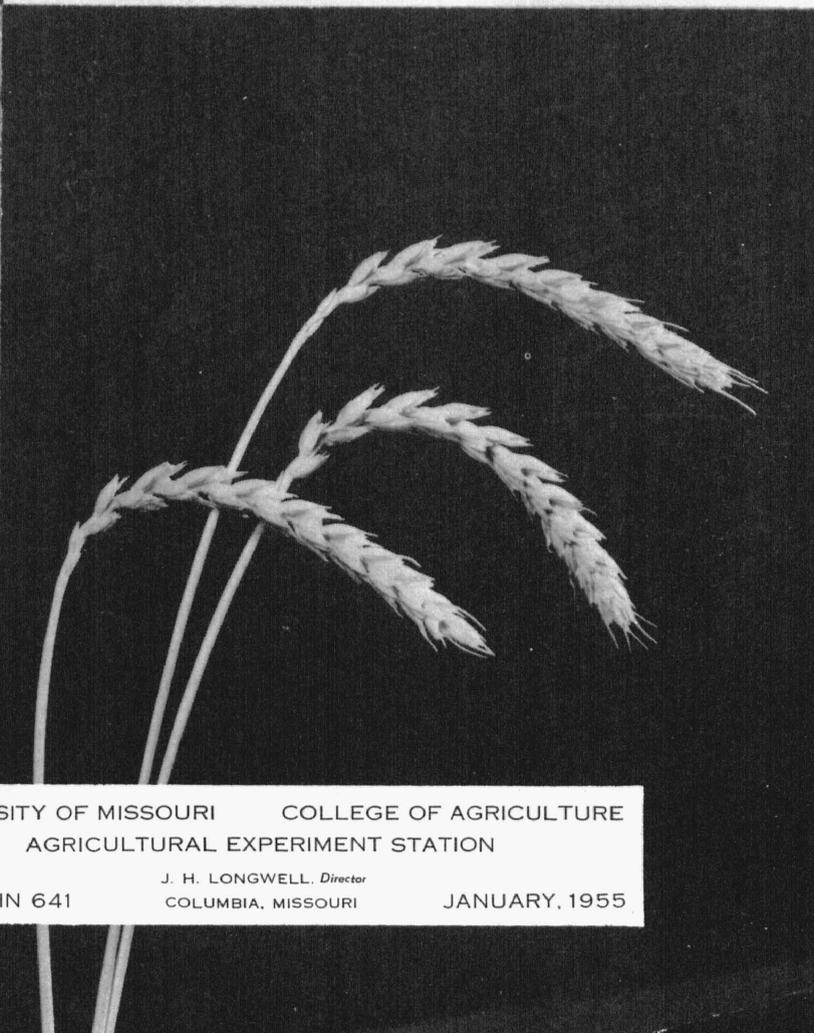




# **CORN Substitutes for Fattening Cattle**



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78, "Feeding and Management"

# Corn Substitutes For Fattening Cattle

A. J. Dyer, L. A. Weaver

Corn is used more than all other grains combined for fattening cattle in the Midwest. It is usually available in large amounts and at reasonable cost. Under abnormal circumstances, however, corn may be either short in supply or relatively high in price or both. When this occurs, other feeds are sometimes substituted for corn. The home-grown grains most frequently available for this purpose are barley, wheat and oats; in some instances, molasses is used and, within a very limited area, rice grain.

The highly variable results obtained by experiment stations in early tests with corn substitutes

indicated the need for additional information. Feeding tests conducted by the Missouri Agricultural Experiment Station in 1930-31 compared corn with wheat and rice; in 1938-41, corn with barley; and in 1936-37, corn with molasses. These comparisons were made at the stated times because conditions gave birth to the need. In 1930, wheat was cheaper than corn, and high yields of rice were being obtained on river bottom land and used for livestock feed. Barley was receiving strong emphasis in Missouri cropping systems in 1938-41. In 1936, there was a widespread drought, a low corn yield and molasses was fed by many.

## PART I WHEAT VS. CORN IN CATTLE FATTENING RATIONS

Corn and wheat are similar in composition but have different physical characteristics. The average composition of each, according *FEEDS AND FEEDING*, by Morrison, is shown in Table 1.

Both grains are rich in total digestible nutrients and low in fiber. The chief differences are: corn contains more fat than wheat (3.9 percent compared with 1.9 percent) and less protein (8.6 percent compared with 13.2 percent). Their physical characteristics differ more widely, wheat being relatively small and flinty while corn is large and comparatively soft. Considering these differences, these questions obviously need to be answered: (1) Can wheat be substituted completely for corn or, if not, to what extent? (2) Should wheat be ground for cattle? (3) Does wheat require as much protein as corn to balance the ration?

