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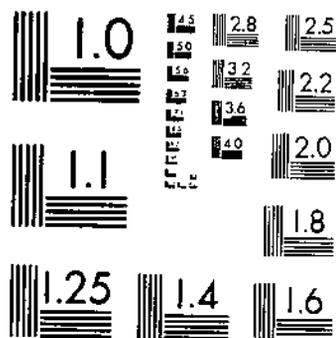
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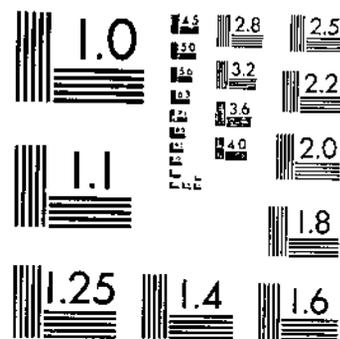
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COMPARISON OF FEEDS FOR FATTENING BEEF CALVES BEFORE AND AFTER WEANING
BLACK, W. H. TROWBRIDGE, E. A. 1 OF 1

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UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.

COMPARISON OF FEEDS FOR FATTENING BEEF CALVES BEFORE AND AFTER WEANING¹

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RECENT TREND IN BEEF PRODUCTION

In recent years there has been an increasing demand for lighter cuts of meat on the beef market in the United States. In an attempt to satisfy this changing demand, producers have striven to have cattle fat enough for slaughter when they are comparatively young. The more economical use of grain by younger cattle has been a contributing factor in the growth of this practice, though the ability of older cattle to make extensive use of roughage not otherwise marketable has offset this advantage to some extent. However, when calves to be fattened are raised instead of purchased, the breeding herd of beef cows utilizes to advantage coarse roughages that are less suitable for calves. Consequently, the maintenance of a breeding herd and the fattening of the calves produced may replace the grazing and fattening of older cattle on many farms. The improvement of permanent pastures, the diversion of unprofitable tilled land into permanent and semipermanent pastures, and the development, on many Corn Belt farms, of pasture systems that provide grazing for the greater part of the year, have made the maintenance of breeding herds more practical and profitable.

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To meet the demand for smaller cuts of beef and to produce beef more economically, it has been found practical, under certain conditions, to full-feed well-bred beef calves grain or concentrate mixtures previous to weaning and have them fat enough for slaughter at weaning time or a few months thereafter. Three years of cooperative work by the United States Department of Agriculture and the University of Missouri at Sni-a-Bar Farms, Grain Valley, Mo., showed that grain-fed calves weighed about 100 pounds more at weaning time than similar calves fed no grain and were usually fat enough for slaughter when weaned at 8 months of age.³ When such calves were not marketed at weaning time, the practice of feeding grain before weaning shortened the subsequent feeding period. The most suitable grain ration for such feeding became a problem of importance.

In 3 years of cooperative feeding tests at Sni-a-Bar Farms comparing (1) shelled corn alone, (2) shelled corn (8 parts by weight) and cottonseed cake (1 part) and (3) shelled corn (2 parts by weight) and oats (1 part), it was found that suckling calves fed 140 days consumed less grain per 100 pounds of gain when fed shelled corn alone than when fed either of the other two rations. However, the calves fed the shelled corn and cottonseed cake made greater gains, were fatter, and were valued 50 cents per 100 pounds higher at weaning time than those fed corn alone or the corn-oats mixture. The increased value of the calves fed shelled corn and cottonseed cake and their greater gains more than offset the cost of the increased feed consumed.⁴

OBJECT OF EXPERIMENTS

The object of the experiments reported in this bulletin was to compare the following four concentrate mixtures for feeding calves from the time they were old enough to eat such feeds until weaning time and for fattening them in dry lot: (1) Shelled corn (8 parts) and cottonseed cake (1 part), (2) ground or cracked corn (8 parts) and cottonseed cake (1 part), (3) shelled corn (8 parts), cottonseed cake (1 part), and a mixture containing principally ground alfalfa hay and molasses and, therefore, referred to as alfalfa-molasses mixture (1 part), and (4) ground or cracked corn (8 parts), cottonseed cake (1 part), and alfalfa-molasses mixture (1 part). The mixtures were made by weight. These investigations were carried on at Sni-a-Bar Farms during 1931-32 and 1932-33.

