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TEXAS AGRICULTURAL
Experiment Station,

EXPERIMENT STATION.

not illustrated

BULLETIN No. 6,

JUNE, 1889.

FEEDING EXPERIMENT.

Agricultural and Mechanical College.

COLLEGE STATION, BRAZOS COUNTY,
TEXAS.

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HOUSTON :
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1889.

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Feeding Experiment.

In planning this feeding experiment it may be well to state that we have attempted to throw light on the practical, rather than on the scientific, side of the question. It is the first of a series of feeding tests that we expect to continue for several years, and we have thought best to consider questions that are of immediate importance to the cattle feeders of the State.

Four questions are submitted to the cattle and feed stuffs employed.

1. Is it possible to conduct a feeding test that will be sufficiently accurate to be of value, and at the same time make it an object lesson to the practical cattle man and give him information which he can make use of?

2. Is there any practicable method of sheltering range steers in winter feeding, and will it be profitable?

3. What feed stuffs that are obtainable in the State will give the best results in proportion to cost?

4. Can the common, unimproved Texas steer be fattened with profit?

The above questions may seem simple, and, it may be thought, ought to be readily answered by any feeder who has had much experience in feeding cattle, but when such questions are submitted to practical cattle men wide diversity of opinion is shown in the replies, and accurate data as to gain in weight, quantity of food consumed, and relative value of different feed stuffs, cannot be obtained.

So far as the first question is concerned we decided to use 48 steers, and to handle them in such a way that the number might be increased to 500 or 1000 if desired. We have used six steers to test each ration, knowing that men who feed on a large scale have little confidence in feeding tests made with but one or two animals. The variation in gain in weight of steers fed together on the same ration in this test shows that popular prejudice against single animal tests is well founded.

The steers were fed but twice each day, and no condiments or special foods used to encourage the steers to eat large

quantities. No attempt was made to secure the largest possible gain, as the object sought was to learn the effect of certain rations fed to different lots of steers under as near similar conditions as we could provide.

THE FEEDING SHED.

A building 38x80 feet, 7 feet high from ground to plates, was put up with a floored alleyway 10 feet wide running lengthwise in the centre of the building, of which two feet on each side is boxed one foot deep for feeding trough or manger. The north side and ends of the building are boarded up tight, the remaining side slatted sufficiently close to prevent steers from breaking through. The spaces on either side of feeding alley are fenced off every 20 feet, thus making eight pens 14x20 feet. Pens have ground floor. Partitions are made removable, and double doors are provided at ends of building to drive wagons through and haul out manure.

A door opens from each pen into an outside open yard 20x32 feet, the yards having connecting gates to allow passage of wagon and transfer of cattle. Water troughs are permanently placed in the partitions between each two pens and kept full of clean water supplied from a cistern and regulated by an automatic float valve.

The feed for each pen of steers was carefully weighed and placed in the mangers. When any remained it was taken out and weighed just before next feeding time. Weights of food given in tables No. 1, 2 and 3, represent amounts eaten after deducting quantity left in mangers from amount fed.

Cattle were driven from pens to scales and weighed singly at the same time each day after morning feeding. We had planned to weigh the steers twice each week, but it was found that shifting the cattle from pens to scales interfered seriously with the consumption of food for that day. It was even found necessary to keep the barn locked and exclude visitors for the first month to prevent disturbing the steers, but during the latter half of the time the cattle had become accustomed to the handling and would not stop eating when strangers entered the barn.

SHELTER.

While stockmen, generally, know that cattle will not gain weight if exposed during cold, wet weather, the opinion is common that shelter is impracticable. In fact it has been found that range steers will not always thrive when tied up and closely confined; their legs stiffen and swell up; they will not always eat, and as turning out and tying up again each day is entirely out of the question, there is reason for the common opinion.

We assume that economical feeding in Texas must include shelter, and that the solution of the problem, how to make sheltering practicable with range steers, is essential to an improved and profitable method of feeding. We therefore adopted the plan of removing the horns at the beginning of the experiment and allowed each lot of six steers to run loose together in their respective pens.

The steers and eight old cows were simply "roped," drawn up to a post and the horns sawed close to the head with a light butcher's saw and the animals turned loose without further attention. Of the 60 head dehorned all were eating regularly after three days, and most of the openings had closed up and ceased to discharge after the third week.

While sawing off the horns of a full grown steer may seem severe treatment and somewhat cruel, the fact that the operation requires very little skill and time, that it is safe, that it tames the animal to a surprising degree, and that a drove of the wildest cattle may be run loose together in a building, the same as a flock of sheep, and that they will fatten faster after dehorning than before, leads us to believe that dehorning has solved the problem of making sheltering practicable, and that it will be adopted by the Texas cattle feeder.

The comparison of gain in weight and food consumed by Pens Nos. 8 and 9 shows strikingly the effect of dehorning and shelter compared with ordinary out-of-door feeding.

FEED STUFFS.

In compounding formulas for feed rations, we have thought best to use cotton seed in its various forms in nearly every combination,

for the reason that over a considerable portion of the State cotton seed is one of our cheapest feed stuffs.

We have also made use of silage largely, notwithstanding the fact that it is practically unknown in the State. That silage is one of the most economical and desirable feeding materials, where corn and sorghum thrive, has been conclusively demonstrated in every state east of the Mississippi river and several west.

While there is much to learn in regard to the kind of crops to grow for silage, how to handle and how to feed them, no further experiments are required to determine that silage must be included in our feed stuffs if we propose to use the cheapest materials.

Lots Nos. 8 and 9 were fed on hay and corn. No. 8 dehorned, and under shelter ; No. 9, out of doors without removing the horns, to compare one lot with the other, and also to compare both lots with steers on rations containing cotton seed silage.

The difference in gain and cost of food consumed, shows that hay and corn alone are expensive feed stuffs at the prices given, compared with some of the other rations.

We had planned to feed pigs with the steers, to learn the value of the droppings and waste for pork, but were unable to carry out that part of the work with this lot.

The silage used for feeding was (see chemist's report of analysis) mostly corn, harvested after the kernels became hard, and cut up into lengths of from 1-2 to 2 inches. A layer of sorghum was placed in the center of one of the silos and was fed out between Feb. 8th and 15th.

We are not prepared as yet to say that sorghum silage is of greater or less value than corn, weight for weight or based on cost of production. Corn, sorghum and cow-pea vines, all make a fine quality of silage, seem to be equally well relished by cattle and give good results in feeding.

Pen No. 1, a lot of eight old cows were fed from the 1st of January, weights of cows and food consumed were taken for comparison with the steers from January 8th.

CLASS OF STOCK FED.

The steers used in this experiment were mostly three and four years old, native, Brazos Co. range cattle. They were not selected stock, as we desired to begin our work in feeding with cattle ranking below the average cattle of the State, rather than above.

The assertion is often made that such cattle can not be fed with profit ; and it is probably true in the northern states. Our experiment shows that if such cattle can be procured at 2 cents per pound gross, in ordinary condition, and sold at 2 3-4 to 3 cents after adding from 150 to 200 pounds to the gross weight, that the inferior native Texas steer may be profitably fed on the rations of pens Nos. 3, 4, 6 and 7, and probably 2 and 8, if dehorned and sheltered. At present there is profit in growing steers on the range and selling at 2 cents gross when the steer is about three years old. Admitting this to be the case there would be still more profit in breeding and raising a good class of grades, for they would, if properly handled weigh more at same age and the cattle feeder could afford to pay 1-4 to 1-2 cent more per pound for graded steers to feed. For these reasons we selected the poorest grade of Texas cattle to begin our work, believing that if it can be satisfactorily demonstrated that such cattle can be fed with profit, it would have a greater influence in encouraging the improvement of native cattle than if we had selected good grade steers.

The "scrub-stock man" is suspicious of all results claimed to have been made with pure-bred or graded cattle, but the introduction of feeding establishments in the State where common steers may be sold from the range, will soon lead to discrimination in prices in favor of good grades. When such a condition is established, (it is in fact already in operation in several places in the State) no further argument will be needed to convince the intelligent rangeman that it is good policy to improve his cattle by using good bulls.

