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# Silage and Grains for Steers

J.W. Wilson

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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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**SILAGE AND GRAINS FOR STEERS**

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**BROOKINGS, SOUTH DAKOTA**

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### SUMMARY

1. With the rapidly increasing price of lands we believe a preliminary feeding period one of the best methods to follow in fattening cattle for market.

2. Corn silage produced more than twice as much gain as sorghum silage when fed as the sole ration. It required over twice as much sorghum silage for a pound of gain as it did corn silage.

3. When three pounds of oilmeal were added to both the sorghum and the corn silage rations, the gains were more than doubled over lots that received the silages alone, and the cost of producing these extra gains was reduced in both cases by adding oilmeal.

4. Large gains secured during the first 91 days of both experiments were maintained when steers were put on fattening ration.

5. Where the corn plant will mature there is no benefit to be derived in growing sorghum for the silo.

6. A preliminary feeding period with some cheap feed is desirable and we know of no other plant that will produce this cheap feed better than corn.

7. By feeding the leguminous hays better gains were made than with silage alone, but not as cheap gains. At the end of the 91 day preliminary feeding period, steers that received silage alone were in better condition than any of the lots receiving corn silage and hay. This was probably caused by the additional corn received in the ration.

8. The results indicate that alfalfa hay is the best of the legumes to feed with corn silage for a large gain. By tables III and IV, weights and gains, it will be noted that steers of lot IV made larger gains per head than any of

the other lots. These extra gains were undoubtedly caused by feeding alfalfa during the preliminary period. However, the gains of the steers that received sweet clover hay during the preliminary period were nearly as large as those that received alfalfa hay. Just what the result would have been had we fattened these two lots on the same grain ration I am unable to state.

9. Corn silage as the sole roughage with the grains proved to be a suitable substitute for hay, as the average daily gain per head of the different steers, when we consider the length of the fattening period, are similar to gains made in other experiments where hays were fed.

10. Prairie hay did not prove to be of as much value when fed with corn silage, during the preliminary period in producing a large gain, as did the hays made from the legumes. This no doubt was caused by the absence of protein in the ration. See analysis of hays.

11. Sweet clover considered by so many as a troublesome weed, when made into hay before the stems become too woody and the hay run thru a cutter, proved to be nearly as valuable for feeding with corn silage during the preliminary period as alfalfa hay.

#### ANALYSIS OF FEED

By Guy E. Youngberg, Chemist

Sample	Moisture	Ash	Crude Protein	Crude fiber	Ether ex.	N-free extract
Wild hay .....	7.66	8.05	11.25	26.28	2.25	44.51
Alfalfa hay .....	9.14	7.45	16.56	21.83	2.45	42.57
Corn silage .....	72.60	1.47	2.54	4.64	.89	17.86
Clover hay .....	9.17	8.81	15.00	20.18	2.79	44.05
Sweet clover hay ..	8.11	4.71	9.21	34.27	1.22	57.52

## SILAGE AND GRAINS FOR STEERS

BY JAMES W. WILSON

This bulletin includes the results of two experiments, one conducted in 1913 and the other in 1914, in feeding silage to steers. Each experiment was divided into two periods. The first period is known as the preliminary feeding period, or the time when large gains are made on comparatively cheap feeds, and the second period when the more expensive feeds are fed to fatten for market.

The quality of corn silage varies from year to year, depending on the kind of corn grown and its condition when put into the silo. The best kind to grow to produce good gains with cattle is the variety that will mature ears before frost. In the fall of 1913 a few unusually warm days during the last week in August dried up the corn prematurely and as a result reduced the feeding value of the silage. The condition of the weather, too, has an influence on the gains made by cattle receiving a full feed of silage. During continuous cold weather cattle will eat more feed and make larger gains than when the weather is changeable.

### THE EXPERIMENTS

Twenty head of yearling steers were purchased for each experiment and divided into five different lots of four head each. In 1913 a load of grade Herefords from the range country in Wyoming was secured and in 1914 a load of grade Aberdeen Angus from western South Dakota was purchased. These steers had never had any silage, but it only required a few days to get them accustomed to eating it. They were weighed three days in succession after they had been taught to eat silage and the average was taken as the weight at the beginning. They were also weighed three days at the close and the average taken as the final weight of the test.

### THE OBJECT

The object was to determine the relative value of sorghum silage and corn silage, both with and without oil-



meal for the preliminary gain; also the value of feeding the leguminous hays with silage for the preliminary gain, also the relative feeding value of the commonly grown grains with corn silage as the sole roughage ration for fattening cattle. A further object was to show how these big cheap gains with silage during the preliminary period could be maintained after the steers were put on a full feed of grain. Note the gains for individual steers in table I and II of weights and gains and follow the same numbered steer through tables III and IV, which tables include gains when on full feed of grain.

These results and those reported in Bulletins No. 137 and 148 on silage feeding should be studied together.

### SORGHUM AND CORN SILAGE

Sorghum and corn are two of the best drought-resistant plants grown in South Dakota. They are also two of the best plants to grow for the silo, because of the comparatively large yields of green forage. In one of the driest sections of the state the writer observed that those farmers who had planted and cultivated either of these plants, had a yield of forage as compared to practically nothing on the farms where the growing of small grain was relied on exclusively. Too few of our farmers grow either of these plants.

For this experiment we grew nearly 15 tons of sorghum to the acre, outyielding corn by nearly four tons. These yields were made under ordinary farm conditions without the aid of commercial fertilizers, except manure.

### FIRST EXPERIMENT

#### THE PRELIMINARY FEEDING PERIOD, 1913 EXPERIMENT

This period continued for 55 days or until the supply of sorghum silage was exhausted. The object of this preliminary feeding period was to make as large gains as possible with these comparatively cheap feeds before the expensive grains were given for fattening. Some of our feeders do not consider this cheap gain but put the steers on a full feed of corn at once.

