grain,	Roughness,
I.	10.88	.....	C. S. M. & corn sorghum.	776	83.4	2.97	4.10	5.06
II.	10.41	.....	Cotton seed, sorg. & pea.	783	63.2	2.25	5.15	6.36
III.	9.72	.....	Cotton seed, sorghum.	772	58.2	2.08	4.66	6.15
IV.	9.46	.....	Cotton seed, stover.	778	55.0	1.96	4.81	4.71

Period II—Jan. 6-Feb. 3:

I.	11.2	.....	C. S. M. sorghum.	859	65.4	2.20	4.79	6.38
II.	10.4	.....	Cotton seed sorg. and pea.	846	66.4	2.38	4.37	5.45
III.	10.1	.....	C. Seed, sorghum.	830	25.6	.91	10.99	14.14
IV.	9.3	.....	C. Seed stover.	833	14.6	.52	17.91	18.90

Periods I-II—56 days:

I.	11.	.....	C. S. Meal sorghum.	.....	148.8	2.51	4.25	5.45
II.	10.4	.....	C. seed, sorg. & peas	.....	129.6	2.31	4.49	5.57
III.	9.91	.....	C. seed, sorghum.	.....	83.8	1.50	6.60	8.59
IV.	9.38	.....	C. seed, corn stover.	.....	69.6	1.24	7.57	7.68

Period III—Feb. 3-March 3:

I.	10.4	.....	C. S. Meal, sorghum.	920	43.2	1.52	7.19	11.43
II.	10.5	.....	C. seed, sorg & cowpea.	913	32.2	1.15	9.09	12.02
III.	9.3	.....	C. seed, sorghum.	855	16.4	.58	15.89	23.74
IV.	8.9	.....	C. seed, stover.	849	12.8	.45	19.43	24.06

Three Periods—84 days:

Lot No.	Average daily ration per steer.			Avg. wt. per steer beginning.	Avg. gain per steer in 28 days.	Avg. daily gain per head.	Food per lb. of gain.	
	Grain.	Roughness.	Chief food.				Grain.	Roughness.
				Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
I.	10.8	.....	C. S. meal,	.....	192.	2.23	4.82	6.56
	.....	14.6	sorghum.					
II.	10.43	.....	C. seed,	.....	161.8	1.93	5.41	6.85
	.....	13.2	sorg. and peas.					
III.	1.70	.....	C. seed,	.....	100.2	1.19	8.12	11.09
	.....	13.2	sorghum.					
IV.	9.22	.....	C. seed,	.....	82.4	.98	9.41	10.23
	.....	10.	corn stover					

The most important portion of the above tables is the summary giving the results of 84 days. From this we observe that to produce one pound of increase in live weight required:

	Grain.	Roughness.
Lot I, fed cotton seed meal, sorghum hay, etc.....	4.82	6.56
Lot II, fed cotton seed, cow pea and sorghum hay, etc.....	5.41	6.85
Lot III, fed cotton seed, sorghum hay, etc.....	8.12	11.09
Lot IV, fed cotton seed, corn stover, etc.....	9.41	10.23

This clearly indicates the superiority of cotton seed meal compared with an equal weight of cotton seed; the superiority of mixed cow pea and sorghum hay over sorghum hay; and the great advantage of the ration containing cow pea hay as compared with those in which the roughness consisted of sorghum or corn stover.

In rapidity of gains the rations stand in the same rank. The average daily gain per steer was as follows:

Lot 1, cotton seed meal, sorghum, etc.....	2.23 lbs.
Lot II, cotton seed, cow pea and sorghum, etc.....	1.93 lbs.
Lot III, cotton seed, sorghum, etc.....	1.19 lbs.
Lot IV, cotton seed, corn stover, etc.....	.98 lbs.

EFFECT OF FEED ON QUALITY OF STEERS.

The steers were sold in the lots at Auburn to Phillips & Ungermann, Packers, Birmingham, Alabama.

Naturally there was considerable individual difference between the steers, so that the differences in the price put upon each by the packers are not entirely chargeable to the food used.

The packers' estimate of the value of the steers fed on the different rations is shown by the following table, giving the selling prices.

Prices of steers when sold.

Lot No.	No. worth 3½ cents.	No. worth 3¼ cents.	No. worth 3 cents.	Total value of lot.	Principal foods fed.
1	3	2	..	\$164.47	C. S. meal, sorghum.
2	5	..	..	166.25	C. seed, pea, and sorg.
3	..	2	3	134.29	C. seed, sorghum.
4	2	1	2	139.55	C. seed, stover.

When sold Lots I and II were judged to be of nearly equal quality, and in this respect far superior to Lots III and IV. The more nitrogenous (narrower) rations afforded the more rapid fattening and the higher quality as judged by the eye. Judged by percentage of dressed weight or shrinkage during shipping from Auburn to Birmingham, the steers fed on cotton seed meal (Lot I) were superior to Lot III, fed on cotton seed and the same roughness. Taking the weights at Auburn as the live weights, and comparing them with the amount of dressed meat obtained in Birmingham, we find that Lot I, on cotton seed meal and sorghum, netted 54.5 per cent.; Lot

II, on cotton seed and mixed hay, netted 51 per cent.; Lot III, on cotton seed and sorghum hay, netted 50.6 per cent.; Lot IV, on cotton seed and corn stover, netted 51.3 per cent.

In other words, on this basis alone, the packer could have afforded to pay a premium of one-fourth cent per pound gross for Lot I, in comparison with Lot III. It is but fair to add that if live weights in Birmingham could have been ascertained the percentages of dressed meat would doubtless have ranged considerably higher.

FINANCIAL RETURNS.

