UNIVERSITY OF IDAHO
College of Agriculture

Delayed Concentrate Feeding to Steers

PART II

Relation of Quantity of Concentrate Fed to Carcass Grade and Yield

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Digest

Most economical gains were made from steers receiving a roughage with a low intake of a concentrate mixture during the first part of the feeding period.

More economical gains were made with steers fed a roughage without the concentrate mixture the first 28 days than without a concentrate mixture the first 56 days.

The carcass quality was improved by feeding a low concentrate allowance during the early part of the feeding period.

The carcass quality was highest for the steers fed a high intake (13.6 pounds) of the concentrate mixture during the last 33 days of the feeding period.

Delayed Concentrate Feeding To Steers

II. Relation or Quality of Concentrate Fed to Carcass Grade and Yield

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This publication presents the second report of studies on the feeding of large quantities of roughages for optimum returns in the utilization of feeds for fattening steers in Idaho. The feeding of a maximum quantity of roughage with a minimum quantity of concentrate to steers under Idaho steer feeding conditions may contribute to an increase in net returns. The first publication (Test 1 and Test 2) on this subject, reported in Idaho Agricultural Experiment Station Bulletin 291, had as an objective a study of the length of time the concentrate mixture should be fed to fattening steers to give the greatest monetary returns. The object of this second bulletin is to report on experiments whose designs were concerned with the quantity of concentrate mixture to feed with the roughage mixture after the steers had received roughage alone for a given period.

Test 3 (1956-57)

OBJECTIVES

The objectives of the studies in Test 3 were to determine the quantity of a concentrate mixture to give fattening steers after they had been fed an all-roughage ration for 28 and 56 days.

EXPERIMENTAL PROCEDURE

Sixty yearling Hereford steers were purchased and divided into 6 groups of 10 each. They were fed by the group-feeding system for a period of 168 days, from November 19, 1956 to May 7, 1957. The concentrate mixture used was composed of 50 parts ground barley, 24.0 parts ground oats, 24.0 parts dried molasses beet pulp and 2 parts salt. The roughage mixture was composed of approximately 50 percent alfalfa hay and 50 percent corn silage.

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The feeding procedure (Table I) used in this study was as follows:

(1) Three groups of steers (Lots 1, 2, and 3) were fed only a roughage mixture for a period of 28 days. One group (Lot I) was fed 6 pounds of the concentrate mixture for the remaining 126 days of the test. One group (Lot 2) was fed 8 pounds of the concentrate mixture for the remaining 126 days of the test. One group (Lot 3) was fed 10 pounds of the concentrate mixture for the remaining 126 days of the test.

(2) Three groups of steers (Lots 4, 5, and 6) were fed only a roughage mixture for a period of 56 days. One group (Lot 4) was fed 6 pounds of the concentrate mixture for the remaining 98 days of the test. One group (Lot 5) was fed 8 pounds of the concentrate mixture for the remaining 98 days of the test. One group (Lot 6) was fed 10 pounds of the concentrate mixture for the remaining 98 days of the test.

Table 1.—Experimental feeding system

Lot	No. steers	Days on roughage	Concentrate allowance after initial roughage feeding
1	10	28	6
2	10	28	8
3	10	28	10
4	10	56	6
5	10	56	8
6	10	56	10

EXPERIMENTAL RESULTS

The data on the gains, feed consumption and feed requirements for various periods of feeding of the steers of the six lots are shown in Table 2. The steers (Lot 3) fed the 10 pounds of concentrate mixture after being fed the alfalfa hay-corn silage mixture 28 days had the highest rate of gain at the end of 112, 140, and 168 days. The daily gains were 2.11, 2.02, and 1.92 pounds for 112, 140 and 168 days, respectively. These steers had the lowest feed requirements per 100 pounds gain. The steers received an average of 1 part concentrate to 2 parts roughage (hay basis)* for 168 days. The market grades of this group of steers (Lot 3) were highest of any group in the test at the end of 140 days of feeding.

Steers fed 10 pounds of the concentrate mixture (Lot 6), after being fed a roughage mixture of alfalfa hay and corn silage for 56 days, made more rapid and economical gains than did the steers of Lots 1, 2, 4, and 5. The ratio of concentrates to roughage (hay basis) intake of the steers of Lot 6 was 1:2.7.

* The corn silage was converted to the same dry-matter basis as the alfalfa hay.

Table 2.—Comparative gains, feed intakes and feed requirements of steers fed a roughage combination 28 to 56 days before feeding the concentrate mixture (168 days—November 19, 1956 to May 7, 1957).

