Lot 2—4 pounds of soybean pellets fed per head every other day.

Lot 3—6.9 pounds of alfalfa hay per head daily.

Lot 4—Soybean oil meal and salt self-fed (the salt was mixed with the soybean oil meal to limit its consumption and make it possible to self-feed the protein supplement).

The proportions of soybean oil meal and salt were 100 pounds of soybean oil meal and 35 pounds of salt.

TABLE 1. THE EFFECT OF FEEDING A PROTEIN SUPPLEMENT DURING THE LATTER PART OF THE GRAZING SEASON TO TWO-YEAR-OLD STEERS ON BLUESTEM PASTURE

PHASE I—Grazing, Early Summer Period

May 1 to August 1, 1949—92 Days

1. Lot number	1	2	3	4
2. No. steers per lot	9	10	10	10
3. Av. initial weight, lbs.	757	806	769	775
4. Av. final weight, lbs.	991	1003	1002	1018
5. Av. gain, lbs.	234	197	233	243
6. Daily gain, lbs.	2.54	2.14	2.53	2.64

PHASE II—Grazing, Late Summer Period

August 1, 1949 to October 10, 1949—70 Days

7. Period during which soybean pellets were fed	July 18 to Oct. 10, '49	Aug. 10 to Oct. 10, '49	Sept. 1 to Oct. 10, '49	None fed
8. Soybean pellets fed per steer daily, lbs.	3	3	3	
9. Av. initial weight, lbs.	991	1003	1002	1018
10. Av. final weight, lbs.	1060	1101	1099	1072
11. Av. gain, lbs.	69	98	97	54
12. Av. daily gain, lbs.	.99	1.40	1.39	.77
13. Total soybean pellets fed per steer, lbs.	287	183	117	None
14. Total gain per steer, May 1 to October 10, 1949, lbs.	303	295	330	297
15. Appraised value per cwt., October 10, 1949	$ 21.50	$ 22.00	$ 22.00	$ 21.00

OBSERVATIONS

1. The winter of 1949-50 was very mild, extremely dry and ideal for wintering cattle.

2. Two pounds of soybean pellets fed per steer daily to Lot 1 on bluestem pasture produced .66 of a pound of gain per head daily. This is approximately twice as much gain as was obtained with any of the other lots.

3. Steers in Lot 2 fed every other day on pasture gained only .34 of a pound per head daily whereas the steers fed daily in Lot 1 gained .66 of a pound per head daily, which in this test makes daily "caking" appear worth while in so far as gain is concerned.

4. Nearly seven pounds of alfalfa hay per head daily fed as a protein supplement to Lot 3 produced only .26 of a pound of gain per head daily whereas 2 pounds of soybean pellets per head daily fed to Lot 1 produced .66 of a pound of gain per head daily.

5. Lot 4 self-fed the soybean meal and salt mixture gained .27 of a pound per head daily which was about the same as the gain made by the steers fed alfalfa hay but considerably below the .66 of a pound

daily gain made by the check group, Lot 1. No ill effects were noted in the salt-meal group but they did present a somewhat rougher appearance than the other lots at the end of the wintering period. Some difficulty was experienced in getting them accustomed to the salt-meal mixture.

6. All lots showed a loss in weight for the month of March, the most severe loss being in Lot 4, the salt-meal self-fed group.

TABLE 1. WINTERING YEARLING STEERS ON BLUESTEM PASTURE 1949-50

December 11, 1949 to April 15, 1950—125 Days

1. Lot number	1	2	3	4
2. Number of steers per lot	10	10	10	10
3. Method of feeding	Fed soybean Pellets daily	Fed soybean Pellets every other day	Fed Alfalfa Hay daily	Self-fed Soybean oil meal and Salt mixed together
4. Average daily winter ration, lbs.:				
Soybean pellets	2.00	2.02		
Soybean oil meal				1.92
Salt	.14	.14	.11	.62
Alfalfa hay			6.91	
Prairie hay[1]	.38	.38	.24	.91
Bluestem pasture	ad lib	ad lib	ad lib	ad lib
5. Average initial weight	624	622	623	623
6. Average final weight	707	665	655	657
7. Average gain	83	43	32	34
8. Average daily gain	.66	.34	.26	.27
9. Total feed cost per steer	$ 15.79	$ 15.86	$ 13.62	$ 16.21
10. Initial cost per steer at $24.75 per cwt.	$154.44	$153.95	$154.19	$154.19
11. Initial cost per steer plus winter feed cost	$170.23	$169.81	$167.81	$170.40
12. Necessary selling price per cwt. to cover initial cost plus wintering cost	$ 24.08	$ 25.54	$ 25.62	$ 25.94
13. Appraised value per cwt. on May 5, 1950				

1. Prairie hay was fed only when snow covered the grass.

Feed prices: Soybean pellets, soybean meal, $75.00 a ton; alfalfa hay, $17.00 a ton; prairie hay, $13.00 a ton; bluestem pasture, $6.00 for the season; salt, $12.00 a ton.