PROFIT IN FEEDING.

The profit in feeding cattle depends principally on two factors :

- 1st. Cost of food and labor and skill in handling.
- 2nd. Difference in value of steers in ordinary condition, i. e., range cattle, and fat cattle.

The cost of food is governed by conditions peculiar to any certain locality. The food must be either purchased or grown or as will perhaps more often be found advisable, partly grown and partly purchased.

Cattle feeders who put up a feeding plant in the vicinity of a cotton seed oil mill have certain advantages over men who feed at

other places, and the experience of men who have engaged in fattening cattle on cotton seed hulls and cotton seed meal, has shown that the business may be made profitable.

Our experiment shows however that cattle feeders, distant from oil mills where cost of freight and hauling must be added to the mill valuation of cotton seed hulls, may use cotton seed and silage, and the silage may be grown at a cost not above \$ 2.00 per ton, which is less than the cost price of hulls at the mills ; so that with the use of silage and cotton seed the oil mills have no advantage. Our experiment shows that in Pen 2, silage and cotton seed meal did not make as rapid gain nor at as low cost as cotton seed hulls and cotton seed meal in Pen 6; the first making a gain of 170 pounds per head in 83 days at a cost for food of 4.47 cents per pound gain; the second a gain of 202 pounds per head a cost for food of 3.62 cents per pound gain.

In Pen No. 7, cotton seed hulls, silage and cotton seed meal made 178 pounds gain at a cost of 3.93 cents per pound indicating that the hulls at the price given have a higher food value than silage. We confess we are not a little surprised with the result for it does not look reasonable that the dry, hard, and to a large extent indigestible cotton seed hulls have a higher food value than silage.

Owing to delay from an accident while harvesting our corn, it was not ensiled until nearly ripe, a good deal of it quite dry. This may have made it less digestible or it may be that Pens 6 and 7 were better feeders than Pen 2.

Pen 3 on silage and boiled seed made the gain at the least cost per pound, and Pen 4, silage and raw seed, the second lowest in cost ; which would indicate that cotton seed at a valuation of \$7.00 per ton is a cheaper feed with silage than cotton seed meal at \$20.00 per ton with silage or with hulls.

If the gain per period of ten days, of the different pens is studied, Table 14, it will be noticed that some of the rations start the cattle off much quicker than others. As stated in another place regular and frequent weighings were abandoned owing to the wild condition of the cattle ; still we note that the steers fed on boiled cotton seed and silage had made the greatest increase in weight at the end of the period, Feb. 25th.

We have some ground for believing that boiled cotton seed will load range cattle up with fat, while other feed stuffs tend to promote further growth, even with steers four or five years old. Steers in Pen 3, after gaining 145 pounds each, appeared to have gained more fat than steers of Pen 6 after gaining 200 pounds each.

Our attention has been called to this point in previous tests in feeding boiled cotton seed.

In feeding to fatten, it is desirable to ripen the animal in the shortest time, without reference to growth, provided however, that such a method of feeding will not produce a carcass, that while it may be fat, may rank low in quality.

Up to the present time the value of a steer in the markets has been determined principally by his condition, i. e., stage of fatness. In other words fat cattle sell well. Some distinction is made however, butchers in certain markets objecting somewhat to cotton seed fed cattle.

The difference in quality of carcass, relative proportion of edible meat and masses of fat, so prominently brought out at the Chicago and other fat stock shows, is attracting the attention of the consumer and of the butcher, so that while at present fatness gives the animal value, we must begin to study the value of a feed stuff in regard to its effect on the quality of the carcass as well as on the fattening qualities alone. The time will soon come when the quality of the carcass may determine value as much as fatness.

Considering the second point, relating to profit in feeding, difference in value between thin, medium and fat cattle of the same kind, varies in different sections of the country and in different years.

The range in value of Texas steers on the Chicago market for the past spring may be estimated perhaps at $2\frac{1}{4}$ cents per pound gross for thin steers, and $3\frac{3}{4}$ to 4 cents for same steers well fattened, a difference of $1\frac{1}{2}$ to $1\frac{3}{4}$ cents. In this State the value of an 800-pound native 3-year old steer may be estimated at $1\frac{3}{4}$ cents gross and the same steer fattened and weighting 1000 pounds $2\frac{3}{4}$ to 3 cents.

At $1\frac{3}{4}$ cents the 800-pound steer would be worth \$14.00.

At $2\frac{3}{4}$ cents the 1000-pound steer would be worth \$27.50.

At 3 cents the 1000-pound steer would be worth \$30.00.

A gain in value of \$13.50 and \$16.00 respectively by adding 200 pounds of fat.

Our experiment indicates that 200 pounds gain in weight may be made from \$6.00 to \$9.00 worth of silage, cotton seed, cotton seed meal and cotton seed hulls, leaving a good margin for profit after deducting cost of labor, wear and tear of plant and use of capital.

EFFECT OF DEHORNING.

It will be noticed in Table 14 that with the exception of Pens 2, 3 and 6, the steers in all the pens lost weight the first week, some making no gain for twelve days. The loss of weight might be charged to dehorning, but it will also be noticed that steers in Pen 9, not dehorned and running loose in a half-acre lot, lost the most in weight the first week, and, excepting Pen 4, were the last to begin gaining.

The steers were dehorned on the 8th and 9th of January. For two days they were dumpish, lying down a good deal of the time, and did not appear to have much appetite; still the evidence goes to show that failure to gain in weight from the start is due more to change in food and confinement than to removing the horns. Experiments in Arkansas, Tennessee and Wisconsin, support this view.

That dehorning is painful to the animal, and that serious injury may result if the animal is in poor condition, or exposed in cold and wet weather, or half starved, cannot be denied; but the thousands of cattle that have been dehorned in the country within the past two years without apparent injury, would seem to prove conclusively that the operation may be performed as safely as castration, while the pain suffered by the animal for but one or two minutes is not to be compared with injuries cattle inflict on each other with their horns when massed together.

EFFECT OF DIFFERENT RATIONS.

A study of Table 14 shows the comparative effect of the different rations in making rapid gain in weight. From former feeding tests we had been led to believe that raw cotton seed was not as digestible as cooked seed and possessed a lower nutritive value.

If we compare the gains made in weight of steers in Pens 3 and 4 to February 25th, and note also the quantity of cotton seed and silage consumed to that date (see Tables 1 and 2), the gain is greater on the cooked seed in proportion to silage and cotton seed consumed, and the gain on cooked seed much the more rapid of the two, but we find at the close of the experiment (Table 13) that the cost of feed for each pound gained is practically the same. The steers in Pen 3 made largest gain, so that from an economic stand-

point the cooked seed made considerably the best return, the steers in Pen 3 having a higher value per pound, owing to their better condition.

Pen 6, on cotton seed hulls and cotton seed meal, made a steady gain from the first, but not equal to Pen 3 until after seven weeks feeding.

The high value of cotton seed hulls and cotton seed meal for fattening cattle is shown by this experiment.

We are informed by cattle commission men of New Orleans and St. Louis that cattle fattened on this ration "kill well." The meat is firm, of good flavor, tallow of good color, and the butchers make little distinction between cotton seed meal and hull, and cornfed beeves.

Nearly the entire output of hulls from the oil mills is now used for feeding, the hulls in some cases have been shipped several hundred miles for this purpose.

Within the past two years, feeding plants with capacity for feeding from 1000 to 3000 head, have been put into operation at the largest oil mills and the business promises to enlarge until all the hulls will be consumed at the mills.

We have not been able to get much reliable data as to the exact value of hulls for feeding at the mills, owing to the fact that weights and gain of cattle are not kept, nor exact quantity of hulls and meal consumed. Sensational reports of cattle gaining from four to seven pounds per day per head are published in the papers, but such statements are mere guess work or the animals are exceptional feeders.