Lot No.	1	2	3	4	5	6
No. steers	10	10	10	10	10	10
Initial wt. lb.	808	798	808	794	798	804
Days fed only roughage	28	28	28	56	56	56
Days fed conc. and roughage	126	126	126	98	98	98
Total days on test	168	168	168	168	168	168
Daily conc. allowance, lb.	6	8	10	6	8	10
Final wt. lb.						
112 days	1018	1003	1044	979	995	1006
140 days	1038	1030	1091	1019	1060	1078
168 days	1084	1062	1130	1052	1076	1110
Av. daily gain, lb.						
112 days	1.87	1.83	2.11	1.65	1.76	1.80
140 days	1.64	1.66	2.02	1.61	1.87	1.96
168 days	1.64	1.57	1.92	1.54	1.65	1.82
Av. daily conc. lb.						
112 days	4.4	5.8	7.1	3.0	3.8	4.7
140 days	4.7	6.3	7.7	3.6	4.7	5.8
168 days	4.9	6.6	8.1	4.0	5.2	6.5
Av. daily hay, lb.						
112 days	14.4	13.5	12.9	15.0	14.6	14.4
140 days	14.3	13.2	12.5	14.8	14.0	13.9
168 days	14.3	13.0	12.2	14.6	13.7	13.4
Av. daily silage, lb.						
112 days	13.8	12.8	12.2	14.3	13.9	14.4
140 days	13.8	12.7	12.0	14.3	13.5	13.3
168 days	13.8	12.6	11.8	14.2	13.3	13.0
Feed per 100 lb. gain, lb.						
112 days	1745	1762	1529	1956	1937	1933
140 days	2003	1935	1592	2031	1727	1688
168 days	2014	2040	1677	2140	1950	1799

The rate of gain for the 112 first days of feeding was higher for the groups of steers fed roughage alone 28 days than for those steers fed the roughage alone for 56 days. The market grades were the highest at the end of 140 days of feeding for the lots of steers fed the roughage alone 28 days (Lots 1, 2, 3; Table 4). The higher concentrate mixture intake favored a higher finished carcass.

The average daily feed intakes of the alfalfa hay, corn silage and concentrate mixture by periods are shown in Table 3.

The ratios of concentrate to roughage (hay basis) were as follows:

Lot 1—1:3.8; Lot 2—1:2.6; Lot 3—1:2.0; Lot 4—1:4.5; Lot 5—1:3.5; and Lot 6—1:2.7.

Table 3.—Average daily feed intake by feeds and periods.

Period	Period	Alfalfa hay	Corn silage	Concentrate mixture	Total
	days	lb.	lb.	lb.	lb.
			Lot 1		
1	28	17.4	14.8	—	32.2
2	28	14.2	14.2	5.7	34.1
3	28	13.0	13.0	6.0	32.1
4	28	13.1	13.1	6.0	34.0
5	28	14.0	14.0	6.0	34.0
6	28	14.0	14.0	6.0	34.0
			Lot 2		
1	28	17.4	14.8	—	32.2
2	28	12.6	15.6	7.3	32.5
3	28	12.0	12.0	8.0	32.0
4	28	12.0	12.0	8.0	32.0
5	28	12.0	12.0	8.0	32.0
6	28	12.0	12.0	8.0	32.0
			Lot 3		
1	28	17.4	14.8	—	32.0
2	28	12.1	12.1	8.6	32.9
3	28	11.0	11.0	10.0	32.0
3	28	11.0	11.0	10.0	32.0
5	28	11.0	11.0	10.0	32.0
6	28	11.0	11.0	10.0	32.0
			Lot 4		
1	28	17.4	14.8	—	32.2
2	28	15.8	15.8	—	31.6
3	28	13.5	13.5	7.4	34.3
4	28	13.3	13.3	6.0	32.6
5	28	14.0	14.0	6.0	34.0
6	28	14.0	14.0	6.0	34.0
			Lot 5		
1	28	17.4	14.8	—	32.2
2	28	15.8	15.8	—	31.6
3	28	13.0	13.0	7.4	33.4
4	28	12.0	12.0	8.0	32.0
5	28	12.0	12.0	8.0	32.0
6	28	12.0	12.0	8.0	32.0
			Lot 6		
1	28	17.4	14.8	—	32.2
2	28	15.8	15.8	—	31.6
3	28	12.6	12.6	8.8	34.1
4	28	12.0	12.0	10.0	34.0
5	28	11.5	11.5	10.0	33.0
6	28	11.0	11.0	10.0	32.0

Table 4.—Market grades of steers of each lot

Lot. No.	1	2	3	4	5	6
Market grades:						
Choice	7	8	8	5	6	1
Good	3	2	2	4	4	9
Standard	-	-	-	1	-	-

SUMMARY OF TEST 3

Steers fed a roughage mixture of equal parts of alfalfa hay and corn silage for a period of 28 days made more rapid and economical gains than those steers fed the roughage mixture 56 days before receiving the concentrate allowance.