EXPERIMENTAL PROCEDURE

CATTLE USED AND METHODS OF FEEDING AND HANDLING

In these experiments 32 steer calves and 8 heifer calves were used in 1931 and 24 steer calves and 8 heifer calves in 1932. The calves used in 1931 averaged 86 days of age at the beginning of the experiment and those used in 1932 averaged 78 days. All the calves were high-grade Shorthorns sired by good Shorthorn bulls. The dams of the calves showed a predominance of Shorthorn breeding and frequently produced milk in such quantities that it was necessary occasionally to milk some of them when the calves were young.

³ BLACK, W. H., and TROWBRIDGE, E. A. BEEF FROM CALVES FED GRAIN BEFORE AND AFTER WEANING. U. S. Dept. Agr. Tech. Bull. 208, 24 pp., illus. 1930.

⁴ ——— and TROWBRIDGE, E. A. COMPARISON OF GRAIN RATIONS FOR BEEF CALVES BEFORE AND AFTER WEANING. U. S. Dept. Agr. Tech. Bull. 387, 16 pp. 1933.

The dams were wintered each year on bluegrass pasture and such quantities of hay, silage, and other feeds as were necessary to keep them thrifty but not fat. Cows which calved during the winter were given a little grain after calving when it was needed. Open sheds or timber furnished shelter. Each summer the cows and calves were kept on good pasture, the cows receiving no grain. Ample shade, good water, and salt were available at all times.

At the beginning of each experiment with suckling calves, the calves were divided, according to age, weight, grade, and breeding, into four lots having the same number of animals. Two heifer calves were used in each lot both years. Each of these lots received a different feed supplement—one of the four rations to be compared.

The calves were kept with their dams on pasture during the suckling period. A small corral, usually known as a creep, so constructed that the calves but not the cows could enter, was conveniently located in each pasture. The feed supplements were placed in the troughs within the creeps, where the calves entered and ate at will. They were fed in such quantities that feed was always available. The troughs were cleaned daily, and the quantity of feed remaining was deducted from the total quantity fed.

At the beginning, the calves were herded within the vicinity of the creeps and enticed into them with a little alfalfa hay. This practice was discontinued as soon as they learned to enter the creeps of their own accord. At the end of the suckling period the calves were weaned and individual weights were obtained. These weights, as well as the initial weights, were the average of the weights taken in the morning after the animals had finished eating, on 3 consecutive days. The calves were also weighed individually at 28-day intervals and at the end of the dry-lot feeding period. In case a calf died or was removed from the lot at any time prior to the last feeding period, its record was eliminated and the quantity of feed in proportion to its live weight for the time that it was in the experiment was deducted.

At the time of weaning, the calves were placed in dry lots and were full-fed on the same kind of concentrates they had received while on pasture. They were also fed alfalfa hay for the entire period and Atlas sorgo silage 78 days in the first experiment and 53 days in the second experiment. Concentrates were fed twice daily in such quantities as to be cleaned up in 30 to 45 minutes, after which the hay was fed. The silage was fed with the concentrates. All feeds were weighed at feeding time. Each group of calves had 20 by 36 feet of space in a shed open to the south and 36 by 40 feet of lot space. All the feed was given in troughs under the shed. The lots were surfaced with crushed rock. Enough bedding was used to provide a dry place for the cattle to lie down. A small quantity of bedding was eaten when it was first put down.

At weaning time and at the close of the dry-lot feeding period, commission merchants from Kansas City stockyards appraised the four lots of calves on the basis of prices they would bring on that market. The appraised value may be considered as an expression of the packers' opinion as to finish, dressing percentage, and quality of cattle.

FEEDS USED

The corn fed was of No. 2 Yellow grade and of uniform quality. Screening-size cottonseed cake containing 43 percent of protein was used. The alfalfa-molasses mixture contained 30 percent of medium

ground No. 2 alfalfa hay, 30 percent of Cuban cane molasses, 20 percent of cottonseed cake, and 20 percent of reground oat hulls. This mixture analyzed 12.5 percent crude protein, 1.68 percent crude fat, 19.09 percent crude fiber, 7.62 percent ash, 5.59 percent moisture, and 53.52 percent nitrogen-free extract. Various feed mills in Kansas City prepared the mixture on order. The alfalfa hay was locally grown and of good quality. It was bright green in color and sometimes contained from 10 to 25 percent of fine grasses, principally bluegrass. The silage was made from Atlas sorgo grown on the farm and yielded as high as 20 tons per acre. The sorgo contained considerable quantities of grain and was ensiled when slightly mature. Considerable quantities of the sorgo grain passed through the steers whole. The pastures consisted chiefly of bluegrass with some white clover, Korean lespedeza, alsike, and orchard grass.

