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Delayed Concentrate Feeding to Steers

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III. Relation of quantity of concentrate fed during the last of 28 to 56 days of feeding to net economic returns.

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This is the third report of a series of tests on the study of feeding of large quantities of roughage during the initial stages of fattening steers. The first publication on this subject had as a study, the maximum time a roughage may be fed to fattening steers previous to the concentrate allowance to get optimum economical returns and to determine the length of time the concentrate mixture should be fed after the heavy roughage-feeding period (1). The second publication on this subject was concerned with the quantity of the concentrate mixture to feed after they had received a roughage mixture with limited concentrate mixture allowance (2).

The objective of the study presented in this report was to determine the quantity of the concentrate mixture to feed with the roughage mixture and the quantity of the concentrate mixture to feed during the finishing period of 35 or 63 days.

Test 5

The objectives of the experiments of Test 5 were to determine the length of time and the level of the concentrate mixture to feed steers previous to the last 35 or 63 days for most economical returns.

Experimental Procedure

Sixty yearling steers were divided into six lots of 10 each and fed by the group-feeding system for a period of 203 days from October 20, 1958, to May 11, 1959. The design of the experiment is shown in Table 1. The concentrate mixture is presented in Table 2. The roughage was composed of 2 parts baled alfalfa hay by weight and 3 parts corn silage as weighed from the silage pit. This gave a roughage mixture of 66 percent of dry matter in alfalfa hay and 33 percent of the dry matter in corn silage.

The feeding procedure outlined in Table 1 was as follows: (1) all six groups of steers were fed 2 pounds of the concentrate mixture with all the roughage mixture they cared to consume for the first 28 days.

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Table 1.—Experimental Feeding System of Test 5.

Lot No.	Initial period		Intermediate period		Finishing period	
	Days	Concentrate	Days	Concentrate	Days	Concentrate
		lb.		lb.		lb.
1	28	2	140	6	35	14
2	28	2	112	6	63	14
3	28	2	140	8	35	14
4	28	2	112	8	63	14
5	28	2	140	10	35	14
6	28	2	112	10	63	14

Table 2.—Concentrate mixture.

Feed	Parts per 100
Ground barley	49
Ground oats	24
Dried molasses beet pulp	24
Sodium chloride	2
Bonemeal	1

(2) Two groups of steers (Lots 1 and 2) were fed 6 pounds of the concentrate mixture for a period of 140 and 112 days, respectively. Two groups of steers (Lots 3 and 4) were fed 8 pounds of the concentrate mixture 140 and 112 days, respectively. Two groups of steers (Lots 5 and 6) were fed 10 pounds of the concentrate mixture 140 and 112 days, respectively.

(3) Three groups of steers (Lots 1, 3, and 5) were fed 14 pounds of the concentrate mixture the last 35 days. Three groups of steers (Lots 2, 4, and 6) were fed 14 pounds of the concentrate mixture the last 63 days.

Experimental Results

The data on gains, feed consumption, and feed requirements for the various groups of steers are shown in Table 3.

Those steers of Lot 2, fed the 6 pounds of the concentrate mixture for 112 days and 14 pounds of the same mixture for 63 days, made an average daily gain of 2.07 pounds per day, while the steers of Lot 6 were fed 10 pounds of concentrate mixture and made an average daily gain of 1.86 pounds per day. The steers of Lot 2 had a slightly higher numerical rating on market grades, Table 4, and a relatively low feed cost per steer, Table 2. This would indicate that the greatest benefit and most efficient gains are made when steers are fed a high roughage ration during the initial stages of fattening, followed by a high concentrate level during the finishing period.

Table 3.—Comparative gains, feed intakes, feed requirements, and cost of 100 pounds gain of the steers of each lot for the various periods of feeding—Test 5.

