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University of Tennessee Agricultural Experiment Station

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THE UNIVERSITY OF TENNESSEE
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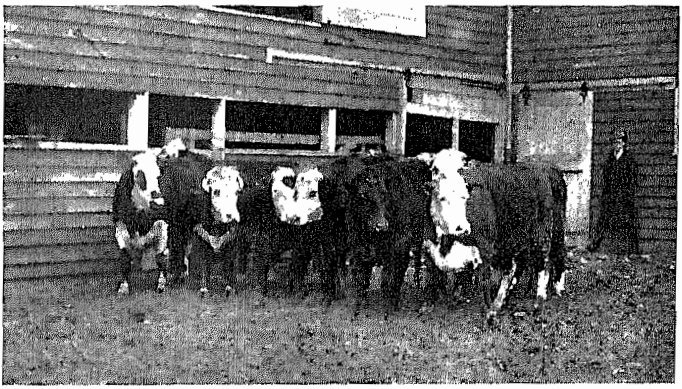
By

M. JACOB AND H. R. DUNCAN



Finished on cottonseed meal and silage

KNOXVILLE, TENNESSEE

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WINTER-FINISHING TWO-YEAR-OLD GRASS STEERS

By

M. JACOB AND H. R. DUNCAN

In Tennessee, a considerable number of cattle are fattened each winter on corn silage and cottonseed meal. Many of our feeders consider this ration satisfactory, but others are of the opinion that it will not produce sufficient finish to command the best reception, with maximum market returns. Hence, they advocate the feeding of additional concentrates, especially during the latter half of the fattening period.

OBJECTS OF THE EXPERIMENT

This experiment, covering 3 years' feeding trials with 2-year-old steers, was undertaken to answer the following questions:

1. The effect on rate of gain, finish, and market value of adding molasses during the entire 120-day finishing period to a ration of corn silage and cottonseed meal.

2. The effect on rate of gain, finish, and market value of adding molasses during the last 60 days of the 120-day feeding period to a ration of corn silage and cottonseed meal.

3. The comparative feeding values of molasses and ground shelled corn when fed in equal amounts during the last 60 days of the 120-day feeding period, with corn silage and cottonseed meal.

4. The practicability of marketing on the New York market, and the reception accorded by that market to the grade of cattle used and fed according to the plans of this experiment.

CATTLE USED

The cattle used were native East Tennessee steers purchased in Cocke, Jefferson, Grainger, and Campbell Counties. They were "twos" or long 2-year-old cattle of the type ordinarily produced in this section of Tennessee and either finished locally or sold to feeders in Kentucky or Virginia. The steers were purchased in September and October off pasture, and most of them carried good grass-finish at the time they were obtained. They were of the "toppy" kind, having color, conformation, and quality indicative of good breeding. While a few of these steers were purebreds, they were mostly of mixed breeding or crossbreds, with a predominance of Hereford blood, and graded medium, good, and choice.

DIVISION OF CATTLE

Forty steers were used each year. They were divided into 4 uniform lots of 10 steers each, on the basis of weight, grade, and breeding.

TABLE 1—*Average daily ration fed for the 3 years*

Feed	Lot 1	Lot 2	Lot 3	Lot 4
	Lbs.	Lbs.	Lbs.	Lbs.
Normal corn silage				
First month	53.1	53.1	53.1	53.1
Second month	51.1	51.1	51.1	51.1
Third month	53.3	50.3	50.3	50.3
Fourth month	50.9	46.9	46.9	46.9
Cottonseed meal				
First month	4.0	4.0	4.0	4.0
Second month	5.0	5.0	5.0	5.0
Third month	6.0	6.0	6.0	6.0
Fourth month	7.0	7.0	7.0	7.0
Molasses				
First month	.....	2.0	.....	.....
Second month	.....	3.0	.....	.....
Third month	.....	3.0	.....	3.0
Fourth month	.....	4.0	.....	4.0
Ground corn				
Third month	.....	.....	3.0	.....
Fourth month	.....	.....	4.0	.....
Salt				
Average daily consumption per steer	.036	.034	.033	.036

