FATTENING 2 YR. OLD steers

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PART I
EARLY EXPERIMENTS

During the early days of cattle feeding, steers usually were not fattened until after they were two years old. A survey made of Costs and Methods of Fattening Beef Cattle in the Corn Belt,* 1919-1923, revealed that 53 percent of the feeder cattle weighed between 751 and 1 000 pounds when purchased, and 14 percent weighed more than 1000 pounds. According to the survey, 67 percent of the cattle fattened in the Corn Belt were two years old or older at the outset compared with 24 percent of yearlings and 9 percent of calves. The most important cattle feeding section of Missouri was included in this survey, along with similar areas in Nebraska, Iowa, Illinois, and Indiana. Because two-year-old cattle dominated the feed lots within Missouri, cattle of this age were used for most of the early beef cattle experimental work at the Missouri Station.

Some of the more important results of these feeding tests were reported in Missouri Bulletins 90, 112, 149, 150, and 218, published during the period of 1911-1924. Because these publications have been out of print for some time and much of the work is still applicable to the production of older cattle, it has been deemed advisable to review briefly the important results of these earlier trials in addition to reporting later unpublished data.

REVIEW OF MISSOURI STATION RESULTS
1911-1924

Bulletin 90 (Part III) Fattening Two-Year-Old Cattle on Bluegrass Pasture—Supplemented Rations Compared with Corn Alone.

The following observations and conclusions were reported in Bulletin 90:

1. Cattle fed either linseed or cottonseed meal with corn gained appreciably more than those receiving only corn.
2. There was little difference between cottonseed and linseed meal when used as a supplement for corn during the entire feeding period.
3. Cattle fed corn alone for five months and corn and linseed for two additional months did as well as those receiving corn and linseed for the entire seven month period.
4. Regardless of ration fed, the gains made per month decreased materially as the feeding period progressed—in general, from about 3 ½ pounds per day to 1 ½ pounds or less. However, the better the ration, the less the decline. For example, the average daily gain for cattle fed corn alone was 0.69 pounds, compared with 1.50 pounds for cattle fed corn and linseed meal.
5. The amount of total feed consumed per day was, in all cases, greater when the corn was supplemented with a nitrogenous supplement.
6. The amount of feed, other than pasture, required to produce 100 pounds gain was in favor of the supplemented rations, although the differences were small, indicating that it might be advisable to limit the use of protein supplement at least until the latter part of the feeding period.

(Bulletin 112 Corn Silage for Fattening Two-Year-Old Steers.)

Objectives of the experiment were: (1) To obtain data concerning the relative value of clover hay and corn silage when each was used as the only roughage in a ration for fattening two-year-old steers. (2) To compare silage with shock corn when approximately equal quantities of dry matter were fed. (3) Ascertain the importance of feeding a dry roughage such as clover hay in addition to silage. (4) To study the value of a nitrogenous concentrate when fed in a ration where corn silage was added to a ration of corn and limited amounts of clover hay.

*USDA Technical Bulletin 23, December, 1927.

A ton of silage as used in this experiment was approximately equal to one-half ton of clover hay.

Estimated on the basis of net profit per steer, a ton of dry matter in the form of corn silage yielded 50.3 percent greater value than a ton of dry matter in the form of shock corn.

The addition of clover hay to a ration in which silage was used was decidedly profitable in this test.

It appears from the data given that fattening cattle which receive corn silage as the only roughage do not continue to do well for longer than 90 days.

One of the most conspicuous features of this test was the notable superiority of the ration in which a protein concentrate was used.

If the most extensive use is to be made of corn silage in fattening cattle it is desirable to feed some high protein concentrate in the ration.

Less shelled corn was required to fatten two-year-old steers when corn silage was included as a part of the ration.

A superior finish on cattle fattened for spring marketing was obtained from feeding silage as part of the ration. The lot which received a ration of shelled corn, linseed oil meal, corn silage and clover hay made maximum gains in live weight, produced the most economical gains, were the best finished and yielded the greatest profit per head.

(Bulletin 149 Preparation of Corn for Fattening Steers.)

Ninety head of two-year-old steers were fed in three different trials conducted during three different years. The steers in each of the three tests were divided into five lots of six head each. A total of 18 cattle per lot were fed on corn prepared in the following ways: Lot 1, ear corn; Lot 2, shelled corn; Lot 3, crushed corn and cob; Lot 4, corn and cob meal; and Lot 5, ground corn. Pigs recovered wasted feeds in all lots.

The largest average daily gains were made by the cattle in Lot 5, fed ground corn; Lot 2, fed shelled corn, was second; Lot 4, fed corn and cob meal, third; Lot 3, fed crushed corn and cob, fourth; and Lot 1 fed ear corn was fifth.

Of every 100 pounds gain made by the cattle and pigs, the following amounts, in pounds, were made by the pigs in the various lots: Lot 1, 21.63; Lot 2, 16.02; Lot 3, 10.63; Lot 4, 4.98; and Lot 5, 4.56.

It may be profitable to shell and grind corn for two-year-old steers when cattle and corn are high in price and hogs are not on hand to utilize the undigested and waste feed.

Corn fed in the ear or shelled is more efficiently used than either crushed or ground corn when cattle and pigs are combined. The results show a slight disadvantage in feeding crushed and ground cobs with the corn.

The cost of gain on cattle, after deducting the value of the gain made by the hogs, was noticeably greater when the corn was shelled, crushed or ground.

