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Acre Yields of Beef from Corn and Meadow Crops

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ACRE YIELDS OF BEEF FROM CORN AND MEADOW CROPS

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INTRODUCTION AND REVIEW OF PREVIOUS WORK CONDUCTED AT THIS STATION²

Profitable cattle feeding is dependent upon wise marketing, careful management, and adequate but economical rations. A great variety of rations can be fed, dependent upon the feeds available, the grade of finished cattle desired and the length of feeding period best adapted to a particular farm. Although rate of gain and finished grade are of great importance, the final answer to a profitable feeding enterprise is a combination of these factors with the pounds of beef produced per acre of cropland utilized.

Corn silage has been used extensively in beef cattle feeding since about 1910. Because of its palatability and high yield of nutrients per acre, a liberal use of corn silage generally lowers the cost of beef production.

During the past 40 years a great many experiments have been conducted by numerous experiment stations to determine the value of silage for cattle feeding. No attempt will be made here to review all of these results. Only the experiments conducted with feeder cattle at the Ohio Agricultural Experiment Station will be discussed.

Yearling and two-year old steers were fed at this Station during the winter feeding season of 1921-22 to compare these ages of cattle when fed corn silage, 2.5 pounds of linseed meal per head daily, mixed hay, and varying amounts of corn grain. A very satisfactory gain of 2.40 pounds per head daily was made by two-year old steers when fed silage, hay, and supplement with no corn. However, their gains were more rapid and the steers were more profitable when they were either full fed corn or given a half full feed of corn with hay, supplement, and all the corn silage they would eat. Likewise, yearling steers made

¹Supervision and technical assistance of H. W. Rogers, farm manager of the Madison County Farm, are herewith gratefully acknowledged.

²These experiments were initiated by the late Prof. Paul Gerlaugh.

greater returns when full fed corn with silage than when fed a half feed of corn. Either lot of steers fed silage, however, was more profitable than a lot full fed corn, hay, stover, and no silage. Yearling steers were more profitable even though they required a larger proportion of corn in their corn and silage ration for most economical results.

An experiment was conducted in 1922-23 to compare calves, yearlings, and two year old steers when full fed or half full fed corn grain with corn silage, mixed hay, and 2.0 pounds linseed meal daily per head. In all ages of steers, a full feed of corn produced faster gains and a higher finish. Even though the feed costs per unit of gain were lower for the younger steers and, on the average, for the steers fed a half feed of corn, the greatest returns were made by the full corn-fed cattle because of a market demand at that time for heavy weight, well-finished cattle.

Experiments were initiated in 1928 at the Madison County Experiment Farm in conjunction with the Ohio Agricultural Experiment Station to study the pounds of beef and dollars returned per acre of cropland when the feeds produced were fed to fattening cattle. The experiment conducted during the feeding season of 1928-29 compared the pounds of beef produced per acre of corn when fed as corn silage or as shelled corn and corn stover. Yearling steers were fed either corn silage or shelled corn and corn stover with a small amount of mixed hay and 2.0 pounds of cottonseed oil meal per head daily. An acre of corn fed as silage produced more than twice as many steer days of feed as a similar acre fed as grain and stover. The silage fed cattle gained at a somewhat slower rate so that the pounds of gain produced per acre were 791 for these steers as compared to 439 for the dry-fed cattle. The cattle finished on silage had a lower market value. When results were based on dollars returned, an acre of corn fed as silage returned \$71.65, while a similar acre of corn fed as the grain and stover returned \$50.80.

The experiment conducted during 1929-30 compared the returns per acre of a lot of yearling steers fed corn silage with a lot fed one-half as much silage and all of the shelled corn they would eat. The steers in both groups were again fed mixed hay and 2.0 pounds of cottonseed oil meal. In this experiment an acre of corn fed as silage returned 712 pounds of beef or \$56.66 as compared to a return of 515 pounds of beef or \$57.06 from a similar acre fed as silage and shelled corn. The full silage fed cattle gained at a somewhat slower rate and sold for slightly less per hundredweight.