Mr. R. L. Maupin, a very successful cattle-feeder at Mobile, Alabama, writes that he gets best results from feeding cracked corn with cotton seed meal and hulls. His ration is 10 lbs. hulls, 5 lbs. cotton seed meal and $3\frac{1}{2}$ lbs. cracked corn per day to 1000-pound steers. The winter of 1888-'89 he fed 115 head, "twos and threes," an average of 90 days (varying from 60 to 115). Average gain $246\frac{1}{2}$ lbs. per head. He states that in his experience cattle not accustomed to confinement will not do well tied up and will sometimes not gain at all for 30 days, therefore he feeds loose under sheds, but believes that injuring from hooking amounts to hundreds of dollars. He will dehorn in future. Mr. Maupin thinks that shelter is essential even at Mobile. Mr. Maupin's skill as a cattle feeder is shown in the gain in weight mentioned above, and his opinions are of value.

Mr. Albert Montgomery, cattle commission merchant of the

New Orleans Stock Yards, who handles a large number of beeves and who has been feeding at New Orleans, and also has an interest in an extensive feeding plant at Houston, writes us that "cotton seed meal and hulls make firm, sweet meat, but it is lacking in fat to be classed prime beef; but if some starchy food such as corn or rice, bran or meal is added the meat rates first-class." Cotton seed meal and hulls alone will fatten, but do not make as good meat, and it is 20 to 30 days slower than with corn or rice meal added." On meal and hulls alone some of the cattle get "off their feed" and do not thrive.

In his experience cotton seed hulls and meal even with other feed has been a failure with calves, yet he states that Mr. J. M. Frost, his partner at Houston, feeds half-breed Brahmin calves, six months old on hulls and meal alone, and they thrive splendidly. The cattle referred to by Mr. Montgomery were fed in open lots with the mud a foot deep and the same is true of one-half or more of the cattle fed by this firm at Houston the past winter.

We examined the cattle at Houston at different times, and confess to some surprise that cattle will thrive under such conditions on any feed, yet they were doing well.

Mr. Vick fed some 3000 head, winter of 1887-'88 at New Orleans out of doors standing in the mud most of the time, on hulls and meal. Cattle doing fairly well, but we learn that he has abandoned out of door feeding. Mr. Vick fed 1500 head at the Southern Oil Mills at Houston the past winter, all tied up under sheds.

From our examination of the cattle fed under the system practiced at the oil mills, in open lots or tied up under sheds, we are of the opinion that these gentlemen will get much better results with range cattle by dehorning and feeding loose under sheds.

Our experiment indicates that cotton seed hulls and meal, without other feed, will make as rapid gain as any other ration except boiled cotton seed.

Pen 9, outside and not dehorned made lowest gain during nearly the entire time. The pen as a whole was thought to be the best feeders in the entire lot at the start. They were larger steers, and selected with reference to giving outside feeding on corn and hay without dehorning; a little advantage, if anything, so that there might be no reason for claiming that the shelter test was not a fair one. The pen contained six steers at the beginning, but the poorest one in the pen, one that had been selected to bring down the average to that of the other pens, was taken sick at the end of the

second week and removed, thus making the pen average even better than at first.

Tables 3 and 13 show that Pen 9 consumed some 10 per cent more corn per head and three times as much hay and made only 18 pounds gain per cwt. and 150 pounds per head, as compared with 23.8 pounds per cwt. and 173 pounds per head with Pen 8 on same ration, but the latter dehorned and under shelter, and this in a winter which was exceptionally warm.

TABLES.

Tables 1 to 3 give average amount of each kind of food consumed per head per day for each period of ten days. The reduction in quantity of silage consumed the first period in March is due to the silage fed at that time being very ripe and dry. The analysis at the same time (see page —) shows that water content dropped to 49.37 per cent. while the average is 64.50 per cent.

Tables 4 to 12 give the weighings of the steers, average gains per head per day, total gain, gain between weighings, and gains from beginning to each weighing. Amount of each kind of feed consumed, cost, etc., is shown at the foot of each table.

Tables 13 and 14 give a summary of the previous tables for ready comparison.

TABLE No. 1.

AVERAGE AMOUNT OF FEED CONSUMED PER DAY PER HEAD FOR EACH PERIOD.

	PEN No. 1.					PEN No. 2.			PEN No. 3.		
	SILAGE	CORN FODDER	COTTON SEED COOKED	COTTON SEED MEAL	COTTON SEED RAW	SILAGE	HAY	COTTON SEED MEAL	SILAGE.	HAY	COTTON SEED COOKED
	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.
January 8-17.....	8.28	7.49	4.51	2.10		14.93	4.40	4.40	13.66	3.26	6.11
January 18-27.....	12.33	5.91	4.80	3.45		21.40	3.44	4.45	20.17	2.59	6.38
January 28—February 6....	14.22	5.59	4.82	4.90		23.38	2.81	5.75	21.09	2.18	7.65
February 7-16.....	13.43	5.87	4.39	4.87		26.50	2.94	6.20	24.14	2.03	8.03
February 17-26.....	14.36	4.89	5.26	4.97	0.21	25.21	2.88	6.75	22.35	1.96	9.23
February 27—March 8.....						19.02	3.21	6.75	15.00	2.81	9.28
March 9-18.....						20.07	2.73	6.66	16.56	1.72	9.93
March 19-28.....						32.84	2.30	6.66	29.69	1.71	8.82
March 29-31.....						16.90	2.53	6.66	16.33	1.60	3.38

TABLE No 2.

AVERAGE AMOUNT OF FEED CONSUMED PER DAY PER HEAD FOR EACH PERIOD.

	PEN No. 4.			PEN No. 5.				PEN No. 6.	
	SILAGE	HAY	COTTON SEED RAW	SILAGE	HAY	COTTON SEED MEAL	CORN AND COB MEAL	COTTON SEED HULLS	COTTON SEED MEAL
	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.
January 8-17.....	10.78	2.84	7.19	14.57	2.79	2.38	6.66	10.90	3.40
January 18-27.....	17.00	1.15	5.89	22.01	2.78	3.10	6.66	14.75	4.43
January 28—February 6.....	17.72	1.86	7.24	22.01	1.96	4.53	7.66	17.48	6.06
February 7-16.....	23.13	2.09	7.66	15.49	1.95	5.00	8.60	15.41	6.48
February 17-26.....	19.83	2.67	7.50	23.14	1.75	5.00	9.90	17.00	7.30
February 27—March 8.....	14.97	3.43	7.44	16.62	1.84	4.92	9.11	16.83	7.00
March 9-18.....	17.34	2.55	7.16	17.43	1.54	5.00	10.00	18.32	7.21
March 19-28.....	29.75	2.23	7.10	28.26	1.08	5.00	10.00	19.79	8.20
March 29-31.....	18.25	2.20	7.22	15.49	1.63	5.00	10.00	18.23	8.66

TABLE No. 3.

AVERAGE AMOUNT OF FOOD CONSUMED PER DAY PER HEAD FOR EACH PERIOD.

	PEN No. 7.			PEN No. 8.		PEN No. 9.		
	SILAGE	COTTON SEED HULLS	COTTON SEED MEAL	HAY	CORN IN EARS WITH THE SHUCK	CORN IN EARS WITH THE SHUCK	HAY	COTTON SEED MEAL
	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.	LBS.
January 8-17	14.61	5 24	1.71	3 55	9 92	9 82	14.19	.....
January 18-27	12.19	6.73	4.08	2 28	11.25	12 93	8.61	.....
January 28—February 6.....	14 88	10.70	6.21	3 79	11 85	14 29	13.08	0.80
February 7-16	11 28	10.82	6 66	4.61	14.94	17.78	13.25	.....
February 17-26.....	13 08	13 72	6 83	3.72	19.39	19 61	16 61	.....
February 27—March 8.....	10 58	13 78	6 76	2 34	18 19	22 42	15 21	.....
March 9-18.....	9 87	12.16	7 40	1.86	19 45	24 86	15 57	.....
March 19-28.....	19.12	11 96	7.20	2.71	18 62	19 95	16 19	.....
March 19-31.....	12 07	7 30	7.20	2.45	19.03	21.47	14 32	.....