The cattle in Lot 5, which were fed finely ground corn, brought the highest price. Lot 4 which was fed corn and cob meal stood second; Lot 2, fed shelled corn, third; Lot 3, fed crushed corn and cob, fourth; and Lot 1 which was fed ear corn, brought the lowest price.

The average net profit per steer for the three trials was greatest in Lot 1 which was fed ear corn; Lot 2, fed shelled corn, was second; Lot 5, fed finely ground corn, third; Lot 3 fed crushed corn and cob, fourth; and Lot 4 fed corn and cob meal showed a slight loss.

The extra finish and higher market price for the cattle fed shelled, crushed, and ground corn was not sufficient to offset the reduced gain in live weight on the cattle and hogs per unit of feed and the extra expense of preparing the corn.

SUMMARY OF DATA (AVERAGE OF THREE TRIALS)

Lot Number [1]	1	2	3	4	5
Number of steers	18	18	18	18	18
Avg. Initial Weight, lb.	971.50	983.04	973.21	981.14	980.32
Avg. Final Weight, lb.	1304.83	1339.61	1313.94	1324.41	1385.90
Avg. Daily Gain per Steer, lb.	2.52	2.71	2.59	2.61	3.08
Avg. Daily Ration per Steer					
Corn, lbs.	17.42	17.87	17.24	17.10	18.33
Nitrogenous Concentrate, lb.	2.78	2.96	2.75	2.71	3.05
Corn Silage, lb.	17.58	17.75	16.00	16.61	18.22
Legume Hay, lb.	2.49	2.69	2.53	2.38	3.08
For Each 100 Pounds of Cattle Gain,					
Pigs gained	21.63	16.02	10.63	4.98	4.56
Gain on Cattle and Pigs per bu. of Corn Fed, lb.	10.53	10.18	9.57	9.10	9.87
Pounds of Dry Matter Fed per 100 lb. Gain on Cattle and Pigs	762.44	842.31	877.78	936.42	873.38

[1] Lot 1 received ear corn, Lot 2 shelled corn, Lot 3 crushed corn and cob, Lot 4 corn and cob meal and Lot 5 ground corn.

(Bulletin 150—Corn Silage in Rations for Fattening Steers.)

Seventy head of two-year-old steers were fed in two tests conducted during two different years for the following purposes: 1, to obtain data concerning the possibility of fattening cattle by the extensive use of corn silage without the use of additional corn in the ration; 2, to determine the value of adding a high protein concentrate to a ration of shelled corn, corn silage, and alfalfa hay; 3, to compare old process linseed oil meal with cottonseed meal in rations containing corn silage.

The average daily gains made by the cattle which received only corn silage were less than when shelled corn was fed. Nevertheless, the gains were satisfactory and revealed the possibility of fattening as many as three to four two-year-old steers per acre of corn harvested as silage.

The average daily gains were increased by the addition of a high protein concentrate to a ration of shelled corn, corn silage, and alfalfa hay.

The gains made by hogs in the lots of cattle which received linseed oil meal were greater than those obtained when cottonseed meal was the supplement either with shelled corn or when fed without shelled corn.

The cost of cattle gain, after deducting the value of the hog gain, was least for cattle which received a ration of linseed oil meal, corn silage, and alfalfa hay. When cottonseed meal was used instead of linseed oil meal, the cost was second lowest. The highest cost was in the lot which received a ration of shelled corn, corn silage, and alfalfa hay without a nitrogenous concentrate.

The steers which did not receive shelled corn in their rations, although not the best, were sufficiently fat to command a good price, and to grade Choice.

Judging from these tests, it was concluded that a high protein concentrate should be included in the ration of fattening cattle receiving shelled corn, corn silage and alfalfa hay.

The net profit per steer was greater in both trials in the lots which received linseed oil meal rather than cottonseed meal, whether they were fed with shelled corn or without corn.

(Bulletin 218—Limited Use of Shelled Corn in Fattening Two-Year-Old Cattle.)

The direct objects of the experiment reported in this bulletin were to obtain data on the following points: (1) The possibility of fattening cattle by the extensive use of corn silage without the use of additional corn in the ration. (2) The possibilities of feeding half a full feed of corn during the entire feeding period, in conjunction with linseed oil meal and a full feed of corn silage and clover hay. (3) The possibility of feeding a full feed of corn during the last half of the feeding period only. (4) The possibility of feeding a small versus a large allowance of linseed oil meal with corn silage and clover hay.

Forty two-year-old feeder steers were divided into five lots of eight head each. The following rations were fed:

Lot 1.—Shelled corn; linseed oil cake *(1 pound to 6 pounds of shelled corn);* corn silage; clover hay.

Lot 2.—Shelled corn *(half as much as fed in Lot 1);* linseed oil cake (same quantity as fed in Lot 1); corn silage; clover hay.

Lot 3.—Shelled corn *(full-feed for last 40 days only);* linseed oil cake *(same quantity as fed in Lots 1 and 2);* corn silage; clover hay.

Lot 4.—Linseed oil cake *(same quantity as fed in Lots 1, 2, and 3);* corn silage; clover hay. *No shelled corn.*

Lot 5.—Linseed oil cake *(58 percent more than was fed in Lot 4);* corn silage; clover hay. *No shelled corn.*

Each of the five groups of steers received all the corn silage and clover hay they would eat from the start. In addition, those in Lot 1 received a full feed of shelled corn and linseed oil cake in the proportion of 6 pounds of corn to 1 pound of the linseed cake. The cattle in Lot 2 received the same amount of linseed oil cake as those in Lot 1, but only half as much shelled corn. Those in Lot 3 received the same amount of linseed oil cake as those in Lots 1 and 2, but were fed a full feed of corn only during the last 40 days. The steers in Lot 4 received the same amount of linseed oil cake as those in each of the first three lots, an average of 2.77 pounds per steer daily, while those in Lot 5 received an average daily allowance of 4.4 pounds.