The third experiment conducted at the Madison County Farm in 1930-31 was concerned with the question of whether or not a protein supplement was needed in a ration for yearling steers fattened on corn

silage. Two lots of cattle were fed corn silage and sweet clover hay. One lot was fed 2.0 pounds of cottonseed oil meal and the other, 2.0 pounds of shelled corn daily per head. The cottonseed oil meal was a very good investment in this experiment. The steers fed this supplement gained at the excellent rate of 2.47 pounds per head daily as compared to 2.06 pounds for steers fed shelled corn. The cottonseed oil meal fed cattle returned \$22.15 and those fed corn, \$16.50 per acre of corn fed.

Ground shock corn, stalks and ears, was compared to corn silage in 1931-32. In this experiment the labor and equipment costs necessary to handle the corn from the standing corn in the field until it was in the form fed to the steers was determined. With these considerations, yearling steers fed corn silage returned a net profit of \$21.95 per acre of corn fed. Similar steers fed ground shock corn produced a net loss of \$1.79 per acre. Not only were the labor and equipment costs much higher in the preparation of ground shock corn but the cattle fed this feed gained at a somewhat slower rate than those fed silage.

An experiment conducted during the feeding season of 1932-33 showed that the substitution of ground oats in the place of one-half a full feed of corn silage materially reduced the pounds of beef produced per acre of crops fed.

Yearling steers and steer calves were fed at the Madison County Farm in 1935-36 to compare ground ear corn and stover to ground ear corn and corn silage. Both ages of steers produced more pounds of beef per acre when fed the silage and calves produced more than yearlings. The pounds of beef produced per acre were as follows: Silage-fed yearlings, 530 pounds; dry-fed yearlings, 343 pounds; silage-fed calves, 715 pounds; and dry-fed calves, 459 pounds. In this experiment the market appraisal of the two lots of calves was the same and the appraisal of the dry-fed yearlings was only \$0.10 per hundredweight higher than those fed silage.

The silage feeding investigations conducted during 1936-37 were concerned with the amount of protein supplement required by yearling steers on a heavy silage ration. Two lots of steers were full fed corn silage and legume hay. One lot was fed 2.0 pounds per steer daily of a 46 percent protein supplement which consisted of two parts soybean oil meal, one part tankage, and one part cottonseed oil meal. The other lot was fed one pound of this supplement and one pound of ground shelled corn. The average daily gains of these two lots of steers were identical and the daily feed consumption and feed requirement per unit of gain nearly so. A previous experiment had shown that all of the protein supplement fed in such a ration could not profitably be replaced by ground shelled corn.

In an experiment designed to compare medium and late varieties of corn for silage, very little difference was found between the two in pounds of beef or dollars returned per acre of corn and hay fed. Both types of silage were more profitable on an acre basis than feeding the medium maturing corn as corn and cob meal.

Mature corn silage, immature corn silage, and corn and cob meal were compared at the Madison County Farm in 1941-42. The pounds of beef and dollars returned per acre of corn and hay fed were as follows: Mature corn silage, 698 pounds and \$96.59; immature corn silage, 567 pounds and \$73.11; and corn and cob meal, 452 pounds and \$63.84.

These corn silage feeding investigations conducted by the Ohio Agricultural Experiment Station are in general agreement with those conducted at other stations. When properly supplemented, corn silage is an excellent feed for fattening cattle and ranks at the top of all cattle feeds when based on pounds of beef produced per acre.

OBJECTIVES

The experiments which have been reviewed show that maximum yields of beef per acre were obtained when cattle were full fed corn silage, mixed hay, and protein supplement with no additional grain. However, when such a ration is fed a much larger acreage of corn is consumed than the acres of hay consumed. If other livestock are not kept to utilize additional meadow crops, such a ratio of corn to hay is not considered practical on many farms for soil management and conservation reasons. For this reason, a series of experiments were begun in 1950 to study the value of meadow crops in rations for fattening cattle. The objectives of these experiments were:

- 1) To compare the amount of gain from an acre of hay fed as hay-crop silage with an acre of corn fed as corn silage.
- 2) To compare the amount of gain obtained by grazing a field in rotation pasture to the gain obtained from a similar area fed as hay-crop silage.
- 3) To compare the amount of gain from an acre of corn fed as corn silage to an acre of corn fed as ground ear corn.