TABLE No. 4.
PEN No. 1.—OLD COWS.
LIVE WEIGHTS.

TAG NO.	Jan. 8	Jan. 14	Jan. 17	Jan. 21	Jan. 24	Jan. 28	Jan. 31	Feb. 4	Feb. 8	Feb. 25	TOTAL GAIN	No. DAYS FED	GAIN PER DAY
164	645	650	650	650	670	680	700	710	715	760	115	48	2.4
90	760	755	815	825	860	880	880	870	875	945	185	48	3.9
6	845	860	865	880	890	875	900	910	920	965	120	48	2.5
5	750	760	770	780	800	800	830	830	870	930	180	48	3.8
24	840	800	715	710	760	780	795	800	885	885	45	48	0.9
30	590	600	600	590	630	640	640	645	665	715	125	48	2.6
4	630	620	635	640	650	675	685	675	690	720	90	48	1.9
9	730	759	790	790	790	820	835	845	855	895	165	48	3.4
Average weight per head.	724	724	729	732	756	769	764	786	803	832	128	48	2.67
Av. gain pr. head pr. day bet. weighings	0	0	0.55	0.75	8.00	3.25	5.00	0.50	4.25	2.88	.....	.....	.....
Total gain from beginning per head.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
FOOD CONSUMED.													
5881	Silage, at \$2.00 per ton												
2302.7	Corn fodder, at \$5.00												
3639.1	Cotton seed cooked, at \$7.00 per ton												
1344.4	Cotton seed meal, at \$20.00 per ton												
16.5	Cotton seed raw, at \$7.00												
	Total cost of feeding												
											Dollars	Cents	
											\$ 4	58	
											5	75	
											6	37	
											15	44	
											\$32	05	
											19		

Total gain, 1025 pounds.
Cost per pound gain, 3.14 cents
Gain per cwt., 17.7 pounds.

TABLE No. 5.
PEN No. 2—SIX STEERS.
LIVE WEIGHTS.

TAG NO.	Jan 8	Jan 14	Jan 17	Jan 21	Jan 24	Jan 28	Jan 31	Feb 4	Feb 8	Feb 25	Mch 11	Mch 31	TOTAL GAIN	No. DAYS FED	GAIN PER DAY
33	700	715	700	700	745	745	775	770	790	850	860	890	190	83	2.3
17	630	640	615	615	620	625	640	630	705	725	740	765	135	83	1.6
15	805	760	750	760	750	780	785	800	* 790	820	840	865	60	83	0.3
49	690	740	720	765	780	815	815	830	840	890	925	960	270	83	3.3
11	640	645	640	645	670	680	710	700	680	740	775	800	160	83	1.9
12	710	750	750	760	775	795	805	805	805	875	865	915	205	83	2.5
Average wt. per head	696	708	696	708	723	740	755	761	768	818	834	866	170	83	2.05
Av. gain per head per day betw'n weighings		2.00	-4 00	3.00	5.00	4.25	5.00	1.20	1.75	2.94	1.14	1.60			
Total gain from beginning per head		12	0	12	27	44	59	65	72	122	138	170			
FOOD CONSUMED.															
POUNDS.															
11306.7	Silage, at \$2.00 per ton														
1530.2	Hay, at \$6.00 per ton														
2978.0	Cotton seed meal, \$20.00 per ton														
	Total cost of feeding														
	Dollars												Cents		
	11												31		
	4												39		
	29												78		
	45												68		

Number of pounds gain in weight, 1020.
Cost of gain per pound, 4.47 cents.
Gain per cwt., 24.3 pounds.

TABLE NO. 6.
PEN NO. 3.—SIX STEERS.
LIVE WEIGHT.

TAG NO.	Jan. 8	Jan. 14	Jan. 17	Jan. 21	Jan. 24	Jan. 28	Jan. 31	Feb. 4	Feb. 8	Feb. 25	Mrch 11	Mrch 31	TOTAL GAIN	No. DAYS FED	GAIN PER DAY
30.....	715	710	715	740	745	770	780	760	785	845	865	900	185	83	2.2
5.....	765	785	780	790	810	810	820	830	840	890	910	910	145	83	1.7
42.....	750	785	765	780	820	820	830	835	840	900	915	950	200	83	2.4
20.....	815	820	800	815	840	860	860	870	875	945	965	990	175	83	2.1
4.....	930	910	865	870	925	930	945	950	975	1035	1070	1050	120	83	1.4
9.....	690	745	735	755	770	775	790	800	820	860	900	900	210	83	2.5
Average wt. per head.....	777	793	777	792	818	828	838	841	856	913	938	950	173	83	2.08
Av. gain per head per day betw'n weighings.....	2.66	2.66	-5.33	5.00	866	2.50	3.33	0.75	3.75	3.35	1.79	0.60	.....	.....	.....
Total gain per head from beginning.....	16	16	00	15	41	51	61	64	79	146	161	173	.....	.....	.....
POUNDS.	FOOD CONSUMED.														
10054.9.....	Silage, at \$2.00 per ton.....														
1145.0.....	Hay, at \$6.00 per ton.....														
4578.0.....	Cotton seed cooked, at \$7.00 per ton.....														
	Total cost of feeding.....														
													Dollars	Cents	
													10	05	
													3	43	
													16	23	
													29	71	

Number of pounds gain in weight, 1085.
Cost of gain per pound, 2.85 cents.
Gain per cwt., 22.2 pounds.

TABLE NO. 7.
PEN NO. 4.—SIX STEERS.
LIVE WEIGHTS.

TAG NO.	Jan. 8	Jan. 14	Jan. 17	Jan. 21	Jan. 24	Jan. 28	Jan. 31	Feb. 4	Feb. 8	Feb. 25	Mrch 11	Mrch 31	TOTAL GAIN	No. OF DAYS FED	GAIN PER DAY
10	780	780	755	785	835	860	840	840	865	885	895	950	170	83	2.0
47	980	950	925	910	910	910	920	920	910	990	1020	1050	70	83	0.8
18	890	860	865	850	835	880	890	905	910	955	980	1015	125	83	1.5
6	830	835	845	855	875	885	895	895	920	950	975	1000	170	83	2.0
3	820	830	830	820	853	850	885	875	885	930	960	1005	185	83	2.2
23	660	685	680	700	725	730	725	740	740	770	800	825	165	83	1.9
Average wt. per head...	827	823	812	820	839	853	859	863	872	913	938	975	148	83	1.8
Av. gain per head per day betw'n weighings		-.4	-.15	-.7	0.75	3.50	2.00	1.00	2.25	2.41	1.79	1.80			
Total gain per head from beginning.		00	00	00	12	26	32	36	45	86	111	148			
POUNDS.	FOOD CONSUMED.												Dollars.	Cents.	
9361.5	Silage, at \$2.00 per ton												9	36	
1174.5	Hay, at \$6.00 per ton												3	52	
3562.4	Cotton seed, raw, at \$7.00 per ton												12	47	
	Total cost of feeding												25	35	

Number of pounds gain in weight, 885.
Cost of gain per pound, 2.86 cents.
Gain per cwt., 17.8 pounds.

TABLE NO. 8.
PEN NO. 5.—SIX STEERS.

LIVE WEIGHTS.

