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I. Lamb Feeding II. Fattening Shep on Grass

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SOUTH DAKOTA

AGRICULTURAL COLLEGE

EXPERIMENT STATION

BROOKINGS, SOUTH DAKOTA

Department of Animal Husbandry

I. LAMB FEEDING

II. FATTENING SHEEP ON GRASS

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LAMB FEEDING

James W. Wilson

H. G. Skinner

The production of a high class of meat products from the raw materials at hand should be the aim of every stockman in the state.

Of all the animals on the farm the sheep is regarded by many as the most profitable, not only from the fact that it will convert, economically, the grains and forage plants into higher selling products, but also because it has no equal as a weed destroyer and a general improver of the farm. Of the six hundred or more different weeds and grasses found on our prairies and cultivated fields, the sheep will eat nearly all. The days of raising sheep in large flocks in this state, for the feeder market, is slowly passing away. However, numerous flocks of pure-breds are being started, and this line of improvement is keeping pace with the gradual change that is being made, from the extensive to the intensive mode of farming.

Good profits have been realized during the past winter by the raisers and feeders of sheep because of the brisk demand for mutton from foreign countries. This demand, according to the report of the Foreign Markets Division, Department of Agriculture, was brought about by a falling off of the imports into England from her colonies. During the first three months of the present year there were 2,399,922 pounds more of mutton exported from the United States than during the corresponding months one year ago. While this large increase is unusual and was no doubt the cause of the prevailing high price of mutton, good fat lambs are always in demand.

This experiment was undertaken in order to determine the relative feeding value of some of the newer grains recently introduced into this state, as compared with those of a more staple nature; and also the benefit, if any, of grinding the

same when fed to lambs under the same conditions. There were eighty-one lambs in all, divided into lots of nine each; no attempt was made to furnish a balanced ration for any lot, but the conditions in every respect were such as should be provided by the average farmer, and the gains are in keeping with those that might be expected when one grain is fed. We did, however, add bran to three of the lots to note the advantage, if any, in feeding the mixture. After two weeks trial with the lot receiving ground macaroni wheat, it was found that they did not like it, and it was thought better to add one-fourth bran by weight to the ration, in order to increase its palatability.

PLAN OF THE EXPERIMENT

These lambs, with the exception of twenty-five head, were all grade Shropshires and Hampshires, principally the first cross of pure-bred rams, and were raised on the College farm. The twenty-five head that were purchased were about the same age as ours, all being about nine months old at the beginning of the experiment. Up to the fifteenth of December they had been running on a prairie grass pasture, when they were put through the dipping vat in order to kill all ticks, lice, or any other external parasites, after which they were kept in a closed barn for four days to prevent their taking cold. Dipping should be done every fall and spring to rid sheep of these pests and to guard against the further propagation of the same, as they are a menace to the good health of the animals. The lambs were fed, during a preliminary period of three weeks, about one-half pound per head per day of a ration consisting of a mixture of the grains to be used in the experiment. At the expiration of this time they were divided into nine different lots of nine each, particular attention being given not to have more than three head of the ones purchased in any one lot, and as uniform as possible throughout.

Their quarters consisted of an enclosed shed divided into nine different apartments, each opening into a small yard, of

about the same size, on the outside of the shed. The object of this was to give ample room for exercise, but the shed was arranged with a sliding door at the entrance in order that it could be closed at night and in severe stormy weather. Sheep do not need as warm a barn in winter as other animals on the farm, but a draft or too close confinement sometimes proves more detrimental than no shed at all.

Salt and water were kept before them at all times.

Hay-racks with feeding-boxes at the lower side were used for partitions—space economizers that answer the purpose very well. The lambs were weighed individually at different intervals at the same time of day and a complete record kept, which will appear later in this Bulletin. This frequent weighing was done in order that, should a lamb get sick or die, the actual weight could be deducted, as there is a marked difference in the individual gains of all fattening animals.

The following tables contain an account of the kind of grain, the record number, the weight at the beginning of the test, the weight at different intervals, the weight of wool shorn, and the total gain per head of each lamb. They also show the total weight per lot at the beginning, their weight and gain at different intervals, and the total weights and gains at the conclusion of the test.

This definite information is presented, thinking that it might be of value to the reader in comparing the individual gains, and showing the time when the largest gains were made in the various lots, during the fattening period.

It will be seen that it was not always the lightest, nor the heaviest lamb that made the best gain, but that individuality played no unimportant part in their tendency to fatten.

They show further that the lots fed on ground grain did not make as large a gain for the periods as those fed on whole grain. This is especially true during the first part of the experiment. The macaroni wheat and speltz were ground quite fine at first, but later on merely cracked, and the lambs ate them with a higher degree of relish than at first. The object in grinding, as aforesaid, was to compare the results

with those obtained when the whole grains were fed, and also to have some definite information to furnish in reply to the numerous inquiries concerning these grains.