### Plan

Two tests were conducted, each involving 4 lots of cattle. In the first test, the cattle were fed as follows.

Lot I—Shelled corn 10 parts and cottonseed cake 1, by weight, and alfalfa hay.

Lot II—Ground wheat 10 parts and cottonseed cake 1, by weight, and alfalfa hay.

Lot III—Shelled corn 5 parts, ground wheat 5 parts and cottonseed cake 1 part, by weight, and alfalfa hay.

Lot IV—Whole wheat 10 parts and cottonseed cake 1 part, by weight, and alfalfa hay.

The second test differed from the first in the following ways: 1. The rations listed for Lots III and IV were discontinued. Instead, a mixture of wheat and oats was fed (Lot III, below) and part of the roughage in another (Lot IV, below) consisted of corn silage. 2. Clover hay replaced alfalfa in all rations. 3. The ratio of wheat to protein concentrate was widened. Four lots of cattle were fed as follows:

Lot I—Shelled corn 10 parts and cottonseed cake 1 part, by weight, and clover hay.

Lot II—Ground wheat 20 parts and cottonseed cake 1 part, by weight, and clover hay.

TABLE 1 -- AVERAGE COMPOSITION AND TOTAL DIGESTIBLE NUTRIENTS

Concentrate	Average Total Composition (Percent)					Total Digestible Nutrients
	Protein	Fat	Fiber	N-free Extract	Mineral Matter	
Wheat, all analyses	13.2	1.9	2.6	69.9	1.9	80.0
Corn, dent, Grade No. 2	8.6	3.9	2.0	69.3	1.2	80.1

Lot III—Ground wheat 9 parts, ground oats 3 parts and cottonseed cake 1 part, by weight, and clover hay.

Lot IV—Ground wheat 20 parts and cottonseed cake 1 part, by weight, corn silage and clover hay.

#### Feeds Used And Feeding Procedure

The feeds consisted of No. 2 shelled corn, semi-hard wheat, and oats, purchased locally. No. 2 leafy alfalfa hay was used in the first trial and slightly stemmy red clover hay of good quality in the second trial, along with corn silage from corn that would have yielded approximately 40 bushels of grain per acre.

Roughage and concentrates were fed each morning and evening. When hay was the only roughage, the same amount was fed to each lot. The corn silage, fed only to Lot IV in the second test, was mixed with the concentrates. It was placed in the trough; the ground wheat and cottonseed cake spread over it; then all were mixed together.

The amount of concentrates fed was small at the beginning, 3 to 4 pounds per head daily, but was in-

creased gradually until, after 2 weeks, the cattle were receiving close to a full feed. After that, increases were made more slowly.

#### Cattle

Good grade yearling feeder steers purchased at a terminal market in fleshy condition were used in the first test. The cattle in the second test were of Good and Medium grades and medium flesh. Initial, monthly, and final weights were secured for each head of cattle.

#### Market Data

The dressing percentage and official U.S.D.A. carcass grade were obtained for each head of cattle.

#### Pork Credit

Feeder pigs were lotted with the cattle in sufficient numbers to consume grain that would have been wasted. No additional feed was given to them. The dirt feed lots prevented complete recovery of the grain when lots were muddy.

#### Results of First Test

Data for the first test are in Table 2.

TABLE 2 -- WHEAT VS. CORN FOR FATTENING YEARLING STEERS  
August 12 to November 20, 1930 (100 days) -- First Test  
All Figures Represent Pounds Unless Stated Otherwise

	Lot I Corn, Shelled 10 Cottonseed Cake 1 Alfalfa Hay	Lot II Wheat Ground 10 Cottonseed Cake 1 Alfalfa Hay	Lot III Corn, Shelled 5 Gr. Wheat 5 Cottonseed Cake 1 Alfalfa Hay	Lot IV Wheat, Whole 10 Cottonseed Cake 1 Alfalfa Hay
Number of Cattle Used	8	8	8	8
Avg. Initial Weight	555.9	553.7	556.7	561.7
Avg. Final Weight	793.7	737.3	813.9	777.8
Avg. Total Gain	237.8	183.6	257.2	216.1
Avg. Daily Gain	2.38	1.84	2.57	2.16
Avg. Total Feed Consumed:				
Corn	1230.0		660.0	
Wheat		961.0	660.0	1444.0
Cottonseed Cake	123.0	96.0	132.0	144.0
Alfalfa Hay	483.0	491.0	508.0	518.0
Avg. Daily Ration:				
Corn	12.3		6.6	
Wheat		9.6	6.6	14.4
Cottonseed Cake	1.2	.9	1.3	1.4
Alfalfa Hay	4.8	4.9	5.1	5.2
Feed Per 100 lbs. Gain:				
Corn	517.1		256.5	
Wheat		523.2	256.5	668.1
Cottonseed Cake	51.7	52.3	51.3	66.8
Alfalfa Hay	203.1	267.4	197.5	239.8
Pork Credit per Bu. of Grain Fed	.7	.3	.6	1.8
Selling Price \$/cwt.	\$12.00	\$10.50	\$12.00	\$11.25
Dressing Percent (warm weights)	59.2	56.9	59.4	57.7
Shrink (%)	2.3	2.2	2.9	0.6
Carcass Grade	Average Good	Low Good	Average Good	Low Good

