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## Fattening Yearling Beef Cattle on Pasture

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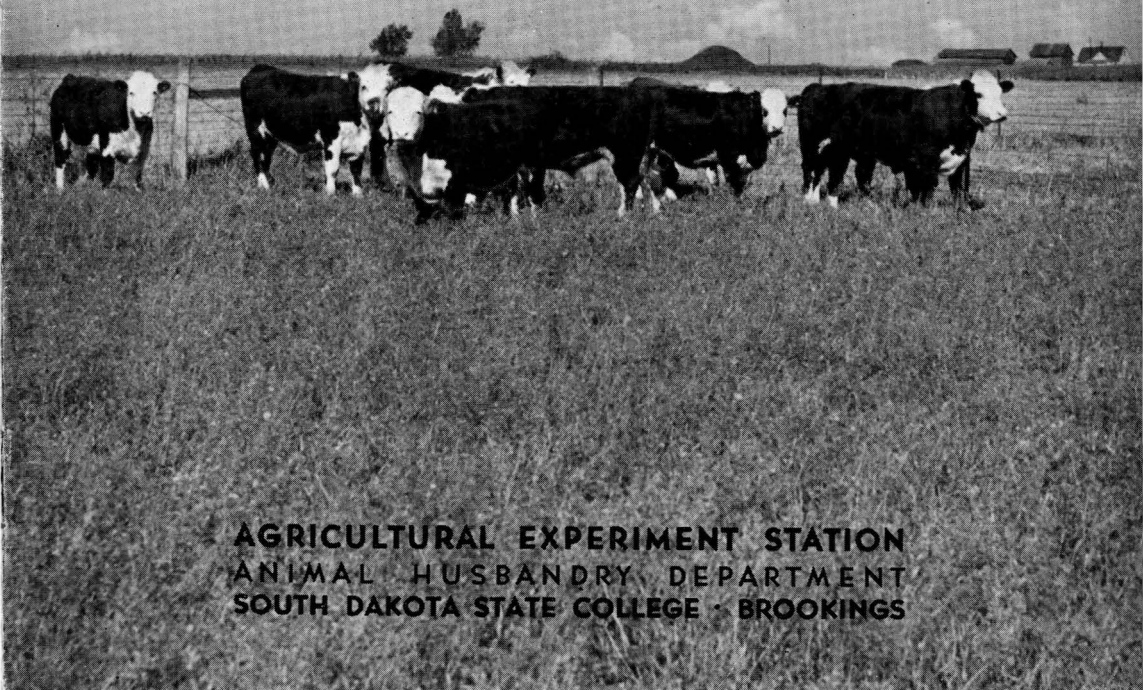
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# FATTENING

YEARLING *Beef* CATTLE

# ON PASTURE



**AGRICULTURAL EXPERIMENT STATION  
ANIMAL HUSBANDRY DEPARTMENT  
SOUTH DAKOTA STATE COLLEGE - BROOKINGS**

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# Fattening Yearling Beef Cattle on Pasture

By W. C. McCONE<sup>1</sup>

Many feeders are following the practice of fattening beef cattle on pasture. To aid the producer in planning his feeding program, research was conducted on various methods of using the feeds available on most South Dakota farms. Other experiment stations have shown the worth of limited winter feeding, followed by using maximum amounts of grass, in the production of fat yearlings. The present study is a report on the suitability of this method under South Dakota conditions and with locally grown feeds.

Research was planned to study: (1) the efficiency of various South Dakota roughages in rations for wintering

beef calves, and (2) the practicability and economy of fattening these calves on grass as yearlings.

Feeding trials were designed to measure the beef producing capacity, on a per acre basis, of two types of pasture common in South Dakota. This information should be beneficial in planning a pasture and crop rotation system which will result in greater over-all farm production for this area.

The experiment divided itself naturally into two parts, a winter phase and a summer phase, which will be discussed separately.

## Wintering With Various Roughages

Forty-eight Hereford calves (thirty-two steers and sixteen heifers) were used in each of three years of the experiment. These were spring calves that were purchased late in the fall. Four lots, composed of eight steers and four heifers each, were fed during the winter phase. Random selection, within sexes, was used in making up the lots, and type and condition ratings were then taken on each calf. Single-day weights were used in starting and completing the experiment, and the cattle were weighed at 28-day intervals during the trial.

Roughages in the form of alfalfa hay, brome hay, and corn silage,

which are common feeds in this area, were compared as winter feed for calves to be finished on pasture the following summer. Three lots of calves were wintered on rations which were designed to produce a daily gain somewhere between a pound and a quarter and a pound and a half. Another lot was full-fed as a check lot, to compare full feeding in the dry lot with wintering and finishing on grass. This was the only group of cattle that received soybean oilmeal as a source

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of protein supplement. The rations of the remaining three lots were balanced by adding alfalfa hay as the

source of the protein supplement.