RATIONS FED

The silage fed was normal corn silage made from crops yielding approximately 40 bushels per acre, and was allowed to become fairly matured before being put into the silo. During the first 60 days the 4 lots were fed as much silage as they would consume, and the average amount for each lot was the same. During the last 60 days, lots 2, 3, and 4, being fed additional concentrates, consumed somewhat less silage than lot 1. While lot 1 was continued on a silage-feeding basis of as much as the steers would consume, lots 2, 3, and 4 were fed an amount of silage equal to the average of the lot which consumed the smallest amount. This means, of course, that lots 2, 3, and 4 were fed the same amount of silage during the last 60 days, which was an average of about 3 to 4 pounds less per steer per day than lot 1. A medium cottonseed meal ration was fed, but the amount was the same for all lots during the entire experiment. Previous work at the Tennessee Station has shown that a medium cottonseed-meal ration fed with silage gave more economical results than either low or high cottonseed-meal allowances. In this experiment, light-colored 41 per cent cottonseed meal was used.

Molasses was fed to lot 2 during the entire 120-day feeding period, and to lot 4 during the last 60 days.

Ground shelled corn was added to the ration of lot 3 during the last 60 days of the feeding period. Corn was ground, as it was not practicable in this experiment to have hogs follow the cattle.

Louisiana cane, or "blackstrap", molasses was used. Only a low ration of corn or a medium ration of molasses was fed, as this was considered more economical than a heavier ration of either of these concentrates. It was the purpose to study the effect of their addition to the maximum silage ration.

Average prices of feeds for the 3 years

Corn silage	$ 5.00 per ton
Cottonseed meal	24.25 per ton
Molasses	16.33 per ton
Ground shelled corn	22.66 per ton
Salt	20.00 per ton

Feed prices are on the basis of actual cost, with the exception of silage, which was arbitrarily fixed. Molasses was secured from a local feed-mixing plant, at a price somewhat lower than the country-point feeder would have had to pay.

The cattle were housed and fed in 4 roomy, well-ventilated pens, sufficiently bedded, and with water before them at all times.

They were not taken out of their pens except to be weighed, which made it possible to conserve all manure. Feeding was done morning and night at regular intervals, one-half the daily allotment being allowed at each feeding. In order that the cattle might become accustomed to the feed and surroundings and obtain a uniform fill, they yere given preliminary feeding for 2 weeks immediately preceding the beginning of the experiment. As a rule, concentrates were fed on top of the silage, but at times were mixed with it in order to bring about maximum and more even consumption of silage by the 4 lots. Molasses was diluted with water in the proportion of 1 to 3 in order to facilitate handling, and this mixture was then poured over the silage and cottonseed meal. All cattle were weighed individually on 3 consecutive days at the beginning of the experiment, and the average of the 3 weights was considered the initial weight. Similar weighings were made every 30 days during each trial until the experiment was completed.

Appraisal and Marketing

As it was thought that the cattle had sufficient merit for the eastern trade, it was planned to market them in New York. In order to obtain unbiased expert appraisal, arrangements were made each year with the Armour Packing Company to send one of their most experienced cattle buyers from Chicago to grade and appraise

the 4 lots. In each instance they were sold to the packer representative, for eastern consignment at the appraised prices. It was agreed that the price was to be the same as on the Chicago market for cattle of the same grade on the corresponding day. The steers were graded individually, but the market price was made on each lot. They were sold on weights obtained early in the morning without feed, less 3 per cent for shrinkage. When the cattle were slaughtered in New York, records of dressing percentages, carcass gradings, and selling prices were obtained.

TABLE 2—*Three-year average of weights and gains—and rank of lots*

	Lot 1	Lot 2	Lot 3	Lot 4
	Lbs.	Lbs.	Lbs.	Lbs.
Average initial weight of steers	1079.6	1076.9	1079.0	1077.7
Average gain per steer first 60 days	116.8	136.1	125.5	124.4
Average gain per steer second 60 days	106.9	112.3	108.8	94.7
Average total gain per steer, 120 days	223.7	248.4	234.3	219.1
Average daily gain per steer, 120 days	1.86	2.07	1.95	1.82
Average wgt. of steers at end of 120 days	1303.3	1325.3	1313.3	1296.8