The most uniform gain of the lambs in any lot was that of those fed on whole bread wheat, the difference being only thirteen pounds; while the greatest variation was in the lot fed on corn and bran, being thirty-eight pounds.

We find that the two lambs making the largest and smallest gains were in lots six and eight, making sixty and seventeen pounds respectively. They were practically of the same weight at the beginning, but the former made a good gain at the start and kept it up throughout the experiment, while the latter was very uneven in its gains. We are safe in attributing this difference to the ground grain in the latter lot, for not in a single instance of any of the former lot was there a loss recorded after they got on full feed. But in the latter lot a standstill and loss in their weights will be noted, especially during the first period of the experiment.

WEIGHTS AND GAINS

Lot I—Corn

LAMBS Number	January 5	January 17	January 31	February 14	February 28	March 14	March 28	April 6	April 24	Weight of Wool	Weight April 24, plus Wool	Total Gain per Head
572	83	84	89	89	92	96	103	106	115	7	122	39
115	92	96	102	102	104	105	111	114	112	7	119	27
621	80	79	83	86	91	93	102	104	105	6	111	31
214	100	102	107	112	121	127	134	139	140	12	152	52
626	96	100	104	104	109	118	123	129	131	7.5	138.5	42.5
579	69	75	81	86	95	100	103	112	114	7	121	52
624	67	74	81	84	90	94	99	100	106	6	112	45
627	63	61	67	67	73	75	82	83	88	5.5	93.5	30.5
503	77	70	80	80	83	88	91	99	103	6	109	32
Total.....	727	741	794	810	858	896	948	986	1014	64	1078	
Gain		14	53	16	48	38	52	38			92	351

Lot II—Wheat

LAMBS Number	January 5	January 17	January 31	February 14	February 28	March 14	March 28	April 6	April 24	Weight of Wool	Weight April 24, including Wool	Total Gain per Head
596	84	82	86	91	97	100	107	108	113	8.5	121.5	37.5
595	86	86	94	96	100	103	106	111	113	9.5	122.5	36.5
618	61	63	70	74	79	81	88	92	104	5	109	48
604	73	73	82	85	88	92	95	98	100	11.5	111.5	38.5
631	69	70	76	80	87	87	95	101	102	7.5	109.5	40.5
458	81	90	97	96	103	106	112	120	120	7	127	38
619	90	86	101	102	105	114	119	119	125	7.5	132.5	42.5
519	88	92	99	99	106	112	118	120	127	6.5	133.5	45.5
608	62	64	70	76	81	84	87	91	91	6	97	35
Total.....	702	706	775	799	846	879	927	960	995	69	1064	
Gain		4	69	24	47	33	48	33			104	362

Lot III—Macaroni Wheat

LAMBS Number	January 5	January 17	January 31	February 14	February 28	March 14	March 28	April 6	April 24	Weight of Wool	Weight April 24, including Wool	Total Gain per Head
539	75	79	88	91	97	99	104	108	115	7	122	47
557	81	87	90	91	92	95	95	96	96	5	101	20
629	69	71	75	76	80	83	87	88	100	6.5	106.5	37.5
580	73	78	85	86	93	98	100	101	108	7.25	115.25	42.25
434	90	87	96	102	108	111	121	124	132	8.25	140.25	50.25
551	97	101	104	104	112	116	118	121	129	10	139	42
590	70	76	82	82	87	87	87	88	87	6	93	23
413	84	86	93	95	104	111	115	116	131	7	138	54
564	87	82	86	85	97	100	106	108	109	8	117	30
Total.....	726	747	799	822	870	900	933	950	1007	65	1072	
Gain		21	52	23	48	30	33	17			122	346

Lot IV—Speltz

LAMBS Number	January 5	January 17	January 31	February 14	February 28	March 14	March 28	April 6	April 24	Weight of Wool	Weight April 24, including Wool	Total Gain per Head
576	73	75	79	83	85	85	85	87	93	6	99	26
120	83	94	101	103	108	112	123	126	129	8	137	54
587	77	81	84	90	93	97	110	110	113	8	121	44
563	85	87	93	100	107	111	114	108	118	7	125	40
598	89	89	94	96	99	102	103	103	103	6	109	20
507	70	74	80	84	86	90	97	101	106	7.5	113.5	43.5
562	85	89	93	102	104	105	115	112	119	8.5	127.5	42.5
622	72	74	80	85	86	90	98	101	102	9	111	39
Total.....	634	663	704	743	768	792	845	848	883	60	943	
Gain		29	41	39	25	24	53	3			95	309