EFFECTS OF THE FOUR RATIONS ON SUCKLING CALVES

TOTAL GAINS, FEED COSTS, AND VALUES OF CALVES

The total gains, feed costs, and values of the calves for the two suckling periods are given in table 1.

The 2-year averages show that the calves getting shelled corn and cottonseed cake (lot 1) gained, in 140 days, 8 pounds more than those getting ground corn and cottonseed cake (lot 2), 22 pounds more than those fed shelled corn, cottonseed cake, and alfalfa-molasses mixture (lot 3), and 13 pounds more than those fed ground corn, cottonseed cake, and alfalfa-molasses mixture (lot 4). The lot 2 calves, in turn, gained 14 pounds more than lot 3 and 5 pounds more than lot 4. Lot 3 calves made the smallest total gains but had a slightly higher appraised value than any of the other three lots. Lot 4 was valued the lowest. Lots 1 and 2 were valued the same both years of the experiment. The higher valuation of lot 3 was due chiefly to the slightly higher finish the second year of the experiment, but these differences in appraised values are not significant. All the supplements fed produced calves fat enough for slaughter at weaning time. However, the calves were placed in dry lot after weaning and fattened to a higher degree to determine whether the additional gain would increase the returns above feed costs.

The calves in lot 2 had the highest feed cost per steer and per 100 pounds of gain. The differences were not significant between lots 2 and 4, but they were significant between lots 2 and 1 and lots 2 and 3.

RATIONS AND DAILY GAINS

During the first experiment, lots 1 and 3 had access to specially constructed creeps located, as it was thought, with equal convenience to shade and water and to the calves. In 1931, the lot 3 calves consumed nearly 1 pound more concentrates per head daily than did the calves of lot 1 (table 2). To offset so far as possible any differences in pasture or accessibility of creeps, the lot 1 calves in 1932 were put in the pasture used by lot 3 in 1931, and the latter calves were put in the pasture previously used by lot 1. The quantities of supplements eaten also were reversed, lot 1 consuming three-fourths of a pound more of the grain ration than did lot 3. This indicates that the creep in one pasture had a slightly more favorable location than the creep in the other pasture.

TABLE 1.—Average initial and final weights, total gains, feed costs, and values of the calves for the suckling period of each experiment

Lot no.	Supplement fed	Period of experiment	Calves		Average weight		Average total gain	Cost of supplemental feed ¹		Average appraisal per hundred-weight at end of period	Average net value per calf ²
			Number	Days	Initial	Final		Per 100 pounds gain	Total per steer		
1	Shelled corn and cottonseed cake	June 23–Nov. 10, 1931	10	84	224	533	309	1.97	6.10	8.50	36.57
		June 28–Nov. 15, 1932	8	69	205	538	333	1.24	4.13	5.10	20.63
		Average	9	77	216	536	320	1.64	5.22	6.80	28.00
2	Ground corn and cottonseed cake	June 23–Nov. 10, 1931	10	83	225	528	303	2.87	8.73	8.50	33.54
		June 28–Nov. 15, 1932	8	78	206	529	323	1.68	5.44	5.10	18.89
		Average	9	81	217	529	312	2.34	7.27	6.80	26.22
3	Shelled corn, cottonseed cake, and alfalfa-molasses mixture.	June 23–Nov. 10, 1931	10	85	224	521	297	2.51	7.45	8.50	34.24
		June 28–Nov. 15, 1932	8	90	204	504	300	1.20	3.59	5.25	20.33
		Average	9	87	215	513	298	1.93	5.73	6.88	27.29
4	Ground corn, cottonseed cake, and alfalfa-molasses mixture.	June 23–Nov. 10, 1931	10	92	224	505	281	3.12	8.76	8.50	31.64
		June 28–Nov. 15, 1932	8	76	208	547	339	1.44	4.89	4.90	19.16
		Average	9	85	217	524	307	2.37	7.04	6.70	25.40

¹ Feed prices were as follows: Shelled corn, 56 cents per bushel in 1931 and 35 cents in 1932; ground corn, 61 cents per bushel in 1931 and 40 cents in 1932; cottonseed cake, \$36 per ton in 1931 and \$20 in 1932; and alfalfa-molasses mixture, \$20 per ton in 1931 and \$25 in 1932.