PROCEDURE AND RESULTS

The research presented here was conducted during the four year period of 1950-54. Yearling feeder steers were purchased in the fall and fed the hay-crop silage, corn silage, and ground ear corn rations during the winter feeding season. Steer calves were also purchased in

the fall, were wintered to gain about one pound per head daily and were then used to measure the value of pasture the following spring and summer.

The yields of all crops produced on the farm and fed to the cattle were obtained. In addition, the acreage of pasture utilized by the cattle fed in the summer was recorded. This information was then used to determine the pounds of beef produced per acre by the various groups of cattle. In calculating the area of land required to produce the soybean oil meal fed to the cattle, soybeans were calculated to produce 82 percent soybean oil meal. The yields of crops obtained during the four years in which these experiments were conducted and the feed prices used in calculating feed costs per hundredweight of gain are listed in Table 1.

TABLE 1.—Yields per Acre of Crops Fed and Feed Prices Used

Year	Hay	Hay-crop silage	Corn silage	Ear corn	Soybeans	Soybean oil meal
Yields per acre	Ton	Ton	Ton	Bu.	Bu.	Ton
1950	2.0	7.8	16.8	99.6	30.0	
1951	2.5	7.7	11.8	65.0	25.0	
1952	2.5	7.5	11.5	69.0	25.0	
1953	2.5	7.5	10.0	60.0	25.0	
Feed prices						
1950-51	\$25.00	\$9.00	\$12.00	\$1.50		\$ 85.00
1951-52	25.00	9.00	12.00	1.75		100.00
1952-53	25.00	9.00	10.50	1.75		95.00
1953-54	25.00	8.00	10.00	1.50		80.00

The meadow crop used for pasture, hay, and silage in these experiments was a mixture of alfalfa, clover, brome, and timothy. The hay crop silage was wilted silage made without a preservative. The hay-crop silage fed in 1952-53 contained 71.7 percent moisture and 3.6 percent crude protein. That fed in 1953-54 contained 73.5 percent moisture and 4.7 percent crude protein.

The cattle fed in these experiments were choice quality feeder steers purchased on the Kansas City market. They were fed in barns with access to outdoor lots and were individually branded and weighed. At the end of the experiments the steers were slaughtered at local packing plants where carcass grades and dressing percentages were obtained for each lot.

CATTLE FED IN DRY LOT

1950-1951 EXPERIMENT

In the first year's experiment, 21 yearling steers were fed hay-crop silage, 10 a full feed of ground ear corn, and 10 a full feed of corn silage. Mixed hay of good quality was fed to all three lots. The 21 steers were fed hay-crop silage and no grain from October 3, 1950, until February 6, 1951. During this 126 day period they gained at the rate of 1.66 pounds per head daily. For the last 70 day period they were fed an average of 8.0 pounds of ground ear corn and gained 1.60 pounds daily per head. The steers in the other two lots were full fed either ground ear corn or corn silage for the entire experimental period. The average daily feed consumption of the various lots of cattle and the results obtained in this experiment are presented in Table 2.

TABLE 2.—Returns per Acre from Hay-crop Silage, Corn Silage, and Corn and Cob Meal

1950-1951 Experiment

	Lot 1 Hay-crop silage	Lot 2 Corn and cob meal	Lot 3 Corn silage
Number steers in lot	21	10	10
Average weight, October 3, 1950	660	663	660
Average weight, April 17, 1951	981	1071	1020
Average daily gain, 196 ⁴ days	1.64	2.08	1.84
Average daily ration, 196 days, lb.:			
Hay-crop silage	44.3		
Corn silage			42.9
Corn and cob meal (Lot 1, 70 days)*	8.0	15.9	
Soybean oil meal		1.5	1.5
Mixed hay	3.6	4.1	3.4
Feed per cwt. of gain, lb.:			
Hay-crop silage	2708.0		
Corn silage			2336.0
Corn and cob meal	174.0	763.0	
Soybean oil meal		72.0	81.0
Hay	218.0	197.0	184.0
Cost per cwt. of gain	\$18.65	\$21.87	\$19.76
Selling price per cwt.	\$34.20	\$36.65	\$34.95
Gain per acre	334.0	511.0	571.0
Dressing percentage	59.2	62.0	58.3
Carcass grades:			
Choice	2	9	5
Good	11	1	3
Commercial	8		2

*Corn and cob meal fed to Lot 1 from February 6 to April 17.