Pigs were allowed to follow the steers to utilize any undigested feed and any that might otherwise be wasted.

Results indicated:

1. During the 100 day feeding test, two-year-old cattle on full feed of grain consumed approximately three-fourths as much corn silage and hay as cattle fed one-half as much grain, or as cattle full-fed corn during the last 40 days of that feeding period. They consumed about one-half as much silage and hay as cattle fed all the silage and hay they would eat supplemented with 2.77 pounds to 4.4 pounds of linseed oil meal daily.

2. Cattle full-fed shelled corn, linseed oil meal, corn silage and legume hay averaged 3.05 pounds daily gain, which was approximately 25 percent more than the average daily gain made by cattle in each

of the other lots.

3. Cattle fed one-half a ration of corn, 2.77 pounds linseed oil meal, and all the silage and hay they would eat, gained only slightly more than cattle fed silage, hay, and linseed oil meal; the same result was obtained with cattle fed corn silage, hay and linseed meal during the first 60 days with a full feed of corn added during the last 40 days.

4. No pork was produced from waste of cattle which did not receive corn. The amount of pork produced behind the cattle which received either one-half ration of corn or corn for the last 40 days of the feeding period, was about three-fifths and two-fifths, respectively, of the quantity produced behind cattle full-fed corn for 100 days. Where no corn was fed or where the corn was limited, the consumption of silage and hay was increased materially.

5. The addition of 58 percent more of linseed oil meal to a ration of 2.77 pounds linseed meal, corn silage, and legume hay at will, did not increase the gains materially.

6. Cattle fed all the corn silage and legume hay they would eat and either 2.77 pounds of linseed oil meal daily, or 4.4 pounds linseed oil meal daily, or 2.77 pounds linseed oil meal and one-half feed of corn, or 2.77 pounds linseed oil meal and corn for the last 40 days, were little more than half finished at the conclusion of the test.

7. Slightly better results were obtained where cattle were started on corn silage, legume hay, and linseed meal, with a full feed of corn added during the last 40 days of a 100-day feeding period, than where cattle were fed corn silage, legume hay, linseed meal and a half ration of corn throughout the 100-day feeding period.

8. When corn silage and legume hay are relatively cheap, compared with corn, their extensive use, with or without a small quantity of linseed oil meal, was shown to be advisable, especially during the early part of a feeding period.

9. The dressing percentages for the different lots varied from 60.10 percent to 61.50 percent. Variations, however, could not, in all cases, be attributed to the ration fed.

10. It is evident from the data that the relative prices of feeds, cattle, and pork must be considered, together with other conditions, in planning cattle feeding operations, if the best results are to be obtained.

PART II
RESULTS OF 1936-1951 EXPERIMENTS

Beef cattle are grown primarily for the conversion of pasture and roughage into an edible product. No other class of livestock can be used so extensively to produce highly nutritious food for man from crops that have little market value. Furthermore, the Missouri Agricultural Experiment Station has repeatedly demonstrated that only by making liberal use of such feeds can production costs be kept at a minimum.

It has long been known that older cattle are better adapted for maximum use of pasture and roughage than young cattle. This is true because animals approaching maturity need less feed for growth, leaving more to produce fat or finish. Thus, a two-year-old steer, in comparison with a calf or yearling, has greater feed capacity and tendency to fatten. It is recognized, too, that if cattle receive only pasture and roughage, the end product generally will not carry sufficient finish to meet the requirements of the better grades of slaughter cattle. It is important, therefore, to know to what extent and how pasture and roughage can best be utilized to produce a finished product.

The following material reports results of seven experiments with two-year-old steers dealing with this problem.

The object of this series of Missouri experiments was to produce steers with sufficient finish to grade "Good" in the carcass. *Since these tests were completed, the U.S.D.A. grading system has been altered so that the former "Good" grade and the current "Choice" grade, so far as these cattle are concerned, are practically the same.*

There were important reasons for choosing this grade. First, there is a limit to what can be accomplished in fattening cattle primarily on roughage and pasture. Second, retailers sell almost as much fresh beef of this grade as any other three grades, indicating its popularity with consumers; and finally, this makes it possible for the producer to supply beef of satisfactory quality at relatively low production costs.

The data that will be discussed deal primarily with the results obtained during the fattening period. In some cases fattening was started immediately after the cattle were purchased; in others, many months after they were acquired as feeder calves. In the latter cases, only brief mention will be made of the treatment preceding the fattening period.

Fattening 2-Year-Old Feeder Cattle in Winter

Experiment I:

For the first test, coming two-year-old Medium to Good grade feeder steers were purchased in February, 1936, and finished the following June. These cattle were divided into three uniform lots of 8 head each and were fed to the same degree of finish, regardless of the time required to fatten them. Lot 1 was full fed grain during the entire test. Lot 2 was also fed grain but only about half as much per day as Lot 1. Lot 3 was fed roughage alone for the first 56 days and then given a full feed of grain. Table I lists the results.