Lot V—Ground Speltz

LAMBS Number	January 5	January 17	January 31	February 14	February 28	March 14	February 28	April 6	April 24	Weight of Wool	Weight April 24, including Wool	Total Gain per Head
567	81	89	90	95	97	101	107	115	117	9	126	45
615	76	74	77	81	81	85	90	95	98	6.5	104.5	28.5
637	67	68	71	74	74	77	82	86	90	6.75	96.75	29.75
556	92	96	100	106	100	106	110	116	120	6.5	126.5	34.5
588	83	88	88	91	93	93	97	102	112	6.5	118.5	35.5
635	66	72	73	79	80	81	85	87	90	6.25	96.25	30.25
555	104	108	110	112	111	114	116	118	120	8	128	24
142	92	95	98	101	106	111	121	123	127	8	135	43
166	70	75	78	81	81	86	89	93	96	7.5	103.5	33.50
Total.....	731	765	785	820	823	854	897	935	970	65	1035	
Gain		34	20	35	3	31	43	38			100	304

Lot VI—Corn and Bran

LAMBS Number	January 5	January 17	January 31	February 14	February 28	March 14	March 28	April 6	April 24	Weight of Wool	Weight April 24, including Wool	Total Gain per Head
528	81	85	86	99	103	115	124	126	133	8.5	141.5	60.5
616	78	78	82	89	93	98	100	103	103	5	108	30
311	92	95	92	101	108	116	124	130	141	7.5	148.5	56.5
602	85	89	92	102	103	111	117	119	126	8	134	49
459	96	98	102	112	112	118	127	132	138	10	148	52
574	67	65	67	74	77	79	81	83	83	6.5	89.5	22.5
614	71	66	68	74	76	82	88	91	92	6.5	98.5	27.5
594	90	92	94	97	101	101	109	110	115	9	124	34
610	69	65	65	68	79	85	87	90	94	6	100	31
Total.....	729	733	748	816	852	905	957	984	1025	67	1092	
Gain		4	15	68	36	53	52	27			108	363

Lot VII—Macaroni Wheat and Bran

LAMBS Number	January 5	January 17	January 31	February 14	February 28	March 14	March 28	April 6	April 24	Weight of Wool	Weight April 24, including Wool	Total Gain per Head
585	92	92	101	107	110	111	112	114	112	5.75	117.75	25.75
606	66	69	74	78	80	83	89	95	97	7	104	38
511	88	91	92	98	99	103	110	114	116	8	124	36
520	74	74	79	84	86	89	94	100	109	8	117	43
565	63	65	74	78	82	85	95	100	102	6	108	45
577	88	92	94	104	108	110	118	125	123	9	132	44
625	107	109	116	115	121	121	125	131	126	6.25	132.25	25.25
169	85	87	92	100	105	106	115	121	119	7.25	126.25	41.25
633	65	68	78	83	85	90	95	100	95	6.75	101.75	36.75
Total.....	728	747	800	847	876	898	953	1000	999	64	1063	
Gain		19	53	47	29	22	55	47			63	335

Lot VIII—Ground Macaroni Wheat and Bran

LAMBS Number	January 5	January 17	January 31	February 14	February 28	March 14	March 28	April 6	April 24	Weight of Wool	Weight April 24, including Wool	Total Gain per Head
352	74	76	82	86	90	93	99	102	112	7.5	119.5	45.5
589	77	76	85	84	83	87	92	94	88	7	95	18
138	87	90	94	96	93	103	114	117	125	6.5	131.5	44.5
599	87	85	93	95	95	95	100	100	98	6.5	104.5	17.5
553	99	101	110	118	118	122	124	132	138	8.5	136.5	37.5
584	70	72	78	79	81	85	90	91	96	8	104	34
521	76	74	81	83	84	89	93	96	105	8	113	37
566	86	85	93	98	101	107	110	111	119	7	126	40
Total	656	659	716	739	745	781	822	843	881	59	930	
Gain		3	57	23	6	36	41	21			87	274

Lot IX—Speltz and Bran

LAMBS Number	January 5	January 17	January 31	February 14	February 28	March 14	March 28	April 6	April 24	Weight of Wool	Weight April 24, including Wool	Total Gain per Head
612	80	79	87	89	95	98	100	102	102	8	110	30
586	85	86	93	101	106	107	112	117	121	7.25	128.25	43.25
514	78	85	93	98	101	106	113	117	123	6.25	129.25	51.25
559	82	75	83	88	97	94	100	102	111	7	118	36
522	76	74	82	86	91	93	95	98	103	7	110	34
510	82	80	86	91	95	96	103	107	116	8	124	42
603	84	81	89	92	100	102	105	106	106	8.25	114.25	30.25
573	98	98	104	108	114	115	115	117	117	7.75	124.75	26.75
535	72	76	81	85	92	93	98	103	103	8.5	111.5	39.5
Total	737	734	798	838	891	904	941	969	1002	68	1070	
Gain		-3	64	40	53	13	37	28			101	333