It will be noted in Table 2 that the cheapest gains, considering the feed prices used, were made by the cattle fed the hay-crop silage. However, they produced considerably less gain per acre than the other two lots and sold for the lowest price. The corn silage fed lot returned the most pounds of beef per acre but sold for \$1.70 per hundredweight less than those fed ground ear corn. Thus there was little difference in this year's experiment in dollar returns per acre whether the corn crop was fed as ground ear corn or as corn silage.

1951-1952 EXPERIMENT

In this experiment two lots of 10 steers were fed hay-crop silage. Lot 1 was fed 9.5 pounds of ground ear corn for the last 95 days on feed. Lot 2 was fed a similar total amount of corn but was fed 5.0 pounds of ground ear corn for 186 days. Lots of 10 steers each were again full fed ground ear corn and corn silage. The results of this experiment are given in Table 3.

TABLE 3.—Returns per Acre from Hay-crop Silage, Corn Silage, and Corn and Cob Meal
1951-1952 Experiment

	Lot 1	Lot 2	Lot 3	Lot 4
	Hay-crop silage	Hay-crop silage	Corn and cob meal	Corn silage
Number steers in lot	10	10	10	10
Average weight, October 12, 1951	606.0	599.0	606.0	602.0
Average weight, May 20, 1952	965.0	935.0	1058.0	1000.0
Average daily gain, 221 days	1.62	1.52	2.05	1.80
Average daily ration, lb.:				
Hay-crop silage	38.0	38.0		
Corn silage				40.0
Corn and cob meal*	(95 day)	(186 day)		
Soybean oil meal	9.5	5.0	15.6	
Hay	2.7	2.7	3.8	2.3
Feed required per cwt. gain, lb.:				
Hay-crop silage	2339.0	2488.0		
Corn silage				2230.0
Corn and cob meal	251.0	277.0	761.0	
Soybean oil meal			71.0	81.0
Hay	164.0	176.0	184.0	129.0
Feed cost per cwt. of gain	\$18.87	\$20.33	\$24.88	\$19.04
Gain per acre, lb.	417.0	388.0	398.0	575.0
Dressing percentage	57.0	54.8	60.8	58.8
Carcass grades:				
Prime			4	
Choice	3	1	6	8
Good	7	8		2
Commercial		1		

*Corn and cob meal fed to Lot 1 from February 15 to May 20, and to Lot 2 from November 16 to May 20.

Superior results with hay-crop silage were obtained in this experiment when the larger amount of ground ear corn was fed during the latter part of the feeding period. Steers fed 9.5 pounds of ground ear corn for the last 95 days produced an average overall daily gain of 0.10 pound more than those fed 5.0 pounds of ground ear corn for the 186 days. They also produced gains at lower cost, yielded a higher dressing percentage and produced a higher proportion of carcasses grading choice.

The inadequacy of hay-crop silage as the only feed for fattening cattle was clearly shown in this experiment. The cattle in Lot 1 made a very satisfactory gain of 2.31 pounds per head daily for the first 28 days on hay-crop silage. For the next 8 weeks, however, they gained only 0.43 pound per head daily and during two 28 day periods gained only 0.14 pound. When ground ear corn was added to this ration the steers gained 2.23 pounds per head daily for the 95 day period in which it was fed.

The cattle full fed corn silage in this experiment yielded a 2.0 percent lower dressing percentage than the full ground ear corn fed steers and their carcasses graded lower. Those fed silage, however, produced a hundred pounds of gain for \$5.84 less and returned 177 pounds more beef per acre than those fed ground ear corn.

1952-1953 EXPERIMENT

This year's investigation was changed slightly from the two previous years in that no cattle were fed corn silage without additional corn grain. One lot of 10 steers, Lot 2, was full fed ground ear corn. Another lot of cattle, Lot 1, was fed one-half as much ground ear corn and all of the corn silage they would eat. Both of these lots were fed 1.5 pounds of soybean oil meal per head daily. Lot 3 was fed one-half the amount of ground ear corn fed to Lot 2 and a full feed of hay-crop silage without additional supplement. A fourth lot of 10 steers was fed hay-crop silage and no corn and cob meal for the first two months. After this time they were started on ground ear corn, which was increased to a full feed by the end of the feeding period. Lots 3 and 4 were thus fed approximately the same total amount of ground ear corn. The results of this experiment are presented in Table 4.