Observations:

1. In addition to cottonseed cake, alfalfa hay, and corn silage, the following average amount of shelled corn was required to fatten each steer in the various lots: Lot 1, 19 bushels; Lot 2, 13 bushels; and Lot 3, 11 bushels. The steers in Lot 2 required 69 percent and those in Lot 3, 59 percent as much corn as the Lot 1 steers which were full fed grain for the entire period. Thus, the use of larger amounts of roughage reduced the amount of corn required to finish the cattle.
2. More time was required to fatten Lots 2 and

TABLE 1 -- A COMPARISON OF RATIONS USED TO FATTEN TWO-YEAR-OLD STEERS IN DRY LOT
February 7, to June 12, 1935

Ration	Lot 1 Shelled Corn 10 Cottonseed Cake 1 Alfalfa Hay Corn Silage	Lot 2 Shelled Corn 10 Cottonseed Cake 1 in half the amount of Lot 1 Alfalfa Hay Corn Silage	Lot 3 Shelled Corn 10 Cottonseed Cake 1 Full fed after Feeding Alfalfa Hay Corn Silage for 56 days
Days Fed	78	98	98
Avg. Initial Weight (lb.)	831.8	831.3	830.9
Avg. Final Weight (lb.)	996.2	973.4	997.5
Total Gain (lb.)	164.4	142.1	166.6
Avg. Daily Gain (lb.)	2.11	1.45	1.70
Avg. Total Feed:			
Shelled Corn (lb.)	1074.1	774.7	632.4
Shelled Corn (bu.)	19.2	13.3	11.3
Cottonseed Cake (lb.)	107.4	74.2	63.2
Alfalfa Hay (lb.)	154.1	291.1	344.0
Corn Silage (lb.)	809.6	2552.4	3384.0
Average Daily Ration:			
Shelled Corn (lb.)	13.8	7.6	15.1*
Cottonseed Cake (lb.)	1.4	.8	1.5*
Alfalfa Hay (lb.)	2.0	3.0	3.5
Corn Silage (lb.)	10.4	26.0	34.5
Feed Consumed per 100 lb. Gain:			
Shelled Corn (lb.)	653.3(11.7 bu.)	523.6(9.4 bu.)	379.6(6.8 bu.)
Cottonseed Cake (lb.)	65.3	52.2	38.0
Alfalfa Hay (lb.)	93.7	204.8	206.5
Corn Silage (lb.)	492.5	1796.2	2031.2
Dressing Percentage	59.8	56.5	57.1
Carcass Grade	Low Good**	Low Good**	Low Good**

*Based on 42 Days
**"Choice" under new U.S.D.A. grading system

3 than Lot 1 (98 days compared to 78 days) because they gained at a slower rate.

3. Lot 3 steers, which were fed only roughage for the first 56 days and then full fed corn, gained faster than Lot 2 steers, which were fed grain the entire time at half the rate used for Lot 1.

4. Lot 1 steers, full fed the entire time, were slightly fatter than any of the other lots of cattle, judging from market grades.

5. In this test, Lot 2, fed one-half full feed of grain for the entire period, made the smallest daily gains and smallest total gain.

6. Feeding only roughage during the first part of the feeding period and then full feeding grain resulted in larger gains than feeding a 50 percent allowance of grain for the entire feeding period.

Experiment II:

This test (Dec. 1936—May 1937) was a repetition of Experiment I, except that none of the lots was full fed from the beginning. Short two-year-old steers of Medium to Good grade that weighed 750 pounds were used. They were approximately 80 pounds lighter at the beginning than the cattle in the preceding test.

Pertinent data are reported in Table 2.

Observations:

1. Lots 2 and 3 required 18 and 17 bushels of corn, respectively. This is more than was consumed in the first test by cattle fed in the same manner. The cattle used in the second test, however, were lighter and thinner at the start and thus had to make more total gain to attain the same degree of finish. They were, therefore, fed for a longer period and required more corn.

2. The total gain and average daily gain were greater for Lot 3, fed roughage without any grain during the first 84 of the 140-day feeding period. Such results were in accord with those of the first test.

3. The cattle fed roughage alone prior to full feeding had a higher dressing percentage and a higher carcass grade than cattle that were fed a half ration of grain during the entire test.

Conclusions:

The following conclusions were drawn from the results of these two feeding tests.

TABLE 2 -- A COMPARISON OF RATIONS USED TO FATTEN TWO-YEAR-OLD STEERS
December 7 to May 24, 1937

Ration	Lot 2 Shelled Corn 10 Cottonseed Cake 1 limited to 50% of a full feed Alfalfa Hay Corn Silage	Lot 3 Shelled Corn 10 Cottonseed Cake 1 full fed 56 days after feeding for 84 days, Alfalfa Hay Corn Silage
Days Fed	140	140
Avg. Initial Weight (lb.)	747.25	753.95
Avg. Final Weight (lb.)	964.97	1004.75
Avg. Total Gain (lb.)	217.72	250.80
Avg. Daily Gain (lb.)	1.55	1.79
Avg. Total Feed:		
Corn (lb.)	1000.91	942.78
Corn (bu.)	17.87	16.83
Supplement (lb.)	100.09	94.27
Alfalfa Hay (lb.)	520.50	683.12
Corn Silage (lb.)	4499.37	4933.12
Avg. Daily Ration:		
Corn (lb.)	7.15	16.83*
Cottonseed Cake (lb.)	.71	1.68
Alfalfa Hay (lb.)	3.71	4.87
Corn Silage (lb.)	32.13	35.23
Feed Consumed per 100 lb. Gain:		
Corn (lb.)	459.71(8.2 bu.)	375.90(6.7 bu.)
Cottonseed Cake (lb.)	45.97	37.58
Alfalfa Hay (lb.)	239.06	272.37
Corn Silage (lb.)	2066.58	1966.95
Dressing Percentage	58.27	58.87
Carcass Grade	Low Good**	Low Good**

*Based on 56 days only
**"Choice" under new U.S.D.A. grading system.