TAG NO.	Jan. 8	Jan. 14	Jan. 17	Jan. 21	Jan. 24	Jan. 28	Jan. 31	Feb. 4	Feb. 8	Feb. 25	Mrch 11	Mrch 31	TOTAL GAIN.	No. DAYS FED	GAIN PER DAY
2	710	705	725	715	770	843	785	790	810	880	990	975	265	83	3.2
1	690	660	665	710	700	700	725	715	730	790	810	880	250	83	3.0
12	920	905	875	885	920	935	945	930	955	1010	1030	1065	145	83	1.7
14	940	885	925	925	990	935	960	935	965	1010	1015	1070	130	83	1.6
19	660	670	640	700	715	735	750	750	760	840	870	895	235	83	2.8
45	990	950	910	980	975	985	1000	985	1040	1080	1110	1145	135	83	1.9
Average wt. per head...	808	796	790	819	835	835	861	851	877	935	961	1005	197	83	2.37
Av. gain per head per day betw'n weighings.		-12	-18	.85	5.33	-2.00	6.00	2.50	6.50	3.41	1.86	2.20			
Total gain per head from beginning.....		00	00	11	27	35	53	43	69	127	153	197			
POUNDS.	FOOD CONSUMED.														
10337.5.....	Slage, at \$2.00 per ton.....														
942.2.....	Hay, at \$6.00 per ton.....														
2186.5.....	Cotton seed meal, \$20.00 per ton.....														
4297.0.....	Corn and cob meal, 40 cents per bushel for the corn.....														
	Total cost of feeding.....														
													Dollars.	Cents.	
													10	34	
													2	82	
													21	86	
													24	56	
													59	58	

Number of pounds gain in weight, 1180.
Cost of gain per pound, 5 cents.
Gain per cwt., 24.4 pounds.

TABLE NO. 9.

PEN NO. 6.—SIX STEERS.

LIVE WEIGHTS.

TAG NO.	Jan. 8	Jan. 14	Jan. 17	Jan. 21	Jan. 24	Jan. 28	Jan. 31	Feb. 4	Feb. 8	Feb. 25	Mrch 11	Mrch 31	TOTAL GAIN	NO. OF DAYS FED	GAIN PER DAY
24.....	590	650	665	765	715	725	735	725	740	760	820	850	260	83	3.1
52.....	745	770	760	810	820	825	830	850	855	900	920	1000	255	83	3.1
43.....	860	825	845	885	850	870	865	870	875	915	975	985	125	83	1.5
34.....	570	615	635	650	680	700	705	720	725	785	825	845	275	83	3.3
38.....	800	800	780	750	765	775	820	830	870	850	930	970	170	83	2.0
13.....	880	805	850	850	825	860	860	835	895	945	1000	1005	125	82	1.5
Average wt. per head...	741	744	756	785	776	793	803	805	827	859	912	943	202	83	2.43
Av. gain per head per day betw'n weighings.....		0.50	4.00	9.66	-3.00	4.25	3.33	0.50	5.50	1.88	3.79	1.55	.....	.....	.....
Total gain per head from weighings.....		3	15	44	35	52	62	64	86	118	171	202	.....	.....	.....
POUNDS.	FOOD CONSUMED.												Dollars	Cents	
8158.5.....	Cotton seed hulls, at \$3.00 per ton												12	28	
3160.0.....	Cotton seed meal, at \$20.00 per ton												31	60	
	Total cost of feeding												43	88	

Number of pounds gain in weight, 1210.

Cost of gain per pound, 3.63 cents.

Gain per cwt., 27.2 pounds.

TABLE NO. 10.

PEN NO. 7.—SIXSTEERS.

LIVE WEIGHTS.

TAG NO.	Jan. 8	Jan. 14	Jan. 17	Jan. 21	Jan. 24	Jan. 28	Jan. 31	Feb. 4	Feb. 8	Feb. 25	Mch. 11	Mch. 38	TOTAL GAIN	NO. OF DAYS FED	GAIN PER DAY
7.....	860	870	910	960	990	1005	990	1010	1045	1125	1160	1160*	300	66	4.8
35.....	665	600	620	655	660	670	680	680	725	760	780	790	125	83	1.5
8.....	700	665	675	690	705	700	710	710	735	780	815	855	155	83	1.9
25.....	650	630	670	660	690	N. W.	715	705	735	785	790	815	165	83	2.0
16.....	745	700	660	700	710	725	735	745	755	825	860	890	145	83	1.7
28.....	710	685	675	690	705	710	725	730	760	795	845	885	175	83	2.1
Average wt. per head...	722	692	702	726	743	762	759	763	793	805	875	866	177	83	2.2
Av. gain per head per day betw'n weighings.....		-30	-20	0 30	5.66	4.75	1.00	-.1	7.50	3.06	2.14	1.45			
Total gain per head from beginning.....		00	00	4	21	40	37	41	71	123	155	177			
POUNDS.	FEED CONSUMED.												Dollars	Cents	
6228.6.....	Silage at \$2.00 per ton.....												6	23	
4976.6.....	Cotton seed hulls at \$3.00 per ton.....												7	46	
2814.0.....	Cotton seed meal at \$2.00 per ton.....												28	14	
	Total cost of feed.....												\$41	83	

No. of pounds gain in weight, 1065.

Cost of gain per pound, 3.93 cents.

Gain per cwt., 24.6 pounds.

* Steer 3.93, Tag No. 7 gained 300 pounds, and was so fat that he was butchered March 12th.

TABLE No. 11.

Shelter

PEN No. 8—SIX STEERS.
LIVE WEIGHTS.

TAG NO.	Jan 8	Jan 14	Jan 17	Jan 21	Jan 24	Jan 28	Jan 31	Feb 4	Feb 8	Feb 25	Mch 11	Mch 31	TOTAL GAIN	No. DAYS FED	GAIN PER DAY
48	880	855	870	875	825	900	905	875	925	970	1000	1040	160	83	1.9
26	900	880	910	895	915	895	905	920	925	1035	1085	1160	260	83	3.1
32	555	570	560	575	575	560	570	575	590	620	675	700	145	83	1.8
44	675	710	700	715	720	710	730	720	745	835	835	840	165	83	2.0
41	680	655	665	660	655	650	675	660	700	740	765	785	105	83	1.3
50	680	700	700	715	705	735	735	735	755	835	810	885	205	83	2.5
Average wt. per head...	628	728	734	739	743	743	753	748	773	818	862	901	173	83	2.09
Av. gain per head per day betw'n weighings			0.66	1.25	1.33	-0.25	3.66	-1.25	6.25	3.88	1.65	2.00			
Total gain from begin- ning per head...			6	11	15	14	25	20	45	111	134	173			
POUNDS.	FOOD CONSUMED.												Dollars	Cents	
1536.1	Hay, at \$6.00 per ton												4	60	
7760.3	Corn in ears, at 40 cts. per bushel												38	80	
	Total cost of feeding												43	40	

Number of pounds gain in weight, 1040.
Cost of gain per pound, 4.17 cents.
Gain per cwt., 23.8 pounds.

TABLE NO. 12.

PEN NO. 9.—SIX STEERS.

Open

LIVE WEIGHT.

TAG NO.	Jan. 8	Jan. 14	Jan. 17	Jan. 21	Jan. 24	Jan. 28	Jan. 31	Feb. 4	Feb. 8	Feb. 25	Mrch II	Mrch 31	TOTAL GAIN	No. DAYS FED	GAIN PER DAY
22.....	670	650	670	675	700	655	693	720	700	775	790	840	170	83	2.0
46.....	900	870	880	880	880	870	890	895	895	965	985	1040	140	83	1.7
21.....	870	825	865	865	905	875	870	880	870	965	965	1000	130	83	1.6
27.....	880	850	865	860	880	885	860	890	920	945	1005	1015	135	83	1.6
36.....	1060	1085	1060	1070	1070	1130	1125	1110	1125	1185	1220	1275	215	83	2.6
Average wt. per head.....	876	856	868	870	880	883	887	899	902	965	993	1034	158	83	1.90
Av. gain per head, per day betw'n weighings.....		-20	-8	-6	0.81	-1.50	1.33	3.00	0.75	3.65	2.00	2.05			
Total gain per head from beginning.....		00	00	00	13	7	11	23	26	89	117	158			

FOOD CONSUMED.

POUNDS.	Dollars	Cents
Corn in ears, at 40 cts. per bushel.....		00
Hay, at \$6.00 per ton.....	36	00
Cotton seed meal, at \$20.00 per ton.....	17	55
Total cost of feeding.....	53	40

Number of pounds gain in weight, 790.
 Cost of gain per pound, 6.83 cents.
 Gain per cwt., 18.0 pounds.