The fastest gaining lot of cattle in this experiment was the one fed a half feed of ground ear corn with corn silage. These steers also returned the most beef per acre and sold for only \$0.25 per hundred-weight less than those full fed ground ear corn whose costs of gain were \$4.36 per hundredweight higher.

**TABLE 4.—Returns per Acre from Hay-crop Silage, Corn Silage, and Corn and Cob Meal
1952–1953 Experiment**

	Lot 1 Half feed corn and cob meal, corn silage	Lot 2 Corn and cob meal	Lot 3 Half feed corn and cob meal, hay-crop silage	Lot 4 Hay-crop silage, corn and cob meal after two months
Number steers in lot	10	10	10	10
Average weight, October 21, 1952	670.0	667.5	672.0	677.0
Average weight, May 19, 1953	1158.5	1140.0	1094.5	1074.0
Average daily gain, 210 days	2.33	2.25	2.01	1.89
Average daily ration, lb.:				
Corn and cob meal	8.2	16.4	8.2	8.3
Soybean oil meal	1.5	1.5		
Hay	3.1	3.7	3.4	3.4
Corn silage	24.7			
Hay-crop silage			28.1	29.8
Feed required per cwt. gain, lb.:				
Corn and cob meal	354.0	731.0	409.0	438.0
Soybean oil meal	63.0	65.0		
Hay	132.0	165.0	168.0	179.0
Corn silage	1062.0			
Hay-crop silage			1399.0	1574.0
Feed cost per cwt. of gain	\$19.07	\$23.43	\$18.63	\$20.27
Selling price per cwt.	\$22.75	\$23.00	\$22.08	\$22.16
Total corn fed per steer, bu.	24.7	49.3	24.7	24.8
Gain per acre, lb.	526.0	435.0	476.0	435.0
Dressing percentage	61.7	63.3	61.2	60.9
Carcass grades:				
Prime	1	6		
Choice +	9	4	6	5
Choice			1	1
Choice —			3	4

The steers fed hay-crop silage and a half feed of ground ear corn throughout the experiment gained slightly faster and at a lower cost than those started without grain and ending on a full feed. However, these two lots of cattle sold for nearly the same price, yielded about the same proportion of dressed carcass and carcasses of similar grade. There was, therefore, little real difference between these two lots of cattle.

1953-1954 EXPERIMENT

The first three lots of cattle in the 1953-54 experiment were fed the same rations as those fed in the previous year. Since a question of the value of feeding a protein supplement with a half feed of ground ear corn and hay crop silage had been asked locally, the fourth group of steers were fed 1.5 pounds of soybean oil meal per head daily. This amount of soybean oil meal replaced an equal amount of ground ear corn so that the energy content of the two rations remained similar. The results obtained are presented in Table 5.

TABLE 5.—Returns per Acre from Hay-crop Silage, Corn Silage, and Corn and Cob Meal
1953-1954 Experiment

	Lot 1 Half feed corn and cob meal, corn silage	Lot 2 Corn and cob meal	Lot 3 Half feed corn and cob meal, hay-crop silage	Lot 4 Same as Lot 3 with soybean oil meal
Number steers in lot	10	10	10	10
Average initial weight, October 20, 1953	685.0	686.0	688.0	685.0
Average final weight, May 1, 1954	1098.0	1096.0	1043.0	1067.0
Average daily gain, 193 days, lb.	2.14	2.12	1.84	1.98
Average daily ration, lb.:				
Corn and cob meal	7.7	15.5	7.7	6.3
Soybean oil meal	1.5	1.5		1.5
Corn silage	25.0			
Hay-crop silage			30.7	30.7
Hay	2.2	3.5	3.1	3.1
Feed required per cwt. gain, lb.:				
Corn and cob meal	362.0	730.0	421.0	316.0
Soybean oil meal	69.0	70.0		75.0
Corn silage	1183.0			
Hay-crop			1668.0	1551.0
Hay	103.0	166.0	170.0	158.0
Feed cost per cwt. of gain	\$17.73	\$20.52	\$17.82	\$17.95
Selling price per cwt.	\$24.25	\$25.00	\$22.25	\$22.50
Pounds of beef produced per acre	490.0	408.0	409.0	398.0
Dressing percentage	61.0	61.1	58.3	59.2
Carcass grades:				
Choice +	5	5	1	3
Choice	5	1	6	4
Choice —		4	1	2
Good +			1	
Good			1	1