## RESULTS

Corn silage evidently is the better feed for the production of this cheap gain. It is highly palatable and from results reported in Bulletin No. 137 of this Station and from results of this experiment the nutrients of the corn plant evidently are highly digestible after they undergo fermentation in the silo.

## LOT I. CORN SILAGE

The average ration for these steers was 37 pounds per head daily. As before stated, this silage was not as good as silage fed in a former experiment and results reported in Bulletin No. 137. The corn was dried up prematurely by the hot winds. One steer in this lot was unusually wild and did not make an average gain. See table No. I and II weights and gains.

	Pounds
Average weight at beginning.....	674
Average weight at close.....	759
Average gain per head.....	85
Average gain per head daily, 55 days.....	1.55
Silage consumed .....	8350
Silage for a pound of gain.....	24
Valuing silage at \$3 a ton, cost of producing 100 pounds of gain.....	\$3.70

## LOT II. CORN SILAGE AND OILMEAL

By adding three pounds of oilmeal per head daily we more than doubled the gain, reduced the silage for a pound of gain, increased the consumption of silage daily and also lessened the cost of making a pound of gain. The average ration was 48 pounds of silage and 2.9 pounds of oilmeal daily. The oilmeal, sprinkled over the silage, evidently was an appetizer, as these four steers consumed nearly three-quarters of a ton more in the 55 days than did the four receiving corn silage alone.

	Pounds
Average weight at the beginning.....	669
Average weight at close.....	854
Average gain per head.....	185



Average gain per head daily, 55 days.....	3.36
Total silage consumed.....	9840
Silage for a pound of gain.....	13
Oilmeal for pound of gain.....	.08
Valuing corn silage at \$3 a ton and oilmeal at \$36	
a ton, cost of producing 100 pounds of gain..	\$3.55

### LOT III. CORN SILAGE AND OILMEAL

The average daily ration consisted of 42 pounds of silage and 3.8 pounds of oilmeal per head. Not knowing the digestibility of our western corn silage, this lot was fed one pound more per head daily of oilmeal than Lot II. From the gains it is evident that the ration contained too much protein. By feeding this extra pound of oilmeal the cost of producing a pound of gain was greatly increased, a factor that feeders of all kinds of live stock should keep in mind when feeding the comparatively high priced by-products of mills and factories.

	Pounds
Average weight at beginning .....	664
Average weight at close .....	836
Average gain per head .....	172
Average gain per head daily, 55 days.....	3.12
Silage consumed .....	9430
Silage for a pound of gain—.....	13
Oilmeal for a pound of gain.....	1.23
Valuing corn silage at \$3 per ton and oilmeal at	
\$36 a ton, cost of producing 100 pounds of	
gain .....	\$4.27

### LOT IV. SORGHUM SILAGE

One of the largest yielding and comparatively drought resistant plants for green forage is sorghum. For this experiment we received about 15 tons of green forage to the acre or between four and five tons more than the yield of green corn. By planting a larger variety of corn we could have secured as many tons to the acre as we did of sorghum, but for fattening cattle we prefer a variety of corn in which the ears will be in the dent stage at time of cutting. Some people plant sorghum with the corn intended

for silage, but results of this experiment show that sorghum silage is inferior to corn silage for producing gain. The average daily ration per head was 40 pounds.

	Pounds
Average weight at beginning.....	673
Average weight at close.....	714
Average gain per head.....	41
Average gain per head daily, 55 days.....	.74
Total silage consumed.....	8905
Silage for a pound of gain.....	54
Valuing sorghum at \$3 a ton, cost of producing 100 pounds of gain.....	\$8.14

#### LOT V. SORGHUM SILAGE AND OILMEAL

By adding three pounds of oilmeal per head daily we more than doubled the gain made by lot IV, receiving sorghum silage alone, and greatly reduced the cost of producing the gain. These results show that there is no benefit to be derived in growing sorghum for the silo where the corn plant will mature. Where equal quantities of oilmeal were fed to two different lots of steers, the one receiving corn silage and the other receiving sorghum silage, the gains per head were nearly twice as large with the lot that received corn silage. With two lots of steers, the one fed all the corn silage they would eat, and the other lot all the sorghum silage they would eat, the steers that received the corn silage produced over twice as much gain in 55 days as those receiving sorghum silage. The sorghum was cut before the frost when the seed heads were black. The silage was sour and not as good as the corn silage. These steers consumed 47 pounds of silage and 2.9 pounds of oilmeal per head daily.

	Pounds
Average weight at beginning.....	675
Average weight at close.....	777
Average gain per head.....	102
Average gain per head daily, 55 days.....	1.85
Total silage consumed.....	10395
Silage for a pound of gain.....	25

Oilmeal for a pound of gain..... 1.57  
 Valuing sorghum at \$3 a ton and oilmeal at \$36  
 a ton, cost of producing 100 pounds..... \$6.64

Table No. 1  
 WEIGHTS AND GAINS

No. of steer	Weight Dec. 4	Weight Jan. 3	Weight Jan. 27	Gain per head	Gain per head daily
Lot I. Corn Silage					
88	674	750	780	106	1.93
100	579	642	660	81	1.47
98	745	810	858	113	2.05
99	700	732	738	38	.67
Total	2698	2934	3036	338	
Average	674	733	759	85	1.55
Lot II. Corn Silage and Three Pounds Oilmeal					
90	707	810	897	190	3.45
91	686	814	875	189	3.43
83	605	692	773	168	3.04
84	678	749	873	195	3.54
Total	2676	3065	3418	742	
Average	669	766	854	185	3.36
Lot III. Corn Silage and Four Pounds Oilmeal					
89	595	684	738	143	2.60
82	663	756	806	143	2.60
95	695	832	884	189	3.43
94	705	828	916	211	3.83
Total	2658	3100	3344	686	
Average	664	775	836	172	3.12
Lot IV. Sorghum Silage					
96	707	750	762	55	1.00
93	666	712	714	48	.87
92	634	680	651	17	.30
81	686	736	730	44	.80
Total	2693	2878	2857	164	
Average	673	719	714	41	.74
Lot V. Sorghum Silage and Three Pounds Oilmeal					
87	680	754	806	126	2.29
86	592	646	659	67	1.21
97	690	768	800	110	2.00
85	740	824	846	106	1.92
Total	2702	2992	3111	409	
Average	675	748	777	102	1.85

### THE FATTENING PERIOD, 1913 EXPERIMENT

With the exception of lot II the lots were redivided taking one from each lot to form the four new lots. This

was done in each lot, at close of the preliminary feeding period, because the condition of the steers was not as uniform as it was at the beginning of the experiment. The steers of Lot II were continued on the same ration as they had been receiving, three pounds of oilmeal per head daily and all the corn silage they would eat.