RANK OF LOTS, BY YEARS, IN RATE OF GAIN

Rank	First year	Second year	Third year	Final rating (actual average)
1st	Lot 3	Lot 2	Lot 2	Lot 2
2nd	Lot 4	Lot 3	Lot 3	Lot 3
3rd	Lot 2	Lot 1	Lot 4	Lot 1
4th	Lot 1	Lot 4	Lot 1	Lot 4

Although in dividing the cattle it was the purpose to make the 4 lots as nearly uniform as possible, there were some differences in their performances. Theoretically, lots 1, 2, and 4 should have made practically the same gains for the first 60 days, as their rations were identical during this period. But in this instance lots 3 and 4 made an average gain of 8.1 pounds more per steer than the check-lot 1. Feeding molasses to lot 2 produced 13.9 pounds more gain than the average gain per steer of lots 1, 3, and 4 for the first 60 days.

During the second 60-day period there was little difference in the gains of the 4 lots. The addition of corn to lot 3 produced only 1.9 pounds additional average gain per steer over lot 1; but it should be remembered that lot 1 consumed 3.5 pounds more silage per steer per day than lot 3. Lot 2 continued to show the best gain, being 5.4 pounds more per steer than lot 1—a rather insignificant difference.

The most marked difference in gains during the last 60-day feeding period was in lot 4, which gained 12.1 pounds less per steer than check-lot 1. Lot 4 was the low-gaining lot during the last 60 days for each of the 3 years. The rather sudden addition of molasses during the middle of the feeding period seemed to retard gains to some extent.

Table 2 shows the total gains and the ranking of the lots in gains for the entire 120-day feeding period. The daily gains of all lots are good, considering that an extensive use of silage was made in the rations. If they had been full-fed on concentrates, these cattle would probably have consumed 20 pounds or more per head daily, and made greater gains, but as it was, they received only one-third to one-half this amount of concentrates. Lot 2 gained 24.7 pounds and lot 3 gained 10.6 pounds more per steer than lot 1, while lot 4 gained 4.6 pounds less per steer than lot 1. Whether or not these larger gains by lots 2 and 3 may be justly considered as superior to those of lot 1, will be made clearer by a study of the remaining data covering this experiment.

TABLE 3—*Three-year average consumption of feed, and feed costs of gain*

	Lot 1	Lot 2	Lot 3	Lot 4
	Lbs.	Lbs.	Lbs.	Lbs.
Feed required for 100-pounds gain for 120 days:				
Silage	2795	2442	2589	2768
Cottonseed meal	295	266	282	301
Molasses	.....	145	.....	96
Ground corn	.....	.....	90	.....
Salt	2.0	1.7	1.7	2.0
Feed cost of 100-pounds gain for 120 days	$ 10.58	$ 10.53	$ 10.92	$ 11.37

Table 3 is self-explanatory. In cost per 100-pounds gain, lots 1 and 2 were practically the same. Lot 3 was 38 cents higher and lot 4 was 84 cents higher than lot 2. Considering lots 3 and 4, in which there was a direct comparison of corn and molasses, the molasses increased the feed requirements and cost of 100-pounds gain, and was therefore less efficient than corn. If gain were counted at the same cost in lot 4 as in lot 3, the molasses would have to be figured at $7.26 per ton. It cost $16.33 per ton.

MARKETING INFORMATION

TABLE 4—*Market grade of finished cattle on foot*

Lots	No. choice	No. good	No. medium	No. fair
1	.....	6	19	5
2	.....	9	18	3
3	.....	5	18	7
4	2	2	19	7

TABLE 5—*Appraised on-foot prices by years, per cwt.*

Lot	First year (1931)	Second year (1932)	Third year (1933)
1	$ 8.05	$ 6.58	$ 4.50
2	7.35	6.86	4.60
3	8.05	6.49	4.50
4	7.70	6.46	4.35

TABLE 6—*Selling prices of carcasses by years, per cwt.*

Lot	First year (1931)	Second year (1932)	Third year (1933)
1	$ 14.41	$13.14	$ 8.81
2	14.27	13.57	8.81
3	14.77	14.04	8.81
4	14.24	13.63	8.90

TABLE 7—*Dressing percentages by years. Final experimental weight and chilled-carcass-weight basis (warm weight of carcass with 3% off)*