As noted in Table 5, the production obtained from the steers in Lot 1 fed one-half feed of ground ear corn with corn silage was very similar to those full fed ground ear corn and no silage. There was very little difference between these two lots in rate of gain, carcass yield or carcass grade. The steers in Lot 2 sold for \$0.75 more per hundred-weight than those fed silage, a difference which was not reflected in dressing percentage or carcass grade. With the feed prices used, the corn silage fed cattle produced a hundred pounds of gain for \$2.79 less than those fed no silage and produced 82 pounds more beef per acre.

Lots 3 and 4 were used to compare the value of feeding 1.5 pounds soybean oil meal in place of an equal weight of ground ear corn when fed with hay-crop silage. The results contained in Table 5 show some slight advantage in rate of gain, selling price, and dressing percentage for the cattle in Lot 4 which were fed the soybean oil meal. However, their feed costs were slightly higher and the pounds of beef produced per acre slightly lower. There was no appreciable difference in carcass grades between the two lots.

As has been mentioned, the steers in Lot 4, which were fed soybean oil meal, gained 0.14 pound per head daily faster than those fed the same hay-crop silage ration without soybean oil meal, Lot 3. Much of the difference in gain between these two lots occurred in one two-week period. For some unexplainable reason the steers in Lot 4 gained 0.96 pound per head daily faster than those in Lot 3 during the second two-week period of the experiment. During the remaining 170 days on experiment the gains of the two lots were very similar. It is therefore doubtful if the soybean oil meal was the main contributing factor in the difference in average daily gain which occurred between these two lots.

CATTLE FED ON PASTURE

During each of four years, groups of steer calves were purchased in the fall, wintered to gain 1.00 to 1.25 pounds per head daily, and then used to measure the pounds of beef produced per acre from pasture. These calves were fed corn silage, mixed hay, and a limited amount of soybean oil meal during the wintering period. They were grazed on pasture, without additional feed, for about two months and then fed ground ear corn on pasture. Some soybean oil meal and hay were also fed on pasture, the amounts depending upon the quality and amount of pasture feed available. In calculating the amount of beef produced per acre, the area of land required to produce the corn and soybean oil meal fed was included. The hay fed on pasture was harvested from the pasture area during the early part of the season when

an excess of forage was produced. The gains made and feeds fed during the wintering period were not included in the determination of the pounds of beef produced per acre. The results of these pasture investigations are presented in Table 6.

Due to lingering difficulties from shipping fever in the group of calves shipped to the farm in the fall of 1951, no feed or weight records were kept during the wintering period. These cattle appeared to be in normal health, however, when turned to pasture in the spring and made quite satisfactory summer gains.

TABLE 6.—Returns per Acre from Pasture—Results of Four Experiments

	1949-1950	1950-1951	1951-1952	1952-1953
Number of steers fed	21	20/19*	19†	24
Wintering Period:				
Days in period	187	157		168
Initial weight, lb.	457.0	615.0		526.0
Final weight, lb.	682.0	808.0		694.0
Average daily gain, lb.	1.20	1.22		1.00
Average daily ration, lb.:				
Corn silage	24.0	28.3		20.2
Mixed hay	3.2	6.2		4.3
Soybean oil meal	0.5	0.41		0.16
Pasture Period:				
Days in period	58	70	73	58
Initial weight, lb.	682.0	808.0	572.0	694.0
Final weight, lb.	807.0	910.0	717.0	816.0
Average daily gain, lb.	2.15	1.49	1.98	2.10
Fed on Pasture Period:				
Days in period	68	74	105	86
Initial weight, lb.	807.0	910.0	717.0	816.0
Final weight, lb.	972.0	1067.0	950.0	1013.0
Average daily gain, lb.	2.44	2.12	2.22	2.29
Average daily ration, lb.:				
Corn and cob meal	8.0	8.4	10.6	9.8
Soybean oil meal	0.37	0.40	0.36	0.37
Mixed hay	4.7	2.6	2.8	1.1
Selling price per cwt.	\$28.25	\$35.55	\$30.25	\$21.35
Dressing percentage	56.5	57.4		56.6
Carcass grades	8 good 13 comm.	15 choice 4 good		1 choice 18 good 5 comm.
Pounds of beef produced per acre when grazed and fed on pasture	382.0	302.0	400.0	386.0