*Rate of Gain*

The fastest daily gain, 2.57 pounds, was made by cattle in Lot 3, fed a mixture of shelled corn and ground wheat. The second best gains were made by steers fed corn, Lot 1, 2.38 pounds daily. Steers fed whole wheat, Lot 4, ranked third, 2.16 pounds and the cattle fed ground wheat were last, 1.84 pounds.

*Average Daily Ration*

All cattle consumed large amounts of grain except those fed ground wheat. The consumption of ground wheat fluctuated greatly from day to day and digestive disorders occurred frequently. These disturbances could be attributed partially to grinding of the wheat, as none occurred when whole wheat was fed and the number of disturbances was reduced by changing from finely ground to coarsely ground wheat. Neither did they occur when shelled corn and ground wheat were mixed together and fed. The cattle that were fed whole wheat ate the most feed; those eating corn-wheat mixture were second in amount; those eating shelled corn, third; and those on ground wheat ate least by a wide margin.

*Feed Required per 100 Pounds Gain*

There was little difference in grain required per 100 pounds of gain made by cattle in Lots 1, 2, and 3, which were fed shelled corn, ground wheat, and a mixture of the two, respectively. The amounts ranged from 513 to 523 pounds. Cattle fed ground wheat (Lot 4) required substantially more hay than the other lots of cattle. Steers fed whole wheat used approximately 25 percent more grain per hundredweight gain than any other lot of cattle. Much of this wheat was undigested.

*Pork Credit*

The amounts of gain made by pigs per bushel of grain fed to cattle were 1.8 pounds for whole wheat; 0.7 pounds for shelled corn; 0.6 pounds for corn-wheat mixture; and 0.3 pounds for ground wheat. Most of the waste feed was recovered during dry weather but much was lost when lots were muddy.

*Market Data*

Steers fattened with shelled corn and shelled corn-ground wheat mixture (Lots 1 and 3) brought \$12.00 per hundredweight and yielded carcasses of "Middle Good"\* grade. Cattle fed whole wheat brought \$11.25 and those fed ground wheat, \$10.50 per hundredweight. Both lots yielded "Low Good" carcasses. Selling prices reflected fairly accurately the differences in dressing percentages and carcass grades.

\*Equivalent to present Choice grade

*Observations*

1. A mixture of shelled corn and ground wheat (equal parts by weight) produced faster daily gain (0.2 pound faster) than shelled corn alone and with practically the same amounts of feed.

2. Ground wheat, when fed as the only grain, caused frequent digestive disorders that resulted in slow gains. Grain consumption was relatively low.

3. Whole wheat was not masticated thoroughly and large amounts passed through the cattle undigested. This resulted in large gains by hogs running with the cattle. These hog gains, however, were not sufficient to offset inefficient cattle gains.

**Second Test**

The second test was conducted February 20 to June 12, 1931, and differed from the first as described under "Plan of Experiment." Changes were made in an attempt to overcome the difficulties experienced in the first test. Ground wheat had caused serious digestive disorders. This posed the question: Could this be reduced materially or eliminated by adding some feed other than corn to the ground wheat? To test this possibility, ground oats was added to the ground wheat for Lot 3 and corn silage furnished part of the roughage in Lot 4. The mixture of ground oats and wheat contained 25 percent oats by weight, 40 percent by volume. Another change was made; the ratio of wheat to protein concentrate was widened from 10 to 1 to 20 to 1, thus giving recognition to the higher protein content of wheat. Corn silage was mixed with ground wheat to give more bulk and to separate the wheat particles so that they could not form a pasty mass during mastication.

**Results of Second Test**

Results of the second trial are presented in Table 3.