1. Providing roughage as the only ration for a limited time and then full feeding grain is a superior method to that of feeding a limited amount of grain (approximately 50 percent of a full ration) from start to finish.

2. Eleven bushels of shelled corn (first test) to 18 bushels (second test), properly supplemented, and fed after receiving a ration of roughage only, can produce a satisfactory finish on two-year-old steers.

Fattening After Extensive Roughage and Pasture

Experiment III:

In the fall of 1938, a test was begun to study the extent to which roughage and pasture can be used in producing beef of Good grade from cattle of various ages. Calves of Good to Choice feeder grade were purchased for test animals. One lot of 8 head was full fed during the first winter and marketed as slaughter cattle weighing approximately 800 pounds at the end of a 168-day fattening period. Other similar lots were given only roughage or roughage and pasture for varying lengths of time before being fattened. Missouri Bulletin 466, "Making Beef From Roughage and Pasture," reports the entire test.

Reviewing results with these cattle that were fattened and sold as two-year-olds, four groups were fattened at different times during 1940, with a single lot being sold in each of the following months: April, July, September and November. By starting the full feeding periods at different stages of the experiment, it was possible to study the effects of utilizing increasing quantities of roughage and pasture on the final weights of the cattle and the amount of grain required to fatten them. The first group, which was sold in April, was started on feed January 2, 1940. It was representative of the entire group in average weight, flesh, and conformation. The results obtained with this and other lots of cattle fattened during the same year are given in Table 3.

The cattle in Lot 1 had been fed corn silage and legume hay during the first winter and grazed the following spring and summer on wheat-Korean lespedeza pasture, and on bluegrass pasture in late fall

TABLE 3 -- THE PERFORMANCE OF TWO-YEAR-OLD STEERS ON FULL FEED AFTER UTILIZING INCREASINGLY LARGER AMOUNTS OF ROUGHAGE AND PASTURE

	Lot 1	Lot 2	Lot 3	Lot 4
	Jan. 2 to April 22, 1940	April 22 to July 8, 1940	July 15 to Sept. 16, 1940	Oct. 1 to Nov. 5, 1940
Ration	Legume Hay Corn Silage Shelled Corn Cottonseed Meal	Legume Hay Shelled Corn Cottonseed Meal	Legume Hay Shelled Corn Cottonseed Meal	Legume Hay Shelled Corn Cottonseed Meal
Days on Feed	111	77	63	35
Avg. Initial Weight (lb.)	768.1	957	1035.1	1159.3
Avg. Final Weight (lb.)	1045.9	1109.3	1188.7	1259.4
Total Gain (lb.)	277.8	152.3	153.6	100.1
Avg. Daily Gain (lb.)	2.48	1.98	2.44	2.86
Avg. Total Feed:				
Shelled Corn (lb.)	1355.0	1154.0	1050.0	561.0
Shelled Corn (bu.)	24.2	20.6	18.75	10.02
Cottonseed Cake (lb.)	135.4	115.4	105	56.1
Hay (Alfalfa & Lespedeza) (lb.)	445.4	751.4	590	408.4
Corn or Atlas Silage (lb.)	1996.8	none	none	none
Avg. Daily Ration:				
Shelled Corn (lb.)	12.2	15.0	16.7	16.0
Cottonseed Cake (lb.)	1.2	1.5	1.7	1.6
Hay (lb.)	4.0	9.8	9.4	11.7
Corn Silage (lb.)	18.0	none	none	none
Feed Consumed per 100 lb. Gain:				
Shelled Corn (bu.)	8.7	13.5	12.2	10.0
Cottonseed Cake (lb.)	48.7	75.7	68.3	56.1
Alfalfa & Lespedeza Hay	160.5	493.2	384.2	408.0
Corn Silage (lb.)	718.5	none	none	none
Dessing Per Cent	70.81	58.17	59.07	61.28
Carcass Grade	High Good*	Middle Good*	Middle Good*	Middle Good*

*"Choice" under new U.S.D.A. grading system.

and early winter prior to being placed on a full feed of grain. They averaged 425 pounds as calves and 768 pounds as coming two-year-olds in January, 1940, when started on full feed. Twenty-four bushels of shelled corn were required during a feeding period of 111 days to bring the cattle to Good[1] grade at a final weight of 1,046 pounds.

When these cattle were marketed in April, another lot (Lot 2), representative of those which had been on a ration of corn silage and legume hay during the second winter, was started on full feed. This trial was similar to the practice followed by some cattlemen of full feeding cattle in dry lot after wintering them on roughage. Initial weight was 957 pounds, and final weight, when finished in July, was 1,109 pounds. The total gain of 152 pounds per steer was made at the daily rate of 1.98 pounds. The poor quality of the hay fed and the absence of corn silage from the ration probably accounted, to some degree, for the low gain. An average of 21 bushels of shelled corn was consumed per steer. Compared with the preceding lot, less grain was required and more weight marketed. This fact becomes more obvious with each succeeding lot of cattle marketed in 1940.

When Lot 2 was marketed in July, another representative lot was selected from the remaining cattle which had been on small grain-lespedeza pasture since April. It should be noted that about 80 pounds of gain had been made on pasture from April 22 to July 15. Only 63 days of full feeding and 18¾ bushels of corn were required to finish these cattle. They were marketed in early September.