² Based on appraised value with feed cost (exclusive of pasture) deducted.

TABLE 2.—Average rations and daily gains per head during each 28-day period before the calves were weaned

Year	28-day period no.	Lot 1		Lot 2		Lot 3		Lot 4	
		Ration	Gain	Ration	Gain	Ration	Gain	Ration	Gain
1931	1	0.48	1.74	1.25	2.01	0.85	2.04	1.63	1.78
	2	1.74	2.98	4.22	2.98	3.37	2.53	3.90	2.39
	3	4.03	2.03	6.74	1.98	5.81	2.34	6.05	2.34
	4	6.15	2.46	8.20	1.62	6.97	2.14	6.88	1.73
	5	7.39	1.85	8.99	2.62	8.33	1.53	8.83	1.81
Average		4.13	2.21	5.49	2.24	5.07	2.13	5.56	2.01
1932	1	.96	2.54	1.63	2.39	.69	2.10	1.16	1.88
	2	2.03	2.45	3.13	2.36	2.45	2.53	1.05	2.96
	3	3.61	1.97	4.71	2.18	4.93	2.10	3.40	2.30
	4	6.86	2.47	7.48	3.05	5.43	2.82	7.31	2.81
	5	8.60	2.46	9.11	1.56	4.85	1.06	9.00	2.69
Average		4.42	2.38	5.21	2.32	3.67	2.14	4.53	2.43
1931 and 1932	1	.71	2.14	1.44	2.26	.77	2.12	1.35	1.84
	2	1.89	2.71	3.68	2.67	2.91	2.53	2.78	2.67
	3	4.27	2.00	5.73	2.07	5.37	2.22	5.07	2.35
	4	6.82	2.47	6.87	2.33	6.20	2.48	7.10	2.29
	5	8.01	2.16	9.05	2.09	6.50	1.32	9.00	1.95
Average		4.28	2.30	5.35	2.27	4.37	2.13	5.00	2.22

The pastures of lots 2 and 4 were adjacent with a shed open on one side, facing south, and partitioned in the middle for serving both lots of calves. In 1931, lot 2 consumed slightly less feed supplement than did lot 4. In 1932 the pastures for lots 2 and 4 were reversed. In this year lot 2 consumed considerably more feed than did lot 4. However, during the summer of 1932 the pasture of the lot 2 calves was grazed closely. The dams of these calves lost 45 pounds, on the average, during the grazing period, whereas the dams of the lot 4 calves gained 49 pounds during the same period. A possible explanation for the comparatively large quantity of supplement consumed by lot 2 in 1932, therefore, is that because of the lessened milk flow and poorer pasture, the calves went oftener to the creep.

The palatability of the shelled-corn and cottonseed-cake ration was improved by the addition of the alfalfa-molasses mixture, by grinding the corn, or by grinding the corn and adding the mixture, as indicated by the greater quantities of feed consumed. The addition of the alfalfa-molasses mixture to ground corn and cottonseed cake seemed to lessen the palatability of the ration, as indicated by the smaller quantity consumed.

Grinding the corn increased considerably the quantity of feed eaten. During the 2-year period, lot 2, which received ground corn, consumed over 25 percent more feed supplements than lot 1, receiving whole corn. However, as already stated, part of the increased consumption was undoubtedly due to the decreased milk flow of the dams in 1932. Lot 4, fed ground corn, consumed 16 percent more feed than lot 3, fed shelled corn. Adding the alfalfa-molasses mixture to shelled corn and cottonseed cake increased the feed consumption only 2.2 percent, but both grinding the corn and adding the alfalfa-molasses mixture increased the consumption 18.2 percent. Adding the above-mentioned mixture to the ground corn and cottonseed cake decreased the quantity eaten 5.5 percent.

During the 140-day suckling period, the calves fed ground corn and cottonseed cake ate 138 pounds more corn than those fed shelled corn and cottonseed cake, whereas the calves receiving ground corn, cottonseed cake, and the alfalfa-molasses mixture consumed only 43 pounds more corn than those fed shelled corn and cottonseed cake. Adding alfalfa-molasses mixture to the shelled corn and cottonseed cake resulted in a decreased corn consumption of 31 pounds, and adding the supplement to ground corn and cottonseed cake decreased the quantity of corn eaten by 95 pounds. In both cases, the alfalfa-molasses mixture apparently substituted for some of the corn.