### THE OBJECT

Some people have an idea that a gain made by feeding silage is nothing but a "fill" and that it cannot be maintained after changing to a grain ration. By noting the gains made by the same numbered steer through the two different tables of weights and gains this point will be settled. During a dry year in some sections of the corn-belt, the supply of hay is limited. It was desired to ascertain, in both of the experiments, the value of corn silage as the sole roughage ration with the different grains. Again, the time may come when we will consider our land too valuable to grow hay for steers.

When we consider these steers were fed for 115 days, the average daily gain compares favorably with gains made by steers receiving hay with grains. All grains were ground and not mixed with silage when fed. One-tenth as much oilmeal, by weight, was fed as steers were eating grain. Both loads of steers sold on the Chicago market within a few cents of the top for the day. Of course they were of good quality at the beginning.

### LOT I. CORN AND CORN SILAGE

The average daily ration for these steers was 11 pounds of silage, 18 pounds of ground corn and 1.8 pounds of oilmeal.

	Pounds
Average weight at beginning.....	748
Average weight at close.....	994
Average gain per head.....	246
Average gain per head daily, 115 days..	2.13
Silage consumed .....	5180
Silage for pound of gain.....	5.2
Corn consumed .....	8455



Corn for pound of gain.....	8.6
Oilmeal consumed .....	845
Oilmeal for pound of gain.....	.08

Salesmen in the market considered these the second best finished lot of steers.

#### LOT II. CORN SILAGE AND OILMEAL

These steers received three pounds of oilmeal per head daily and all the silage they wanted for 170 days. The average daily ration per head was 41 pounds of silage and 3 pounds of oilmeal. During the first 55 days they made an average daily gain of 3.36 pounds, the largest gain made by any of the lots during the preliminary period. For the next 115 days they made an average daily gain per head of 1.46 pounds. This included a wild steer No. 83 that did not gain as he should. As to finish, the experts rated them in fourth place.

	Pounds
Average weight at beginning.....	862
Average weight at close.....	1030
Average gain per head.....	168
Average gain per head daily, 115 days..	1.46
Silage consumed .....	18853
Silage for a pound of gain.....	28
Oilmeal consumed .....	1380
Oilmeal for a pound of gain.....	2

#### LOT III. OATS AND CORN SILAGE

These steers received 11 pounds of corn silage per head and all the ground oats they would eat daily, which averaged 15 pounds per head, and also 1.5 pounds of oilmeal. This was one of the best rations fed. These steers ranked third in the market.

	Pounds
Average weight at beginning.....	773
Average weight at close.....	1026
Average gain per head.....	252
Average gain per head daily, 115 days..	2.19
Silage consumed .....	5180
Silage for a pound of gain.....	5.1



Oats consumed .....	7060
Oats for a pound of gain.....	6.9
Oilmeal consumed .....	706
Oilmeal for a pound of gain.....	.07

#### LOT IV. BARLEY AND CORN SILAGE

We experienced some difficulty at first in getting these steers to eat the ground barley. They were given 11 pounds of corn silage and all the barley they would eat, which amounted to an average of 13 pounds per head daily. They also received one-tenth as much oilmeal as they were eating grain.

	Pounds
Average weight at beginning.....	729
Average weight at close.....	948
Average gain per head.....	219
Average gain per head daily, 115 days..	1.90
Silage consumed .....	5155
Silage for a pound of gain.....	5.8
Barley consumed .....	6245
Barley for a pound of gain.....	7.1
Oilmeal consumed .....	624
Oilmeal for a pound of gain.....	.07

These steers were rated as being the poorest of the five lots.

#### LOT V. SPELTZ AND CORN SILAGE

These steers received daily 11 pounds per head of corn silage, all the ground speltz they would eat and one-tenth as much oilmeal by weight as they were eating grain. They consumed 17.6 pounds of grain per head daily.

The salesmen in Chicago selected this lot as being the best.

	Pounds
Average weight at beginning.....	835
Average weight at close.....	1085
Average gain per head.....	250
Average gain per head daily, 115 days..	2.17

Silage consumed .....	5180
Silage for pound of gain.....	5.1
Speltz consumed .....	8235
Speltz for a pound of gain.....	8.2
Oilmeal consumed .....	822
Oilmeal for pound of gain.....	.68