The results obtained from comparing shelled corn with ground wheat, Lot 1 vs. Lot 2, were comparable to those secured in the first test; that is, cattle fed shelled corn ate more feed, gained faster, fattened more quickly and yielded a higher dressing percentage and carcass grade. Also, the pork credit per bushel of corn fed to cattle was much higher than that obtained from ground wheat. The cattle fed ground wheat, however, gained more efficiently than cattle fed shelled corn, in spite of frequent digestive disturbances and relatively slow gains.

Adding ground oats to ground wheat improved the results slightly in a few respects and worsened them in others. The cattle ate more feed (11.3 compared to 10.4 pounds per head daily), yielded superior

TABLE 3 -- WHEAT VS. CORN FOR FATTENING YEARLING CATTLE  
February 20 to June 12, 1931 (112 days)

All Figures in Pounds Unless Stated Otherwise

	Lot I Shelled Corn 10 Cottonseed Cake 1 Clover Hay	Lot II Ground Wheat 20 Cottonseed Cake 1 Clover Hay	Lot III Ground Wheat 9 Ground Oats 3 Cottonseed Cake 1 Clover Hay	Lot IV Ground Wheat 20 Cottonseed Cake 1 Corn Silage Clover Hay
Number of Cattle Used	8	8	8	8
Avg. Initial Weight	513.9	508.8	513.0	515.4
Avg. Final Weight	796.6	743.2	752.4	762.6
Avg. Total Gain	282.7	234.5	239.4	247.2
Avg. Daily Gain	2.53	2.09	2.14	2.21
Avg. Total Feed Consumed:				
Corn	1468.3			
Wheat		1113.3	875.3	1099.8
Oats			291.8	
Cottonseed Cake	146.8	56.0	97.4	54.9
Corn Silage				401.0
Clover Hay	653.3	650.7	650.7	416.6
Avg. Daily Ration:				
Corn	13.1			
Wheat		9.9	7.8	9.8
Oats			2.6	
Cottonseed Cake	1.3	.5	.9	.5
Corn Silage				3.6
Clover Hay	5.9	5.8	5.8	3.7
Feed per 100 lbs. Gain:				
Corn	519.5			
Wheat		474.8	365.5	445.0
Oats			121.8	
Cottonseed Cake	52.0	23.8	40.6	22.3
Corn Silage				162.2
Clover Hay	232.0	277.6	271.9	168.7
Pork Credit per Bu. of Grain Fed	1.4	.6	.3	.4
Selling Price \$/cwt.	7.65	6.35	6.25	6.60
Dressing Percentage (warm weights)	57.4	56.6	55.6	56.4
Shrink (%)	2.1	3.0	1.9	3.8
Avg. Carcass Grade	Low Good	Average Medium	High Medium	Average Medium

carcasses by 1/3 grade, and shrunk less enroute to the market but the efficiency of gain was lowered, likewise the dressing percentage and the cattle sold for 10 cents less per hundredweight.

Mixing ground wheat with corn silage did not increase the consumption of grain but the steers gained more rapidly and efficiently and brought \$0.25 more per hundredweight than the cattle fed ground wheat alone. Carcass data indicate, however, that the higher selling price was not justified.

#### Summary and Conclusions

Wheat and corn were compared in two tests. In the first test, wheat was fed as a complete substitute for corn, both as whole and ground grain, and as a partial substitute by mixing ground wheat with shelled corn. Ground wheat as the only grain caused frequent digestive disturbances. To cope with this situation two rations were added in the second test,

namely, ground wheat 9 and ground oats 3 parts, by weight, and ground wheat was mixed with a small amount of corn silage.

The two tests show that:

1. Shelled corn produced faster gains than either ground or whole wheat fed alone, and a superior finished product based on selling price, carcass grade, and dressing percentage.

2. Ground wheat and shelled corn fed together gave excellent results—fastest gains of all lots of cattle, efficiency equal to the best, and carcasses equal to those from cattle fed corn alone.

3. Ground wheat fed as the only grain caused frequent digestive disturbances, slow gains and resulted in carcasses of relatively low grade.

4. Feeding whole wheat as a complete substitute was wasteful; cattle did not masticate or digest it thoroughly. Hogs made good gains from the feed

which otherwise would have been wasted but not enough to offset poor feed utilization by cattle.

5. The addition of ground oats to ground wheat did not improve the overall results materially.

6. The mixing of ground wheat with a small

amount of corn silage produced slightly more rapid and efficient gains than ground wheat as the only grain concentrate.