Winter daily rations fed per head for the four lots were as follows:

Lot number and designation	Shelled corn	Corn silage	Soybean oilmeal	Alfalfa hay	Brome hay
I (Full-fed)	Full-fed	Full-fed	To balance ration	5 lbs.	-----
II (Silage)	3 lbs.	Full-fed	-----	5 lbs.	-----
III (Brome)	3 lbs.	-----	-----	5 lbs.	Full-fed
IV (Alfalfa)	3 lbs.	-----	-----	Full-fed	-----

Each lot received salt, bonemeal, and limestone, free choice. Water heated by electric tank heaters was kept available for the cattle at all

times during the winter phase. Twice-daily feeds, at morning and evening, were offered the cattle.

## Results of Winter Feeding

The three winter feeding trials were not carried out over equal periods, as untimely snowstorms in the fall of 1946 and 1947 made it impossible to move the calves and get them started on feed at the desired time. As the winter feeding phase ended at approximately the same time each year, this meant that the feeding periods were 125, 146, and 165 days for 1947, 1948, and 1949, respectively. Forty-eight calves were started on the experiment each year, but in the winter of 1948 two calves died. These death losses could not be attributed to any factor directly concerned in this experiment.

Tables 1, 2, and 3 show winter feeding results for the years 1947, 1948, and 1949, respectively. In terms of daily gain, the results for the three years were fairly consistent, with Lot I (full-fed corn) making the greatest gains each year. This was followed by Lot II (full-fed corn silage) with daily gains approximately half a pound less

than those of Lot I. The gains in Lot IV (full-fed alfalfa hay) were the same as those for Lot II in 1947 and 1948, but were somewhat lower in 1949. In the first two years, Lot IV out-gained Lot III (full-fed brome hay) but in 1949 Lot III made the larger gain.

This might indicate that the relative quality of the hay for the various years differed somewhat and had an effect on the gains that were made. It may be noted that with the exception of Lot IV for 1949, all lots made greater daily gains in 1948 than in 1947, and again greater gains in 1949 than in 1948. This may be directly related to the fact that the length of the feeding period increased from year to year.

In calculating feed prices, the average prices in effect for the various feeds during the period of the experiment each year were used. On the basis of these prices, corn silage produced one hundred pounds of beef at

less cost each year than did the brome or alfalfa hay. These trials showed that corn silage was worth 62 percent as much as alfalfa hay per pound for its ability to produce gain. Differences in cost between alfalfa hay and corn silage were greater than this; thus, the silage lot produced gains at less cost.

In calculating costs and financial results, only cash outlays for the live-stock and feed were included. Labor, interest, and other costs that feeders must consider were not included, as they would be quite similar for all lots and would not change the differences shown between lots.

Table 1. Data from Winter Feeding Phase, January 21 to May 26, 1947 (125-day feeding period)

Lot No.	I Alfalfa hay, corn silage, corn full- fed, soybean oilmeal	II Alfalfa hay, corn silage full- fed, 3 lbs. corn	III Alfalfa hay, brome hay full- fed, 3 lbs. corn	IV Alfalfa hay full- fed, 3 lbs. corn
No. animals in lot .....	12	12	12	12
Av. wt. per animal (lbs.)				
Initial .....	486	485	488	488
Final .....	712	648	607	652
Av. total gain .....	226	163	119	165
Av. daily gain .....	1.81	1.30	0.96	1.32
Av. daily ration (lbs.)				
Shelled corn .....	9.30	3.00	3.00	3.00
Soybean oilmeal .....	0.58			
Alfalfa hay .....	5.00	5.00	5.00	16.80
Corn silage .....	8.70	20.55		
Brome hay .....			11.50	
Mineral .....	0.08	0.09	0.07	0.07
Feed per cwt. gain (lbs.)				
Shelled corn .....	512.0	229.8	313.8	226.7
Soybean oilmeal .....	32.1			
Alfalfa hay .....	276.1	383.0	523.0	1270.8
Corn silage .....	480.7	1574.6		
Brome hay .....			1204.7	
Mineral .....	4.2	5.3	6.7	4.9
Feed cost per cwt. gain (\$) .....	16.69	12.44	18.82	15.52
Financial results per animal (\$)				
Cost per cwt. in feed lot .....	16.00	16.00	16.00	16.00
Initial cost per animal .....	77.76	77.60	78.08	78.08
Feed cost .....	37.77	20.30	22.49	25.67
Initial plus feed cost .....	115.33	97.90	100.57	103.75
Necessary selling price per cwt.* .....	16.22	15.11	16.56	15.91

\*Necessary selling price per cwt. to cover initial cost and feed cost.