Lot	First year (1931)	Second year (1932)	Third year (1933)
	Per cent	Per cent	Per cent
1	55.61	55.37	54.87
2	54.75	55.56	55.26
3	54.25	55.68	54.46
4	53.35	56.09	55.01

TABLE 8—*Summary of marketing information for 3 years*

	Lot 1	Lot 2	Lot 3	Lot 4
Average grade of finished cattle on foot (100 per cent as perfect)	90.2 (Med.)	91.2 (Good Med.)	89.8 (Med.)	89.8 (Med.)
Average appraised price of finished cattle on foot	$ 6.38	$ 6.27	$ 6.35	$ 6.17
Average dressing percentage (final exp. wt. and chilled-carcass-wt. basis)	55.28	55.19	54.80	54.82
Average carcass grade (100 per cent as perfect)	90.7 (Med.)	90.8 Med.)	91.1 (Med.)	90.8 (Med.)
Average selling price of carcasses per cwt.	$12.12	$12.22	$12.54	$12.26

As originally planned, at the conclusion of each year's feeding period, every steer was graded individually by a representative of the Armour Packing Company. Table 4 shows the results of this grading. A number was given to each grade and a mathematical grade was worked out, which is shown in table 8. Armour's cattlemen, coming from Chicago, where the best of corn-fed cattle are on sale daily, were rather critical of these silage-fed cattle. Most of these cattle had reached a good finish. Most of them carried good grass finish for cattle of their age when purchased, and after a gain of at least 250 pounds per steer, were well conditioned. They were well ribbed, well covered around the pin bones, full in the breeches, and carried lots of cod fat.

In calculating the dressing percentage, the final experimental weights were used rather than the selling weights because the selling weights varied considerably from the final experimental weights during the 3 years. Considering the above condition, and the fact that the cattle were en route three or four days before being slaught-

ered, and that the chilled-carcass weight (warm-carcass weight less 3 per cent) was used, a dressing percentage of 55 is fair and indicates that the cattle carried considerable condition.

The chief criticism was that they were too grassy—not as trim-middled as corn-fed cattle, which, of course, would affect the dressing percentage but not necessarily the carcass.

The prices at which the cattle were appraised on foot and purchased are shown, by years, in table 5 and summarized in table 8. The carcass prices are shown in tables 6 and 8. These data are rather confusing. There are few consistencies in any of them. The average on-foot prices do not follow the on-foot average gradings, and the dressing percentages and carcass prices do not coincide with the on-foot prices. The lots were so close that it was impossible, apparently, for the appraisers to appraise them in the order of their dressing percentage and carcass value. The extreme differences in on-foot valuations during the 3 years were made the first year. A difference of 70 cents per hundred-weight was made in favor of lot 1 over lot 2, but there was a difference of only 14 cents per hundred in the carcass values between these two lots.

Considering the 3-year averages, all of which are very close, lot 1 ranks first with respect to on-foot valuation and dressing percentage, and last on carcass value. Lot 2 is first in on-foot grade only. Lot 3 is first in carcass grade and carcass value. Lot 4 has an average showing, with the exception of being last in on-foot appraisal.

Molasses has a reputation for being palatable and tending to increase the consumption of other feeds to which it is added. This property was evident to a slight extent, as lots 2 and 4 usually ate their feed first; but an appetizer was not needed in the ration of silage and cottonseed meal, as lot 1 ate greedily, especially after the meal was added. Lot 3 appeared to relish the addition of ground corn to its ration.

Molasses also has the reputation of improving the condition of the hair and finish of an animal. The above data do not support

TABLE 9—*Rate of shedding of* 1930-31 *cattle.* (*March* 21, *at the end of the experiment*)

Lot	Three-fourths or more	One-half	One-fourth	Slight
1	4	2	2	2
2	5	4	.....	1
3	5	3	.....	2
4	6	2	2	.....

this supposition. If they did, the two molasses lots would probably have been appraised higher more regularly. An attempt was made to grade the lots on rate of shedding and appearance of the hair. The molasses lots were not superior in either of these respects, to any appreciable extent.

Observations made other years were similar to the above; that is, the condition of the various lots was too close to warrant any conclusion in favor of molasses. Various cattlemen were asked to rank the lots on appearance of hair, and no uniform opinions were secured.