FEED CONSUMPTION PER 100 POUNDS OF GAIN

The quantities of supplements consumed per 100 pounds of gain, by 28-day intervals, are shown in table 3. As the suckling period advanced the supplements consumed per 100 pounds of gain increased in all instances.

TABLE 3.—Average quantities of feed supplements consumed per 100 pounds of gain by 28-day periods for the 2 experiments

28-day period no.—	Lot 1	Lot 2	Lot 3	Lot 4
	Pounds	Pounds	Pounds	Pounds
1.....	32.5	65.2	35.9	71.5
2.....	65.3	138.0	117.3	110.5
3.....	216.2	253.5	242.7	223.3
4.....	263.0	301.2	257.2	319.8
5.....	374.2	463.3	504.7	465.1
Average ¹	186.5	240.8	208.7	233.3

¹ Based on the total quantity of feeds consumed and total gain for entire period.

The most efficient use of corn in the ration was made by the calves fed shelled corn and cottonseed cake (lot 1), whereas the least efficient use of the corn resulted when it was ground (lot 2). Grinding the corn in a shelled-corn and cottonseed-cake ration resulted in an extra requirement of 48 pounds of corn and 6 pounds of cottonseed cake for 100 pounds of gain. The next least efficient use of corn was made by the lot 4 calves, fed ground corn, cottonseed cake, and alfalfa-molasses mixture. Grinding the corn and adding the mixture necessitated the use of 47 pounds more feed per 100 pounds of gain than when the shelled corn and cottonseed cake ration was used. The extra feed required included 21 pounds of corn, 3 pounds of cottonseed cake, and 23 pounds of alfalfa-molasses mixture. The second best use of corn was made by the calves fed the shelled corn, cottonseed cake, and alfalfa-molasses mixture (lot 3). To make 100 pounds of gain, these calves required only about 1 pound of corn and 21 pounds of alfalfa-molasses mixture more than the quantity required by the calves receiving shelled corn and cottonseed cake (lot 1). When ground corn was fed (lot 4) instead of whole corn (lot 3), there was an extra requirement of about 20 pounds of corn, 2 pounds of cottonseed cake, and 2 pounds of alfalfa-molasses mixture to produce 100 pounds of gain.

Both grinding the corn and adding the alfalfa-molasses mixture resulted in 25 percent more grain being required to produce 100 pounds of gain. Adding the above-mentioned mixture to shelled corn and cottonseed cake, however, did not decrease the efficiency of the ration so much as grinding the corn.

COMPARISON OF THE FOUR RATIIONS FOR FATTENING CALVES IN DRY LOT AFTER WEANING

INITIAL AND FINAL WEIGHTS AND TOTAL GAINS

The average initial and final weights and total gains for each lot are given in table 4.

TABLE 4.—Average initial and final weights and total gains of the calves in dry lot for 196 days

Lot no.	Time of experiment	Calves ¹	Average weight		Average total gain
			Initial	Final	
1	{Nov. 10, 1931-May 24, 1932.....	Number 9	Pounds 7538	Pounds 894	Pounds 1357
	{Nov. 15, 1932-May 30, 1933.....	8	548	890	358
	Average.....		538	895	358
2	{Nov. 10, 1931-May 24, 1932.....	5	531	910	380
	{Nov. 15, 1932-May 30, 1933.....	7	537	875	338
	Average.....		533	894	360
3	{Nov. 10, 1931-May 24, 1932.....	9	525	870	351
	{Nov. 15, 1932-May 30, 1933.....	7	508	872	364
	Average.....		515	874	357
4	{Nov. 10, 1931-May 24, 1932.....	9	501	890	329
	{Nov. 15, 1932-May 30, 1933.....	8	517	915	368
	Average.....		522	870	347

¹ In most of the lots, the number of animals is less than during the preceding experiment as some of the calves were removed at weaning time.

² 1 steer was removed from this lot at the close of the sixth period, Apr. 26, 1932, for the show herd. The average initial weight of all the steers in this lot includes the weight of this steer. The final weight of this steer was calculated by adding to his weight at the end of the preceding period the average gain made in the last period by the remaining 8 steers. The feed, weight, and gain records of the steer are included in all tables.