For 56 days.—The cattle cost $2\frac{3}{4}c$ per pound in November. No charge is here made for freight, since on a fraction of a carload this was a very heavy expense per head, and since, moreover, the few Alabama cattle that could have been had without any freight charges would have cost no more near home than was paid for this larger and more uniform lot of cattle in Mississippi. During the period between the purchase of these cattle, in November, 1903, and their sale, in March, 1904, to a packing house in Birmingham, Alabama, the prices of cattle fell. The estimated decline in the price of cattle of this grade was about $\frac{1}{2}c$ per pound. Hence, under normal conditions and with a market neither advancing nor declining, we should have realized $\frac{1}{2}c$ more per pound than the cattle actually brought, which would have given a fair profit on each of the four lots.

The price paid in our lots at Auburn was $3\frac{1}{2}$ cents per pound for the best ten steers, $3\frac{1}{4}$ cents per pound for the five steers ranking next, and 3 cents per pound for the five poorest steers.

Since the gains made by most of the steers were quite unsatisfactory during the third period, and since this is

believed to have been largely due to the inferior quality (mouldiness) of the corn chop purchased, we have calculated the financial returns at the end of 56 days' feeding, as well as at the end of 84 days' feeding.

For the 56 days embraced in the first two periods of the experiment, the financial results were as follows:

Lot I:

To 3878 lbs. live weight, at $2\frac{3}{4}c$	\$106.64	
To 3948 lbs. sorghum hay, at \$6.67 per ton..	13.16	
2054 lbs. cotton seed meal, \$22 per ton	22.60	
1025 lbs. corn chop, \$26 per ton.....	13.33	
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	155.73	
By 4602 lbs. live weight, at $3\frac{1}{2}c$ and $3\frac{1}{4}c$		\$153.69
Loss on 5 steers in 56 days		1.84

Lot II:

To 3915 lbs. live weight at $2\frac{3}{4}c$	\$107.58	
To 1805 lbs. cowpea hay, at \$10 per ton..	9.02	
1805 lbs. sorghum hay, at \$6.67 per ton	6.02	
1940 lbs. cotton seed, at \$14 per ton....	10.88	
970 lbs. corn chop, at \$26 per ton.....	12.61	
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	146.11	
By 4563 lbs. live weight at $3\frac{1}{2}c$		159.71
Gain on 5 steers in 56 days.....		13.60

Lot III:

To 3858 lbs. live weight, at $3\frac{3}{4}c$	\$106.10	
To 3608 lbs. sorghum hay, at \$6.67 per ton	12.03	
1844 lbs. cotton seed, at \$14 per ton....	12.91	
923 lbs. corn chop, at \$26 per ton....	12.00	
	<hr/>	
	143.04	
By 4277 lbs. live weight, at $3\frac{1}{4}$ and $3c$..		\$132.40
Loss on 5 steers in 56 days		10.64

Lot IV:

To 3889 lbs. live weight, at $2\frac{3}{4}c$	\$106.95	
To 2676 lbs. shredded corn stover, at \$4..	5.35	
1756 lbs. cotton seed, at \$14.....	12.29	
878 lbs. corn chop, at \$26.....	11.41	
	<hr/>	
	136.20	
By 4237 lbs. live wt., at $3\frac{1}{2}$, $3\frac{1}{4}$, and $3c$		\$138.78
Gain on 5 steers in 56 days		2.58

In this period of 56 days there is a profit of \$13.60 from the lot fed on a mixture of cowpea and sorghum hay and cotton seed; a profit of \$2.58 from the lot fed on corn stover and cotton seed; a slight loss from Lot III, the lot fed an cotton seed meal; and a considerable loss from the lot fed on cotton seed and sorghum hay.

For 84 days.—During the third period of 28 days, the cattle in all lots made very slight gains, largely due, it is believed, to the poor quality of the corn chop fed during the last three weeks of the experiment. Hence the unsatisfactory results of the third period greatly reduce the financial returns for the entire experiment of 84 days.

Financial returns for 5 steers per lot for 84 days with low, medium, and high prices of foodstuffs.

	Low.	Medium.	High.
Cotton seed, per ton	\$10.00	\$12.00	\$14.00
Cotton seed meal per ton	18.00	20.00	22.00
Corn chop, per ton	20.00	23.00	26.00
Cowpea hay, per ton	5.00	7.50	10.00
Sorghum hay, per ton..	4.00	5.00	6.67
Shredded corn stover, ton	2.50	3.25	4.00

	Dr.	Cr.	Dr.	Cr.	Dr.	Cr.
<i>Lot I.</i>						
By 5 steers, selling price..		164 47	.....	164 47	.....	164 47
To 5 steers, bought at 2¾c.	106 64	.....	106 64	.....	106 64	.....
To food fed	55 55	.....	64 03	.....	74 55	.....
Profit or Loss.....	Profit	2.28	6.20	Loss	16.72	Loss
<i>Lot II.</i>						
By 5 steers, selling price..		166 25	.....	166 25	.....	166 25
To 5 steers, bought at 2¾c.	107 58	.....	107 58	.....	107 58	.....
To food fed.....	39 81	.....	47 94	.....	60 31	.....
Profit or Loss.....	Profit	19.86	Profit	10.73	0 64	Loss..
<i>Lot III.</i>						
By 5 steers, selling price..		134 29	.....	134 29	.....	134 29
To 5 steers, bought at 2¾c.	106 10	.....	106 10	.....	106 10	.....
To food fed.....	36 56	.....	44 38	.....	53 24	.....
Profit or Loss.....	8.37	Loss..	16.19	Loss..	25.05	Loss..
<i>Lot IV.</i>						
By 5 steers, selling price..		139 55	.....	139 55	.....	139 55
To 5 steers, bought at 2¾c.	106 95	.....	106 95	.....	106 95	.....
To food fed.....	29 50	.....	32 99	.....	41 38	.....
Profit or Loss.....	Profit	3.10	0.39	Loss..	8.78	Loss..