TABLE 10—*Financial statement*

	Lot 1	Lot 2	Lot 3	Lot 4
Average initial value of steers per cwt. @ $5.83	$ 62.56	$ 62.40	$ 62.51	$ 62.44
Average feed cost per steer	23.67	26.14	25.55	24.92
Total cost of finished steer (initial and feed)	86.23	88.54	88.06	87.36
Appraised value of finished steers per cwt.	6.38	6.27	6.35	6.17
Average sale returns per steer (with 3 per cent off experimental weights)	79.32	79.13	79.23	76.46
Average loss per steer (heavy loss sustained third year)	6.91	9.36	8.83	10.90
Returns from silage per ton (all loss absorbed by silage)	2.74	1.91	2.09	1.38
Average margin received	0.55	0.44	0.52	0.34
Average necessary margin	1.03	1.12	1.14	1.13

Table 10 is probably the most important table from which to draw conclusions. The amount of the profit or loss is what the feeder is most interested in. These trials were conducted when cattle values were low and on mean or declining markets. These were the years of cheap corn, cheap cattle, and glutted markets. A comparative low margin would have shown a profit, but such a margin was not available.

Lot 1 came through with the least loss, and from other standpoints was superior to the others.

First, the ration was the simplest—only silage and cottonseed meal.

Second, the ingredients of the ration are perhaps the most readily available and practical in the South, for cattle feeding. The yields of silage are good, and the weather is ideal for making silage. Other experimental work has shown that an acre of corn as silage will produce more beef than an acre of corn in any other form. Cottonseed meal is easily obtainable in the South and is a wonderful supplement and concentrate to use with silage. The South can hardly compete with the corn-belt in corn-finished cattle. Molasses is available at a reasonable price only in the extreme south or in the vicinity of feed-mixing plants. As a rule, the feeder is

so located that he cannot afford to pay transportation charges on small lots of molasses.

Third, lot 1 made the maximum use of silage and the minimum use of concentrates, a condition which appears desirable in the South, as there is not the demand here for cattle carrying extremely high finish. Good cattle finished on silage and cottonseed meal seem to be very satisfactory for southern markets.

Fourth, the ration was easily fed. It required no preparation or mixing and caused no inconvenience. The corn required grinding, as there were no hogs following the cattle; and the molasses was a troublesome feed on cold days and disagreeable to handle. More time and extra buckets and tubs were necessary for feeding the molasses.

Fifth, the ration fed lot 1 was more desirable than those of lots 2 and 4 for the value of the manure. The purchased molasses contributed very little of fertilizer value. The fertilizer elements in it, considered as a whole, are worth only 16 per cent as much as those in cottonseed meal. It contains more potash but only 7 per cent as much nitrogen. Very often the residual fertilizer elements recovered in the manure are considered of major importance in buying feeds.

Sixth, it is possible to produce good beef with the type of cattle used, by feeding nothing but silage and cottonseed meal.

Admitting that the carcasses of lot 1 did sell the lowest of the 4 lots on the New York market, they sold at prices which indicated that they were considerably above the average of carcasses received by that market. This fact was evident from comparisons of the prices received for these carcasses and the prices received for other grades reported by the Market News Service, Bureau of Agricultural Economics, United States Department of Agriculture.

CONCLUSIONS

1. The ration of normal corn silage and cottonseed meal, fed lot 1, was the most desirable. This lot made gains at low costs, was given the highest appraisal on foot, and showed the smallest financial loss.

2. The addition of corn or molasses to the check-ration of silage and cottonseed meal failed to improve results in most instances. Slight advantages due to their addition were noted in grades on foot and in the carcass prices, but these effects did not register any financial advantage in the outcome of the feeding project.

3. Corn was superior to molasses as a supplementary concentrate.

4. Lots 2 and 4, fed molasses, were not superior to lots 1 and 3 in condition of hair, quickness of shedding, or general appearance.

5. It is unprofitable to feed cattle as they were fed in these experiments on margins of only 34 to 55 cents. With a margin of $1.03 or more, all lots would have broken even on the basis of prices paid or charged for feed, or else have shown a net profit.