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## Corn Silage for Steers and Mill Products for Steers

J.W. Wilson

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JANUARY, 1914

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# AGRICULTURAL EXPERIMENT STATION

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SOUTH DAKOTA  
STATE COLLEGE OF AGRICULTURE  
AND MECHANIC ARTS

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ANIMAL HUSBANDRY DEPARTMENT

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## CORN SILAGE AND MILL PRODUCTS FOR STEERS

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BROOKINGS, SOUTH DAKOTA

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## SUMMARY.

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1. The results show that all of the steers made good gains while receiving corn silage as the sole roughage ration.

2. Oil meal, dried distilled grains and cottonseed meal are valuable feeds to mix with corn silage for the economical production of a pound of gain. The results show that their relative value ranks in the order mentioned above.

3. The largest gains and the most uniform gains were made by steers in lot that received oil meal and corn silage. The average daily gain compares favorably with the gains made by steers of a similar age receiving a full feed of corn and oil meal. However the latter was a much more expensive ration.

4. The steers receiving oil meal consumed an average of ten pounds more of corn silage per head daily than those receiving cottonseed meal and silage and also made a larger and a cheaper gain than steers in other lots.

5. The results of this experiment show that the dried distilled grains feed was not as valuable as oil meal to mix with silage but more valuable than cottonseed meal. The gains were larger and more uniform than those that received cottonseed meal. Fewer pounds of silage and dried distilled feed were required for a pound of gain than with lot that received silage and cottonseed meal.

6. Corn silage and shelled corn does not make the best ration, it all being too carbonaceous. The steers in lot receiving oats and silage made larger and more uniform gains than those that received shelled corn.

## CORN SILAGE FOR STEERS

James W. Wilson

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This bulletin includes the results obtained in the second year's work of a series of experiments at this Station in feeding corn silage as the sole roughage ration to steers.

In a test conducted during the winter of 1911-12 we fed yearling steers for a period of ninety days on first class corn silage as the sole ration. The results of this experiment were reported in bulletin No. 137, and show that, during the ninety days feeding period, an average gain of 2.4 pounds per head was made daily.

When oil meal, cottonseed meal, and dried distilled grains were fed with the silage, during the first ninety days of the second experiment, the average daily gains for two of the lots were larger than in the first test where the by-products were not fed. They were as follows: Lot I, oil meal and silage, 2.69 pounds; Lot II, cottonseed meal and silage, 2.08 pounds; Lot III, dried distilled grains and silage, 2.49 pounds.

For the entire feeding period of 146 days, the average daily gains per head were as follows: Lot I, 2.45 pounds; Lot II, 1.95 pounds; Lot III, 2.17 pounds. These gains are similar to gains made by steers for the same length of feeding period, but receiving a more expensive ration of grain, oil meal, and hay.

The silage for this second experiment was not as good as that used one year ago, because we were forced to cut the corn after it had been frosted three times. Some of the leaves were lost while handling and a majority of the ears were in the milk stage instead of the

dent stage. Silage made from such corn is not as valuable for feeding purposes as that from corn cut when it is dented before the frost. However, since corn is frequently injured by frost in the northern part of the Corn-Belt the results will be of interest to feeders of silage.

The object of this experiment was to determine the relative feeding value of oil meal, cottonseed meal and dried distilled grains, when fed with corn silage as the sole roughage ration. These three by-products, and especially the first two, are commonly used by feeders of corn to furnish the protein of the ration.

Two years' experience with forty different cattle teaches that by careful feeding, increasing the allowance of corn silage gradually from the time they learn to eat it until they are on full feed, there is little danger of getting them off feed.

There were three lots of yearling steers of four head each. Each lot was given 12 pounds of the by-product daily and all the silage the steers would eat. The lots were of practically the same weight at the beginning. The experiment continued for 146 days.

The meals were mixed with the silage both morning and evening.

This experiment calls attention to the value of corn silage when properly supplemented with high protein feeds. I believe that when we feed our corn crop in the form of silage we will be able to make beef at a profit under almost any conditions likely to present themselves.

The old custom of stocking cattle through the winter will soon be a practice of the past. The grains on grass through the summer will be maintained and an additional gain equal to the one made on the grass will be secured in the winter by feeding silage.



Lot I

### CORN SILAGE AND OIL MEAL.

These steers received three pounds of oil meal per head daily and all the corn silage they would eat. At the close of the experiment they were eating an average of 55 pounds of silage per head daily. The oil meal was more palatable than either of the other feeds and the steers were fatter than steers of other lots at the close of the experiment. They were well coddled and had the appearance of corn fed cattle.