At the abnormally high prices of feed prevailing during the past winter, there was a financial loss with every lot of steers fed for 84 days. On a basis of medium prices for food stuffs on the farm, Lot II, fed on mixed cowpea and sorghum hay, cotton seed, and corn chop, afforded a profit of \$10.73, in addition to the value of the manure, all other lots entailing a loss. With unusually low prices for food, every lot, except Lot III, afforded a profit, Lot II leading.

Whatever the price of feed the ration of mixed cowpea and sorghum hay, cotton seed, and corn chop, was the most profitable.

As before stated, the fall in the price of fat cattle between the time of purchase and of sale of these cattle was about half a cent per pound. Had there been a stationary, instead of a declining market, there would have been an additional credit of at least \$20 for each lot, or sufficient to make a profit on every lot except Lot III, with food stuffs at the highest rating.

The production of beef in the South should be thought of as two distinct lines of business, which may be combined on one farm or which may be entirely separate. These divisions are: (1) The growing of cattle from the time of conception until the animal has reached sufficient size to be fed or finished for market, which is usually when a grade of the beef breeds is between two and three years of age; (2) Feeding or finishing cattle, usually between two and three years.

The first operation to be most highly profitable requires an abundance of good pasturage and the almost exclusive reliance on foods grown on the farm, many of which could not be marketed at all unless first converted into some form of livestock. In feeding operations on the other hand, use can often be made of purchased

food, especially of cotton seed meal. But even in feeding cattle in winter there will be, as a rule, most clear profit to the farmer who utilizes crops raised on his own land, for example, such foods as were fed in this experiment to Lot III.

It is generally recognized in states where immense numbers of beef cattle are fed for market from 4 to 5 months, that the profit consists chiefly in buying cattle at a low price per pound and in selling them when fattened at a considerably higher price per pound. It is a common saying that the difference between the buying and the selling price must be at least one cent per pound if the feeder is to obtain a satisfactory profit in addition to the manure.

Readers are cautioned against concluding that a certain feeding operation is unprofitable simply because every pound of increase in live weight has cost more than the same pound will sell for. The profit lies chiefly in the enhanced value of every pound of the animal's weight when feeding was begun, an increase in value due to the superior quality (or degree of fatness) of the finished steer. The following example of a steer weighing 900 pounds when feeding was begun, may make this important statement clearer:

	Dr.	Cr.
To cost of feed, 100 days, at 12c per day.....	\$12.00	
By value of 200 lbs. increase in wt., at 3½c.....		\$7.50
By increased value of original wt. 900 lbs. at 1c....		9.00
		<hr/> \$16.50
Profit	\$4.50	
	<hr/> \$16.50	

Here the feed cost more than the value of the increased weight, or one pound of gain cost 6 cents, but sold for only 3½c. Yet this transaction was directly profitable, to say nothing of the indirect profit from the manure

and from the utilization of food that would otherwise have been wasted.

The essentials to the highest profit in producing beef in Alabama are:

(1) The use of *thoroughbred* bulls of the beef breeds, and, as soon as practicable, of dams having some beef blood;

(2) Abundance of good pastures;

(3) Economical production on the farm of cowpea, sorghum, and other hay, and other foods needed in wintering cattle;

(4) Intrusting the care of cattle to men who have studied the business both of crop production and of feeding;

(5) Increased attention to marketing, including the raising of such numbers of beeves and of such quality as will be worth shipping in carload lots to the best markets North or South; equitable freight rates; increased appreciation on the part of local butchers of the superior value of well bred and well fattened beeves; and cooperation in selling and shipping.

HEALTH OF THE STEERS.

This was good throughout the experiment, with the exception of an occasional case of scouring. The conclusion was drawn that for these particular lots of steers fed the specified kinds of roughness *ad libitum* it is not safe to feed more than 7.5 pounds of cotton seed meal per day per steer to steers fed as those in Lot I, nor more than 7.8 pounds of raw cotton seed to Lot II, nor more than 7.5 pounds of raw cotton seed to Lot III, nor more than 6.9 pounds of raw cotton seed to Lot IV, which also received corn stover. Although corn stover is considered as constipating, yet cotton

seed, a very laxative food, had to be fed in smaller amounts with the above named roughness than when fed with cow pea hay and sorghum, both of which are considered more laxative than the stover. Our experience that between 7 and 8 pounds is the maximum daily ration of raw cotton seed which can be safely fed to steers, without inducing scouring, agrees closely with results at the Oklahoma Station, where the maximum amount recommended was 8 pounds. (Okla. Sta. Bul. No. 58, p. 37).

Manure produced.—As elsewhere stated, the steers spent far more time in the yards than under shelter, and most of the manure dropped in the yards was lost, due to drainage of lots.

About a week after the steers were sold, all the manure lying under the sheds and also the thick layer of manure extending out about six feet from the sheds was weighed before being hauled to the fields. The total amount hauled out from the four sheds aggregated 29,600 pounds of excellent manure. Making allowance for that produced during the preliminary period, it is estimated that about 27,000 pounds was produced during the 84 days of the experiment proper. In other words there was *saved* from the sheltered manure about 16½ pounds of manure per steer daily, and doubtless the amount wasted was much greater. No bedding was used except the rejected stems of the hay and stover. Bedding should have been used. At \$2.00 per ton the manure *saved* would average an additional credit of \$6.75 per lot.

COST OF PRODUCING BEEF.