THE FEEDS USED

The following table is a record of the kinds of grains and mixtures fed, the number of lambs in each lot at the close of the experiment, the total quantity of each kind of grain consumed, the total number of pounds of gain made, the pounds of grain required for a pound of gain and the average

gain per head daily of each lot and lamb up to the time of shearing. For the purpose of determining when the largest gain is made, before or after shearing, we have arranged this table in two periods, the first containing ninety-two and the last seventeen days. The first one includes the time it took after they were separated into lots, at the beginning of the experiment, to get them accustomed to their quarters and on full feed, and the second includes the period after they were shorn. It will be seen by the above tables that during the first two weeks of the first period they did not make creditable gains. These lambs were ready for market at the end of the first period, but as we were desirous of noticing the effects of the shearing and to test the market with shorn lambs, they were kept seventeen days longer. At the beginning of the test the respective lots received one pound of the corn and wheats; one pound and one-eighth of the speltz and the grain and bran mixures per head daily; this was gradually increased at the rate of one-half pound per day until they were getting all they would eat up clean. Up to the time of shearing they had been receiving all of the upland prairie hay they would eat, which, after several careful weighings at different intervals, was found to be about one pound and one-half per head daily. After this time they were changed to *Bromus inermis* hay until the end of the test, concerning which we will state more later on.

It was found that they did not take to the ground grains, and in the case of the ground speltz they did not eat all of the husks.

Speltz (*Triticum dicoccum*) is a grain that is very similar to barley in appearance. It has been grown in South Dakota for a number of years and has proved itself well adapted to our conditions and especially in the drier parts of the state. It is a large yielder, making over sixty bushels per acre on the College farm.

The following is an analysis of this grain, prepared by J. H. Shepard, Chemist of this Station:

ANALYSIS OF SPELTZ

(Husks)

	Air Dry Substance	Water Free Substance
Water	8.12
Ash	7.45	8.10
Ether Extract.....	1.48	1.61
Crude Fiber.....	39.02	42.46
Crude Protein.....	2.39	2.60
N.-free Extract.....	41.54	45.23
Total Nitrogen.....	.383	
Albuminoid Nitrogen.....	.300	.326

(Husk and Grain)

	Air Dry Substance	Water Free Substance
Water	10.172
Ash	2.956	3.29
Ether Extract.....	2.467	2.75
Crude Fiber.....	11.450	12.75
Crude Protein.....	11.577	12.90
N.-free Extract.....	61.398	68.31
Total Nitrogen.....	1.84	2.04
Albuminoid Nitrogen.....	1.42	1.58

It will be seen by the following table that, during both periods of the experiment, it required a larger quantity of the ground speltz to make a pound of gain than it did with the whole speltz, and from the above table of the analysis it can be seen that about one-fifth of the protein of the whole grain is contained in the husk, which in itself is a sufficient reason for not grinding this grain for sheep. This husk constitutes approximately twenty-five per cent of the whole grain.

Three lots were fed macaroni wheat (*Triticum durum*); (1) The whole wheat alone; (2) The whole wheat mixed with one-third its weight of bran; (3) The whole wheat ground

and mixed with one-third its weight of bran. Many choice varieties of the durum or macaroni wheats have been introduced recently into this state from Russia by the United States Department of Agriculture. Our conditions are evidently well suited for its culture, especially in the drier sections of the state, from the fact that it will yield from twenty-five to one hundred per cent more than the common bread wheats. The variety sown was Kubanka, a very hard variety of the durum type, and thinking it might be too hard when fed to lambs, we ground it for one lot. In comparing the gains made we find that not in either case did the mixture equal the whole wheat, and that it required more pounds of grain in each instance to make a pound of gain than from the whole wheat.

In this connection it should be stated that Arnautka, Wild Goose and other varieties of the macaroni, or durum wheats, have long been successfully grown in South Dakota, especially in the German Russian settlements, but the lack of a profitable market for wheats of this type has hitherto prevented their more extensive cultivation.

Comparing the gains made by the whole bread wheat and the whole macaroni wheat, the former produced the most even gains. It required practically the same number of pounds of each grain for a pound of gain, but the advantage, if any, was with the macaroni wheat, as it is not worth so much in the market per bushel as No. 1 Northern.