TABLE II  
Weights and Gains, Fattening Period

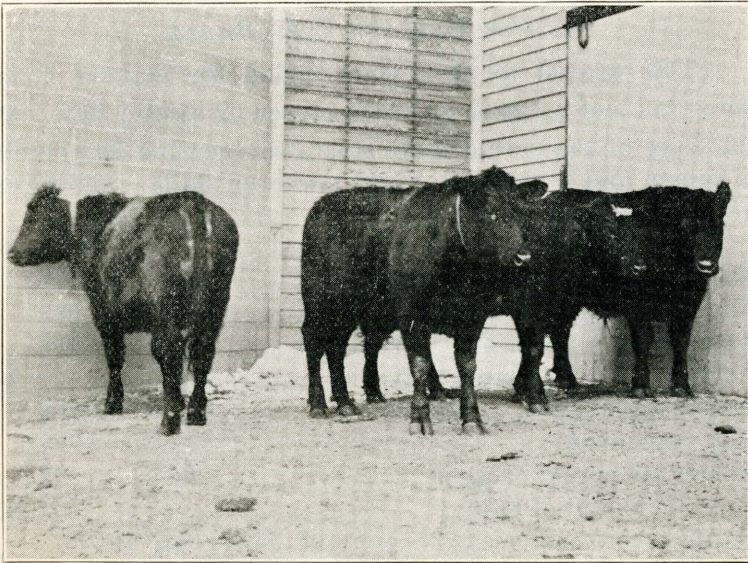
No. of steer	Weight Jan. 27	Weight Feb. 26	Weight Mar. 28	Weight Apr. 28	Weight May 22	Gain per head	Average gain per head daily
Lot I. Corn and Corn Silage							
92	651	755	820	902	967	316	2.74
100	660	730	805	860	908	248	2.15
97	800	845	935	980	1025	225	1.95
95	884	955	1040	1110	1078	194	1.68
Total	2995	3285	3600	3852	3978	983	
Average	748	821	900	963	994	245	2.13
Lot II. Corn Silage and Oilmeal							
91	894	940	1020	1058	1077	183	1.59
90	916	940	1055	1096	1128	212	1.84
83	758	750	840	862	859	101	.87
84	882	925	995	1030	1059	177	1.53
Total	3450	3555	3910	4046	4123	673	
Average	862	888	977	1011	1030	168	1.46
Lot III. Oats and Corn Silage							
88	780	835	915	986	1031	251	2.18
85	846	920	1000	1060	1105	259	2.25
81	730	815	905	958	1029	299	2.60
89	738	805	865	910	939	201	1.74
Total	3094	3375	3685	3914	4104	1010	
Average	773	843	921	978	1026	252	2.19
Lot IV. Barley and Corn Silage							
93	714	780	860	930	955	241	2.09
86	659	725	800	870	899	240	2.08
99	738	775	845	904	922	184	1.60
82	806	850	925	986	1017	211	1.83
Total	2917	3130	3420	3690	3793	876	
Average	729	782	855	925	948	219	1.90
Lot V. Speltz and Corn Silage							
94	916	980	1050	1128	1133	217	1.88
96	762	835	945	1006	1031	269	2.33
98	858	925	990	1068	1109	251	2.18
87	806	850	935	1046	1069	263	2.28
Total	3342	3590	3920	4248	4342	1000	
Average	835	897	980	1062	1085	250	2.17

## SECOND EXPERIMENT

## The 1914 Preliminary Feeding

The twenty head of yearling grade Aberdeen Angus steers used for this test were purchased from five different parties in the vicinity of Ree Heights, South Dakota. They were not as uniform in size as was desired but were all of good breeding and good quality.

The object was to ascertain the value of adding hay to the ration of corn silage and especially hay made from the leguminous plants. Lot I was fed red clover hay and corn silage; Lot III, sweet clover hay and corn silage; Lot IV, alfalfa hay and corn silage; Lot V, prairie hay and corn silage; Lot II, corn silage alone. The lots receiving hay were given the same quantity of corn silage daily and all the hay they would eat, while the lot receiving silage only was given all the silage it would eat for 91 days. We consider all of these feeds comparatively cheap and believe if more of our cattle feeders would give attention



Lot I. At close of 91 day preliminary feeding period.

to this preliminary feeding period there would be less complaint of losing money in fattening cattle. Now, whether this was the proper period to feed these cheap feeds, or whether we could have continued for 30 or 60 days longer, we are unable to state. But when we consider the gains made by Lot II and the condition of the cattle at the end of the 91 days period, it is evident that the silo is a very important factor in all sections where corn is grown and cattle fattened for the market.

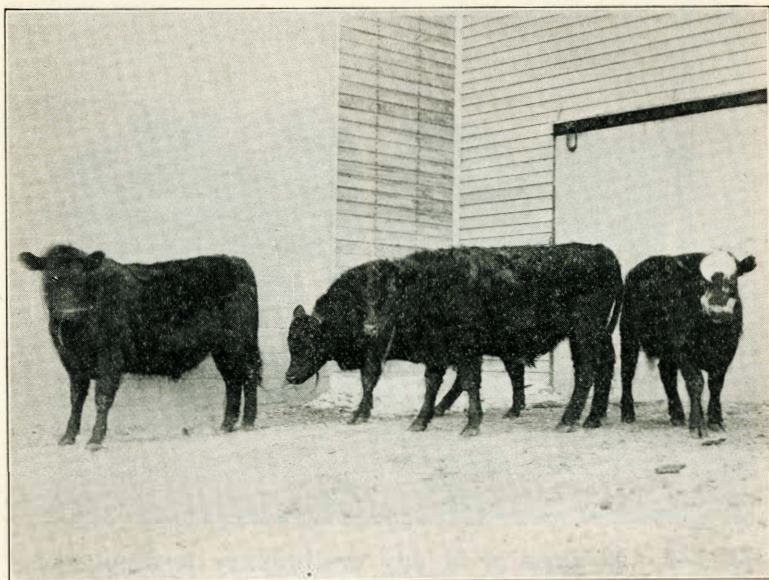
Our 90 day test in feeding steers and the results reported in Bulletin No. 137 of this Station, show that the average gain per head daily was 2.45 pounds. The silage for that test and the present test was as good as one could desire. The kernels of corn were well dented but the bottom leaves on the stalks were partially dried. However, the natural juices of the plant were sufficient to keep the silage without the addition of water.

#### CLOVER HAY AND CORN SILAGE

This proved to be a good ration for making large gains but not as good as sweet clover or alfalfa hay. At the close of the period these steers were eating 59 pounds of silage and 2 pounds of hay per head daily. This was all the hay they would eat.