Project 68: Factors Influencing the Salt Requirements of Beef Cattle

The Effect of Withholding Salt on the Growth and Condition of Steers and on the Apparent Digestibility of Feed Constituents

Ed F. Smith and D. B. Parrish

(Preliminary Report—Not for Publication)

I—The Effect of Withholding Salt on the Growth and Condition of Steers.

Twelve good quality Hereford steer calves were used in this study. They were divided into two lots of six steers each. Both lots were treated similarly throughout the experiment except that one lot was allowed free access to salt and the other was not. The calves were started on test December 18, 1948, wintered on dry grass, used in spring digestion trial, grazed, then full fed in dry lot, and marketed on December 2, 1949.

OBSERVATIONS

1. Lot 2, which did not have access to salt, evidenced a craving for salt early in the feeding period. It was necessary to fence the old salting grounds to prevent the steers from eating the soil.
2. Lot 1, which received salt during the wintering period, gained 39 pounds more per head than Lot 2, which received no salt. The only evidence of salt deficiency of the calves of Lot 2 at this time was less weight and a thinner and rougher appearance when compared to Lot 1.
3. During the summer period on grass, the salt-fed group gained 36 pounds more per head than the non-salt group and the hair presented a glossy appearance, whereas the non-salt group failed to shed all their winter hair.
4. Both groups were removed to dry lots on July 20 for the full feeding phase of this test. Lot 1 had free access to salt. Lot 2 did not. Both lots made exceptionally good gains and performed satisfactorily except for one steer in Lot 2, the non-salt lot. This steer failed to respond to feeding and became emaciated. He was killed on October 27 and an autopsy was performed which revealed nothing abnormal. This steer was omitted in computing the results of this test.
5. The fact that the non-salt steers gained slightly more on full feed than the salt steers indicates that steers on a full grain feed do not require as much salt as those on dry feed or green grass.
6. Over the 327-day period that the steers were on test, those having access to salt gained 65 pounds more than the steers not having access to salt and sold for 50c a hundred more. The non-salt steer carcasses were better covered over the chuck and round and generally graded higher.

TABLE 1. THE EFFECT OF WITHHOLDING SALT ON THE GROWTH AND CONDITION OF STEERS

December 18, 1948 to December 2, 1949—327 Days

PHASE I—WINTERING

December 18, 1948 to May 1, 1949—134 Days

1. Management	Salt, Free Choice	No Salt
2. Lot number	1	2
3. Number of steers per lot	6	5
4. Average daily ration, lbs.:		
Soybean pellets	1.50	1.50
Salt (ad lib feeding)	.04	
Bluestem grass	ad lib	ad lib
Prairie hay[1]	1.94	1.94
5. Initial weight per steer	477	482
6. Gain per steer, lbs.	60	21
7. Weight per steer, May 1, 1949	537	503
8. Daily gain per steer	.45	.16

PHASE II—GRAZING

May 23, 1949 to July 20, 1949—58 Days[2]

9. Initial weight per steer May 23, 1949[2]	536	506
10. Gain per steer	152	116
11. Weight per steer, July 20, 1949	688	622
12. Daily gain per steer	2.62	2.00
13. Average daily salt consumption in pounds (ad lib feeding)	.10	

PHASE III—FULL FEEDING

July 20, 1949 to December 2, 1949—135 Days

14. Gain per steer	349	355
15. Final weight per steer	1037	977
16. Daily gain per steer	2.59	2.63
17. Average daily ration, lbs.:		
Ground shelled corn	16.34	14.48
Prairie hay	8.46	8.61
Soybean meal	1.96	2.00
Ground limestone	.08	.08
Salt (ad lib feeding)	.07	

SUMMARY—ALL PHASES

18. Total gain per steer	560	495
19. Daily gain per steer	1.71	1.51
20. Dressing percent[3]	56.3	57.1
21. Carcass grades:		
Average good	1	1
Low good		2
Top commercial	5	1
Average commercial		1
22. Selling price per hundredweight at market	$ 23.50	$ 23.00

1. Prairie hay was fed only when snow covered the grass. A total of 260 pounds of hay was consumed per steer.
2. May 1 to May 23, 1949 the steers were on a digestion trial.
3. Figured with 2.13 percent cooler shrink.