The remaining cattle were put in dry lot for full feeding when the grazing season ended October 1. At that time they averaged 1,160 pounds, and their entire gain had been made from roughage during two winters and pastures during two summers. Ten bushels of grain fed in 35 days were required to finish these cattle to an average final weight of 1,260 pounds.

Summary:

Each of the four lots of catle was finished to the same grade. Lots did not vary within the grade, however, from middle to high Good.[1] The range in final market weight was from 1,046 to 1,260 pounds, a difference of 240 pounds. Greater weight was obtained by more extensive use of roughage and pasture.

The total amounts of grain required to finish the cattle ranged from 24 bushels for the first lot to 10 bushels for the last lot sold. Each succeeding lot of cattle required less corn. In other words, in each case a greater percentage of the total gain was made

[1]"Choice" under the new U. S. D.A. grading system.

from roughage and pasture. These results clearly indicate that the grain required to finish 2-year-old cattle can be reduced materially by extensive use of roughage and pasture. However, such a method of feeding requires more time to finish the cattle, and excellent roughage and pasture in abundant amounts are essential for its success.

Experiment IV:

In the fall of 1940, another group of Good to Choice feeder steer calves was obtained and so far as early treatment was concerned, were handled in about the same way as the group of cattle described in Experiment III. At various ages, lots of 8 head each, representative of the entire group, were full fed grain until the cattle were fat enough to grade Good. In 1942 two lots of two-year-old cattle were started on full feed July 7, and two lots on September 1. In this test, however, a comparison was made between full feeding in dry lot and full feeding on pasture. Prior to full feeding, the cattle had been grazed together. Cattle in Lots 7 and 9 were full fed in dry lot, and Lots 8 and 10 were full fed on pasture. The data obtained from this test are given in Table 4.

A close study of the data in Table 4 reveals practically no difference between Lot 7 and Lot 8 as far as weights and gains are concerned. A relatively small amount of grain was required to finish each of these lots of cattle. Those that were full fed on pasture (Lot 8) took less grain than those full fed in dry lot (Lot 7); e.g., 12.1 bushels compared to 14.6 bushels. Cattle full fed on pasture had a slightly higher dressing percentage and a higher carcass grade. The higher dressing percentage of the pasture-fed cattle can be attributed probably to greater shrink enroute to market. The dry lot cattle brought a slightly higher price, but carcass data indicate that it was unwarranted. For each 100 pounds gain made, pasture saved 1.9 bushels corn, 10.6 pounds protein concentrate, and 400 pounds of hay. Another observation that deserves consideration is the fact that when grain is fed on pasture, the carrying capacity of the pasture is increased.

When Lots 7 and 8, discussed above, were sold on September 1, two other representative lots of cattle were started on full feed, one in dry lot and one on pasture. The data for these cattle also are contained in Table 4, as are data on Lots 9 and 10.

In this case, when the cattle full fed in dry lot (Lot 9) were compared with those full fed on pasture (Lot 10), the differences in weights and gains were negligible, as was true with comparable lots (7 and 8)

TABLE 4 -- A COMPARISON OF FULL FEEDING IN DRY LOT WITH FULL FEEDING ON PASTURE AFTER EXTENSIVE PERIODS ON ROUGHAGE AND PASTURE;

	Lot 7*	Lot 8*	Lot 9*	Lot 10*
	July 7 to Sept. 1, 1942	July 7 to Sept. 1, 1942	Sept. 1 to Oct. 6, 1942	Sept. 1 to Oct. 6, 1942
Ration	In Dry Lot Mixed Hay Shelled Corn Soybean Meal	On Bluegrass Korean Lespedeza Pasture Shelled Corn Soybean Meal	In Dry Lot Mixed Hay Shelled Corn Soybean Meal	On Bluegrass Korean Lespedeza Pasture Shelled Corn Soybean Meal
Avg. Initial Weight (lb.)	991.62	996.37	1081.35	1086.12
Avg. Final Weight (lb.)	1123.29	1128.42	1140.33	1146.00
Avg. Total Gain (lb.)	131.67	132.05	59.08	59.88
Avg. Daily Gain (lb.)	2.35	2.36	1.69	1.71
Avg. Total Feed Required:				
Shelled Corn (lb.)	816.14	678.07	460.79	438.82
Shelled Corn (bu.)	14.57	12.11	8.23	7.80
Soybean Meal (lb.)	81.61	67.81	46.08	43.68
Mixed Hay (lb.)	527.37	none	294.00	none
Avg. Daily Ration:				
Shelled Corn (lb.)	14.57	12.11	13.16	12.48
Soybean Meal (lb.)	1.46	1.21	1.32	1.25
Mixed Hay (lb.)	9.42	none	8.40	none
Feed Consumed per 100 lb. gain:				
Shelled Corn (lb.)	619.85	513.53	779.91	729.55
Shelled Corn (bu.)	11.07	9.17	13.93	13.03
Soybean Meal (lb.)	61.98	51.35	77.99	72.95
Mixed Hay (lb.)	400.54	none	497.60	none
Dressing Percentage	60.09	61.00	59.53	60.85
Carcass Grade	Middle Good+	Middle Good+	Middle Good+	Middle Good+

*All lots of cattle weighed the same on July 7, 1942. Lots 7 and 8 had been wintered on alfalfa hay and sorgo silage, and 9 and 10 had been wintered on alfalfa hay and barley silage. Lots 7 and 8 had gained 154 lbs. in winter; Lots 9 and 10, 127 lbs.