*One steer killed by lightning June 28, 1951.

†Considerable difficulty from shipping fever was encountered in the group of calves fed during the fall and winter of 1951-52. For this reason, weight and feed records were not obtained during the wintering period.

The data presented in Table 6 show quite uniform results in rates of gain and pounds of beef produced per acre in three of the four experiments. The steers fed on pasture in the summer of 1951 were heavier than those fed in the other three years and gained somewhat slower, especially during the period when grazed without grain. This particular group of cattle also produced considerably less beef per acre than that obtained in the other three years.

The average pounds of beef produced per acre for three years, exclusive of 1951, was 389 pounds. The average for all four groups of cattle fed on pasture was 368 pounds of beef per acre of pasture and other feeds fed.

Cattle marketed off pasture may sell at a disadvantage to those marketed from dry lot. However, because of some differences in finished grade, the wide fluctuation which occurred in the cattle market during the four year period in which these experiments were conducted and since cattle were sold at different times during the year it is difficult to make such a comparison from these experiments.

DISCUSSION

The results of the four experiments presented are in agreement with previous experiments relative to the value of corn silage for fattening yearling steers. The highest yield of beef per acre of corn is obtained when the entire corn crop is fed as corn silage. In two experiments in which steers were fed corn silage and protein supplement without additional grain, an average of 573 pounds of beef were produced per acre. When a half feed of ground ear corn was fed with corn silage in two other experiments, the average acre yield of beef was 508 pounds. A full feed of ground ear corn was fed without corn silage in four experiments in which the average pounds of beef produced was 438 pounds per acre.

Although the total weight of beef produced from an area of corn is greatest when it is fed as silage, cattle fed on silage alone are not as well finished as when some additional grain is fed. In these experiments all of the cattle fed in dry lot were marketed at the same time. Under these conditions, the cattle fattened on silage alone graded somewhat lower than those fed corn and cob meal. There was considerably less difference in carcass grades when a half feed of ground ear corn was fed with the corn silage. In one experiment, 1953-54, the steers fed corn silage and a half feed of corn and cob meal yielded fully as high a proportion of dressed beef which graded slightly higher than those full fed ground ear corn.

In all comparisons, with the feed prices used, the steers fed corn silage produced gains at lower costs than those fed ground ear corn without silage. On the average, the feed costs per hundred pounds of gain varied directly with the amount of ground ear corn fed.

Such factors as weight, age and grade of feeders and length of feeding period should be considered in deciding what proportion of corn silage to feed. Older, heavier cattle will fatten to a higher grade on corn silage alone than will younger cattle. Lower grades of feeder cattle which are not suited for finishing to the top market may make more profitable use of a heavy feed of corn silage than top quality feeders which can be profitably fed to the higher grades. When a high proportion of silage is fed to cattle of similar age, weight and quality, a longer feeding period will be required to reach a given market grade. With these considerations, a liberal amount of corn silage will generally be a profitable addition to most cattle fattening rations.

Hay-crop silage made without the addition of a preservative does not contain the grain which is found in well-eared corn silage. For this reason, hay-crop silage as the only feed for fattening cattle is not as satisfactory as corn silage. Hay-crop silage does have the advantage, however, in that it is a richer source of protein. In these experiments, hay-crop silage was fed with different amounts of ground ear corn for varying periods. The results show that it is necessary to feed approximately a half feed, about 8 pounds per head daily, of ground ear corn to yearling steers with hay-crop silage to fatten them to a similar grade as those fed corn silage, protein supplement, and no grain. A total of seven lots of steers were fed hay-crop silage in these four experiments. The average pounds of beef produced per acre by these seven lots was 408 pounds.