To afford final conclusions as to the cost of producing beef, it will be necessary to raise a number of animals in different years and under widely different conditions. However, the following data based on the re-

sults with three steers is offered as a preliminary contribution to our knowledge on this subject.

An account was kept of the amount of food consumed by each of three calves from the age of two or three weeks until taken from the pasture at the end of the second grazing season, November 1, 1903, when we were offered 3 cents per pound for them by a local butcher. These animals were Dangus, a steer sired by a registered Angus, and out of a large cow that seemed to be about $\frac{1}{2}$ Jersey; Toom, a steer sired by a registered Red Poll bull, and out of a large native cow, apparently a Shorthorn grade; Holstein, a cross-bred Shorthorn Holstein. All of these were dropped between September 21 and December 17, 1901. The history of these individuals is as follows: For the first one or two weeks after birth the calves, then belonging to private individuals, subsisted on the milk afforded by one teat of the dam. One of these calves, Holstein, dropped on the Station Farm, was never allowed to suck, but was fed for the first few weeks on whole milk or part whole milk. The account for food stands as follows:

Dangus—

	Dr.	Cr.
2009 lbs. skimmed milk, at $\frac{1}{4}$ c	\$5.02	
172 lbs. bran and corn meal, first winter, at 1c.....	1.72	
214 lbs. leguminous hay, first winter, at $\frac{1}{2}$ c.....	1.07	
180 lbs. grain, first spring at 1c.....	1.80	
Eight months' pasturage at 25c.....	2.00	
294 lbs. cotton seed, second winter, at $\frac{5}{8}$ c.....	1.84	
132 lbs. cotton seed meal and wheat bran, second winter, at 1c	1.32	
399 lbs. hay, second winter, at 1-3c.....	1.33	
86 lbs. green rye, at $\frac{1}{8}$ c.....	.11	
8 $\frac{1}{2}$ months' pasturage, at 30c.....	2.55	
	<hr/>	
To cost of food up to age of 25 months.....	18.76	
By weight at 25 months (Nov. 1, '03) 888 lbs. at 3c..		26.64
Excess of value over cost of feed.....	7.88	
	<hr/>	
	\$26.64	\$26.64
Cost of food per pound of live weight, 2.11c.		

Toom (1/2 Red Poll)—

	Dr.	Cr.
2100 lbs. skim milk, at 1/4c	\$5.25	
131 lbs. wheat bran, first winter, at 1c.....	1.31	
248 lbs. rice meal, first winter and spring, at 5/8c....	1.55	
311 lbs. leguminous hay, first winter, at 1/2c.....	1.55	
8 months' pasturage, at 25c.....	2.00	
361 lbs. cotton seed, second winter, at 5/8c.....	2.25	
180 lbs. wheat bran and cotton seed meal, second winter, at 1c	1.80	
484 lbs. sorghum hay, second winter, at 1-3c.....	1.61	
86 lbs. green rye, at 1/8c.....	.11	
8 1/2 months' pasturage at 30c.....	2.55	
	<hr/>	
To total cost of feed to 25 months	19.98	
By 848 lbs. live weight, at 3c		25.44
Excess of value of steer over cost of feed	5.46	
	<hr/>	
	\$25.44	\$25.44

Cost of food per pound of live weight, 2.35c.

Holstein-Shorthorn—

1554 lbs. skim milk, at 1/4c....	3.88	
144 lbs. wheat bran and corn meal first winter, at 1c..	1.44	
150 lbs. leguminous hay at 1/2c .....	.75	
8 months' pasturage, at 25c	2.00	
374 lbs. cotton seed, second winter, at 5/8c.....	2.35	
200 lbs. wheat bran and corn meal, 2nd winter, at 1c.	2.00	
393 lbs. corn stover, second winter, at 1-5c.....	.79	
51 lbs. vetch hay, second winter, at 1/2c.....	.26	
84 lbs. green rye, at 1/8c.....	.11	
8 1/2 months' pasturage at 30c.....	2.55	
27 lbs. cotton seed meal at 1.1c.....	.30	
	<hr/>	
To total cost of feed to 23 months	16.43	
By 865 lbs. live weight at 3c		25.95
Excess of value over cost of feed	9.52	
	<hr/>	
	\$25.95	\$25.95

Cost of food per pound live weight, 1.9c.

From the above financial statement, it will be seen that at the high prices of recent years, the total average cost of food eaten by each animal from the age of two to four weeks until 24.3 months old, averaged \$18.39, and

that the value of the average steer at this age, weighing 867 pounds, was \$26.01. This gives an average difference of \$7.62 between cost of food and selling price, and must cover the cost of the calf at 2 to 4 weeks old, and other items of expense.

A much more favorable financial showing could have been made had not each of these steers been used in feeding experiments during each of two winters. There was no special effort to grow the animals as economically as possible when economy conflicted with experimentation as to the comparative value of foods. It is planned to grow in future a lot of grade beef calves with the primary object of producing beef as cheaply as the conditions at Auburn permit, and we are confident that with this end in view the cost can be greatly reduced below the figures given above by the following changes in the method of handling the animals:

- (1) By decreasing the amount of grain in winter and the substitution for it of leguminous hay and winter pastures.

- (2) By the use of cheaper grain food, chiefly cotton seed.

- (3) By causing the calves to be dropped after Christmas and keeping them only two winters if they are ready for market.

In order to make it easier for each reader to draw his own conclusions from the data above and to place his own local prices on the foods used, the following summary of the average amounts of food consumed per animal up to the age of 24.3 months, has been prepared.

Average amount of food consumed by grade steers from age of 2 to 4 weeks to age of 24.3 months.

First year—

1888 pounds skim milk.
 258 pounds grain.
 225 pounds hay
 8 months' pasturage.