7. Feeding wheat at the ratio of 20 parts to 1 part protein concentrate by weight seemed satisfactory.

## PART II CORN VS. BARLEY

### Plan

Barley was substituted completely and partially for shelled corn in fattening rations fed to yearling steers in each of four trials. All cattle were fed alfalfa hay and corn silage plus the following concentrates:

Lot I—Shelled corn, 10 parts, and cottonseed cake, 1 part by weight.

Lot II—Shelled corn and ground barley, 5 parts each, and cottonseed cake, 1 part by weight.

Lot III—Ground barley, 10 parts and cottonseed cake, 1 part by weight.

A fifth test was conducted utilizing steer calves and the same rations that were fed to Lots I and II.

### Feeds Tested

The barley was of Missouri Early Beardless variety and good quality but of low test weight, 37.5 pounds per bushel in two trials and 42 pounds in one trial. Shelled yellow corn of No. 2 grade and cottonseed cake of 41 percent crude protein were fed. The silage was made from corn that would have yielded 30 to 40 bushels per acre and the alfalfa hay was U. S. No. 2 grade. During a short period in one trial, lespedeza hay was fed. The procedure was to feed the silage first, then grain, then hay. Salt was available at all times.

### Cattle

Good and choice yearling feeder steers in thin condition were used in each of three tests and medium

TABLE 4 -- GROUND BARLEY VS. SHELLED CORN FOR FATTENING YEARLING STEERS  
Average, 4 Years Results

	All Figures Represent Pounds Unless Stated Otherwise		
	Lot I Sh. Corn 10 Cottonseed Cake 1 Alfalfa Hay Corn Silage	Lot II Gr. Barley 10 Cottonseed Cake 1 Alfalfa Hay Corn Silage	Lot III Sh. Corn 5 Gr. Barley 5 Cottonseed Cake 1 Alfalfa Hay Corn Silage
Number of cattle used	7.8	7.8	8.0
Avg. Length Feeding Period (days)	130.1	129.6	129.5
Avg. Initial Weight	607.5	611.8	612.8
Avg. Final Weight	884.8	917.5	904.0
Avg. Total Gain	277.3	305.7	291.2
Avg. Daily Gain	2.13	2.36	2.25
Avg. Total Feed Consumed:			
Shelled Corn	1487.1		833.3
Ground Barley		1658.3	833.0
Cottonseed Cake	148.7	165.8	166.6
Alfalfa Hay	446.5	424.0	441.8
Corn Silage	1950.7	1800.0	1979.1
Avg. Daily Ration:			
Shelled Corn	11.4		6.4
Ground Barley		12.8	6.4
Cottonseed Cake	1.1	1.3	1.3
Alfalfa Hay	3.5	3.4	3.5
Corn Silage	15.4	14.3	15.7
Feed per 100 lbs. Gain			
Shelled Corn	536.2		286.1
Ground Barley		542.5	286.1
Cottonseed Cake	53.6	54.3	57.2
Alfalfa Hay	168.5	142.5	160.9
Corn Silage	736.2	605.3	720.8
Dressing percent (warm weight)	59.1	58.7	59.6
Avg. Carcass Grade	Avg. Good	Avg. Good	Avg. Good

TABLE 5 -- GROUND BARLEY VS. SHELLED CORN FOR FATTENING STEER CALVES  
1 Year's Results

All Figures Represent Pounds Unless Stated Otherwise		
	Lot I Corn 10 Cottonseed Cake 1 Alfalfa Hay Corn Silage	Lot II Gr. Barley 10 Cottonseed Cake 1 Alfalfa Hay Corn Silage
Number of cattle used	8	8
Avg. Length Feeding Period (days)	182.0	182.0
Avg. Initial Weight	371.7	371.7
Avg. Final Weight	777.8	801.4
Avg. Total Gain	406.1	429.7
Avg. Daily Gain	2.23	2.36
Avg. Total Feed Consumed:		
Shelled Corn	1911.7	
Ground Barley		1917.5
Cottonseed Cake	191.8	191.8
Alfalfa Hay	440.3	453.3
Corn Silage	1508.0	1575.0
Avg. Daily Ration:		
Shelled Corn	10.5	
Ground Barley		10.5
Cottonseed Cake	1.1	1.1
Alfalfa Hay	2.4	2.5
Corn Silage	8.3	8.7
Feed per 100 lbs. Gain:		
Shelled Corn	470.7	
Ground Barley		446.2
Cottonseed Cake	47.1	44.6
Alfalfa Hay	108.4	105.5
Corn Silage	371.3	366.5
Dressing percent (warm weight)	59.7	58.4
Avg. Carcass Grade	Middle Good	Low Good

grades were used in another. Steer calves of choice grade were used during the fifth test.