	Pounds
Average weight at beginning .....	644
Average weight at close .....	1001
Average gain per head, 146 days.....	357
Average gain per head first 90 days.....	242
Average gain per head daily, 146 days.....	2.45
Average gain per head daily, first 90 days.....	2.69
Average pounds silage for a pound of gain.....	19.7
Average pounds of oil meal for a pound of gain.	1.2
Valuing the silage at \$4 a ton and the oil meal at \$32 a ton, the cost of producing 100 pounds of gain would be .....	\$5.86



Lot II

**CORN SILAGE AND COTTONSEED MEAL.**

This lot received cottonseed meal and all the corn silage they would eat. At the close of the experiment the steers were eating an average of 45 pounds of silage per head daily. This mixture did not prove to be as good as the oil meal and silage mixture. From the beginning they were not anxious for their feed. Neither were the steers in as good condition at the close as those of the oil meal lot.

	Pounds
Average weight at beginning .....	655
Average weight at close .....	941
Average gain per head, 146 days.....	285
Average gain per head, first 90 days.....	187
Average gain per head daily, 146 days.....	1.95
Average gain per head daily, first 90 days....	2.08
Average pounds of silage for pound of gain ....	21.2
Average pounds of cottonseed meal for pound of gain .....	1.5
Valuing the silage at \$4 a ton and the cottonseed meal at \$32 a ton, the cost of producing 100 pounds of gain would be .....	\$6.64





Lot III

### CORN SILAGE AND DRIED DISTILLED GRAINS

Dried distilled grains is a comparatively new proteinaceous feed in the market. At the close of the experiment the steers were eating an average of 52 pounds of silage per head daily. This by-product did not prove to be as good as oil meal but better than cottonseed meal. The steers were in better condition at the close than those of the cottonseed lot.

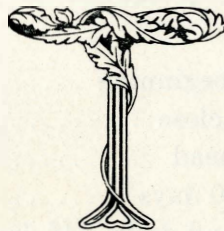
	Pounds
Average weight at the beginning .....	644
Average weight at the close .....	961
Average gain per head, 146 days .....	317
Average gain per head first 90 days .....	224
Average gain per head daily, 146 days .....	2.17
Average gain per head daily, first 90 days .....	2.49
Average pounds of silage for pound of gain ....	20.3
Average pounds of dried distilled grains for pound of gain .....	1.3
Valuing the silage at \$4 a ton and the dried dis- tilled grains at \$24 a ton, the cost of produc- ing a pound of gain would be .....	\$5.50

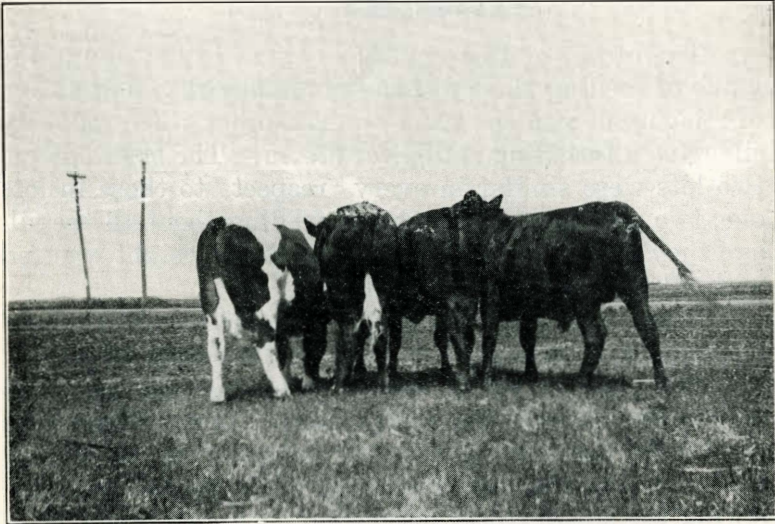
**EXPERIMENT NO. 2**

The object of this experiment was to determine the value of feeding shelled corn and oats with a half ration of silage and also the value to each other when fed with silage as a fattening ration for steers. The steers of the two lots were similar in every respect to those in lots one, two and three. Instead of feeding them all the silage they would eat, one-half as much by weight was fed with all the grain they would eat.

While oats is the best feed we have for all kinds of livestock it is an expensive feed for fattening steers.