Second year—

480 pounds grain, chiefly cotton seed.
 1276 pounds sorghum hay and corn stover.
 8½ months' pasturage.

From the above detailed data previously noted we learn that the average cost of feed and pasturage for a steer up to the age of 24.3 months was \$18.39. Of this, the cost incurred during the first year for calves dropped in the fall was \$10.45; the cost of food and pasturage the second year was \$7.94.

The average cost of food per pound of live weight was 2.12 cents, which cost could have been reduced if the prime object in feeding these animals had continually been the cheapest production of beef.

RICE MEAL VERSUS CORN MEAL FOR CALVES.

Calves dropped in the fall of 1901 were used in this experiment. They were grades of the beef breeds. Each calf was fed a moderate ration of skim milk, as much lespedeza (Japan clover) hay as it would eat, and as much of the grain mixture named below as it would eat without waste. The calves were first fed for nearly two months on the ration which each was to receive during the experiment proper.

During these two months the amount of grain eaten was small, and especially during this time the rice meal

proved decidedly inferior in palatability to the corn meal. Indeed, it was impossible to make the calves eat sufficient of the rice meal, so that it became necessary to use wheat bran as one-third of the weight of the rice meal ration, and of course wheat bran likewise constituted one-third of the corn meal mixture.

The experimental period proper extended from January 1 to April 2, 1902, a period of ninety-one days. The detailed records for each calf are given in the table below:

Rice meal versus corn meal for calves.

Name.	Grain, lbs.	Hay, lbs.	Skim milk, lbs.	Live wt. Jan. 1. Lbs.	Gain, lbs.	Breed.
<i>Rice meal lot—</i>						
Toom	153	237	1620	180	152	½ Red Poll
Foxella	252	300	417	195	137	¾ Angus
Total	405	537	2037	375	289	
<i>Corn meal lot—</i>						
Andrew	261	306	475	192	150	¾ Angus
Dangus	138	214	1609	125	200	½ Angus
Total	399	520	2084	317	350	

The calves receiving rice meal made an average daily gain per head of 1.6 pounds, while the lot eating corn meal averaged 1.9 pounds per head.

To make one pound of increase in live weight, the following amounts of food were needed:

	Rice meal.	Corn meal.
Lbs. grain required to make 1 lb. of gain . . .	1.40	1.24
Lbs. hay required to make 1 lb. of gain . . .	1.85	1.49
Lbs. skim milk required to make 1 lb. gain . .	7.04	5.70

From the figures given above it will be seen that corn meal was decidedly superior to rice meal in giving more rapid growth, and in requiring a smaller amount of food per pound of growth. Corn meal is also superior in composition and palatability. The rice meal used evidently consisted partly of ground rice hulls.

After an experience of five months in feeding rice meal to calves, we are led to the conclusion that it is not an especially desirable food for calves. However, the gains made by these calves on rice meal indicate that when the price is very much cheaper than that of corn that it may be thus used. A briefer experience in feeding rice polish suggests that it may be found to be a very desirable food for calves, as also we have found it for hogs.

SHREDDED CORN STOVER VERSUS SORGHUM HAY.

During the winter of 1902-03 an experiment was begun to determine the relative values of shredded corn stover and sorghum hay, using yearling cattle, most of which were grades of the beef breeds. The experiment was interrupted by sickness of two of the animals, which was not due to the feed. In the fifty days before this interruption the rate of daily gain was much greater with the sorghum lot than with those fed the corn stover. The latter was of medium to poor quality and was decidedly unpalatable.

Of the corn stover offered, 37 per cent. remained uneaten in the troughs, although this food was fed in such limited quantities as to make the animals consume as large a proportion of it as possible. During a part of the time the stover was sprinkled with brine, but this did not noticeably increase its palatability.

The sorghum was eaten clean. At first it was cut into short lengths, but this was found to be unnecessary, the

yearlings consuming a bright good grade of sorghum hay fed whole as well as when cut. The grain ration fed in connection with both the stover and the sorghum hay consisted by weight of four parts cotton seed, one part cotton seed meal, and one part wheat bran, a very satisfactory combination.

MANURE MADE.

Manure from a young calf.—A Jersey heifer calf, dropped October 15, 1901, was kept in a box stall from November 3 to April 30, 1902, except that for one day every two weeks she was allowed to run in a lot, and the manure for this day was thus lost. Pine leaves were freely used as bedding, and in more liberal quantity than is customary.

The total amount of manure, including bedding, as weighed a week after the close of the experiment was 1645 lbs. produced in 176 days. This is about 9.4 lbs. of manure and bedding per day, which is a larger amount than would be obtained with the usual amount of bedding.

During this time this calf consumed 204 lbs. of wheat bran, 323 lbs. hay (chiefly lespedeza and crimson clover), 92 lbs. of whole milk, and 1191 lbs. of skim milk.

Assuming 6 lbs. of skim milk as equivalent to 1 lb. of grain, we have a total amount of feed eaten, equivalent to about 740 lbs. of grain and hay. Hence for every pound of air-dry food consumed there was produced about 2.2 lbs. of manure.

Manure produced by yearling beef animals.—Beginning January 17th, 1902, the combined liquid and solid manure dropped by six head of yearling cattle, most of which were grades of the beef breeds, was saved and

weighed daily. The arrangement for catching the droppings consisted only of the usual wooden manure gutter and the use of pine leaves as bedding. The floors of the stalls were of clay, and hence there was some loss of the liquid manure from the four steers. The cattle had to be taken from the barn for a short time twice a day for water, which represented the loss of such manure as was dropped during a daily period of about one-half hour. From these statements it will be seen that the effort was rather to determine the amount of manure that the farmer could expect to save from cattle of this kind, kept under shelter, than to determine from a scientific standpoint the actual and exact weight of the excreta.