	Pounds
Average weight at beginning.....	775
Average weight at close.....	983
Average gain per head.....	208
Average gain per head daily, 91 days.....	2.29
Silage consumed .....	21150
Hay consumed .....	1257
Silage for pound of gain.....	25
Hay for pound of gain.....	1.5.
Valuing corn silage at \$3 a ton and clover hay at \$10 a ton, cost of producing 100 pounds of gain .....	\$4.55





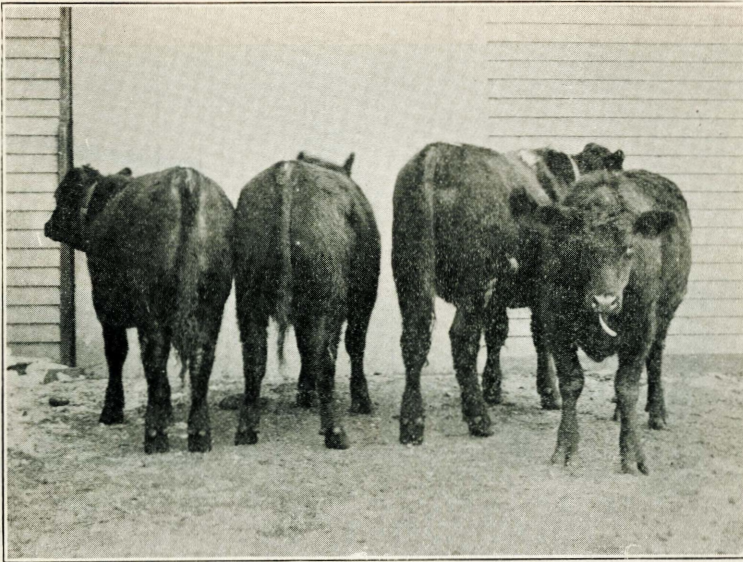
Lot II. At close of 91 day preliminary feeding period.

#### CORN SILAGE

This lot was given all the corn silage they would eat without the addition of any other feed. The object of feeding this way was to use this lot as a check on other lots receiving the hays. This lot of steers was in better condition at the close of the 91 days test than any of the other lots and the gains were the cheapest.

	Pounds
Average weight at beginning .....	780
Average weight at close .....	992
Average gain per head .....	211
Average gain per head daily, 91 days.....	2.32
Total silage consumed .....	22764
Silage for a pound of gain .....	27
Valuing silage at \$3 a ton, cost of producing 100 pound of gain .....	\$4.03



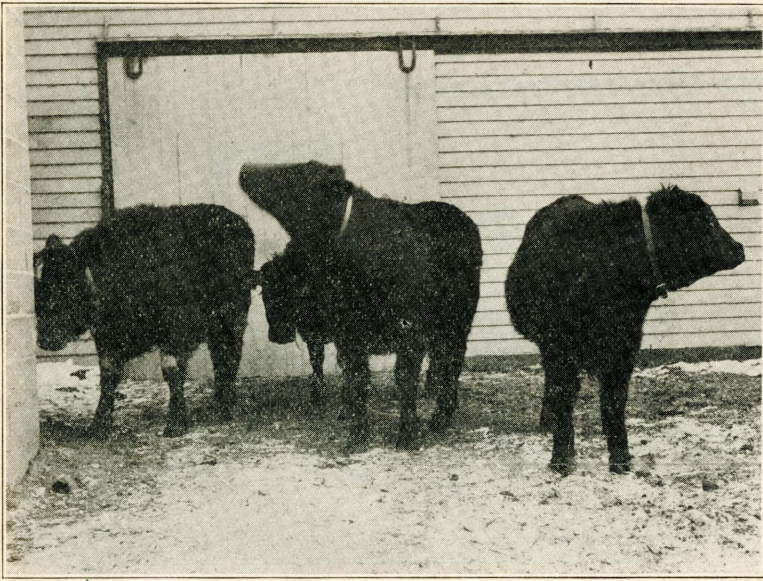


Lot III. At close of 91 day preliminary feeding period.

#### SWEET CLOVER HAY AND CORN SILAGE

In the beginning a little difficulty was experienced with this lot in getting them to eat the sweet clover hay, but after it was run through the hay cutter the palatability was greatly increased. Because of the excellent gains made by these steers and because of the great drought-resistant quality of this plant it must be considered as one of our very best plants to grow for hay.

	Pounds
Average weight at beginning .....	774
Average weight at close .....	997
Average gain per head .....	223
Average gain per head daily, 91 days .....	2.45
Total silage consumed .....	21231
Total hay consumed .....	1399
Silage for pound of gain .....	23
Hay for pound of gain .....	1.5
Valuing silage at \$3 a ton and sweet clover hay at \$10 a ton, cost of producing 100 pounds of gain .....	\$4.34



Lot IV. At close of 91 day preliminary feeding period.

#### ALFALFA HAY AND CORN SILAGE

Alfalfa is probably the most commonly grown legume in the Northwest. These steers had the opportunity of eating all the hay they wanted in addition to their silage ration, which was the same as for the other lots, and yet they consumed only a pound more than did steers of lot III, and 3 pounds more than did steers of Lot I.

	Pounds
Average weight at beginning .....	778
Average weight at close .....	1005
Average gain per head .....	227
Average gain per head daily, 91 days.....	2.49
Silage consumed .....	21230
Hay consumed .....	1455
Silage for pound of gain .....	23
Hay for pound of gain.....	1.6
Valuing silage at \$3 a ton and alfalfa hay at \$10	
a ton, cost of producing 100 pounds of gain	\$4.30





Lot V. At close of 91 day preliminary feeding period.

#### PRAIRIE HAY AND CORN SILAGE

We fed these steers prairie hay to show its relative value to the leguminous hays when fed with corn silage. It will be noted that the smallest gains were made by this lot. There was a difference of nearly one-half a pound less per head daily between this lot and the lot that received alfalfa hay and silage, and about one-third of a pound less than the lot that received silage alone.