+"Choice" under new U.S.D.A. grading system.

TABLE 5 -- A COMPARISON OF FULL FEEDING IN DRY LOT WITH FULL FEEDING ON PASTURE
October 12, to December 7, 1944--56 days

Lot	F7 (G-R)	F9 (G-R)
Full Fed 56 Days	On Mixed Grass-Korean Lespedeza Pasture	In Dry Lot
Number per Lot	16	16
Avg. Initial Weight (lb.)	1044.8	1051.7
Avg. Final Weight (lb.)	1179.7	1224.1
Avg. Total Gain (lb.)	134.9	172.35
Avg. Daily Gain (lb.)	2.4	3.1
Avg. Total Feed Consumed per head		
Shelled Corn (lb.)	830.7	833.3
Shelled Corn (bu.)	15.0	14.9
Soybean Meal (lb.)	83.1	83.3
Alfalfa Hay (lb.)	*56.9	808.4
Avg. Daily Ration per head		
Shelled Corn (lb.)	14.8	14.9
Soybean Meal (lb.)	1.48	1.49
Alfalfa Hay (lb.)	11.4	14.43
Feed Consumed per 100 lbs. Gain		
Shelled Corn (lb.)	615.8	483.50
Soybean Meal (lb.)	61.58	48.35
Alfalfa Hay (lb.)	none	469.1
Dressing Percentage	61.80	61.2
Carcass Grade	Good**	Good**

*Timothy hay was fed only during the last 5 days on test.
**"Choice" under new U.S.D.A. grading system.

in the earlier test. The cattle full fed on grass sold at a higher price. They also had a greater dressing percentage by 1.3 percent. For each 100 pounds gain, 0.9 bushels of corn, 5 pounds protein concentrate, and nearly 500 pounds of legume hay were saved by pasture feeding. The value of pasture was slightly less after September 1 than immediately after July 7.

Experiment V:

Later, another comparison was made of full feeding two-year-old cattle in dry lot with full feeding on pasture.

The cattle used in this test were obtained as calves in the fall of 1942 and were roughed through two winters and grazed during the summers of 1943 and 1944.

On October 12 of the second grazing season, one lot of 16 head was removed from pasture and started on feed in dry lot. At the same time a similar number of steers were started on feed on pasture which, at the time, consisted of a combination of bluegrass and lespedeza.

The data for the finishing period are included in Table 5.

From almost every standpoint, results obtained from the cattle fattened in dry lot were superior to those from the cattle fed on pasture. The dry lot fattened cattle gained faster and graded higher in the carcass. While the cattle fed on pasture had a slightly higher dressing percentage, this was not due to greater finish, but rather to a greater shrinkage in shipment to market, which is to be expected with cattle shipped to market directly off grass.

Grazing Followed by Roughage Alone Before Full Feeding

Experiment VI:

The objective of this test was to see if the amount of corn required to finish cattle could be further reduced by feeding corn silage and legume hay in dry lot for a relatively short period after the grazing season and then full feeding concentrates. One lot of cattle was fed in this manner and the other was full fed from the beginning of the dry lot period. The results are given in Table 6.

Lot 1 was full fed grain from the beginning. Lot 3 was fed a ration of corn silage and clover hay for 46 days and then fed a grain ration for 26 days. The initial and final weights were practically the same for each lot. There was a big difference, however, in rate of gain. Lot 1 gained an average of 2.5 pounds a day, while Lot 3 gained 1.6 pounds per day for the 46 day period and, subsequently, on a full feed of grain, gained only 1.3 pounds per head per day. It is not entirely clear why the cattle in this lot gained less per day during the time they were on full feed when they received only roughage. However, it is recognized that experimental error may often have

TABLE 6 -- PRODUCING TWO-YEAR-OLD FAT STEERS WITH LESS CORN
Roughed Two Winters--Pastured Two Summers--Then Fed in Dry Lot

	Lot 1*		Lot 3**	
Avg. Initial Weight (lb.)	1052	1053	1127	Nov. 17, 1946
Avg. Final Weight (lb.)	Nov. 17, 1946, 1168	Nov. 17, 1946, 1127	1160	Dec. 12, 1946
Avg. Total Gain (lb.)	116	74	33	
Avg. Daily Gain (lb.)	2.5	1.6	1.3	
Avg. Total Feed Consumed:				
Shelled Corn (bu.)	10.8	none	6.3	
Soybean oil Meal (lb.)	60	none	35.4	
Clover Hay (lb.)	220	392	135	
Corn Silage (lb.)	588	1280	457	
Avg. Daily Ration:				
Shelled Corn (lb.)	13.0	none	13.6	
Soybean oil meal (lb.)	1.3	none	1.4	
Clover Hay (lb.)	4.8	8.5	5.2	
Corn Silage (lb.)	12.8	27.8	17.6	
Feed Per 100# Gain:				
Shelled Corn (bu.)	9.3	none	19	
Soybean oil meal (lb.)	52	none	106	
Clover Hay (lb.)	190	529	407	
Corn Silage (lb.)	507	1726	1374	
Dressing Percentage	58.96		60.61	
Carcass Grade	Good+		Good+	

*Full fed from October 2, 1946 to November 17, 1946 --(Marketed at end of 46 days of full feeding.)
**Fed only roughage from October 2, to November 17, 1946 or 46 days; full fed grain from November 17 to December 12, 1946 or 26 days. (Marketed after 126 days feeding.)
+"Choice" under new U.S.D.A. grading system.

undue influence upon data obtained during short feeding periods (in this case 26 days) because of variations in fill at the time initial and final weights are taken. The degree of finish attained was approximately the same for both lots, but more time and more roughage were used to fatten Lot 3.