#### Marketing

Carcass weights and grades were secured for each head of cattle.

#### Results

The results obtained with yearling steers are in Table 4.

Ground barley substituted completely for shelled corn (Lot III) produced the fastest daily gain, 2.36 pounds compared with 2.13 pounds from shelled corn (Lot I). A mixture of ground barley and corn (Lot III) made the second highest daily gains, 2.25 pounds. Cattle receiving barley alone consumed more grain and less roughage than cattle fed shelled corn. Ground barley fed alone was used more efficiently than either shelled corn or a mixture of the two, based on feed required per hundredweight of gain. A mixture of the two was used less efficiently than either grain fed alone. All cattle averaged good\* in the carcass. Dressing percentages ranged from 58.7 for cattle fed ground

\*Equivalent to the present U.S. Choice grade.

barley to 59.6, the highest, for cattle fed corn-barley mixture.

One test comparable to the foregoing was made with steer calves and the results are contained in Table 5.

Steer calves fed ground barley gained slightly faster than those fed shelled corn (2.36 compared with 2.23 pounds daily), consumed practically the same amounts of feed, and required slightly more grain per unit of gain but less roughage. Carcasses from both groups were within the U. S. Good\* grade carcasses of corn-fed steers graded middle good; those of the barley-fed steers graded low good or 1/2 grade below the corn-fed cattle. Dressing percentage was slightly higher for the cattle that were fed corn.

#### Summary

Five tests were conducted, four with yearling cattle comparing ground barley with shelled corn by substituting the barley completely and partially for corn, and one test with calves wherein barley was substituted completely for corn.

The following conclusions were made, based on these tests:

1. Ground barley fed alone and in a mixture with shelled corn produced faster gains than shelled corn when fed to yearlings (4 tests). Ground barley ranked first, the mixture was second, and shelled corn last in rate of gain.

2. Ground barley produced faster gains than shelled corn when fed to calves.

3. Corn and barley were utilized with about equal efficiency when each was fed alone. Mixing them together reduced efficiency.

4. Carcasses were approximately equal from all rations.

### PART III

## MOLASSES VS. CORN IN CATTLE FATTENING RATIONS

Drought and grasshoppers either destroyed the corn crop or greatly lessened corn yields during 1936. Thus, there was need for other feeds in cattle rations. Molasses was available at reasonable cost. What to expect from using small amounts (1 pound) in cattle rations had been tested to a limited extent at the University of Missouri and reported in Bulletin 223, "The Use of a Limited Amount of Molasses in Feeding Yearling Steers." Additional information was needed on what results to expect from substituting molasses extensively for shelled corn in fattening rations of cattle. One test was conducted on this problem.

Results of this test follow.

#### *Objective*

The object of this experiment was to determine the value of molasses when substituted completely and partially for shelled corn in fattening rations fed to yearling steers.

#### *Materials and Procedure*

Four rations were fed, each to one lot of eight head of cattle. The concentrates were limited in two of these rations (Lots 1 and 2) to approximately 50 percent of the total amounts consumed by cattle in the remaining two lots which were full fed (numbers 3 and 4). The rations and rate of feeding were:

<p>Ration 1--shelled corn, 10 parts Lot 1    cottonseed meal, 1 part           corn silage           alfalfa hay (4 lbs. per head daily)</p>	} by weight	The amount of concentrates fed Lots 1 and 2 was restricted to one-half the amount of concentrates consumed by Lot 4 which was full fed
<p>Ration 2--molasses, 5 parts Lot 2    cottonseed meal, 1 part           corn silage           alfalfa hay (4 lbs. per head daily)</p>	} by weight	

<p>Ration 3--shelled corn, 8 parts Lot 3    cottonseed meal, 1 part           corn silage           wheat straw</p>	} by weight	The amount of concentrates fed Lot 3 was limited to the amount of concentrates consumed by Lot 4 which was full fed
<p>Ration 4--molasses, 4 parts Lot 4    cottonseed meal, 1 part           corn silage           wheat straw</p>	} by weight	

<p>Ration 4--molasses, 4 parts Lot 4    cottonseed meal, 1 part           corn silage           wheat straw</p>	} by weight	Full fed concentrates consisting of molasses 4 parts and cottonseed meal 1 part
<p>Ration 4--molasses, 4 parts Lot 4    cottonseed meal, 1 part           corn silage           wheat straw</p>	} by weight	

#### *Feeds Tested*

The feeds used in this test were:

Molasses, standard Louisiana blackstrap, Baume reading of 42° at 90 degrees F.