One pig was put in the lot receiving oats and two pigs in the lot receiving shelled corn. It was found with the oat lot that the pig was not necessary as he merely made a living and lost 12 pounds, while the two pigs following the steers receiving shelled corn and silage gained 94 pounds during the 146 days feeding period.



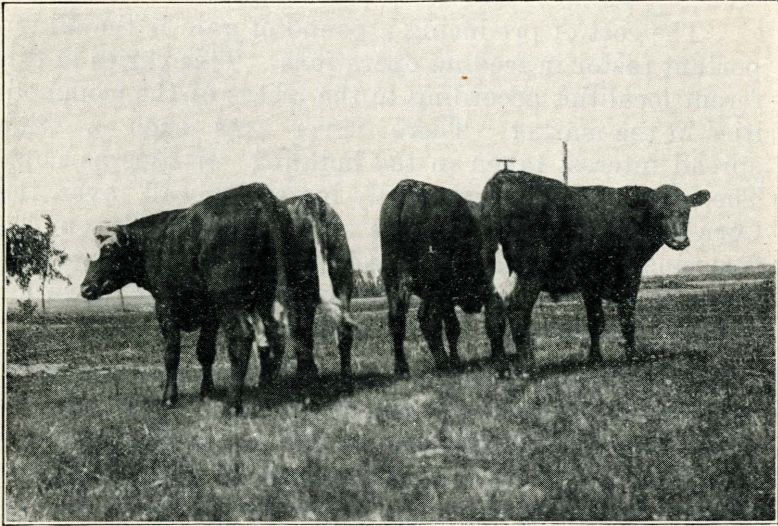


Lot IV

### OATS AND CORN SILAGE

With the exception of those in lot I, these steers were fatter than steers of other lots. At the close of the experiment these steers were eating 27 pounds of corn silage and 11 pounds of oats per head daily.

	Pounds
Average weight at beginning .....	673
Average weight at close .....	992
Average gain per head .....	319
Average gain first 90 days .....	207
Average gain per head daily, 146 days .....	2.18
Average gain per head daily, first 90 days .....	2.30
Average pounds silage for pound of gain .....	10.9
Average pounds of oats for pound of gain .....	4.7
Valuing the corn silage at \$4 a ton and the oats at one cent a pound, the cost of producing 100 pounds of gain would be .....	\$6.88



Lot V

### SHELLED CORN AND CORN SILAGE

At the close of the experiment these steers were eating 27 pounds of silage and 17 pounds of corn per head daily.

	Pounds
Average weight at beginning .....	681
Average weight at close .....	987
Average gain per head .....	306
Average gain first 90 days .....	189
Average gain per head daily, 146 days .....	2.09
Average gain per head daily first 90 days .....	2.01
Average pounds of silage for pound of gain ....	11.6
Average pounds of corn for pound of gain .....	5.9
Valuing the silage at \$4 a ton and the shelled corn at one cent a pound, the cost of producing 100 pounds of gain would be .....	\$8.22

## FEED FOR POUND OF GAIN

The cost of producing a pound of gain is the all-important factor in feeding operations. This varies in different localities according to the prices of the commodities in the market. There never was such a wide spread interest taken in the building of silos as now. The price of land is gradually increasing all over the Corn-belt and in the absence of the large herds on the free range the producer of beef is forced to utilize everything he grows to the best possible advantage in order to make the cheapest pound of gain.

A silo properly constructed is a permanent improvement just as much as a woven wire fence. By its use the entire corn plant is utilized, we believe, to the very best advantage. Of course its use is confined to the livestock system of farming entirely, but we believe this to be the best system in the end. In these two experiments good gains were made with all the lots and the prices quoted for the feeds used are liberal. Yearling steers fed silage for 90 days after taken off the pasture in the fall made a larger gain than they probably would have made on the best of pasture. The three lots that received corn silage and the by-products made a much larger gain in the same period of time than they probably would had they received a full feed of corn. For the 146 days feeding period, with the exception of one lot, the average daily gain per head was over 2 pounds.

The following is a statement of the average amount of feed required to produce a pound of gain for the 146 days feeding period:

Lot I	19.7 lbs. of silage and 1.2 lbs. of oil meal.
Lot II	21.2 lbs. of silage and 1.5 lbs. of cottonseed meal.
Lot III	20.3 lbs. of silage and 1.3 lbs. of dried distilled grains.
Lot IV	10.9 lbs. of silage and 4.7 lbs. of oats.
Lot V	11.6 lbs. of silage and 5.9 lbs. of shelled corn.