Steers fed 10 pounds of the concentrate mixture for 28 or 56 days made more rapid gains than those steers receiving 6 or 8 pounds of the concentrate mixture per day after being fed the roughage mixture for 28 or 56 days.

Test 4 (1957-58)

The objectives of Test 4 were:

(1) To determine whether the feeding of 2 pounds of a concentrate mixture for a 28-day period, prior to the feeding of the maximum allowance of the concentrate mixture, would be more economical than the roughage alone.

(2) To determine the total allowance of the concentrate mixture for the greatest monetary returns.

(3) To determine the relative value of the carcasses, after the steers of each of the above ration treatments were fed a high concentrate mixture, during the final period of 33 days of feeding.

Table 5.—Experimental plan

Lot	No. steers	Feed mixture first 28 days	Concentrate allowance for 135 days	Feed allowance last 33 days
1	10	Alfalfa hay	6	All lots received 10.7 lb. concentrate mixture, 14.7 lb. corn silage and all the hay they would consume.
2	10	Alfalfa hay plus 2 lb. concentrate	6	
3	10	Alfalfa hay	8	
4	10	Alfalfa hay plus 2 lb. concentrate	8	
5	10	Alfalfa hay	10	
6	10	Alfalfa hay plus 2 lbs. concentrate	10	

EXPERIMENTAL PROCEDURE

Sixty yearling Hereford steers were purchased and divided into six groups of 10 each. They were fed by the group-feeding method for a period of 196 days, from December 3, 1957 to June 17, 1958. The concentrate mixture used was composed of 50 parts ground barley, 24 parts of ground oats, 24 parts of dried molasses beet pulp, and 2 parts of salt. An outline of the experimental plan is shown in Table 5.

The feeding procedure was as follows:

(1) One group (Lot 1) was fed alfalfa alone during the first 28 days, and 6 pounds of the concentrate mixture with alfalfa hay during the succeeding 135 days.

(2) One group (Lot 2) was fed 2 pounds of the concentrate mixture with alfalfa hay during the first 28 days, and 6 pounds of the concentrate mixture with alfalfa hay during the succeeding 135 days.

(3) One group (Lot 3) was fed alfalfa hay alone during the first 28 days, and 8 pounds of the concentrate mixture with alfalfa hay during the succeeding 135 days.

(4) One group (Lot 4) was fed 2 pounds of the concentrate mixture with the alfalfa hay during the first 28 days, and 8 pounds of the concentrate mixture with alfalfa hay during the succeeding 135 days.

(5) One group (Lot 5) was fed alfalfa hay alone during the first 28 days, and 10 pounds of the concentrate mixture with alfalfa hay during the succeeding 135 days.

(6) One group (Lot 6) was fed 2 pounds of the concentrate mixture with the alfalfa hay during the first 28 days, and 10 pounds of the concentrate mixture with alfalfa hay during the succeeding 135 days.

At the end of 163 days of feeding, all groups were placed on a high concentrate ration. They were fed 13.6 pounds of the concentrate mixture, 14.7 pounds of corn silage, and all the alfalfa hay they would consume for the final 33 days of feeding. The daily intakes of the roughages and concentrate mixture of the six lots are shown in Table 7.

The ratios of concentrate-to-roughage (hay basis) intake for the various lots were: Lot 1—1:2.2; Lot 2—1:2.1; Lot 3—1:1.7; Lot 4—1:1.6; Lot 5—1:1.5; and Lot 6—1:1.3.

EXPERIMENTAL RESULTS

The data relating to the gains, feed consumption and feed requirements for the six groups of steers are shown in Table 6. The rates of gain for the total period of 196 days are not exactly the

Table 6.—Comparative gains, feed intakes and feed requirements of steers fed various levels of concentrate mixture with alfalfa hay, (196 days—December 3, 1957 to June 17, 1958).