We give an analysis of the average composition of bread wheats and macaroni wheats as prepared by the Bureau of Chemistry, United States Department of Agriculture; and also an analysis of the wheats fed, prepared by J. H. Shepard, Chemist of this Station:

Average Composition of Wheats Exhibited at World's Columbian Exposition, and Analyzed in Bureau of Chemistry

	Air Dry Per Cent
Moisture	10.62
Ash	1.82
Fat	1.77
Fiber	2.36
Protein	12.23
Starch and undetermined.....	71.20
	<hr/>
	100.00

Average Composition of Macaroni Wheats Examined in Bureau of Chemistry

	Air Dry Per Cent
Moisture	10.95
Ash	1.78
Fat	1.88
Fiber	2.26
Protein	14.18
Starch and undetermined.....	68.95
	<hr/>
	100.00

Bread Wheat Grown on College Farm (1902)

	Air Dry Per Cent	Water Free Per Cent
Moisture	12.505
Nitrogen	2.33	2.66
Crude Protein (N.x5.7).....	13.28	15.16

Kubanka Grown by J. H. Shepard (1902)

Moisture	15.06
Nitrogen	2.076	2.444
Crude Protein (N.x5.7).....	11.833	13.931

In the above analyses it may be seen that the protein content of the bread wheat is much larger than it is in the analyses for all varieties. This wheat was raised on the College farm and

the grains were shrunken. Millers usually discriminate in price against this kind of wheat, when it is really worth more as a feed than the plump kind, because it is richer in protein. This increase in protein content of wheat will be treated in a bulletin later by the Chemist of the Station. The analyses of these wheats do not reveal anything that one is superior to the other as a feed, but they do show that the average macaroni wheat does contain nearly two per cent more of protein, or flesh-forming substance, and comes nearer being a balanced ration than the average for the bread wheats.

TABLE 10

	No. of Lambs	Pounds of Grain Consumed up to Shearing	Pounds of Grain Made up to Time of Shearing	Pounds of Grain for a Pound of Gain	Average Gain per Head Daily before Shearing	Pounds of Grain Consumed after Shearing	Pounds of Grain Made after Shearing	Pounds of Grain for a Pound of Gain after Shearing	Average Gain per Head Daily after Shearing	Pounds of Wool Shorn	Total Pounds of Grain Fed	Total Pounds of Gain Made	Total Pounds of Grain Required for a Pound of Gain	Total Average Gain per Head Daily	Cost of Grain for Pound of Gain
Lot I—Corn.....	9	1380	259	5.3	.31	255	92	2.8	.60	64	1635	351	4.6	.35	4.1
Lot II—Wheat.....	9	1513	258	5.8	.31	255	104	2.5	.67	69	1768	362	4.9	.37	4.8
Lot III—Macaroni Wheat.....	9	1472	224	6.5	.27	238	122	1.9	.79	65	1710	346	4.9	.35	4.7
Lot IV—Speltz.....	8	1544	214	7.2	.29	255	95	2.7	.69	60	1799	309	5.8	.35	5.8
Lot V—Ground Speltz.....	9	1691	204	8.3	.24	306	100	3.1	.65	65	1997	304	6.5	.31	6.5
Lot VI—Corn and Bran.....	9	1581	255	6.2	.31	289	108	2.7	.70	67	1870	363	5.1	.37	4.3
Lot VII—Macaroni Wheat and Bran.....	9	1719	272	6.3	.32	300	63	4.8	.41	64	2019	335	6.0	.34	5.4
Lot VIII—Ground Macaroni Wheat and Bran.....	8	1305	187	6.9	.25	241	87	2.8	.64	59	1546	274	5.6	.31	5.7
Lot IX—Speltz and Bran.....	9	1950	232	8.4	.28	322	101	3.8	.66	68	2272	333	6.8	.34	6.3

It will be seen by the above table that there are only eight lambs in lots four and eight. These two missing lambs were in good condition the night before, but were found dead in the morning. We are at a loss to know the cause, as the post-mortem by the Station Veterinarian did not reveal anything unusual.

No exact record was kept of the quantity of hay consumed, but after several careful weighings, at different intervals of the experiment, it was found that each lot was eating about fourteen pounds, or a pound and one-half each per day. This hay was cut from upland prairie and consisted of a mixture of the numerous grasses and weeds usually found there. However, during the last three weeks of the test we substituted *Bromus inermis* hay for the rest of the period. It was noticed that they ate a trifle more of this hay than of the former, and made a larger gain, as is shown by the above table. *Bromus inermis* grass is now being grown quite extensively throughout the state and has qualities not found in other grasses. It is as early in the spring as fall sown rye, yields from two to three tons of hay to the acre and furnishes the latest pasture in the fall. When it is cut at the proper stage stock prefer it to the best made timothy hay. Its nutritive value, as compared to other grasses, has never been determined, but from its analysis, as compared with that of timothy (Bulletin 40 of this Station) it will be found that the former contains a trifle over two per cent more of protein, or flesh-forming material, than the latter. Protein is a desirable element to have in a fodder to feed in conjunction with our grains, which are all rich in carbohydrates, or fat-forming foods.

MARKET PRICE OF FEEDS USED

The following was the market price of the feeds fed at the time of the experiment:

Corn, fifty cents per bushel.

Wheat, sixty cents per bushel.