Lot. No.	1	2	3	4	5	6
No. Steers	10	10	10	10	10	10
Days fed 2 lb. conc.	28	28	28	28	28	28
Days fed 6 lb. conc.	140	112				
Days fed 8 lb. conc.			140	112		
Days fed 10 lb. conc.					140	112
Days fed 14 lb. conc.	35	63	35	63	35	63
Av. initial wt., lb.	698	697	700	710	708	700
Av. final wt., lb.						
28 days	778	787	790	800	794	792
112 days	946	941	944	939	970	968
140 days	982	984	1003	989	1034	1014
203 days	1092	1116	1103	1054	1067	1078
Av. daily gain, lb.						
28 days	2.86	3.21	3.21	3.21	3.04	3.29
112 days	2.11	2.18	2.18	2.04	2.34	2.39
140 days	2.03	2.04	2.16	1.99	2.33	2.24
203 days	1.94	2.07	1.98	1.69	1.76	1.86
Av. daily conc., lb.						
28 days	2.3	2.3	2.3	2.3	2.3	2.3
112 days	5.1	5.1	6.5	6.5	8.3	7.8
140 days	5.2	5.3	6.8	6.8	8.6	8.3
203 days	6.9	8.0	7.9	9.0	9.5	10.0
Av. daily hay, lb.						
28 days	11.1	12.1	12.4	12.2	11.8	11.9
112 days	9.6	10.2	8.6	9.0	8.2	8.1
140 days	9.8	10.1	8.5	8.7	8.3	8.0
203 days	8.9	8.7	7.9	7.6	7.7	7.1
Av. daily silage, lb.						
28 days	15	15	15	15	15	15
112 days	15	15	13	13	12	12
140 days	15	15	13	13	12	12
203 days	14	13	12	12	11	11
Feed per 100 lb. gain lb.						
28 days	991	912	902	928	942	884
112 days	1378	1549	1283	1392	1195	1165
140 days	1479	1629	1296	1413	1211	1253
203 days	1544	1549	1418	1434	1456	1356
Feed cost 100 lb gain, dollars						
112 days	12.10	12.25	12.52	13.58	12.55	12.23
140 days	13.14	13.34	12.84	14.09	12.93	13.26
203 days	14.97	14.85	14.74	15.73	16.33	15.86

Significantly faster rates of gains were made by the steers fed the lower levels of the concentrate mixture during the first 112 and 140 days than those steers fed the higher levels. These steers had a higher numerical market grade than the steers fed 10 pounds of the concentrate mixture.

Table 4.—Number of steers in each market grade and the total numerical market grade rating of each feed treatment.

Lot No.	Choice			Good			Numerical rating*
	High	Medium	Low	High	Medium	Low	
	Number per lot						
1		3	4	3			100
2	3	2	2	2	1		104
3		4	2	1	3		97
4		2	3	3		2	93
5		2	2	2	2		90
6	1	2	2	1	1	3	92

Test 6 (1959-60)

The objectives of Test 6 were: (1) to determine the optimum economical level of allowance of the concentrate mixture to feed steers after receiving 2 pounds of the concentrate mixture during the initial 28 days of feeding. The roughage allowance was free-choice. (2) to determine the optimum economical allowance of the concentrate mixture to feed fattening steers during the finishing period of 38 days. (3) to compare the results of feeding 1 pound per 100 pounds liveweight plus 1 pound of the concentrate mixture with the above methods. (A 700-pound steer will receive 8 pounds of concentrate in addition to roughage with the above delayed system.) (4) to compare the results of feeding 2 pounds of concentrate mixture for each 100 pounds live-weight in addition to roughage with the above delayed system.

Sixty grade Hereford steers were divided into six lots of 10 steers each on the basis of weight and feeder grade. They were fed 188 days from November 3, 1959 to May 9, 1960.

The outline of the feeding schedule is presented in Table 5. The concentrate mixture was the same as that presented in Table 2 for Test 5. The roughage mixture was the same as used in Test 5.

Table 5.—Experimental feeding system of Test 6.

Lot No.	Initial period		Intermediate period		Finishing period	
	Days	Concentrate	Days	Concentrate	Days	Concentrate
		lb.		lb.		lb.
1	28	2	112	6	48	12
2	28	2	112	6	48	16
3	28	2	112	10	48	12
4	28	2	112	10	48	16
5	1 lb. concentrate cwt. steer + 1 pound					
6	2 lb. concentrate cwt. steer					

* High choice: 12; medium choice: 11; low choice: 10; high good: 9; medium good: 8; low good: 7.

Results

The rate of gain, average daily consumption of the concentrate mixture, alfalfa hay and corn silage, feed per 100 pounds gain and cost of 100 pounds gain for the various periods of the feeding tests are presented in Table 6. The steers of Lot 4, fed 10 and 16 pounds of the concentrate mixture for 112 and 38 days, respectively, made as rapid a gain with less feed cost per 100 pounds gain than the steers of Lot 6 fed 2 pounds of the concentrate mixture per 100 pounds live-weight. The steers of Lot 6 consumed an average of 13.9 pounds of the concentrate mixture per day as compared to 10.2 pounds for the steers of Lot 4, Table 6.