TABLE NO. 13.

SUMMARY OF TABLES.

No. of Pen	Average Weight of Cattle	Pounds. Average Gain per 100 cwt.	Pounds. Average Gain per Day	Pounds. Average Total Gain	Average Cost of Food per lb. Gain	Average Cost of Food per Head	RATION FED
1	724	17.7	2.67	128	3.14 cts.	\$ 4.02*	Silage, corn fodder, boiled cotton seed, cotton seed meal.
2	696	24.3	2.05	170	4.47 "	7.61*	Silage, cotton seed meal and hay.
3	777	22.2	2.08	173	2.85 "	4.95*	Silage, boiled cotton seed and hay.
4	827	17.8	1.80	148	2.86 "	4.22*	Silage, raw cotton seed and hay.
5	808	24.4	2.37	197	5.00 "	9.94	Silage, cotton seed meal, corn and cob meal and hay.
6	741	27.2	2.43	202	3.63 "	7.31*	Hulls, cotton seed meal.
7	722	24.6	2.20	178	3.93 "	6.97*	Silage, hulls, cotton seed meal and hay.
8	728	23.8	2.09	173	4.17 "	7.23*	Hay, corn in ear.
9	876	18.0	1.90	158	6.83 "	10.79	Hay, corn in ear, out doors.

TABLE NO. 14.

SUMMARY OF TABLES.

Average gain per head from beginning.—Gain to date from January 8th.

No. of Pen.	Av. Weight at beginn'g. Jan. 8.	Jan. 14	Jan. 17	Jan. 21	Jan. 24	Jan. 28	Jan. 31	Feb. 4	Feb. 8	Feb. 25	Mch. 11	Mch. 31	RATION FED.
No. 1.....	724	...	5	8	32	45	60	62	79	128	.....	.....	Silage, corn fodder, boiled cotton seed, and cotton seed meal.
" 2.....	696	12	....	12	27	44	59	65	72	122	138	170	Silage, cotton seed meal, hay.
" 3.....	777	16	.....	15	41	51	61	64	79	146	161	173	Silage, boiled cotton seed, hay.
" 4.....	827	-4	-15	-7	12	26	32	36	45	86	111	148	Silage, raw cotton seed, hay.
" 5.....	808	-12	-18	11	27	35	53	43	69	127	153	197	Silage, cotton seed meal, corn and cob meal, hay.
" 6.....	741	3	15	44	35	52	62	64	86	118	171	202	Cotton seed hulls, cotton seed meal.
" 7.....	722	-30	-20	4	21	40	37	45	71	123	153	177	Silage, cotton seed hulls, cotton seed meal, hay.
" 7.....	728	.....	6	11	15	14	25	20	45	111	134	173	Hay, corn on cob with shuck.
" 9.....	876	-20	-18	-6	13	7	11	23	26	89	117	158	Hay, corn on cob with shuck.

The last weight is the average of two weighings made March 30 and April 1.

Report of Chemist.

COMPOSITION OF FEED STUFFS.

The following analyses present the composition of the feed stuffs used in the experiment, as determined by the chemical department of the Station, average analyses of silage from other States for comparison and of a sample of sugar cane bagasse from Georgia.

CENTER PIT.

SAMPLE		Water	Dry Matter	Ash	Crude Fat	Crude Fibre	Protein	Nitrogen Free Extract	When Sampled — January
No.	1.....	60.00	40.00	4.06	2.98	16.64	3.90	12.42	11
"	2.....	67.42	32.58	2.31	2.07	10.17	2.62	15.41	17
"	3.....	66.46	33.54	2.47	1.58	10.96	2.37	15.96	24
"	4.....	66.58	33.42	2.95	1.40	10.07	2.98	15.12	24
"	5.....	62.54	37.46	2.99	2.35	10.76	3.34	18.02	28
"	6.....	65.00	35.00	2.63	2.00	10.80	2.88	16.69	30
"	7.....	65.45	34.55	1.97	1.71	9.30	2.74	18.83	Feb. 1
"	8.....	65.52	34.48	2.73	2.73	9.61	3.36	16.05	9
"	9.....	67.00	33.00	3.50	2.20	12.02	3.31	11.97	8
"	10.....	68.00	32.00	2.42	2.22	10.84	2.53	11.99	12
"	11.....	71.80	28.20	2.91	1.22	14.54	3.14	6.39	15
"	12.....	70.61	29.39	3.09	1.53	13.51	2.70	8.56	25
Average of Pit.....		66.36	33.64	2.83	1.99	11.84	3.00	13.95	.....

SOUTH PIT.

SAMPLE		Water	Dry Matter	Ash	Crude Fat	Crude Fibre	Protein	Nitrogen Free Extract	When Sampled — February
No.	1.....	51.34	48.66	3.06	2.51	10.17	4.35	28.57	5
"	2.....	66.04	33.96	2.71	3.15	9.11	2.81	16.18	8
"	3.....	70.07	29.93	2.82	1.98	12.61	1.76	10.76	21
"	4.....	67.28	32.72	2.54	2.19	13.01	2.42	12.98	15
"	5.....	62.30	37.70	3.40	2.53	12.11	2.80	16.86	28
"	6.....	65.50	34.50	2.91	1.44	12.52	2.32	15.31	25
"	7.....	49.37	50.63	4.38	2.76	17.51	3.25	22.73	Mch 6
"	8.....	62.00	38.00	3.77	2.28	14.30	3.27	14.38	14
"	9.....	69.11	30.89	2.74	1.58	11.91	2.92	11.74	19
"	10.....	65.50	34.50	3.27	1.47	11.28	3.67	14.81	10
Average of Pit.....		62.83	37.17	3.16	2.19	12.45	2.95	17.43	.....

Mostly Sorghum.
Entirely Sorghum.

Average analyses of fodder, corn silage from Experiment Stations of Massachusetts, Connecticut, Wisconsin, Maryland and Texas :

STATE	No. of Analyses	Water	Dry Matter	Ash	Crude Fibre	Crude Fat	Protein	Nitrogen Free Extract
Massachusetts.....	8	79.66	20.34	1.05	5.15	0.79	1.77	11.57
Connecticut.....	47	80.59	19.41	1.37	5.82	0.69	1.49	10.05
Wisconsin.....	1	77.94	22.06	1.70	5.92	0.79	1.92	11.80
Maryland.....	4	79.14	20.86	1.06	7.20	1.05	1.25	8.70
Texas.....	22	64.59	35.41	2.99	12.14	2.09	2.97	15.69

SUBSTANCE	Water	Dry Matter	Ash	Crude Fibre	Crude Fat	Protein	Nitrogen Free Extract
Corn, cob and shuck.....	7.26	92.74	2.65	12.36	4.37	6.68	66.74
Cotton seed meal.....	6.55	93.45	7.60	4.44	11.33	47.19	22.85
Cotton seed hulls.....	13.01	86.99	4.43	47.88	1.14	4.68	28.86
Cotton seed.....	9.99	90.01	3.34	28.74	18.92	21.70	17.31

PEA-VINE SILAGE AND PEA-VINE HAY.

SUBSTANCES	Water	Dry Matter	Ash	Crude Fibre	Crude Fat	Protein	Nitrogen Free Extract
Silage--wet.....	76.91	23.09	3.96	6.36	2.13	3.05	7.59
Hay.....	10.01	89.99	10.62	22.54	5.81	12.68	38.34
Silage--calculated to 100 parts dry matter.....	.....	.....	17.01	27.54	9.18	13.20	32.98
Hay--calculated to 100 parts dry matter.....	.....	.....	11.80	25.00	6.45	14.00	42.75

SUGAR CANE BAGASSE AND SILAGE—100 PARTS DRY MATTER.

SUBSTANCE	Water	Dry Matter	Ash	Crude Fibre	Crude Fat	Protein	Nitrogen Free Extract
Sugar Cane Bagasse, from Georgia.....	10.2	100.	6.20	38.58	7.85	3.67	43.7
Silage.....	.....	100.	8.43	34.23	5.89	8.37	43.08

EXPLANATION OF THE TABLES.