Macaroni wheat, fifty-eight cents per bushel.

Speltz, forty-four cents per bushel.

Bran, fourteen dollars per ton.

The grains necessary to produce a pound of gain in each lot cost the following:

- Lot One, four and one-tenth cents.
- Lot Two, four and eight-tenths cents.
- Lot Three, four and seven-tenths cents.
- Lot Four, five and eight-tenths cents.
- Lot Five, six and five-tenths cents.
- Lot Six, four and three-tenths cents.
- Lot Seven, five and four-tenths cents.
- Lot Eight, five and seven-tenths cents.
- Lot Nine, six and three-tenths cents.

It cost more to make a pound of gain when the grains were fed mixed with bran, or ground, except in the corn and bran lot, than it did when they were fed whole. The cheapest gains were made in the following order: Whole corn, corn and bran, whole macaroni wheat, whole bread wheat, ground macaroni wheat and bran, whole macaroni wheat and bran, whole speltz, speltz and bran, and ground speltz.

By the above table it may be seen that after the lambs were shorn they gained nearly twice as much per day as they did before shearing, which strongly indicates that it is a paying proposition to shear early in the spring before shipping. This increase in gain cannot all be credited to the shearing, as the palatable *Bromus inermis* hay they were getting is preferred by all stock to timothy or prairie hay. However, there are other advantages in shearing before marketing. First, because there can be more sheep put in a car and there is less danger from loss in transit by tramping or suffocation where a long run is to be made. Second, the wool is worth more per pound off than on their bodies. Third, they present a more uniform appearance and the buyers are better able to judge of their qualities, especially when a shearing machine is used.

These lambs were shorn by a machine made by the Chicago Flexible Shaft Company, which does very smooth work, as may be seen by the following cut:



These lambs were weighed at the stockyards at home and shipped to Chicago by the way of La Fox, Illinois, where they were unloaded and kept for a day and a half. They were fed the first day and the following morning on wheat screenings, the usual feed fed to sheep unloaded at these yards, but it was found that they did not eat it readily. Oats was then substituted for the above feed, which was eaten with a relish and they arrived in Chicago on a good fill.

The loss or shrinkage in weight from shipping was about five pounds per head.

They were consigned to Clay, Robinson & Co., and were sold on the open market for \$7.25 per hundred, about 25 cents above the highest price for prime shorn lambs that day and only five cents below those that were unshorn.

The following extracts from the Chicago papers are self-explanatory:

"A deck of fancy lambs fed by the South Dakota Experiment Station was a stellar feature on the market today.

"They were fed on nine different rations by Prof. H. G. Skinner, who accompanied the shipment, with the object of determining comparative values for lamb feeding purposes in South Dakota.

"The stock was of such quality that it was eagerly taken by a local killer at \$7.25, a price away above the market. * *

"The roughness the first two months was wild prairie hay and the last two months on Bromus inermis.

"Authorities agreed that the wheat fed lot and the speltz and bran lot were worth most by 10 cents; the ground macaroni and bran lot was 50 cents below the best, and the others were on about an average."—The Chicago Live Stock World.

TEST LAMBS SELL HIGH

"These lambs were all sold in one bunch at the high price, but in order to determine the results of the different methods of feeding the lambs had been marked and were separated here in bunches of nine, the same as they were fed, and three experts passed judgment on them as to quality and market value.

“The decisions of the three judges—one buyer and two salesmen—as to the quality and value were unanimous. Lot No. 2, which was fed on wheat alone, and lot No. 9, fed on speltz and bran, being considered of equal value and given first place.

“Lot No. 8, which was fed on ground macaroni wheat and bran, was the poorest, and was valued 50 cents below the top lots, had they sold alone, and the other six lots were all valued 15 cents per hundredweight below the best lots. The salesmen judged from the standpoint of gain, weight and finish, and the buyer with a view to their value at slaughter.”
—The Chicago Drovers’ Journal.

After the wool was shorn it was sent to H. T. Thompson & Co., Chicago, and we publish extracts from their letter, unsolicited by us, and also bill of sale:

“We found this to be an exceptionally good lot of wool, in fact the best we have seen from Dakota in a long, long time, and it would be a mistake for the growers in your part of the country to expect the prices obtained for this wool to rule for their clips. The fleeces were entirely clear of seed, chaff, tags and objectionable matter, and they evidently had been housed most of the time, so the color of the wool was bright. * * *

“Another thing which possibly may have added somewhat to its light shrinkage was the evidence of its having been dipped, probably in tobacco dip, early in the season; while we do not believe that dipping adds to the value of the wool, at the time these sheep were dipped there was without doubt a great deal of dirt and foreign matter washed out of the fleeces.”