Table 2. Data From Winter Feeding Phase, January 2 to May 27, 1948 (146-day feeding period)

Lot No.	I	II	III	IV
	Alfalfa hay, corn silage, corn full-fed, soybean oilmeal	Alfalfa hay, corn silage full-fed, 3 lbs. corn	Alfalfa hay, brome hay full-fed, 3 lbs. corn	Alfalfa hay full-fed, 3 lbs. corn
No. animals in lot .....	11	11	12	12
Av. wt. per animal (lbs.)				
Initial .....	438	438	438	438
Final .....	740	653	630	653
Av. total gain .....	302	215	192	215
Av. daily gain .....	2.05	1.47	1.32	1.47
Av. daily ration (lbs.)				
Shelled corn .....	11.34	3.00	3.00	3.00
Soybean oilmeal .....	0.39			
Alfalfa hay .....	5.00	5.00	5.00	16.13
Corn silage .....	5.40	17.75		
Brome hay .....			9.36	
Mineral .....	0.05	0.06	0.06	0.07
Feed per cwt. gain (lbs.)				
Shelled corn .....	553.6	202.3	228.1	204.2
Soybean oilmeal .....	19.2			
Alfalfa hay .....	244.1	337.3	380.2	1097.7
Corn silage .....	263.8	1197.2		
Brome hay .....			711.6	
Mineral .....	2.7	4.4	4.8	4.7
Feed cost per cwt. gain (\$) .....	25.82	15.57	19.90	21.57
Financial results per animal (\$)				
Cost per cwt. in feed lot .....	24.00	24.00	24.00	24.00
Initial cost per animal .....	105.12	105.12	105.12	105.12
Feed cost .....	77.98	33.48	38.21	46.38
Initial plus feed cost .....	183.10	138.60	143.33	151.50
Necessary selling price per cwt.* .....	24.74	21.23	22.75	23.20

\*Necessary selling price per cwt. to cover initial cost and feed cost.

## Feed Prices—Supplement to Tables 1, 2 and 3

Feed	1947	1948	1949
Shelled corn, per bu. ....	\$ 1.30	\$ 2.12	\$ 1.12
Soybean oilmeal, per ton .....	82.00	98.00	72.00
Alfalfa hay, per ton .....	16.00	26.00	23.00
Brome hay, per ton .....	12.00	18.00	18.00
Corn silage, per ton .....	5.00	6.00	6.00
Ground limestone, per cwt. ....	1.30	1.00	1.00
Bonemeal, per cwt. ....	4.40	4.75	4.50
Salt, per cwt. ....	1.50	1.45	1.25

Table 3. Data From Winter Feeding Phase, December 11, 1948 to May 25, 1949  
(165-day feeding period)

Lot No.	I Alfalfa hay, corn silage, corn full- fed, soybean oilmeal	II Alfalfa hay, corn silage full- fed, 3 lbs. corn	III Alfalfa hay, brome hay full- fed, 3 lbs. corn	IV Alfalfa hay full- fed, 3 lbs. corn
No. animals in lot .....	12	12	12	12
Av. wt. per animal (lbs.)				
Initial .....	409	410	411	409
Final .....	757	670	650	633
Av. total gain .....	348	260	239	224
Av. daily gain .....	2.11	1.57	1.45	1.36
Av. daily ration (lbs.)				
Shelled corn .....	9.57	3.00	3.00	3.00
Soybean oilmeal .....	0.30			
Alfalfa hay .....	5.00	5.00	5.00	14.21
Corn silage .....	5.98	18.38		
Brome hay .....			8.80	
Minerals .....	0.06	0.06	0.06	0.06
Feed per cwt. gain (lbs.)				
Shelled corn .....	453.2	190.9	207.1	221.2
Soybean oilmeal .....	14.1			
Alfalfa hay .....	236.7	318.1	345.2	1047.6
Corn silage .....	283.1	1169.6		
Brome hay .....			607.6	
Minerals .....	2.1	3.0	3.0	3.3
Feed cost per cwt. gain (\$) .....	13.19	11.05	13.65	16.54
Financial result per animal (\$)				
Cost per cwt. in feed lot .....	24.50	24.50	24.50	24.50
Initial cost per animal .....	100.20	100.45	100.70	100.20
Feed cost .....	45.90	28.74	32.62	37.05
Initial plus feed cost .....	146.10	129.18	133.32	137.25
Necessary selling price per cwt.* .....	19.30	19.28	20.51	21.68

\*Necessary selling price per cwt. to cover initial cost and feed cost.