II.—Effect of Withholding Salt on Digestibility of Feed Constituents.

The effect of withholding salt on the digestibility of cottonseed meal-silage rations and on alfalfa pellet-silage rations was tested with six steers in each group during the period May 1 to May 23, 1949. Rations were adjusted to minimum requirements. During an adjustment period rations were further reduced if necesary, so that each steer consumed all the feed offered. If the quantity of feed decreased, both silage and protein concentrate were reduced by the same proportion. After adjustment of the rations, the steers were given a ten-day preliminary feeding period. This was followed by a ten-day trial feeding period during which feces were collected for analysis.

The steers receiving salt apparently digested both the cottonseed meal-silage and the alfalfa pellet-silage rations somewhat better than did those receiving no salt, but it is questionable whether the differences are significant.

TABLE 2. THE EFFECT OF WITHHOLDING SALT ON THE APPARENT DIGESTIBILITY OF FEED CONSTITUENTS

1949 data

Lot No.	No. of Steers	Ration	Av. Apparent Digestibility of Rations — Dry Matter	Coefficient Crude Protein	Ether Extract	Crude Fiber	Ash	N. F. E.
1	3	C. S. M. Silage Salt	61.4	62.2	66.3	58.4	40.5	64.2
2*	3	C. S. M. Silage	59.9	61.5	65.7	57.4	36.0	62.5
3	3	Dehy. Alfalfa pellets Silage Salt	60.0	61.9	60.6	49.1	48.1	67.7
4*	3	Dehy. Alfalfa pellets Silage	56.9	59.7	58.4	45.0	40.9	65.8

* Steers had no access to salt during previous five months.

BALANCE STUDY

The six steers on the cottonseed meal-silage ration were also used to study nitrogen, ash, sodium, and chloride balance at the same time as the digestion trials were run.

The animals were all found to be in positive nitrogen balance. Ash output was 6 to 12 percent of intake except in the case of one steer in the non-salt group which died later. This steer also retained less sodium and chlorine than did the others receiving no salt. With the exception of one other steer, sodium retention was similar regardless of which group they were in. Chlorine retention was almost twice as high by steers receiving no salt as those having access to salt.

SODIUM AND CHLORIDE CONCENTRATIONS IN BLOOD

The concentrations of sodium and chlorides in the blood were determined at two stages during this study of the effect of withholding salt. The first analyses were made at the time of the digestion trial, at which time half of the steers had received no dietary salt for six months. Analyses also were made at the termination of the study, at which time salt had been withheld for 11 months. Results indicate that the rations fed during this test either with or without salt, furnished sufficient sodium and chloride to maintain normal blood concentrations of these ions.

Project 68: Factors Influencing the Salt Requirements of Beef Cattle

The Influence of Salt on the Gains of Steer Calves 1949-50

Ed F. Smith - D. B. Parrish

Three lots of steer calves were wintered on silage and 1 pound of soybean pellets per head daily. In addition to this ration Lot 1 received free access to salt, Lot 2 was fed a limited salt allowance (approximately one-sixth of an ounce per head daily) and Lot 3 received no salt.

Lot 1 allowed free access to salt gained 1.26 pounds per head daily.

Lot 2, fed a limited salt allowance, gained about the same. The non-salt fed lot gained considerably less than either of the other lots. Its gain was only .65 of a pound per head daily.

The steers were fed all the silage they would consume. The steers in Lot 1 which had free access to salt consumed 28.2 pounds of silage per head daily whereas the steers in Lot 3 which received no salt consumed only 26.15 pounds of silage per head daily.

The amount of feed required to produce 100 pounds of gain was almost twice as high for the steers not allowed access to salt, Lot 3, as it was for steers fed salt, Lot 1.

TABLE 1. THE INFLUENCE OF SALT ON THE GAINS OF STEER CALVES

December 14, 1949 to April 15, 1950—122 Days

1. Lot number	1	2	3
2. Number of steers per lot	5	4	5
3. Management	Free access to salt	Limited salt allowance	No salt
4. Average initial weight	448	447	448
5. Average final weight	602	596	527
6. Average gain	154	149	79
7. Average daily gain	1.26	1.22	.65
8. Average daily ration, lbs.:			
Soybean pellets	1.00	1.00	1.00
Silage	28.20	29.30	26.15
Salt	.8 oz.	.16 oz.	No salt
9. Feed required per 100 pounds of gain, lbs.:			
Soybean pellets	79.22	81.88	154.43
Silage	2233.77	2399.33	4037.97