The cattle in lot 1, fed shelled corn and cottonseed cake, were the heaviest of the four lots of cattle at the close of the 196-day dry-lot fattening period. The differences in final weight, however, are due chiefly to differences in initial weights at the beginning of the dry-lot period. The differences in total gains made by the four lots of cattle in the dry lot are insignificant as the greatest difference was only 13 pounds, which was between lots 2 and 4.

During the entire experiment of 336 days, lot 1 outgained lot 2 by only 6 pounds, lot 3 by 23 pounds, and lot 4 by 24 pounds.

RATIONS AND DAILY GAINS

The average rations and daily gains of the four lots for each 28-day period are given in table 5.

TABLE 5.—Average ratios and daily gains per head for each 28-day period during fattening in dry lot

Year	28-day period no.	Lot 1			Lot 2			Lot 3			Lot 4		
		Concentrates	Hay ¹	Gain									
1931	1	Pounds 9.06	Pounds 2.85	Pounds 2.21	Pounds 8.17	Pounds 2.85	Pounds 2.06	Pounds 8.58	Pounds 2.81	Pounds 1.84	Pounds 7.58	Pounds 2.81	Pounds 2.00
	2	10.49	3.27	1.41	9.37	3.28	2.34	9.73	3.27	1.90	8.72	3.27	1.98
	3	11.33	3.45	1.97	10.97	3.47	1.99	10.92	3.45	1.87	10.11	3.45	1.30
	4	12.40	4.39	1.74	12.84	4.40	1.11	12.06	4.40	1.48	12.04	4.39	.67
	5	14.23	4.49	2.52	14.31	4.52	1.48	13.94	4.50	1.89	13.67	4.49	1.92
	6	14.75	3.95	1.21	16.13	4.07	2.61	15.39	3.97	1.86	15.26	3.94	2.20
	7	14.99	2.83	1.69	17.18	2.83	1.93	16.44	2.86	1.70	16.56	2.82	1.66
Average		12.47	3.61	1.82	12.71	3.63	1.91	12.44	3.61	1.79	11.99	3.60	1.68
1932	1	10.34	2.56	1.67	10.43	2.52	1.61	11.08	2.27	1.97	11.52	2.36	1.81
	2	11.10	3.40	2.13	11.42	3.69	2.39	11.51	3.58	1.90	11.08	3.49	2.55
	3	12.34	3.90	2.07	11.48	4.05	1.18	13.04	3.66	1.89	13.55	3.72	1.27
	4	13.59	4.03	2.16	11.84	4.25	1.95	13.31	4.08	2.32	13.48	3.87	2.37
	5	13.19	3.13	1.51	13.00	3.47	1.80	13.52	3.51	1.53	14.87	3.99	1.76
	6	13.08	2.87	1.72	14.49	2.91	2.01	15.01	3.29	2.31	15.42	3.25	1.90
	7	12.93	3.74	1.50	13.48	3.57	1.15	14.39	3.37	1.08	15.24	3.51	1.50
Average		12.37	3.38	1.83	12.31	3.49	1.73	13.12	3.44	1.86	13.72	3.44	1.88
1931 and 1932	1	9.72	2.71	1.91	9.30	2.69	1.83	9.83	2.56	1.91	9.55	2.60	1.91
	2	10.89	3.34	1.77	10.40	3.49	2.37	10.62	3.43	1.90	10.35	3.38	2.26
	3	11.84	3.68	2.02	11.23	3.76	1.59	11.98	3.56	1.88	11.83	3.59	1.30
	4	13.09	4.21	1.95	12.34	4.35	1.53	12.69	4.24	1.90	12.76	4.13	1.52
	5	13.71	3.81	2.03	13.70	4.00	1.64	13.73	4.16	1.71	14.27	4.20	1.84
	6	13.92	3.41	1.47	15.31	3.49	2.53	15.29	3.63	2.09	15.34	3.60	2.05
	7	13.96	3.29	1.60	15.33	3.29	1.51	15.42	3.12	1.39	15.99	3.17	1.53
Average		12.42	3.49	1.83	12.52	3.57	1.83	12.78	3.53	1.83	12.86	3.52	1.78

¹ The silage was converted to a hay basis by dividing the quantity of silage fed by 3.

There was a tendency throughout each dry-lot fattening experiment for the calves in all lots to consume a gradually increasing quantity of concentrates. This was true also of the roughages, with the exception of the last two 28-day periods of the experiment.