The results for the twenty-day period were as follows:

	Lbs.
Solid and liquid manure saved from 6 yearlings in 20 days, excluding bedding	2402
Bedding used	179
Total manure per head daily, excluding bedding...	20
Total manure per head daily, including bedding...	21.5
Total cotton seed, cotton seed meal, and wheat bran fed	825
Total sorghum hay and corn stover actually con- sumed	497
Total food	1322
Pounds liquid and solid manure saved per pound of dry food fed	1.8

At this rate six yearlings in one month would produce 3600 lbs. of manure, or, including bedding, about two tons. In other words, a beef animal weighing about 500 lbs. would produce a ton of manure in about 3 months.

GRAZING YEARLING STEERS ON GREEN RYE.

For three weeks, beginning March 11, 1903, four yearling steers, averaging about 500 pounds in weight, were placed on a field of rye, sown on thin upland on the Sta-

tion farm at Auburn during the preceding September. Before being placed on this pasture they had for several days been accustomed to eating green rye and had been all allowed to make the fill that usually occurs when cattle are first placed on green food.

The increase in live weight was 1.67 pounds per head per day.

The rye was about two feet high when the cattle were turned on it, and although too old and coarse to be as palatable as at a younger stage, yet it was eaten clean.

To determine the increase in live weight made by thoroughbred and grade cattle of the beef breeds, weighings were made throughout the pasture season for such beef animals in the Station herd as were kept continuously on pasture. The following table gives first, the data for five calves, grades of the beef breeds; and for five mature cows, thoroughbreds and grades of the beef breeds, for the time that they were kept continuously on pasture.

Gains of Station beef cattle on pasture alone.

Name.	Breed.	Weight in spring.	Gain, lbs.	Days.	Average daily gain, lbs.
Toom.....	½ Red Poll.....	345	160	214	.74
Dangus.....	½ Angus.....	340	152	214	.71
Holstein.....	Hol. short.....	315	177	214	.82
Aubelle.....	Short horn.....	455	95	214	.44
Foxella.....	¾ Angus.....	370	135	214	.63
Dangus 2nd.....	½ Angus.....	238	187	184	1.01
Clementina.....	Red Poll.....	1050	200	183	1.09
Gazelle.....	Short-horn.....	1010	240	183	1.31
Baroness.....	Grade Angus.....	1045	185	183	1.01
Fancy.....	Grade Angus.....	880	145	183	.78
Sally.....	Angus.....	855	245	183	1.34

From the above table it will be seen that the average daily gain of calves having from 50 to 100 per cent. of beef blood, was .72 pound, and that the average daily gain of thoroughbred and grade beef cows was 1.1 pounds.

The pasture was strictly unimproved, or in its natural condition, and consisted chiefly of old poor upland fields, too poor for cultivation, on which the principal growth lespedeza and broom sage.

In order to determine the amount of beef which might be produced from an acre of pasture, a portion of the pasture of the Alabama Experiment Station farm was fenced off and four young steers were kept on it from April 1 to November 1, 1903. The following table gives the breeding of the animals, their weight on April 1, and the gain made during the next seven months.

Gains made by four yearling steers from April 1 to November 1, 1903.

Name.	Breed.	Weight April 1st.	Weight Nov. 1st.	Gain on pasture.	Average daily gain.
Toom.....	½ Red Poll	590	848	258	1.20
Dangus.....	½ Angus	535	888	353	1.64
Holstein.....	Holst-shorthorn	555	865	310	1.44
Cull.....	Scrub	445	715	270	1.26

The area in this pasture was 13.11 acres, of which about 3.1 acres was covered by a dense growth of alders and other timber. On this area the total increase in live weight made by the four steers was 1191 pounds, or at the rate of 91 pounds of increase in live weight for each acre, including thickets. At 3 cents per pound, this is equivalent to a rental of \$2.73 per acre for the entire tract, although, if cultivated, the rental value of the entire tract would not have exceeded half this amount.

Moreover, in the season of 1903, when rains were so favorably distributed for the growth of pasture grasses the steers were not able to consume the entire growth. We estimated that there was food enough for two more similar steers. For three weeks in November this pasture supported seventeen two-year-old steers, without other food.

The average daily gain per head for the three yearling steers with beef blood on pasturage alone was 1.43 lbs. and the average gain for the pasturage season was 307 lbs. per head.

GAINS MADE BY SCRUB CATTLE ON PASTURES.

Conditions of the experiment.—It seemed a matter of importance to study the gains made by scrub cattle (unimproved natives) during the grazing season. Hence in the spring of 1901, an experiment was begun in cooperation with a farmer living in Macon county, Alabama, who every year pastures a large number of cattle of scrub or Jersey blood. One of the principal objects in view was to ascertain what class of animals, or rather animals of what age, made the most rapid gains, or brought the most profit to the dealer or stockman pasturing cattle.

The Station furnished the scales and its representative weighed the cattle several times each year. The pasture is so large and the cattle so wild and the stock so frequently changed by sales and new purchases that only for a few of the several hundred animals weighed are the records in any sense complete. However, by combining the results for the three years, we obtained averages which are believed to have some suggestive value. The pasture on which these cattle grazed consisted of old fields and swampy thickets with a small amount of switch cane. The principal growth relished by cattle

consisted of lespedeza, broom sage, crab grass, swamp grasses, and switch cane. This is strictly an unimproved pasture, no seed of any kind having been sown in it. It is probably an average native or unimproved pasture on sandy land. Most of it is made up of old fields, some that have been uncultivated for many years, and other areas recently thrown out of cultivation. The soil would rank as poor sandy land, worth, perhaps, if in cultivation, \$3 to \$6 per acre.