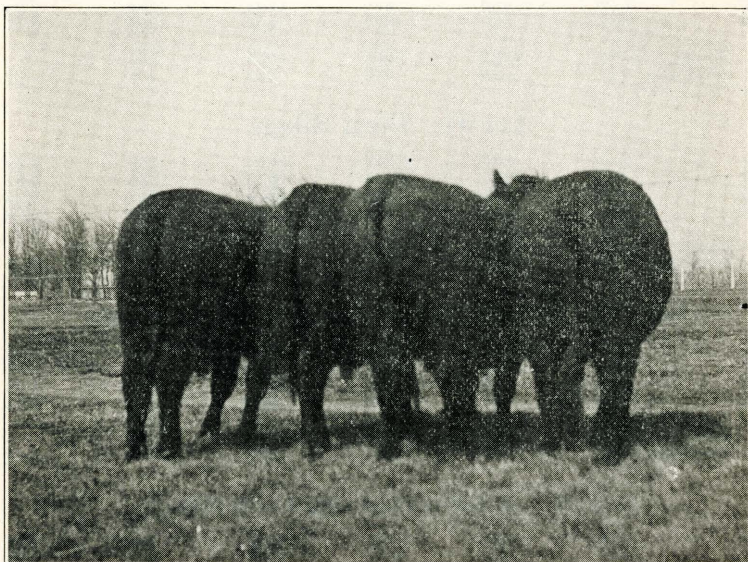
	Pounds
Average weight at beginning .....	769
Average weight at close .....	951
Average gain per head .....	183
Average gain per head daily, 91 days .....	2.01
Silage consumed .....	21257
Hay consumed .....	1093
Silage for pound of gain .....	29
Hay for pound of gain .....	1.5
Valuing silage at \$3 a ton and prairie hay at \$6 a ton, cost of producing 100 pounds of gain	\$4.79

TABLE III. WEIGHTS AND GAINS

No. of steer	Weight Oct. 13	Weight Nov. 12	Weight Dec. 12	Weight Jan. 11	Gain per head	Gain per head daily
<b>Lot I. Clover Hay and Corn Silage</b>						
81	906	1022	1040	1109	203	2.23
79	729	828	868	922	193	2.12
82	831	930	980	1044	213	2.34
80	631	726	800	859	225	2.47
Total	3100	3506	3688	3934	834	
Average	775	876	922	983	208	2.29
<b>Lot II. Corn Silage</b>						
89	826	936	980	1035	209	2.29
87	841	960	1018	1073	229	2.51
84	859	972	1040	1076	217	2.38
85	594	686	726	785	191	2.08
Total	3123	3554	3764	3969	846	
Average	780	888	941	992	211	2.32
<b>Lot III. Sweet Clover Hay and Corn Silage</b>						
90	960	1086	1170	1240	280	3.07
88	721	786	836	886	165	1.81
93	798	880	930	1015	217	2.38
95	618	742	800	850	232	2.54
Total	3097	3494	3736	3991	894	
Average	774	873	934	997	223	2.45
<b>Lot IV. Alfalfa Hay and Corn Silage</b>						
92	702	820	884	942	240	2.63
94	858	950	1000	1068	210	2.30
100	721	840	894	954	233	2.56
91	831	900	990	1056	225	2.47
Total	3112	3510	3768	4020	908	
Average	778	877	942	1005	227	2.49
<b>Lot V. Prairie Hay and Corn Silage</b>						
97	606	684	710	737	131	1.44
98	859	950	986	1044	185	2.03
96	734	830	860	942	208	2.28
99	877	976	1038	1086	209	2.29
Total	3076	3440	3594	3809	733	
Average	769	860	898	951	183	2.01

## FATTENING PERIOD, 1914 EXPERIMENT

The principal object of this part of the experiment was to show the relative value of different grains when fed with corn silage as the sole roughage ration, and also the value of a cheap gain during the preliminary feeding period.



Lot I. At close of 101 day fattening period

## CORN AND CORN SILAGE

The average daily ration per head for this lot was 17.4 pounds of corn silage, 15.7 pounds of ground corn and 1.5 pounds of oilmeal. The salesmen claimed these steers were the best of all the lots. They were fed on red clover hay and corn silage during the 91 days preliminary feeding period.

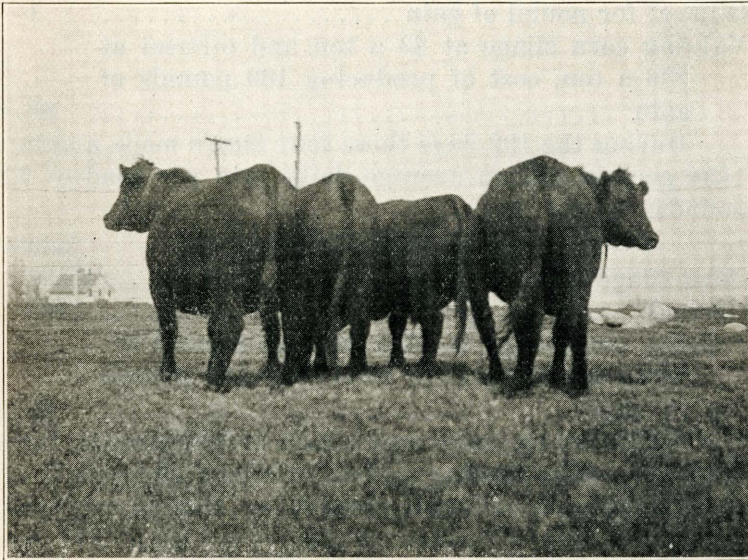
	Pounds
Average weight at beginning .....	983
Average weight at close .....	1212
Average gain per head .....	228
Average gain per head daily, 101 days .....	2.26
Silage consumed .....	7040
Silage for pound of gain .....	7.7



Corn consumed .....	6365
Corn for a pound of gain .....	6.9
Oilmeal consumed .....	636
Oilmeal for pound of gain .....	.07
Valuing silage at \$3 a ton, corn at one cent a pound and oilmeal at \$36 a ton, cost of producing 100 pounds of gain .....	\$9.37

During the preliminary and fattening periods this lot of steers gained 1748 pounds in 192 days and made an average daily gain per head of 2.27 pounds.