There were no significant differences in the manner in which the calves in the various groups responded to increases in feed. However, those in lot 4 seemed to consume their increased feed more readily. The calves in lot 1 tired more quickly of their concentrate ration toward the end of the fattening period.

Lot 1 calves consumed 13 pounds less corn in 196 days than did lot 2, fed ground corn and cottonseed cake. The former lot ate 161 pounds more corn and 20 pounds more cottonseed cake than the calves fed shelled corn, cottonseed cake, and alfalfa-molasses mixture, and they consumed 171 pounds more corn and 21 pounds more cottonseed cake than the calves fed ground corn, cottonseed cake, and alfalfa-molasses mixture. The use of 250 pounds of alfalfa-molasses mixture by lot 3 and 251 pounds by lot 4 apparently effected this replacement. Since this mixture contained 30 percent of Cuban cane molasses, the calves in lots 3 and 4 consumed about 75 pounds of molasses per head in 196 days, or 0.38 pound per day.

FEED CONSUMPTION AND COST PER 100 POUNDS OF GAIN AND VALUES OF CALVES

The average quantities of feed consumed per 100 pounds of gain by 28-day periods for the two experiments are given in table 6. There is a tendency for the quantity of concentrates required to produce 100 pounds of gain to increase as the fattening period advances, although table 6 shows some irregularity in this respect. Lot 1, fed shelled corn and cottonseed cake, produced 100 pounds of gain with the least concentrates and roughage. The quantities of both grain and roughage required to produce 100 pounds of gain were greatest in the ration in which the corn was ground and the alfalfa-molasses mixture was added (lot 4).

TABLE 6.—Average quantities of feed consumed per 100 pounds of gain by 28-day periods for the two experiments

28-day period no.	Lot 1		Lot 2		Lot 3		Lot 4	
	Concentrates	Hay ¹						
	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds	Pounds
1.....	491.5	118.4	499.8	145.9	609.1	136.6	493.1	139.8
2.....	616.7	139.4	337.0	147.0	552.0	178.9	456.2	156.0
3.....	585.5	181.5	694.3	232.0	631.0	188.8	912.1	278.1
4.....	670.5	217.4	324.8	288.5	681.0	230.2	867.3	282.7
5.....	667.5	187.1	810.9	217.5	794.1	242.1	771.8	228.4
6.....	801.3	237.7	654.8	150.3	711.5	178.5	743.4	175.0
7.....	876.1	266.3	956.3	262.6	1,046.4	215.4	1,091.4	198.2
Average.....	651.1	191.9	694.2	191.1	699.8	191.1	722.4	195.6

¹ The silage was converted to a hay basis by dividing the quantity of silage fed by 3.

The average quantities of feed consumed per 100 pounds of gain for the entire fattening period in dry lot, the cost of feed per 100 pounds of gain, and the values for each lot are given in table 7.

TABLE 7.—Average quantities and cost of feed consumed per 100 pounds of gain and the average values of the calves for the entire fattening period in dry lot

Lot no.	Year	Average quantity of feed consumed per 100 pounds of gain		Cost of feed per 100 pounds of gain ²	Average final appraised value per hundredweight	Average net value per calf ³
		Concentrates	Hay ¹			
		Pounds	Pounds	Dollars	Dollars	Dollars
1	1931-32	687.6	197.8	6.30	6.25	22.89
	1932-33	677.2	184.8	4.21	6.78	30.44
	Average	681.1	191.9	5.25	6.50	29.60
2	1931-32	656.5	187.0	6.54	6.65	22.43
	1932-33	712.9	202.5	5.03	6.75	32.00
	Average	681.2	194.1	5.80	6.70	27.67
3	1931-32	691.1	201.4	6.56	6.15	19.00
	1932-33	706.0	185.1	4.71	6.65	33.65
	Average	699.5	194.1	5.64	6.40	26.33
4	1931-32	714.7	214.5	7.31	6.25	14.91
	1932-33	730.1	183.3	5.30	7.00	35.10
	Average	722.4	198.9	6.33	6.63	25.05

¹ The silage was converted to a hay basis by dividing the quantity of silage fed by 3.

² The following feed prices were used: Shelled corn, 40 cents per bushel in 1931 and 25 cents in 1932; ground corn, 45 cents per bushel in 1931 and 30 cents in 1932; cottonseed cake and alfalfa-molasses mixtures, \$20 per ton for each in both years; alfalfa hay, \$12 per ton in 1931 and \$8 in 1932; Atlas sorgo silage, \$4 per ton in both years.