BILL OF SALE OF WOOL

87 lbs. medium wool @ 18½c.....	\$ 16.09
361 lbs. low medium @ 19c.....	68.59
93 lbs. coarse @ 15c.....	16.74
6 lbs. black @ 16c.....	.96
<hr/>	<hr/>
547	\$102.38

Freight	\$4.05
Cartage50
Commission	5.47
Net	\$ 92.46

SUMMARY

1. The lot fed whole corn made the cheapest gain.
2. Whole macaroni wheat was cheaper feed for lambs than ground macaroni wheat and bran, or the whole macaroni wheat and bran.
3. Grinding grain for lambs was not profitable when fed as a separate ration, as it decreased the palatability and therefore interfered with the gains.
4. A more uniform gain was made with the whole wheat lots than with any other feed.
5. Less grain was consumed when *Bromus inermis* hay was fed; this shows that it is more nutritious than prairie hay for feeding lambs.
6. The lot receiving whole macaroni wheat made a cheaper gain at market prices than the lot getting whole bread wheat.
7. Macaroni wheat was equal to bread wheat, pound per pound, when fed to lambs.
8. It cost more to produce a pound of mutton in each case when one-fourth bran by weight was added to the grain.
9. It required one-fourth more of speltz and one-fifteenth more of wheat to produce a pound of gain than it did corn.
10. The lambs made much better gains after they were shorn than they did before.
11. Dipping the sheep in the fall not only kills all external parasites, but is beneficial to the quality of the wool.

FATTENING SHEEP ON GRASS

James W. Wilson

H. G. Skinner

In the fall of 1902 an experiment was conducted with the graining of sheep on grass. The object of this test was to ascertain whether or not it would be profitable to begin the feeding period with sheep, for an early winter market, on the partially dried up grass in the fall of the year, and also to determine the relative value of the different grains when fed separately under these conditions. For the purpose of this experiment a field containing twelve acres of native prairie grass, which had not been pastured or cut for hay that season, was divided up into six equal pastures of two acres each. These pastures contained the numerous varieties of weeds and grasses usually found on the prairie in the fall. The sheep consisted of sixty head of common grade ewes, ranging in age from one to six years, but of no particular breeding. They were divided into six different lots of ten head each, attention being given to have them as uniform as possible throughout. To five of these lots we fed grains and the sixth lot had the grass alone. They were kept under these conditions for six weeks until cold weather set in, when they were taken to the barn. The lot receiving grass alone lost nearly twice as much the last two weeks of the experiment as they did the previous two weeks, which indicates that the prairie grass in this locality when allowed to cure on the ground is not sufficiently nutritious to keep sheep from losing weight.

Thinking that the records of the quantity of feed given daily would be of value to sheep feeders in this state, and especially to the young feeders, we publish it in full in the following tables along with the gains for each lot.

During the last two weeks of the test it will be noticed that there was a falling off in the gains as compared with that made the two preceding weeks, which can be partially accounted for by the fact that by this time the grass was badly frosted, and at the last weighings the sheep did not have the fill as at former weighings.

There was an unusually large amount of rainfall during the month of August, which caused a larger per cent of green grass when the test began than is common. There was a killing frost on the fifteenth of September, followed by lighter frosts and an unusually large amount of precipitation, 1.18 inches, during the month of October. This increased rainfall at the latter end of the experiment no doubt caused a deterioration in the quality of the grasses by the washing out of the soluble ingredients, as is shown by the falling off in the gains of the grass lot at this time. Moreover, it was cloudy and cold nearly every day during these last two weeks, and the gains are in accordance with those which might be expected from feeding unsheltered sheep at this time of the year under such conditions:

DAILY RECORD OF FEEDS

Experiment II

Date	Lot I Corn	Lot II Oats	Lot III Wheat	Lot IV Speltz	Lot V Barley	Lot VI Grass
September 20.....	5	5	5	6	5	
September 21.....	5	5	5	6	6	
September 22.....	6	6	6	7	6	
September 23.....	7	7	7	8	7	
September 24.....	8	8	8	9	8	
September 25.....	9	9	9	10	9	
September 26.....	10	10	10	11	10	
September 27.....	11	11	11	13	11	
September 28.....	12	12	12	14	12	
September 29.....	13	13	13	15	13	
September 30.....	14	14	14	16	14	
October 1.....	15	15	15	17	15	
October 2.....	16	16	16	19	16	
October 3.....	17	17	17	21	17	
October 4.....	18	18	18	23	18	
October 5.....	19	19	19	23	19	
Pounds grain eaten from Sept. 19 to Oct. 6	185	185	185	218	186	
Weight October 6.....	1333	1261	1278	1182	1227	1261
Weight September 19.....	1215	1153	1197	1119	1156	1222
Gain.....	118	108	81	63	71	38