The fodder corn when gathered was in a nearly ripe condition, but the quality varied very widely—some lots having well developed ears while other lots were made up of stalk and fodder of comparatively poor quality. Taken all together it could be called a fair average of drilled fodder corn, in which the kernels were not only glazed but hard.

The samples of silage in the two pits were taken at depths of every two feet—sometimes more frequently—so the average composition might be obtained.

In order that the silage from this station might be compared with that from other stations, the *average analyses* are compiled separately. Just the condition of the silage from the Massachusetts Experiment Station is not known. But from the other reports of the station it is presumed the kernels were glazed, as reported from other stations, except the Connecticut Station, which were “compiled exclusively from the American analysis.”

Along with this analyses is reported the analysis of “*Corn, Cob and Shuck, Cotton Seed Meal, Cotton Seed Hulls and Cotton Seed,*” as used by the Director, in feeding experiments referred to in this bulletin. The analysis of *sugar cane bagasse* sent to the Director from Georgia is also reported upon.

When received the sample was in a well preserved condition, but almost air dry. Only the analysis of 100 parts *dry matter* can therefore be given. It was completely air dried after receiving it and found to still contain 10 *per cent.* of water. For the purpose of comparison, the *average analysis* of 24 samples of silage from this station, calculated to 100 parts *dry matter* is also given. The analytical work was done by Assistant Duncan Adriance.

CONCLUSIONS.

1st. There is a clear advantage from these analyses in favor of Texas silage over that reported from Northern States. The water is lower, while the other ingredients are all higher but the crude fibre not sufficiently so to detract materially from the value of the silage. We can not say if subsequent work will confirm these discrepancies.

2d. There seems to be little difference between the value of the corn silage and that of the pea-vine silage. The changes in the pea-vine silage in the silo are not truly such as would have been expected. The nitrogenous matter in the silo decreased and the fatty

acids increased, as would have been anticipated. But there was also a slight increase of crude cellulose and a decrease in nitrogen free extract.

3d. The sugar cane bagasse is not equal to silage in nutritive value, but it makes a good showing and requires further investigation. A remarkable thing about it is the *large percentage of fats*.

H. H. HARRINGTON,
Chemist.

Conclusions.

We submitted four questions to the experiment. It is left with the reader to decide as to the answer given to the first.

SHELTER

2. We believe the answer is clear as to necessity of shelter. The result confirms several years experience and observation in feeding cattle in the Southern States, but dehorning is essential to make sheltering range cattle practicable.

The evidence in favor of shelter confirms results secured as a rule by careful feeders, and the same is true of dehorning.

FEED STUFFS.

3. For roughness, corn, sorghum and pea-vine silage, hay where it can be produced at low cost, and cotton seed hulls near oil mills.

For the richer part of the ration, boiled cotton seed, cotton seed meal, with perhaps some corn, rice meal or rice bran in sections where they can be procured cheaply.

Corn and sorghum grown for silage should be planted thin enough to mature ears and produce a crop of seed and not harvested until nearly ripe. The silage will then contain a considerable amount of grain, and be of more value to feed with cotton seed and with cotton seed meal and produce a better quality of beef.

PROFIT IN FEEDING TEXAS RANGE CATTLE.

4. With a margin of 1 cent per pound gross between thin and fat cattle, steers may be profitably fed over a large portion of the State (see page 9).

The experiment indicates that silage and boiled cotton seed is the cheapest and most rapid fattening ration of the feedstuffs.

2. Cotton seed meal and cotton seed hulls.
3. Cotton seed meal, cotton seed hulls and silage.
4. Raw cotton seed and silage.
5. Corn and hay at the prices given.

SUGGESTIONS TO FEEDERS.

Two things are essential in fattening animals:

1. To keep the animal comfortable and quiet.
2. To induce him to eat the largest possible amount of nutritious food.

One is of little value without the other. To keep the cattle comfortable, shelter from rain is indispensable. Cattle fall off as rapidly during a cold rainy spell in Texas with the temperature at the freezing point, or a little under, as they do in Dakota with the temperature below zero.

Range cattle, as a rule, will not do their best under close confinement, i. e., tying up by the head. They may be shut up in a building, but need room to move around.

Wild cattle must be handled quietly. *This point we wish to emphasize*, for it is entirely overlooked by too many cattlemen. A barking dog and a noisy loud-mouthed man are two things that should never be permitted to enter a cattle feeding-pen. It should be remembered that when a naturally wild steer is struck with a whip, or disturbed in any way, that he stops gaining weight for a time, and food consumed is a loss.

This is not a sentiment, but a business matter of working the animal machine to its full capacity. Dehorning seems to affect a wild steer somewhat as "throwing" the horse in the Rarey method of breaking colts. Then the head remaining sensitive for some time, wild steers are subdued and stand quietly together in a way that must be seen to be believed.

We are of the opinion that steers should be dehorned but a short time before shutting up to feed so that they may be fattened while their heads are somewhat tender.

FEEDING.

Cattle should be fed twice a day at a regular time, if confined in a building, by the same persons, and strangers excluded for at least a month after cattle are shut up. Feed what the cattle will eat and clean out mangers and troughs once every day. Cattle dislike feed that has been picked over and breathed on.

Vary the rations occasionally to stimulate the appetite; have salt always before them, or better, if the feeder is careful and skillful, sprinkle a little salt on the feed, but care must be exercised not to give too much.

With boiled cotton seed cattle relish a considerable amount of salt. Give free access to good water.

If feeding to ship in the spring, after grass starts keep the cattle off from grass unless it is proposed to finish on grass, otherwise the cattle will lose their relish for silage and dry feed, stop gaining and be in soft condition to ship.

SUGAR CANE BAGASSE.

Attention is called to the analysis of sugar cane bagasse in the report of the chemist (page 29).

The sample was sent to the station with request to analyze and determine feed value from the South Georgia Live Stock and Planting Company, Bainbridge, Ga.

It is stated that the bagasse from 10 acres of sugar cane, after grinding, was piled up about 10 feet high, exposed to the winter rains without cover, and when they commenced hauling it out for manure in the winter the inner part of the pile had a sweet odor, and a bright color and cattle ate it with a relish. The analysis indicates a value not much below that of corn silage for feeding with cotton seed, cotton seed meal, wheat bran, cow peas or other nitrogenous food.

Sugar cane bagasse from the small cane mills will no doubt keep well in silos *if packed in closely and weighted.*

SCIENTIFIC FEEDING.

As stated at the beginning, this experiment was designed to be practical, rather than scientific. We desire, however, to call attention to points that need careful investigation. Through all the Southern States cotton seed and its products have become of great value as feedstuffs. Cotton seed meal alone is used in other portions of the country and abroad, and is the only part of the seed of which the digestibility and nutritive value have been carefully studied.

Almost by accident, we may say, it has been found that cotton seed hulls, rated of no value, except for fuel, until within the past three years, have a feeding value equivalent to that of a fair quality of hay.

In appearance the hulls are hard and indigestible, and from examination of the droppings of hull fed cattle we find that a large

portion of the hulls passes through the animal apparently not acted upon at all by the digestive organs.

On a dry floor, exposed to the air, the droppings make a good bedding for the animals in dry weather.

The digestibility of cotton seed hulls should be determined. The second point is the nutritive value of the oil in the whole seed.

In the summary of Tables 2 and 3 it will be noticed.

Pen 2.—11306.5 lbs.	silage.....	} made....1020 lbs. gain
1530 "	hay.....	
2978 "	cotton seed meal...	
Pen 3.—10054.9 "	silage.....	} made....1035 lbs. gain
1145 "	hay.....	
4578 "	cotton seed (cooked)	
Pen 4.—9361.5 "	silage.....	} made.... 885 lbs. gain
1174.5 "	hay.....	
3562.4 "	cotton seed (raw)..	

The cotton seed fed to Pen 3 (ac-	} 573 lbs. oil,
ording to oil mill averages) would con-	
tain.....		1716 " meal, 2289 " hulls.