Total feed, 192 days	Pounds
Corn silage .....	28190
Clover hay .....	1257
Ground corn .....	6365
Oilmeal .....	636
Valuing the corn silage at \$3 a ton, the clover hay at \$10 a ton, the ground corn at one cent a pound and the oilmeal at \$36 a ton, cost of producing 100 pounds of gain for both periods .....	\$7.20



Lot II. At close of 101 day fattening period.

## CORN SILAGE AND OILMEAL

For the first 91 days these steers had nothing but corn silage. For the last 101 days they had three pounds of oilmeal per head daily and all the silage they would eat. The average daily allowance per head for the 101 day period was 56 pounds of silage and 2.93 pounds of oilmeal with no other forage or grain. Because the gains for this lot at the end of the preliminary period were nearly as large per head as for any other lot, these steers were continued with the addition of oilmeal to determine the wisdom of adding further grain than that found in the silage.

	Pounds
Average weight at beginning .....	992
Average weight at close .....	1219
Average gain per head .....	227
Average gain per head daily, 101 days.....	2.24
Silage consumed .....	22730
Silage for pound of gain.....	25
Oilmeal consumed .....	1184
Oilmeal for pound of gain .....	1
Valuing corn silage at \$3 a ton and oilmeal at \$36 a ton, cost of producing 100 pounds of gain .....	\$6.10

During the 192 days these four steers made a gain of 1754 pounds and an average daily gain per head of 2.28 pounds.

	Total feed, 192 days	pounds
Corn silage .....	45494	
Oilmeal .....	1184	
Valuing corn silage at \$3 a ton and oilmeal at \$36 a ton the cost of producing 100 pounds of gain .....		\$5.10

With this lot there was a gain of 846 pounds during the preliminary feeding period on silage alone at a cost of \$4.03, a comparatively cheap gain. During the fattening period, after 3 pounds of oilmeal per head daily were added to the silage, a gain of 908 pounds was made at a cost of \$6.10 per one hundred pounds.

By dividing the total cost of feeds at valuations mentioned above by the total gain for the 192 days the average cost of producing a pound is reduced to \$5.01 per hundred.

These steers were rated in the market as being equal to those of lot IV fed on barley and corn silage, or second best.



Lot III. At close of 101 day fattening period.

#### OATS AND CORN SILAGE

These steers consumed an average of 17 pounds of corn silage, 15 pounds of ground oats and 1.5 pounds of oil-meal per head daily. This lot made its cheap gain on sweet clover hay and corn silage. They were rated as the poorest finished steers of all the lots.

	Pounds
Average weight at beginning .....	997
Average weight at close .....	1177
Average gain per head .....	180
Average gain per head daily, 101 days .....	1.78
Silage consumed .....	7040



Silage for pound of gain .....	9.7
Oats consumed .....	6256
Oats for pound of gain .....	8.6
Oilmeal consumed .....	622
Oilmeal for pound of gain.....	.08
Valuing corn silage at \$3 a ton, oats at one cent a pound and oilmeal at \$36 a ton, the cost of producing 100 pounds of gain.....	\$11.65

During the preliminary period of 91 days these steers made 894 pounds that cost \$4.34 a hundred. The total gain for both the preliminary and the fattening periods was 1614 pounds.

	Total Feed, 192 Days	Pounds
Corn silage .....	28271	
Oats .....	6225	
Oilmeal .....	622	
Sweet clover hay .....	1399	
Valuing these feeds as before stated and dividing by the total gain, average cost of producing 100 pounds of gain .....		\$7.60

Under ordinary conditions we can expect better results from feeding oats with corn silage because the oats were comparatively light last year.



Lot IV. At close of 101 day fattening period

#### BARLEY AND CORN SILAGE

These steers made the largest gains during the fattening period. Whether this was caused by feeding them alfalfa hay during the preliminary period I am unable to state. It will also be noticed that this lot made the largest gain during the preliminary period, the average daily gain per head being 2.49, as compared to 2.45 for the lot that received sweet clover hay, and 2.29 for the lot that received red clover hay.

	Pounds
Average weight at beginning .....	1005
Average weight at close .....	1236
Average gain per head .....	231
Average gain per head daily, 101 days .....	2.28
Silage consumed .....	7040
Silage for pound of gain.....	7.6
Barley consumed .....	6675
Barley for a pound of gain.....	7.2



Oilmeal consumed .....	667
Oilmeal for a pound of gain.....	.07
Valuing silage at \$3 a ton, barley at one cent a pound and oilmeal at \$36 a ton, cost of producing 100 pounds of gain.....	\$9.65

The experts in Chicago rated these as being equal to the lot fed on corn silage and fattened on corn silage and oilmeal. There would be no profit in feeding steers at a cost of \$9.65 and receive only \$8.40 on the market, but we have a preliminary feeding period of 91 days when these steers were fed mostly on corn silage and all the alfalfa hay they wanted and made 908 pounds at a cost of \$4.30 per hundred.

Total Feed, 192 Days	Pounds
Corn silage .....	28270
Alfalfa hay .....	1455
Ground barley .....	6675
Oilmeal .....	667
Valuing corn silage at \$3 a ton, alfalfa hay at \$10 a ton, ground barley at one cent a pound and oilmeal at \$36 a ton, average cost of producing 100 pounds of gain for both periods....	\$7.00

During the 192 days these steers made an average daily gain per head of 2.38 pounds.



Lot V. At close of 101 day fattening period.

#### SPELTZ AND CORN SILAGE

The results of this test and the one in 1913 indicate that this is a valuable grain to feed with corn silage for fattening an animal. The average daily ration per head was 17 pounds of corn silage, all the ground speltz they would eat, which was about 16 pounds and one-tenth as much oilmeal by weight as they were getting of speltz, which was 1.7 pounds per head daily. We believe this the best small grain crop to grow to feed with corn silage. The lot fed on speltz last year was considered the best of the five lots and it will be noted after a study of the table of weights and gains that three of the four steers fed in the 1914 experiment made good gains and they were in good condition at the close.