From the above it appears as though the returns for lot I and lot III are practically equal. During the 146 days the four steers in lot I consumed 2,440 pounds more

of silage than the four steers in lot III, and gained 162 pounds more and were in much better condition at the close of the experiment than steers in lot III.

## CHEMICAL ANALYSIS OF FEEDS

Guy E. Youngberg, Assistant in Chemistry

	Per cent Moisture	Per cent Ash	Per cent Ether Extract	Per cent Crude Protein	Per cent Nitrogen— free extract	Per cent Crude Fibre
Corn silage .....	67.82	1.77	1.70	2.80	18.18	7.73
Dried distilled grains..	4.19	1.97	12.50	33.12	34.55	13.67
Oil meal .....	6.56	5.17	7.64	33.87	37.11	9.65
Cottonseed meal .....	4.73	4.75	7.56	37.46	30.50	15.00

There is a similarity in the composition of these by-products. The per cent of crude protein is practically the same, while the per cent of crude fibre is much greater in cottonseed meal and dried distilled grains than in oil meal. Crude fibre is the woody portion of a feed and while all feeds contain this element to a greater or less extent a large per cent is not desirable. The results of this experiment correspond to the per cent of this element found in the feeds. Now, the dried distilled grains contain nearly 5 per cent more ether extract or fat than the other two feeds but this is not the element required to balance the ration as corn silage is a carbonaceous feed.

The dried distilled grain was purchased from the Akron Milling Co., Sioux City, Iowa. As to its manufacture I quote from a letter from them: "In regard to the manufacture of distilled spirit feed, will say it is about as follows: The mash for distilled spirit is cooked for some time at a temperature of 312 degrees. The offal composing the feed is as follows: 85 per cent corn, 10 per cent malt, 5 per cent rye. This is the best grade this distillery puts out. In making Bourbon whiskey

the mash is cooked to 210 degrees and the feed is composed as follows: 65 per cent corn, 25 per cent rye, 10 per cent malt. As we wrote you some time ago this is a new feed for us, and we have had no report from other feeders as it has all been sold in the east where we have been unable to secure a report.

“This is a small distillery; they only make 1 1-2 tons per day of this feed for sale. Yours is the first test we have had on this feed. We have only handled it a short time and are therefore not in a position to furnish much information.”



## TABLE OF WEIGHTS AND GAINS

### Lot I, Corn Silage and Oil Meal

No. of Steer	Weight at beginning Jan. 24	Weight Feb. 24	Weight March 24	Weight April 23	Weight May 24	Weight June 18	Gain	Av. gain per head daily
1	679	758	858	942	998	1034	355	2.43
2	566	690	780	864	930	994	428	2.94
3	771	874	948	996	1058	1099	328	2.24
4	560	638	694	744	840	879	319	2.18
Totals	2576	2960	3280	3546	3826	4006	1430	
Av. gain		96	80	66	70	45	357	2.45

### Lot II, Corn Silage and Cottonseed Meal

1	629	686	758	808	862	888	259	1.77
2	751	832	890	912	972	1001	250	1.71
3	625	710	792	834	880	915	290	1.98
4	618	708	780	818	922	960	342	2.34
Totals	2623	2936	3220	3372	3636	3764	1141	
Av. gain		78	71	38	66	32	285	1.95

### Lot III, Corn Silage and Dried Distilled Grains

1	696	802	856	906	976	1000	304	2.08
2	647	726	794	826	876	900	253	1.73
3	650	772	858	941	1020	1030	380	2.60
4	585	688	750	800	860	916	331	2.26
Totals	2578	2988	3258	3476	3732	3846	1268	
Av. gain		102	67	54	64	28	317	2.17

### Lot IV, Corn Silage and Oats

1	660	738	794	814	866	904	244	1.67
2	663	786	808	856	936	988	325	2.22
3	686	806	854	904	940	994	308	2.10
4	683	800	878	946	1020	1083	400	2.74
Totals	2692	3130	3334	3520	3762	3969	1277	
Av. gain		109	51	46	60	52	319	2.18

### Lot V, Corn Silage and Shelled Corn

1	634	690	776	816	870	936	302	2.07
2	658	740	790	834	900	958	300	2.05
3	724	812	920	944	1018	1063	339	2.32
4	710	776	850	890	954	992	282	1.93
Totals	2726	3018	3336	3484	3742	3949	1223	
Av. gain		73	79	37	64	51	305	2.09



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95. The Treatment of Nail Pricks of Horse's Foot.
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97. Speltz and Millet for the Production of Baby Beef.
98. Crop Rotation.
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