Relative gains during the pasturage season in grazing scrub cattle of different ages.

By averaging the results for the different years, it was found that during the portion of the pasturage season covered by our weighings the daily gain made by the different classes of stock for periods of 138, 183, and 236 days (these being the respective intervals between weighings during the three years, were as follows:

Daily gains made by scrub cattle on native pasturage alone.

9 cows averaged per day .....	.28 lb.
14 heifers (300 lbs. and above) averaged.....	.82 lb.
7 yearlings, male and female, averaged.....	.49 lb.
4 suckling calves averaged .....	.67 lb.
13 steers and bulls (above 300 lbs.) average..	.71 lb.

It was impracticable to make weighings early enough in the spring and late enough in the fall to include the entire pasturage season. However, we are confident that the period during which cattle made average gains was at least seven (7) months, or from April 15th to November 15th. Hence, in order to make the results clearer we have calculated from the figures above the gains for a pasturage season of 210 days and the results are given below:

Gains made by scrub cattle during a season of 7 months on pasture.

	Lbs.	Value of increase at 2½¢
Mature cows, sucking calves	59	\$1.48
Heifers above 300 lbs.	172	4.30
Yearlings, up to 300 lbs	103	2.58
Sucking calves	141	3.52
Young steers and bulls	149	3.73

It is obviously unfair to compare the mature cows with the other animals, since the slight gains made by them are due in large measure to the fact that they had nursing calves at their sides. Excluding the cows, we find that the largest gains were made by the heifers that at the beginning of the season weighed more than 300 lbs. It is notable that the heifers should have beaten the steers of corresponding weight. The sucking calves made considerably greater gains than did the yearlings, but it cannot of course be said that sucking calves are most profitable stock for grazing, for the reason that the grazing of this class of animals necessitates supporting the dam, whose gain is slow.

A more accurate idea of the relative profit of grazing these different classes of animals may be obtained by ascertaining what per cent of increase, as compared with the weight in the spring, is made by the average animal of each class during the season of abundant pasturage.

Percent increase during pasturage season of 7 months.

	Avg. wt. in spring.	Per cent. increase.
Cows, suckling calves	615	8
Heifers	440	39
Yearlings, male and female	269	38
Sucking calves	272	51
Steers and bulls	428	35

According to this showing, if scrub cattle are bought and sold at the same price, the investment should return a gross profit of 39 per cent. with large heifers, 38 per cent with yearlings and 35 per cent. with steers. Since

the selling price per pound is considerably above the purchase price, the showing is still more favorable. Of course, from this must be deducted a number of expenditures, including interest or rent and loss from death. If these figures are representative they indicate that either one of these three classes of scrub cattle may be pastured at practically the same profit.

However, for cattle to be kept over winter without feed except the range the losses by death are greater with the calves and yearlings than with older animals. To form a better idea of the weights of these scrub cattle, the reader is referred to the table in the Appendix.

Annual growth made by scrub cattle under range conditions.—It would be of interest to ascertain the weights from year to year and the average gains for an entire year under this system of maintaining scrub cattle without any food in winter. From causes alluded to above our records on this point are fragmentary, the stock being constantly changed.

Ten head of cows averaged an annual increase in live weight of only twenty-four pounds, this poor showing being attributable, of course, to the calves that they suckled. The history of five young steers, weighed at intervals for two years is of interest as showing the effect of age on the rate of growth of very young cattle. The following table gives the details:

Growth made by young scrub steers in two years.

Steer No.	Weight first spring.	Gain first year.	Gain second year.	Gain two years.	Average yearly gain.
	Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
11	218	120	170	290	145
56	238	128	190	318	159
57	326	168	172	340	170
67	304	88	170	258	129
84	234	64	178	242	121
Average					145

From this table we see that the average gain per steer per year was 145 pounds, worth at $2\frac{1}{2}c$ per pound, \$3.67. The increase made by these young steers was

during the first year 42 per cent over their weights in the spring. The same steers made during their second year an increase of 44 per cent. over their weights of the second spring. In other words, there was little difference in the profits during the two years, in spite of the difference in the age.

Loss of weight by range cattle during winter.—The management of this herd of cattle included many matters, which in the opinion of the writers, were at fault, or could have been improved; for example, the almost exclusive purchase of scrub or grade Jersey cattle rather than the raising of calves from the owner's cows and sired by a thoroughbred bull of any of the beef breeds. Another great mistake in management, we believe, consisted in requiring the cattle to subsist throughout the entire winter without any food whatsoever except what they could obtain on the range from canebrakes, cotton stalks, corn stalks, etc. Since our weighing was not made until May of each year, when the cattle had been on pasturage for about a month, it is not possible to estimate exactly the amount of decrease in live weight occurring between the time that the fall pasturage failed and that the grasses put out in the spring.

Of 22 animals of all ages weighed October 1, 1901, at least a month before pasturage greatly deteriorated, and again weighed May 7, about six weeks after the pastures put out in spring, 64 per cent lost in weight during this period of six and a half months.

The losses in weight would have been much greater had our weighings been made about November 15th and April 1st.

It is believed that the shrinkage in live weight during the winter, the utter loss of all food obtained from pasture and range from October to May, and the considerable number of deaths during the winter, more than counterbalance the saving of feed, which is the only point of advantage claimed for this system. Our advice is to winter only so many cattle and those of such quality that it will be feasible and profitable to supply them with hay, if not with both hay and cotton seed, after the pastures or ranges fail in December, January, or February.

APPENDIX.

Individual weights, gains, and percentages of dressed weight of grade steers.