The ratio of concentrate to roughage consumed was the lowest for Lot 5 and highest for Lot 6. The ratios of concentrate to roughage consumed were as follows: Lot 1—1:1.9; Lot 2—1:1.6; Lot 3—1:1.2; Lot 4—1:1.1; Lot 5—1:1; Lot 6—1:1.9.

If the alfalfa hay had been purchased for \$20 per ton instead of \$29, the most profitable group would have been the steers of Lot 2. The feed prices, per ton, used in this study were as follows; ground barley—\$50, ground oats—\$58, dried molasses beet pulp—\$36, steamed bonemeal—\$114, sodium chloride—\$38.40, corn silage—\$8 and alfalfa hay—\$29.

There were no significant differences in loin-eye areas, fat covers of the rib-eye or cooler shrinkage of the steers of any of the six lots, Table 10. The carcass grades were slightly higher for the steers of Lots 3, 4, 5 and 6 than the steers of Lots 1 and 2, Table 8.

The financial report given in Table 11 shows that feed cost per steer per day was highest for the steers of Lots 3 and 6. With alfalfa hay priced at \$29.00, the greatest net return per steer over feed costs was made by the steers of Lot 6. This group of steers was fed 2 pounds of concentrate per 100 pounds of live-weight for the entire period of 188 days.

The feeder grade at the beginning of the test, the slaughter grade at the end of 140 days of feeding and the slaughter grade 5 days previous to date of slaughter are shown in Table 7. A numerical value was given to each grade for the feeder grade and two slaughter grades. The numerical values were as follows: high choice—12; medium choice—11; low choice—10; high good—9; medium good—8; low good—7; and high standard—6. The total numerical grades of the feeder steers were approximately the same for all 6 lots of steers. The total numerical slaughter grade did not vary greatly at the end of 140 days of feeding. The steers of Lots 1 and 2 fed the 6 pounds of the concentrate mixture during the first 112 days had the lowest slaughter grade at the end of the first 140 days. The steers of Lots 3, 4, 5 and 6 fed the high levels of the concentrate mixture had the highest carcass grades, and the highest degree of marbling at the time of slaughter, Table 8 and 9. There

was no significant difference in the loin-eye areas, fat covers over the loin-eyes, cold carcass yields or cooler shrinkage of the six groups of steers, Table 10.

Table 6.—Comparative gains, feed intakes, and feed requirements of the steers of each lot for the various periods of feeding.

Lot No.	1	2	3	4	5	6
No. of steers	10	10	10	10	10	10
Av. initial wt., lb.	732	747	748	760	742	736
Av. final wt., lb.						
28 days	816	822	832	868	848	829
112 days	974	958	992	1021	1020	1018
140 days	1030	1008	1043	1084	1068	1074
188 days	1117	1118	1127	1181	1151	1159
Av. daily gain, lb.						
28 days	3.00	2.66	2.98	3.86	3.79	3.30
112 days	2.16	1.88	2.18	2.33	2.49	2.52
140 days	2.13	1.86	2.11	2.31	2.33	2.45
188 days	2.05	2.97	2.02	2.24	2.18	2.25
Av. daily conc., lb.						
28 days	2.0	2.0	2.0	2.0	7.8	9.8
112 days	5.0	5.0	7.8	7.8	9.4	12.6
140 days	5.3	5.3	8.3	8.3	9.7	13.3
188 days	6.9	7.8	9.2	10.2	10.2	13.9
Av. daily hay, lb.						
28 days	10.8	11.6	7.8	11.5	7.5	7.7
112 days	9.4	9.2	7.6	8.8	6.8	5.4
140 days	9.6	9.9	8.3	8.3	9.7	5.1
188 days	8.9	8.1	7.2	7.6	6.5	4.7
Av. daily silage, lb.						
28 days	16.2	16.2	16.2	16.2	11.2	11.6
112 days	14.2	14.2	12.1	12.2	11.0	8.5
140 days	14.0	14.0	11.8	11.8	10.9	8.4
188 days	13.2	12.4	11.5	10.8	10.8	7.8
Feed per 100 lb. gain, lb.						
28 days	968	1118	938	773	701	883
112 days	1321	1507	1262	1233	1093	1072
140 days	1356	1525	1306	1239	1173	1111
188 days	1420	1433	1383	1269	1266	1175
Feed cost per 100 lb. gain, dollars						
112 days	14.60	16.62	13.96	14.25	15.04	16.90
140 days	15.20	17.01	16.97	16.18	16.26	17.98
188 days	17.23	18.20	18.68	18.04	17.96	19.71

Table 7.—Feeder and slaughter grades of steers.