Shelled yellow corn, numbers 2 and 3 grade mixed.

Cottonseed cake, pea-size, 41% crude protein.

Alfalfa hay, good quality.

Corn silage, from drought corn which would have yielded less than 10 bushels per acre.

Molasses differs from corn markedly in both chemical composition and physical characteristics. Molasses lacks substantially in total digestible nutrients, especially in fat and protein. Analyses of each, according to *Feeds and Feeding*, by Morrison, are shown in Table 6.

#### *Method of Feeding*

The molasses and the cottonseed cake were fed on the corn silage to cattle receiving limited amounts of molasses. This method of feeding was used also for

TABLE 6 -- AVERAGE COMPOSITION AND TOTAL DIGESTIBLE NUTRIENTS

Concentrate	Average Total Composition (Percent)					Total Digestible Nutrients
	Protein	Fat	Fiber	N-free Extract	Mineral Matter	
Molasses, cane	2.9	0	0	62.1	9.0	54.0
Corn, dent, Grade No. 2	8.6	3.9	2.0	69.3	1.2	80.1

TABLE 7 -- BLACKSTRAP MOLASSES IN RATIONS FOR YEARLING STEERS  
1936-1937 Winter

Lot	I	II	III	IV
Days Fed	168	161	133	133
Number of Animals	8	8	8	8
Ration	Alfalfa Hay Corn Silage Corn 10 C.S.M. 1, limited*	Alfalfa Hay Corn Silage Mol. 5 C.S.M. 1, limited*	Wheat Straw Corn Silage Corn 8** C.S.M. 1	Wheat Straw Corn Silage Full Feed of Mol. 4 C.S.M. 1
Avg. initial wt. (lbs.)	583.16	646.95	642.87	647.66
Avg. final wt. (lbs.)	845.91	881.78	904.25	887.33
Total gain (lbs.)	262.75	234.83	261.38	239.67
Avg. daily gain (lbs.)	1.56	1.46	1.97	1.80
Avg. total feed				
Corn (lbs.)	912.27		1614.00	
Corn (bu.)	16.29		28.82	
Molasses (lbs.)		797.71		1447.54
Cottonseed meal (lbs.)	91.23	159.54	201.75	361.89
Silage (lbs.)	4774.38	4663.13	2659.38	3913.14
Alfalfa hay (lbs.)	712.13	692.00		
Wheat straw (lbs.)			192.37	188.86
Avg. daily ration (lbs.)				
Corn	5.43)		12.14)	
Molasses	)5.97	4.95)5.94	)13.66	10.88)13.60
Cottonseed meal	.54)	.99)	1.52)	2.72)
Silage	28.42	28.96	20.00	29.42
Alfalfa hay	4.24	4.30	none	none
Wheat straw			1.45	1.42
Feed to produce 100 lbs. gain (lbs.)				
Corn (lbs.)	347.35		617.49	
Corn (bu.)	6.2		11.03	
Molasses		339.67		604.80
Cottonseed meal	34.74	67.93	77.19	151.19
Silage	1817.08	1985.58	1017.44	1632.72
Alfalfa hay	271.03	294.66		
Wheat straw			73.51	78.80
Initial steer cost per cwt.	\$5.34	\$5.34	\$5.34	\$5.34
Market wt. - St. Louis	845.00	874.20	900.00	859.10
Actual S. P. on St. Louis mkt.	\$9.00	\$8.25	\$9.00	\$8.50
Avg. feeder grade	Good	Medium	Medium+	Medium+
Avg. carcass grade	Medium	Medium	Medium+	Medium
Dressing percentage-hot wt.	53.88	53.32	57.81	57.13

\*Amounts of concentrates fed daily to Lots 1 and 2 were limited to 50% of amounts consumed by Lots 3 and 4, respectively,

\*\*Total amounts of concentrates fed to Lot 3 equalled total amounts fed to Lot 4.

Lot 4 until the cattle were on a full allowance of molasses; thereafter, the molasses was fed in a trough and the cottonseed meal sprinkled uniformly over the molasses. The reason for this feeding procedure was that the cattle had become accustomed to eating the combination of molasses and cottonseed meal at the beginning of the test and, according to the workers, ate more concentrates when fed in this manner. Enough molasses was fed twice daily to keep a supply constantly before the cattle. Alfalfa hay, fed to Lots 1 and 2 only, was limited to approximately 4 pounds per head daily. Corn silage was fed in full amount to all lots of cattle. Cattle in Lots 3 and 4 had access constantly to wheat straw.