In the 1952-53 and 1953-54 experiments, two lots of steers were fed a half feed of ground ear corn with hay-crop silage. The average production of these four lots was 430 pounds of beef per acre as compared to 508 pounds produced by cattle fed the same amount of corn and cob meal with corn silage and a protein supplement. In addition to a smaller yield of beef per acre, the cattle fed hay-crop silage were not as well finished and had a lower dressing percentage when slaughtered.

The 430 pounds of beef produced per acre by steers fed hay-crop silage and a half feed of ground ear corn was very similar to the 438 pounds produced by the full ground ear corn fed steers. Here again, however, there was considerable difference in carcass grade and dressing percentage in favor of the steers fed the larger amount of grain.

These experiments show that yearling steers can be satisfactorily fattened to a grade of choice on hay-crop silage and about 8 pounds of

ground ear corn per head daily. With the price of hay-crop silage used, which was based on the market value of hay, gains on this ration have been economical. These experiments show little difference in results whether this amount of grain is fed for the entire period or is limited at the start and fed in larger amounts near the end of the feeding period. The results of only one experiment conducted are not conclusive but indicate that the addition of a protein supplement to such a ration is of questionable value.

Steers which were wintered, grazed and then fed grain on pasture returned 368 pounds of beef per acre for an average of four experiments. This production does not include the feeds fed or the gains made during the wintering period. This yield of beef compares with 408 pounds for all lots fed hay-crop silage or 430 pounds for four lots fed hay-crop silage and a half feed of corn.

The least amount of beef produced per acre in these experiments was by the cattle fed on pasture. It should be emphasized, however, that less labor and equipment costs are involved in feeding cattle on pasture than in feeding meadow crops from a silo in dry lot. A more detailed study of costs such as fencing, labor, silo, and other equipment costs would be necessary to determine whether pasture or hay-crop silage returned the most profit per acre of crop-land utilized.

These experiments show that corn, whether fed as silage, a combination of silage and grain or as corn and cob meal will return more pounds of beef and more dollars per acre than meadow crops, whether pastured or fed as silage. No measure is included, however, of the value of meadow crops for crop rotation and soil conservation measures. A long time experiment of yields and quality of beef produced by various crop rotation systems would give a more accurate measure of the value of corn and meadow crops for beef production. The value of certain desirable crop rotation systems for beef production could be closely estimated from crop yields per acre and the amounts of feed required per hundred pounds of gain as obtained on the various rations fed in these four experiments.

SUMMARY

Four experiments have been completed in which the pounds of beef produced per acre from corn silage, ground ear corn, hay-crop silage, and pasture were compared. The pounds of beef produced per acre were determined from the area of land required to produce all feeds fed to the cattle with soybeans calculated to contain 82 percent soybean oil meal. On this basis, the average results were as follows:

corn silage with soybean oil meal and no additional grain, 573 pounds; corn silage with soybean oil meal and a half feed of corn and cob meal, 508 pounds; a full feed of corn and cob meal with protein supplement and no silage, 438 pounds; all cattle fed hay-crop silage with varying amounts of corn and cob meal, 408 pounds; average of four lots fed hay-crop silage and a half feed of ground ear corn, 430 pounds; and cattle fed on pasture, 368 pounds of beef per acre.

The one figure of pounds of beef produced per acre does not give an accurate comparison of the value of the feeds fed, since all cattle were not fed to the same slaughter grade or market value. The carcass grades obtained are included in the table of results for each experiment.

These experiments show that when fed to yearling steers an acre of corn was superior to an acre of meadow crops in value of beef returned. Returns from corn were also increased when at least a part of the crop was fed as corn silage.

Without consideration of equipment and labor costs, hay-crop silage returned more beef per acre than a similar area utilized as pasture.

Yearling steers were fattened satisfactorily to high good or choice grade on hay-crop silage and a half feed of ground ear corn, about 8 pounds per head daily, without the addition of a protein supplement.

Although not equal to corn in value of beef produced per acre, the value of meadow crops for soil conservation and management practices should not be overlooked.

REFERENCES

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