Lot No.	Grades							Total Numerical Value
	High Choice	Choice	Low Choice	High Good	Good	Low Good	High Standard	
1		2	3	Feeder grade				93
			1	2	2	1		
			3	3	3	2	1	81
2		3	1	3	2	1		93
		2	3	2	2	1		93
			1	4	2	3		83
3		1	5	1	2	1		93
		2	3	2	2	1		93
			1	2	4	3		91
4	1	2	4	2	1			100
		2	4	1	2	1		94
			3	5	2			91
5		4	4	2				102
		2	4	2	1	1		95
			4	5	1			93
6		7	2	1				106
		2	4	2	2			96
		2	2	3	1	2		91
	1	5	2	1	1		103	

Table 8.—The number of steers in each USDA carcass grade of each feed treatment after a 48 hour chill and the total numerical values of the carcasses.

Lot No.	Choice			Good			Total Numerical Value
	High	Medium	Low	High	Medium	Low	
	number per lot						
1	1	2	1	5	1		97
2		2	3	3	1	1	94
3		3	4	3			100
4	1	5	1	3			104
5	2	2	6				106
6	3	2	4	1			107

Table 9.—Evaluation of the degree of marbling of the rib-eye by the official carcass graders.

Lot No.	Degree of marbling				Totals*
	Slightly abundant	Moderately abundant	Modest amount	Small amount	
1		1	3	6	55
2		1	4	5	56
3		2	8		62
4	2	1	6	1	64
5		2	8		62
6	2	1	6	1	64

Table 10.—Averages of warm carcass yields, areas of loin-eyes, fat thickness, and cooler shrinkages of steers fed different levels of concentrate.

Lot No.	No. of steers	Loin-eye area per steer	Fat cover	Cold carcass yields	Cooler shrinkage
		sq. in.	in.		percent
1	10	12.2	1.88	58.3	1.28
2	10	12.6	2.00	59.4	1.21
3	10	13.0	1.68	60.4	1.24
4	10	12.5	2.00	59.3	1.21
5	10	11.4	1.93	60.4	1.22
6	10	12.8	1.90	60.6	1.16

Table 11.—Financial consideration for the 203-day feeding period.

Lot No.	Av. feed cost per steer-day	Feed cost per 100 lb. gain	Gross return per steer	Purchased value per steer	Feed cost per steer	Total cost per steer	Net return per steer over feed cost
	dollars	dollars	dollars	dollars	dollars	dollars	dollars
1	0.35	17.23	266.53	190.03	66.32	256.35	10.18
2	0.36	18.20	272.30	193.92	67.32	251.44	10.86
3	0.48	18.68	280.57	194.18	80.81	264.99	15.58
4	0.40	18.04	267.64	197.18	75.94	273.12	14.52
5	0.39	17.96	288.74	192.75	73.44	266.19	22.55
6	0.44	19.71	302.79	191.19	83.40	274.59	28.20

* Degree of marbling: 8 = slightly abundant; 7 = moderately abundant; 6 = modest amount; 5 = small amount.

Delaying the feeding of concentrate mixture to steers gave the following results: (Test 5).

1. The feeding of 6 pounds of the concentrate mixture with roughage to steers that had been fed a high roughage ration for 28 days gave the most rapid rate of gain with cheaper feed costs per unit of gain than feeding 10 pounds of the concentrate mixture.
2. The slaughter grades were slightly higher for the steers that received the low concentrate mixture intake during the initial stages of fattening than for those steers receiving higher levels of concentrate during the early part of the feeding period.

Feeding steers 2 pounds of concentrate mixture per 100 pounds live-weight with all the roughage they would consume throughout the entire feeding period gave the following results: (Test 6).

1. A more rapid rate of gain than steers fed 6 pounds of the concentrate mixture during the intermediate period and 12 or 16 pounds the last 48 days of the test period.
2. Approximately the same rate of gain as steers fed 10 pounds of the concentrate mixture during the intermediate period and 16 pounds during the last 48 days of the test period.
3. A loin-eye area not significantly greater than the loin-eye area of steers fed by the other methods of the test.
4. A fat cover, cooler shrinkage value, and a degree of marbling similar to other feed treatments.
5. A carcass grade with a higher numerical value than those steers fed only 6 pounds of the concentrate mixture during the intermediate period and 12 or 16 pounds during the last 48 days.

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