³ Based on appraised value with feed cost (exclusive of pasture) deducted.

The calves in lots 2 and 4, fed ground corn and cottonseed cake with and without the alfalfa-molasses feed, respectively, were slightly fatter and averaged 21 cents per hundredweight higher than those in lots 1 and 3, fed the same feeds but with the corn in shelled form. Practically the same quantities of concentrates and roughage were required to produce 100 pounds of gain in all lots regardless of the form in which the corn was fed or whether or not the alfalfa-molasses feed was included. The grinding of corn increased the cost per 100 pounds of gain \$0.64 and the total gain per steer only 5 pounds (all lots considered). This increased gain did not offset the cost of grinding. Adding alfalfa-molasses mixture (lot 3) to the shelled corn and cottonseed cake ration (lot 1) increased the cost of gains by 39 cents per 100 pounds and lessened slightly the final appraised value of the calves. Grinding the corn and adding the alfalfa-molasses mixture (lot 4) increased the final value of the calves by only 13 cents per 100 pounds. The addition of the alfalfa-molasses mixture (lot 4) to the ground corn and cottonseed cake ration (lot 2) decreased the total gain per steer by 13 pounds and the value per hundredweight by \$0.07.

Fattening calves in dry lot for 196 days following creep feeding previous to weaning, under the conditions of this experiment, did not materially increase the net returns per calf, as shown by a comparison with table 1. During the first year's experiment it was significantly more profitable to sell the calves at weaning time, but in the second year's experiment the profits were nearly as great in favor of dry-lot fattening. The differences in net values were due almost entirely to

a significantly higher market value in November 1931 than in November 1932 and somewhat higher market values in May 1933 than in May 1932.

SUMMARY AND CONCLUSIONS

Experiments were carried on in 1931-32 and 1932-33 at Sni-a-Bar Farms, Grain Valley, Mo., to compare various concentrate rations for calves before and after weaning. High-grade Shorthorns, from 2 to 3 months of age, were used. The dams frequently produced milk in such quantities that it was necessary occasionally to milk some of them when the calves were young. After being weaned the calves received alfalfa hay and Atlas sorgo silage in addition to the concentrates.

In the creep-feeding experiments, which were carried on for 140 days, the calves fed shelled corn and cottonseed cake gained, on an average, 8 pounds more than those fed ground corn and cottonseed cake, 13 pounds more than those fed ground corn, cottonseed cake, and alfalfa-molasses mixture, and 22 pounds more than those fed shelled corn, cottonseed cake, and the alfalfa-molasses mixture.

As an average for the 2 years, the addition of the alfalfa-molasses supplement to a shelled-corn and cottonseed-cake ration and grinding the corn in that ration resulted in a mixture that required 25 percent more feed than did the unground shelled corn-cottonseed cake ration for 100 pounds of gain. The higher gain of the calves fed shelled corn and cottonseed cake and their more economical gains more than offset the slightly higher valuation of the calves getting shelled corn, cottonseed cake, and alfalfa-molasses supplement. Grinding the corn increased the cost of gains significantly but did not materially affect the average rate of gain nor values of the cattle.

In the two dry-lot fattening experiments of 196 days each immediately after weaning, there were no significant differences in total gains made by the four lots of calves fed the same type of ration as they had received previous to weaning. Calves fed shelled corn and cottonseed cake were the heaviest at the end of the experiment, but most of the difference was due to the greater gains made during the creep-feeding period. As was the case during the creep-feeding period, the palatability of the ration was improved during the dry-lot fattening period by grinding the corn or by adding alfalfa-molasses supplement to the ration. Less concentrates were consumed per head and per 100 pounds of gain by the calves fed corn and cottonseed cake than by the calves receiving the alfalfa-molasses feed in addition. The slightly higher valuation, per hundredweight, of the cattle fed ground corn and cottonseed cake, either with or without the alfalfa-molasses mixture over those fed the shelled corn and cottonseed cake was more than offset by the higher feed costs. The practice of grinding the corn, adding alfalfa-molasses mixture, or both, was not justified in these experiments.

There were no significant differences in average net returns per calf between those fed supplements for 140 days before weaning and those continued on those supplements for 196 days after weaning. Differences in market values were almost entirely responsible for differences in net returns.

END