If we estimate hulls as equal to silage and hay, pound for pound, we have 1774 pounds of hulls, with 573 pounds of oil, producing 15 pounds more gain than 1262 pounds of cotton seed meal.

* In a feeding experiment made by the writer at the Mississippi A. & M. College, 1885:

Lot 1.—Five steers, *average weight 602 pounds*, consumed:

6524 lbs.	silage.....	} made....672 lbs. gain
230 "	hay.....	
1715 "	cotton seed (boiled).....	

Lot 2.—Four steers, *average weight 704.5 pounds*, consumed:

6863 lbs.	silage.....	} made....635 lbs. gain
192 "	hay.....	
1114 "	cotton seed meal.....	

Lot 1.—Five steers consumed;

9.87 lbs.	silage.....	} to make.....1 lb. gain
.34 "	hay.....	
2.61 "	cotton seed (boiled).....	

Lot 2.—Four steers consumed:

10.77 lbs.	silage.....	} to make.....1 lb. gain
.30 "	hay.....	
1.75 "	cotton seed meal.....	

Lot 1 contained one steer, the poorest in both lots.

Lot 2, one exceptionally good feeder, the best steer of all.

In 1882, at the same place, our first study of the value of cotton

seed for fattening cattle, two very ordinary native steers were fed all the cooked cotton seed, hay and oat straw they would eat.

Steer No. 1, 4 years old, weight 708 lbs., fed 56 days, gained 260 lbs.; average gain per day 4.64 lbs. Average daily ration, 14.4 lbs. cotton seed, 11 lbs. hay and straw.

Steer No. 2, about 20 months old, weight 350 lbs., fed 49 days, gained 240 lbs.; average gain per day, 4.89 lbs., and 36.5 and 65.7 per cent per cwt. respectively.

All these tests show the value of cotton seed for rapidly loading up the steer with fat, and also show that cotton seed is a much cheaper feed than cotton seed meal for fattening cattle, estimated at average prices of \$7.00 per ton for seed and \$20.00 for meal.

Pen 2, Table 5, average weight of steers, 696 lbs.
 11306.5 lbs. silage }
 1530.2 " hay } made....1,020 lbs. gain
 2978 " cotton seed meal }

Pen 6, Table 9, average weight of steers 741 lbs.
 8158.5 lbs. cotton seed hulls..... }
 3,160 " " " meal..... } made....1,210 lbs. gain

Pen 7, Table 10, average weight of steers, 722 lbs.
 6286.6 lbs. silage }
 4976.6 " hulls..... } made....1,065 lbs. gain
 2814 " cotton seed meal..... }

Pen 2 required:
 11.08 lbs. silage }
 1.4 " hay..... } to make 1 lb. gain
 2.91 " cotton seed meal..... }

Pen 6 required:
 6.74 lbs. cotton hulls..... }
 2.79 " " meal..... } to make.....1 lb. gain

Pen 7 required:
 5.84 lbs. cotton hulls..... }
 4.67 " silage..... } to make.....1 lb. gain
 2.64 " cotton seed meal..... }

Which would indicate that hulls have a higher nutritive value than silage.

Comparing the analysis of cotton seed hulls with silage and medium hay we have the following table:

	Water	Dry Matter	Ash	Crude Fibre	Crude Fat	Protein	Nitrogen Free Extract
Cotton seed hulls { Station analysis }	13.01	86.99	4.43	47.88	1.14	4.68	28.86
Silage (average), {	64.59	35.41	2.96	12.14	2.09	2.97	15.69
Medium hay.....	10.01	89.99	10.62	22.54	5.81	12.68	38.24

The analysis shows that the hulls contain much more crude fibre than hay and silage, nearly twice as much protein and nitrogen free extract as silage, but less than hay; less than half of the fat of silage and hay and less protein and nitrogen free extract than hay.

Cotton seed meal supplies what is lacking in the hulls, and from a *chemical standpoint* cotton seed meal and hulls should make a ration of high nutritive value, provided a considerable part of the hulls is digestible.

It may be that equally good results would have been obtained from feeding a smaller quantity of cotton seed meal.

THE GERMAN STANDARD.

According to the German standards the fattening ox should have a ration with nutritive ratio of 1 to 5.5 and a daily feed for 1000 pounds live weight of 3 lbs. digestible albuminoids and 16 lbs. digestible carbo-hydrates and fats.

We attempted the preparation of standard rations of the several feed stuffs. The digestibility of cotton seed and cotton seed hulls not having been determined so far as we are aware, we assumed that the digestibility of the hulls was equivalent to that of wheat straw, both in the seed and when fed alone, and from this made up the following table of albuminoids and carbo-hydrate equivalence.

Analysis and digestibility of cotton seed meal and corn are compiled from other station reports.

Analysis of hulls and silage from work of the chemist of this station; digestibility of hulls estimated as wheat straw, of silage as corn fodder, by Jenkins. From this we have:

One hundred pounds of the following contain

	DIGESTIBLE SUBSTANCES.		
	Albuminoids. Pounds.	Carbo-Hydrate Equivalence. Pounds.	Nutritive Ratio.
Cotton seed.....	13.79	66.9	1: 4.84
Cotton seed hulls.....	0.79	39.	1: 49.36
Cotton seed meal.....	35.75	53.06	1: 1.45
Silage.....	2.17	21.83	1: 10.05
Corn.....	8.37	76.43	1: 9.13
Hay.....	8.13	42.35	1: 13.50

NOTE.—The above form of expressing nutritive values is borrowed from Whitcher, New Hampshire Bulletin No. 3.

From the above formulas we have as the average nutritive ratios of the several rations:

NO. OF PEN.	Pounds. Av. Weight of Cattle.	Pounds. Average Gain per 1000 lbs.	Pounds. Average Gain per Day.	Nutritive Ratio.
No. 6.....	741	27.2	2.43	1: 4.02
" 7.....	722	24.6	2.20	1: 4.17
" 5.....	808	24.4	2.37	1: 5.11
" 2.....	696	24.3	2.05	1: 3.35
" 8.....	728	23.8	2.09	1: 9.45
" 3.....	777	22.2	2.08	1: 6.60
" 9.....	876	18.0	1.90	1:10.04
" 4.....	827	17.8	1.80	1: 6.76

Two unknown factors prevent drawing a logical conclusion as to comparative value of silage and hulls, i. e., digestibility of hulls and difference between pens of steers.

RATIONS.

We had planned to adopt as near as could be the standard ration with the pens of cattle, except 8 and 9, but found at once that the cattle would not eat 3 lbs. of digestible albuminoids and 16 lbs. of carbo-hydrates and fat per 1000 lbs. of live weight based on the formulas given, nor would they eat sufficient silage to make a ratio of 1 to 5.

The largest amount of silage eaten at any one time was by Pen 2, Table 1, 32.84 lbs. per head per day, while the average amount consumed is under 25 lbs. per day. In several years experience feeding Southern grown corn silage we have found that cows and steers would never consume more than 35 to 40 lbs. per day to 1000 live weight, while the average has not been above 25 lbs. The analysis of silage given by the chemist (page 29), shows that Southern grown silage has a higher nutritive value than Northern grown silage by analysis, and our experience in feeding indicates that we get same return in milk, butter and beef from a less quantity.

Reports from stations in the Northern States are somewhat conflicting, but the evidence seems to show that Southern varieties of corn planted for silage in the Northern States yield more nutritive

matter to the acre and to weight when the season is favorable to maturity than the native varieties.

Not enough feeding tests and analyses have been made of the corn and sorghum grown in the several Southern States to draw conclusions from the comparisons. The indications are that the climate and soil gives to these States certain advantages in the production of silage crops.

We wish to call the attention of experimenters to this evident superiority of Southern silage crops, hoping the matter will receive careful investigation.

Assistant J. W. Carson had charge of the weighing and general supervision of the work. Mr. F. Morrell fed the cattle.

F. A. GULLEY,
Director.