Average weight at beginning .....	952
Average weight at close .....	1178
Average gain per head .....	226
Average gain per head daily, 101 days .....	2.24
Silage consumed .....	7040

Silage for pound of gain .....	7.7
Speltz consumed .....	6375
Speltz for pound of gain .....	7
Oilmeal consumed .....	637
Oilmeal for pound of gain .....	.07
Valuing corn silage at \$3 a ton, ground speltz at cent a pound and oilmeal at \$36 a ton, cost of producing 100 pounds of gain .....	\$7.47

During the preliminary feeding period this lot received prairie hay with the corn silage. While a fairly good gain was made it is much smaller than gains made by lots receiving hay made from a leguminous plant. However, the cost of the gain was not so large as for the fattening period. The lot made a total gain of 1638 pounds, as compared to 1832 or nearly 200 pounds less than the steers that received alfalfa hay during the preliminary period.

Total Feed 192 Days	Pounds
Silage .....	28297
Hay .....	1093
Speltz .....	6375
Oilmeal .....	637
Valuing corn silage at \$3 a ton, prairie hay at \$6 a ton, ground speltz at one cent a pound, and oilmeal at \$36 a ton, cost of producing 100 pounds of gain.....	\$7.38

While the hay is the lowest in price of all hay feed it did not produce the large cheap gains we had in the other lots. The gains made were cheap but they were not large enough to offset the large expensive gain made during the fattening period when ground speltz was fed.

TABLE IV.  
Weights and Gains, 1914-15

No. of steer	Weight Jan. 12	Weight Feb. 10	Weight Mar. 12	Weight Apr. 10	Weight Apr. 23	Gain per head	Average gain per head daily
Lot I. Corn and Corn Silage							
81	1109	1170	1250	1308	1325	216	2.13
79	922	986	1070	1144	1172	250	2.47
82	1041	1106	1196	1232	1248	204	2.02
80	859	930	1010	1070	1103	244	2.41
Total	3934	4192	4532	4754	4848	914	
Average	983	1048	1133	1188	1212	228	2.26
Lot II. Corn Silage and Oilmeal							
89	1035	1118	1192	1250	1266	231	2.28
87	1073	1126	1206	1250	1264	191	1.89
84	1076	1150	1214	1272	1300	224	2.21
85	785	876	958	1022	1047	262	2.59
Total	3969	4280	4570	4794	4877	908	
Average	992	1070	1142	1198	1219	227	2.24
Lot III. Oats and Corn Silage							
90	1240	1296	1382	1414	1437	197	1.95
88	886	946	1006	1054	1075	189	1.87
93	1015	1076	1124	1160	1173	158	1.56
95	850	916	974	1032	1026	176	1.74
Total	3991	4234	4496	4660	4711	720	
Average	997	1058	1124	1165	1177	180	1.78
Lot IV. Barley and Corn Silage							
92	942	1028	1144	1206	1222	280	2.77
94	1068	1102	1234	1332	1348	280	2.77
100	954	1018	1102	1148	1144	190	1.88
91	1056	1074	1174	1222	1230	174	1.72
Total	4020	4222	4654	4908	4944	924	
Average	1005	1055	1163	1227	1236	231	2.28
Lot V. Speltz and Corn Silage							
97	737	816	896	942	965	223	2.25
98	1044	1126	1184	1262	1274	230	2.27
96	942	958	1062	1132	1149	207	2.04
99	1086	1154	1200	1308	1326	240	2.37
Total	3809	4054	4342	4644	4714	905	
Average	952	1013	1085	1161	1178	226	2.24



## AVAILABLE BULLETINS

105. Stock Foods for Pigs.
106. Sugar Beets in South Dakota.
107. Sheep Scab.
108. New Hybrid Fruits.
109. Rusts of Cereals and other Plants.
111. A Study of South Dakota Butter with Suggestions for Improvement.
112. The Killing of Mustard and other Noxious Weeds in Grain Fields by the Use of Iron Sulphate.
113. Progress in Variety tests of Barley.
114. Digestion Coefficients of Grain and Fodders for South Dakota.
115. Report of Work for 1907 and 1908 at Highmore Sub-Station.
116. Acidity of Creamery Butter and its Relation to Quality.
117. Sugar Beets in South Dakota.
123. Milk Powder Starters in Creameries.
125. Fattening Steers of Different Ages.
126. Alkali Soils.
127. Breeding and Feeding Sheep.
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130. Some New Fruits.
131. Scabies (Mange) in Cattle.
132. Effects of Alkali water on Dairy Products.
134. More Winter Dairying in South Dakota.
135. Trials with Millets and Sorghums for Grain and Hay in South Dakota.
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138. Hog Cholera.
139. Soil and Crop and Their Relation to State Building.
141. Co-operative Tests of Alfalfa from Siberian and European Russia.
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145. A Report of Progress in Soil Fertility Investigations.
146. Some Varieties and Strains of Wheat and their Yields in South Dakota.
147. The Effect of Alkali Water on Dairy Cows.
148. Corn Silage and Mill Products for Steers.
149. Some Varieties and Strains of Oats and their Yields in South Dakota.
150. Weeds.
151. Trials with Sweet Clover as a Field Crop in South Dakota.
152. Testing and Handling Dairy Products.
153. Selecting and Breeding Corn for Protein and Oil in South Dakota.
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155. Selection and Preparation of Seed Potatoes, Size of Seed Pieces, and Bud-Variation.
156. Kaoliang, A New Dry Land Crop.
157. Hogging off Corn With and Without Rape. Kaoliang for Pork Production.
158. Proso and Kaoliang as Table Foods.
159. Progress in Plant Breeding.