Lot No.	Name or Number of Steer.	Initial weight.	Gain				Average daily gain,	Dressed weight.	Principal Food.	
			First 28 days.	Second 28 days.	Third 28 days.	Total 84 days.			Roughness.	Concentrate.
I	Dangus	Lbs. 803	Lbs. 122	Lbs. 61	Lbs. 47	Lbs. 230	Lbs. 2.74	% 56.6	Sorghum	Cotton seed meal.
I	Daddy	877	83	90	40	213	2.54	54.3	Sorghum	Cotton seed meal.
I	42	832	88	75	44	207	2.47	55.7	Sorghum	Cotton seed meal.
I	153	733	52	26	19	97	1.15	55.4	Sorghum	Cotton seed meal.
I	308	633	72	55	64	191	2.27	49.3	Sorghum	Cotton seed meal.
I	Average	785	83.4	61.4	42.8	188	2.23	54.5		
II	18.	795	56	40	50	146	1.74	50.9	Sorghum and cowpea	Cotton seed.
II	53.	707	59	81	31	171	2.04	50.7	Sorghum and cowpea	Cotton seed.
II	91.	838	114	73	37	224	2.67	51.7	Sorghum and cowpea	Cotton seed.
II	222	795	70	60	30	160	1.90	50.6	Sorghum and cowpea	Cotton seed.
II	224	780	17	78	13	108	1.29	51.7	Sorghum and cowpea	Cotton seed.
II	Average	783	63.2	66.4	32.2	162	1.93	51.		
III	Holstein	797	21	39	13	73	.90	49.1	Sorghum	Cotton seed.
III	Roan	802	68	37	41	146	1.74	*	Sorghum	Cotton seed.
III	60	735	71	28	—3	96	1.14	51.5	Sorghum	Cotton seed.
III	84.	822	83	11	32	126	1.50	51.3	Sorghum	Cotton seed.
III	237	702	48	13	—1	60	.71	50.6	Sorghum	Cotton seed.
III	Average	772	58.2	25.6	16.4	100	1.19	50.6*		
IV	Toom	746	72	9	26	107	1.27	53.4	Corn stover	Cotton seed.
IV	10.	646	52	—3	13	62	.74	49.8	Corn stover	Cotton seed.
IV	26.	882	71	2	15	88	1.04	52.6	Corn stover	Cotton seed.
IV	217	847	18	40	17	75	.89	50.3	Corn stover	Cotton seed.
IV	236	768	62	25	—7	80	.95	50.4	Corn stover	Cotton seed.
IV	Average	778	55	14.4	12.8	82	.98	51.3	Corn stover	Cotton seed.

*Returns from packer give only 47.6 per cent. for this steer. Yet he was one of the fattest. The possibility of an error in this figure has caused us to omit this figure in making up the average for this lot.

Weights and gains made during the pasturage season by scrub cattle in Macon County.

		Age, years.	Year.	Days between weighings.	Weights in spring.	Gain in one pasturage season.	Daily gain.
	Cows 4 years and older						
68	.....	10	1902	238	652	38	.....
46	.....	8	1902	238	536	82	.....
121	.....	4	1902	238	520	80	.....
62	.....	4	1902	238	586	40	.....
68	..... (?)	8	1903	183	666	64	.....
196	.....	8	1903	183	638	84	.....
189	.....	4	1903	183	700	46	.....
29	.....	10	1903	183	626	36	.....
	Average .....	.....	.....	.....	615	59	.28
	Heifers above 300 lbs..						
71	.....	2	1901	136	510	146	.....
79	.....	2	1901	136	360	122	.....
58	.....	1½	1901	136	310	118	.....
81	.....	1	1901	136	356	68	.....
16	.....	3	1902	238	408	112	.....
22	.....	3½	1902	238	472	146	.....
107	.....	3½	1903	183	542	232	.....
107	.....	2½	1902	238	418	152	.....
194	.....	2½	1903	183	542	88	.....
187	.....	2½	1903	183	600	188	.....
197	.....	2	1903	183	482	198	.....
193	.....	2	1903	183	428	192	.....
51	.....	2½	1903	183	398	148	.....
101	.....	1½	1903	183	342	176	.....
	Average .....	.....	.....	.....	440	149	.82
	Yearlings, up to 300 lbs						
76	.....	1	1901	136	258	24	.....
84	.....	1	1901	136	234	86	.....
36	.....	1	1901	136	256	128	.....
81	.....	1	1901	136	356	68	.....
114	.....	1	1902	238	218	88	.....
124	.....	1½	1902	238	274	94	.....
18	.....	1½	1902	238	272	118	.....
	Average .....	.....	.....	.....	269	89	.49

Weights and gains made during the pasturage season by scrub cattle in Macon County.

		Age, years.	Year.	Days between weighings.	Weights in spring.	Gain in one pasturage season.	Daily gain.
	Sucking calves.						
40	.....	½	1901	136	230	98	.....
131	.....	.....	1902	238	306	54	.....
12	.....	1	1901	136	262	138	.....
51	.....	1	1901	136	293	135	.....
	Average ....	.....	.....	.....	273	106	.67
	Steers above 300 lbs.						
96	.....	3	1901	136	520	90	.....
73	.....	2	1901	136	584	126	.....
27	.....	1½	1901	136	419	67	.....
38	.....	2	1901	136	426	104	.....
41	.....	3	1901	136	486	114	.....
67	.....	1½	1901	136	304	94	.....
63	.....	1½	1901	136	356	104	.....
65	.....	2	1901	136	477	111	.....
87	.....	2	1901	136	470	156	.....
69	.....	1½	1901	136	361	139	.....
11	.....	1½	1902	238	338	94	.....
40	.....	1½	1902	238	304	54	.....
82	.....	2½	1903	183	522	200	.....
	Average, ....	.....	.....	.....	428	112	.71