The amounts of concentrates fed daily to Lots 1 and 2 were limited to 50 percent of the amounts fed to Lots 3 and 4. Lot 4 was full-fed concentrates and Lot 3 received the same poundage daily of concentrates as Lot 4.

#### Data

Yearling feeder cattle in thin flesh, of medium grade, and principally Shorthorn breeding, were used in this test. Initial, 28-day, and final weights were obtained. Dressing percentages and carcass grades were secured at the time the cattle were marketed.

Table 7 gives the data from these tests.

It must be noted that Lot 1 was fed for 7 more days than Lot 2; thus, comparisons of the items, "total feed consumed" and "total gain," have not been made. All other data, however, are comparable.

### Conclusions

Pertinent facts discovered when molasses and corn were fed in limited amounts were:

1. Corn produced faster daily gain than molasses, 1.56 compared with 1.46 pounds or nearly 7 percent.
2. To produce 100 pounds gain, molasses-fed cattle required more feed in the following amounts:
 

cottonseed meal	33 lb.
silage	169 lb.
alfalfa hay	23 lb.
3. Less molasses (7.6 pounds) than corn was required per 100 pounds gain.
4. Corn-fed cattle brought 75 cents more per hundredweight.

Facts relative to full feeding of molasses compared with approximately full feeding (Lot 3) of corn are:

1. Corn produced faster gain, 1.97 compared with 1.8 pounds or nearly 9 percent.
2. Molasses-fed cattle ate 9.4 pounds more silage daily.
3. To produce 100 pounds gain, molasses-fed cattle required more feed in the following amounts:
 

cottonseed meal	74 lb.
corn silage	615 lb.
straw	5 lb.
4. Corn-fed cattle brought 50 cents more per hundredweight.
5. Cattle fed molasses did not shed hair as quickly as corn-fed cattle; this, plus the messy appearance resulting from molasses clinging to the hair coats, in some cases, detracted from their appearance.
6. Molasses was used more efficiently when fed in limited amounts than when full fed.

## PART IV ROUGH RICE VS. CORN

Corn and rice differ widely in both composition and physical characteristics. The average composition of each is shown in Table 8.

Rice is much higher in fiber and minerals than corn but contains less fat and protein and less total digestible nutrients. Rice is relatively small and flinty and enclosed in hard hulls that have sharp ridges with tooth-like projections.

### Rations Fed

Rice was fed in ground form and compared with shelled corn in rations used to fatten cattle. Two lots of cattle were fed as follows:

Lot I. Shelled corn, 10 parts, cottonseed meal, 1 part, by weight, and soybean hay.

Lot II. Ground, rough rice, 7 parts, cottonseed meal, 1 part, by weight and soybean hay.

### Feeds and Method of Feeding

Shelled corn, yellow and white mixed, of number 2 grade, and rice produced on experimental fields at

Elsberry, Mo., comprised the grains. Cottonseed meal with 43 percent crude protein content and locally grown soybean hay were used.

Cattle were fed concentrates and hay twice daily. The amounts of grain were increased rapidly for the first two weeks and slowly after that until the cattle were on full feed.

### Description of Cattle

Choice grade yearling Hereford steers were purchased at a terminal market for this test. Initial, monthly, and final weights were obtained for each head of cattle. Carcass grades and dressing percentages were obtained.

### Results

Cattle that were fed shelled corn (Lot I) gained faster by 0.24 pound daily than cattle fed ground rough rice, 2.15 pounds compared with 1.81 pounds daily per head. Rice was highly palatable. Cattle ate more rice daily than shelled corn. Twenty-five percent

TABLE 8 -- AVERAGE COMPOSITION AND TOTAL DIGESTIBLE NUTRIENTS

Concentrate	Average Total Composition					Total Digestible Nutrients
	Protein	Fat	Fiber	N-free Extract	Mineral Matter	
Rough Rice	7.9	1.8	9.	64.9	5.2	70.2
Corn	8.6	3.9	2.	69.3	1.2	80.1

more rice was required per 100 pounds gain. Selling price and carcass grade were both in favor of corn-fed cattle.

*Summary*

Ground, rough rice and mixed shelled corn were compared in rations fed to yearling steers. The following conclusions were indicated.

1. Ground, rough rice was worth about 75 percent as much per pound as shelled corn, using the amount of feed required per hundred pounds of gain as the measuring stick.
2. Superior gain and finished and carcass grades were secured from feeding corn.
3. There were no objectional features to the feeding of rice and if its cost is low enough, it can be substituted satisfactorily for corn.