Date	Lot I Corn	Lot II Oats	Lot III Wheat	Lot IV Speltz	Lot V Barley	Lot VI Grass
October 6.....	20	20	20	23	20	
October 7.....	20	20	20	23	20	
October 8.....	20	21	20	24	21	
October 9.....	20	21	20	24	21	
October 10.....	20	21	20	24	21	
October 11.....	20	22	20	24	21	
October 12.....	20	22	20	34	21	
October 13.....	20	23	20	24	22	
October 14.....	20	23	20	24	22	
October 15.....	20	23	20	24	22	
October 16.....	20	23	20	24	22	
October 17.....	20	24	21	25	23	
October 18.....	20	24	21	26	23	
October 19.....	20	25	21	26	24	
Pounds grain eaten from Oct. 6 to Oct. 20	280	312	283	339	303	
Weight October 20.....	1386	1312	1324	1232	1277	1230
Weight October 6.....	1333	1261	1278	1182	1227	1261
Gain.....	53	51	46	50	50	-31

Date	Lot I Corn	Lot II Oats	Lot III Wheat	Lot IV Speltz	Lot V Barley	Lot VI Grass
October 20.....	20	25	21	27	24	
October 21.....	20	25	21	27	24	
October 22.....	21	26	22	28	25	
October 23.....	21	26	22	26	25	
October 24.....	21	26	22	26	25	
October 25.....	21	26	22	26	25	
October 26.....	21	26	22	26	25	
October 27.....	21	26	22	26	25	
October 28.....	21	26	22	26	25	
October 29.....	21	26	22	26	25	
October 30.....	21	26	22	26	25	
October 31.....	21	26	22	26	25	
November 1.....	21	26	22	26	25	
November 2.....	21	26	22	26	25	
Pounds grain eaten from Oct. 19 to Nov. 3	292	362	306	368	348	
Weight November 3.....	1411	1350	1334	1248	1324	1171
Weight October 20.....	1386	1312	1324	1232	1277	1236
Gain.....	25	38	10	16	47	-59

By the above tables it will be seen that it required from two to three weeks to get the sheep on full feed, or all they would eat up clean. This feature was governed altogether by the kind of grain that was fed, as they were unable to consume as large a quantity of the corn and wheat as they did of the other three grains, which were of a more bulky nature. However, there is no criterion which can be followed in sheep-feeding, but the feeder should study his flock from day to day and be sure not to over-feed them, in order to get the best results.

The following table shows a complete record of the feeds consumed, the gains made, the pounds of grain for a pound of gain, the cost of producing a pound of gain and the gain per head daily:

	No. of Sheep	Pounds of Grain Eaten on Grass	Pounds of Gain made on Grass	Pounds of Grain for Pounds of Gain	Cost of Grain for Pounds of Gain on Grass	Average Gain per Head Daily
Lot I—Corn.....	10	757	196	3.9	3.12	.44
Lot II—Oats.....	10	859	197	4.4	3.00	.44
Lot III—Bread Wheat.....	10	774	137	5.6	5.30	.31
Lot IV—Speltz.....	10	925	129	7.2	4.70	.29
Lot V—Barley.....	10	837	168	5.0	3.50	.38
Lot VI—Grass.....	10	—52			

The cost of gain was based on the current prices for these grains at that time, which were as follows:

- Corn, 45 cents per bushel.
- Oats, 22 cents per bushel.
- Bread wheat, 56 cents per bushel.
- Speltz, 30 cents per bushel.
- Barley, 34 cents per bushel.

The cost of producing a pound of gain varied from three to five and three-tenths cents, oats being the cheapest and speltz the dearest feed.

This makes the second test at this Station with the feeding of speltz and barley to sheep under the same conditions, and in each case the latter grain has proved cheaper. In the preceding experiment it will be noticed that the three lots of lambs receiving speltz, it required more pounds of this grain than any of the others to produce a pound of gain. The same is true in this experiment and the one conducted two years ago at this Station, which is strong evidence that this grain is not as good, pound per pound, as the other grains that have been used when fed to sheep. In this experiment it required nearly twice as much of speltz to produce a pound of gain as it did corn, about one-third more than it did barley, over one-third more than it did oats, and over one-third more than it did wheat.

In conclusion, we might state that the natural conditions of the grasses in an average season are well suited for the cheap production of a pound of mutton; that the grains that produced the best gains are large yielders and widely grown in this state; that when sheep are put on a partially dried up prairie grass pasture, as these were, there will be a gradual decrease in their weights in case of unusually heavy rains during the fall, unless they are grained.

It is undoubtedly true that in the central and western portions of the state, where the buffalo and grama grasses predominate, the dried-up pastures afford more nutritious feed than in the southeastern portion of the state, where the native nutritious grasses have been largely driven out by inferior introduced grasses.

It is also true that as we go westward in the state we find a constantly decreasing rainfall during the late summer and fall months, and in this particular the feeders in these localities have an advantage over those located farther east.