These results indicate that either method can be used to finish cattle of this age and previous treatment in a relatively short time after the completion of the grazing season. In both cases, relatively small amounts of grain were necessary. Lot 1 consumed 10.8 bushels of shelled corn and Lot 3 required only 6.3 bushels. The availability and price of feed, and the trend of market prices would be factors to consider in deciding which of the two methods should be followed.

Producing Fat Two-Year-Olds From Lightweight Yearlings

Experiment VII:

The objection sometimes raised by cattle feeders to the system followed in the tests previously reported is that the cattle turnover is too slow. Some feeders do not want to keep cattle on hand for two years. Consequently, they either buy yearling feeder cattle, rather than calves, or feed out the yearling steers they have raised to market as long yearling or short two-year-old slaughter cattle. Then, too, in most cases when the system of producing fat two-year-olds was followed, the cattle were fleshier at the close of the first grazing season than the majority of feeder yearlings available at central markets.

This situation posed the question of whether the results could be duplicated with yearling feeder cattle of less weight and finish. In an effort to answer this question, feeding trials were begun in the fall of 1950 with thinner, lighter, Good and Choice feeder cattle that averaged 605 pounds. They were fed corn silage and legume hay in winter, grazed from April 20 to October 1, and then were full fed grain in dry lot. The data from this test are contained in Table 7.

In winter these cattle made an average daily gain of 1.5 pounds per head and a total gain of 207 pounds. They consumed 1.4 tons of corn silage and 0.4 ton of red clover hay during the winter. This represents low-cost production. During the summer they made a total net gain of 220 pounds and required only 10.7 bushels of corn to finish to the present grade of Choice at a final home weight of 1,121 pounds. These results would indicate that thin, lightweight yearlings can be made fat principally from roughage and pasture. The chief difference is that they weighed less when marketed than the cattle in the previous tests.

TABLE 7 -- PRODUCING FAT TWO-YEAR-OLD FROM THIN YEARLING STEERS WITH MAXIMUM ROUGHAGE AND PASTURE

December 6, 1950 to November 19, 1951

	Lot 1
A. Number of Cattle	10
B. Wintering Phase, December 6, 1950 to April 20, 1951	135 days
1. Feed Fed (Avg. per head)	
Corn Silage (ton)	1.4
Red Clover Hay (ton)	.4
2. Average Weight of Cattle (lb.)	
December 6, 1950	605.4
April 20, 1951	812.4
3. Avg. Total Gain (lb.)	207.0
4. Avg. Daily Gain (lb.)	1.53
C. Grazing Phase	
1. April 20 to April 30	
Kind of Pasture	Bluegrass
Avg. Gain or Loss (lb.)	42.3 loss
2. April 30 to Sept. 29	
Kind of Pasture	Wheat-Lespedeza
Avg. Total Gain (lb.)	262.5
Avg. Daily Gain (lb.)	1.74
3. April 20 to September 29 - Net gain (lb.)	220.2
Net Avg. Daily Gain (lb.)	1.36
D. Winter and Pasture Gains Combined	
Avg. Total Per head (lb.)	427.2
E. Full Feeding Phase in Dry Lot to Choice Grade	
1. Date initiated	September 29
2. Avg. Initial Weight (lb.)	1032.6
3. Time required to reach Choice Grade-- (days)	51
4. Date marketed	November 19, 1951
Feed required to reach Choice Grade, Avg. Per Head	
Shelled Corn (bu.)	10.7
Linseed and Soybean Meal (lb.)	37.0
Legume Hay (lb.)	447
Corn Silage (lb.)	237
5. Gain required (lb.)	88.7
6. Final Home Weight (lb.)	1121.3
F. Percentage of the total Gain that was made--	
From Roughage in Winter	40.1
From Pasture	42.7 } 82.8
From Full Feeding	17.2

CONCLUSIONS FROM THE EXPERIMENTS

1. Feeding roughage alone for a period and then full feeding grain proved superior to feeding roughage and a 50 percent allowance of grain for the entire test, when fattening medium to a good grade feeder cattle for spring marketing.

2. If roughage and pasture are used to the maximum extent for feeding, more time is required to finish the cattle, and greater weight is sold.

3. Cattle of good conformation are needed where roughage and pasture are to be used extensively and the cattle marketed in November.

4. An abundance of high quality pasture is necessary at all times in summer to make best pasture gains and thus lessen the amount of grain required to finish the cattle.

5. Full feeding grain on Korean lespedeza pasture before October gave as good or slightly better results than dry lot feeding. Full feeding grain on pasture after October I was not as good as full feeding grain in dry lot. The quality of pasture furnished after October 1 was relatively low.

6. The amounts of shelled corn required to finish two-year-old cattle fattened for marketing in the fall ranged from 6.3 to 15 bushels. The corn was properly supplemented in all cases. This was accomplished by wintering the cattle well and by furnishing abundant, excellent pasture during the entire grazing season.

7. Eighty to 85 percent of the total gain required to fatten two-year-old steers can be made from roughage and pasture when the cattle are obtained as calves and furnished good roughage and pasture until the fattening period.

8. Roughage and pasture can be used advantageously to produce Choice fat steers. Such a feeding program is not only efficient but also fits the current system of agricultural production in Missouri.