Lot No.	1	2	3	4	5**	6
No. steers	10	10	10	10	10	10
Initial wt. lb.	716	706	708	706	702	720
Days fed hay	28		28		28	
Days fed 2 lb. conc. with hay		28		28		28
Daily conc. allowance	6	6	8	8	10	10
Days fed conc.	135	163	135	163	135	163
Days fed finishing ration	33	33	33	33	33	33
Final wt. av. lb						
140 days	942	966	968	962	1008	980
168 days	996	1013	1008	1008	1032	1019
196 days*	1022	1038	1056	1046	1070	1068
Av. daily gain, lb.						
140 days	1.61	1.86	1.86	1.83	2.18	1.85
168 days	1.66	1.82	1.78	1.80	1.96	1.78
196 days	1.56	1.70	1.78	1.73	1.88	1.77
Av. daily conc., lb.						
140 days	4.7	5.1	6.2	6.6	7.6	8.0
168 days	5.1	5.4	6.6	7.0	8.0	8.4
196 days	6.3	6.6	7.6	7.9	8.8	9.1
Av. daily hay, lb.						
140 days	16.2	15.6	14.3	13.9	13.3	13.4
168 days	15.5	14.9	13.7	13.6	13.0	12.7
196 days	13.5	13.2	12.2	12.2	11.7	11.4
Av. daily silage, lb.						
Last 33 days	14.7	14.7	14.7	14.7	14.7	14.7
Feed per 100 lb. gain, lb.						
140 days	1297	1115	1105	1124	959	1152
168 days	1262	1136	1161	1164	1093	1309
196 days	1417	1313	1252	1304	1224	1296

* Weights after 20 hours without feed.
**One steer in Lot 5 swallowed pieces of wire which caused him to refuse to eat. A magnet was placed in the rumen with a balling gun. He recovered and continued to gain. The magnet was recovered from the rumen at the time of slaughter. The pieces of wire attached to the magnet was partially dissolved.

true value because of weighing conditions. The initial weights were taken after the steers were allowed all the alfalfa hay they would eat. The final weights were taken at the end of 196 days of feeding when the steers were deprived of feed for a period of 20 hours but were allowed all the water they cared to consume. The last feed allowance was at 8 o'clock of the morning 24 hours prior to the final weighing. However, the relative differences in gains are sufficiently accurate for the rations studied.

The most rapid gains were made by the steers of Lot 5. They were fed 10 pounds of the concentrate mixture daily during the intermediate period of 135 days. These steers were fed a daily allowance of 13.6 pounds of the concentrate mixture with 14.7 pounds corn silage and alfalfa hay during the last 33 days. The ratio of concentrate to roughage consumed by this group was 1:1.5 (hay basis).

The data on the monetary returns are presented in Table 10. The differences in carcass values ranged from 2 to 30 cents per 100 pounds. Factors, other than the feeding treatment, such as individ-

Table 7.—Average feed intake by feeds and periods.

Period	Period	Alfalfa hay	Corn silage	Concentrate mixture	Total
No.	days	lb.	lb.	lb.	lb.
	Lot 1				
1	28	23.4	—	—	23.4
2	28	12.9	—	5.7	18.6
3	28	16.0	—	6.0	22.0
4	28	17.3	—	6.0	23.3
5	28	11.4	—	6.0	17.4
6	28	12.1	14.7*	6.8	21.4
7	28	1.8	14.7	13.6	30.1
	Lot 2				
1	28	22.7	—	2.0	24.7
2	28	15.0	—	5.7	20.7
3	28	15.8	—	6.0	21.8
4	28	12.3	—	6.0	18.3
5	28	12.1	—	6.0	18.1
6	28	11.4	14.7*	6.9	20.8
7	28	3.2	14.7	13.6	31.5
	Lot 3				
1	28	23.4	—	—	23.4
2	28	12.7	—	7.2	19.9
3	28	14.7	—	8.0	22.7
4	28	9.4	—	8.0	17.4
5	28	11.2	—	8.0	19.2
6	28	10.6	14.7*	8.5	21.6
7	28	3.0	14.7	13.6	31.4
	Lot 4				
1	28	22.1	—	2.0	24.1
2	28	15.3	—	7.2	22.5
3	28	13.4	—	8.0	21.4
4	28	13.9	—	8.0	21.9
5	28	11.9	—	8.0	19.9
6	28	12.0	14.7*	8.5	23.0
7	28	4.2	14.7	13.6	32.5
	Lot 5				
1	28	22.8	—	—	22.8
2	28	14.2	—	8.0	22.1
3	28	12.4	—	10.0	22.4
4	28	9.4	—	10.0	19.4
5	28	7.8	—	10.0	17.8
6	28	11.3	14.7*	10.3	24.1
7	28	3.8	14.7	13.7	32.2
	Lot 6				
1	28	23.0	—	2.0	25.0
2	28	12.7	—	7.9	20.4
3	28	13.4	—	10.0	23.6
4	28	10.6	—	10.0	20.6
5	28	7.2	—	10.0	17.2
6	28	9.3	14.7*	10.3	22.1
7	28	3.4	14.7	13.7	31.8

* Fed during the last 5 days of the period.

ual steer performances, conformation and ability to gain contributed in part to these differences.

The greatest net return was made by those steers of Lot 2, fed 2 pounds of the concentrate mixture with alfalfa hay during the first 28 days. The steers consumed 6 pounds of the concentrate mixture during the next 135 days, and 13.6 pounds of the concentrate mixture during the last 33 days. These steers consumed a ratio of 1 part concentrate to 2.1 parts of roughage (hay basis) for 196 days. The steers of Lot 2 had the highest carcass value of $44.22 and the lowest feed cost per 100 pounds gain. The lowest net return was made by the steers of Lot 6. These steers were fed the same as Lot 3, except they received 10 pounds of the concentrate mixture, during the intermediate 135 days interval.

The difference in the monetary values of the carcasses, feed costs per 100 pounds gain, carcass grades at the end of the 196 days of feeding, and the market grades at the end of 140 days feeding of Lots 2, 3, 4, and 5 were not greatly different. (Table 8).

The steers in Lot 2 made the most rapid gains and had the highest cold carcass dressing percent.

The most rapid gains were made by the steers (Lot 5) that had received only alfalfa hay for the first 28 days. They were fed 13.7 pounds of the concentrate mixture and 14.7 pounds of corn silage with all the alfalfa hay they would consume the last 33 days. These steers consumed 1 part concentrate and 1.4 parts roughage (hay basis).

The slowest gains were made by the group of steers (Lot 1) fed 6 pounds of the concentrate mixture 135 days after being fed only alfalfa hay the first 28 days. These steers consumed 1 part concentrate to 2.2 parts roughage (hay basis).

CARCASS OBSERVATIONS

All steers were slaughtered after a 20-hour fast with access to water. The carcasses were "ribbed" after being in the cooler 24 hours, and grades were determined at the time of the "ribbing" by a government grader. The carcass grades and dressing percentages are shown in Table 9.

Table 8.—Market grades after 140 days of feeding

Lot No.	Choice	Good			Standard
	Low	High	Medium	Low	High
		Number per lot			
1	2	1	4	1	2
2	1	2	4	3	
3	1	5	3	1	
4		3	3	4	
5	4	1	3	2	
6	1	3	3	2	1

Table 9.—Carcass grades and cold dressing percentages at the end of the feeding test after being fed 13.6 lb. of concentrate the last 33 days

Lot No.	Choice			Good			Standard	Dressing
	High	Medium	Low	High	Medium	Low	High	percentage
	Number per lot							
1	4	1	-	3	-	1	1	57.8
2	1	3	1	4	1	-	-	58.2
3	2	2	1	4	1	-	-	57.7
4	2	1	1	5	1	-	-	57.1
5	2	3	1	3	1	-	-	57.6
6	2	1	1	5	1	-	-	55.7

Table 10.—Monetary evaluations of carcasses, live weights, gains and net returns

Lot No.	Carcass (1) value per 100 lb.	Live wt. value (2) per 100 lb.	Feed costs per 100 lb.	Total cost of gains per steer	Net return per steer
	Dollars	Dollars	Dollars	Dollars	Dollars
1	43.75	25.50	18.79	57.50	62.91
2	44.22	25.75	17.59	58.40	67.68
3	44.10	25.46	17.74	61.74	65.51
4	43.92	25.12	18.64	57.50	65.05
5	44.12	25.50	18.22	67.05	65.93
6	43.98	24.49	19.56	68.07	49.46

(1) Cold carcass weights.
(2) Value at feed pens.

SUMMARY OF TEST 4 (1957-58

The most rapid gains were made by the steers fed only alfalfa hay for 28 days and 10 pounds of the concentrate mixture during the intermediate period of 135 days. These steers had the highest market grade at the end of 140 days of feeding.

The slowest gains were made by those steers fed only alfalfa hay for 28 days and 6 pounds of the concentrate mixture for 135 days.

The highest carcass value, cheapest gains, and the greatest net returns were made by the steers fed 2 pounds of the concentrate mixture with alfalfa hay for the first 28 days. These steers were fed 6 pounds of the concentrate mixture with the alfalfa hay during the intermediate period of 135 days, and 13.6 pounds of the concentrate mixture with the roughage during the last 33 days.

Feeding a low concentrate mixture allowance during the early part of the feeding period tended to increase the carcass quality in all ration treatments.