Three years' results are summarized in Table 4. The groups fed for limited gains, Lots II, III, and IV, made total gains of approximately 200 pounds per head in comparison to about 300 pounds total gain in the full-fed Lot I.

Groups on limited feeding required an average of 225 pounds of corn to produce one hundred pounds of beef, in comparison to 506 pounds of corn needed per hundred pounds gain in the full-fed, check lot.



Table 4. Three Years' Average Data From Winter Feeding Beef Calves (145-day feeding period)

Lot No.	I Alfalfa hay, corn silage, corn full- fed, soybean oilmeal	II Alfalfa hay, corn silage full- fed, 3 lbs. corn	III Alfalfa hay, brome hay full- fed, 3 lbs. corn	IV Alfalfa hay full- fed, 3 lbs. corn
No. animals in lot .....	35	35	36	36
Av. wt. per animal (lbs.)				
Initial .....	444	444	446	445
Final .....	736	657	629	646
Av. total gain .....	292	213	183	201
Av. daily gain .....	1.99	1.45	1.24	1.38
Feed per cwt. gain (lbs.)				
Shelled corn .....	506.3	207.7	249.7	217.4
Soybean oilmeal .....	21.8			
Alfalfa hay .....	252.3	346.1	416.1	1138.7
Corn silage .....	342.6	1313.8		
Brome hay .....			841.3	

\*Necessary selling price per cwt. to cover initial cost and feed cost.

## Fattening Cattle on Pasture

Although the summer phase of this experiment was a continuation of the winter phase, it is discussed separately, as the cattle from the three lots on limited feeding were reallocated and the rations were changed in starting the summer phase. The full-fed, dry lot (Lot I) continued with no change in cattle and constituents of the ration, as this lot was a check used in comparing grass-fed cattle and dry-lot-fed cattle. Four new lots (V, VI, VII and VIII), of six steers and three heifers each, were formed from cattle used in Lots II, III, and IV of the winter phase. Each summer lot consisted of one heifer and two steers from each of the three winter lots. Single-day weights were used in starting and completing the trials, and the cattle were weighed at every 28-day interval during the trials with the exception of a 70-day weight.

The summer phase of this experiment was started at the time when pastures had made sufficient growth

so that cattle could get a fill readily. Native grass, which was mainly Kentucky blue grass, and mixed brome and alfalfa pastures were used. Tests were made on both types of pastures to measure the value of feeding corn throughout the summer phase, as compared to pasturing for 8 to 10 weeks then adding corn and protein supplement to the ration until the cattle were marketed. No protein supplement was added to any of the pasture rations until after the initial 8 to 10 weeks.

Summer phase daily rations per head for the five lots were as follows:

### Lot I

1. Shelled corn, full-fed
2. Soybean oilmeal (enough to balance the ration)
3. Alfalfa hay, 5 pounds
4. Salt, bonemeal, and limestone, free choice

### Lot V

1. Native grass pasture (principally Kentucky bluegrass)

2. Cracked shelled corn and soybean oilmeal added after the first 8 to 10 weeks on pasture

Lot VI

1. Brome and alfalfa pasture
2. Cracked shelled corn and soybean oilmeal added after the first 8 to 10 weeks on pasture

Lot VII

1. Brome and alfalfa pasture
2. Cracked shelled corn throughout the pasture season
3. Soybean oilmeal added after the first 8 to 10 weeks on pasture

Lot VIII

1. Native grass pasture (principally Kentucky bluegrass)
2. Cracked shelled corn throughout the pasture season
3. Soybean oilmeal added after first 8 to 10 weeks on pasture.

Lot V, VI, VII, and VIII received salt, free choice, on pasture. Water was available at all times for all five lots. Two daily feedings were continued, at morning and evening, for the dry lot, and the remaining lots were fed one daily morning feed on pasture.

To guard against bloating, the cattle placed on brome and alfalfa pasture were provided with a good fill of dry roughage before being turned on pasture. In addition, brome hay was fed on the brome and alfalfa pasture during the early part of the summer in an effort to keep the cattle from grazing too much alfalfa.

The various lots were marketed according to the time needed to accomplish relatively equal finish and weight. The objective was to market lots when steers averaged not less than 925 pounds and heifers not less than 875 pounds.

At marketing time, cattle were weighed individually before being loaded for market and again on arrival at the market, in order to determine shrinkage in transit. Animals were graded on foot by a packing company buyer who also gave individual prices on cattle sold. Carcass data, including cold carcass weights, government grade, and color of eye muscle, were obtained on the second day after the cattle were killed.

## Results of Feeding on Pasture

The cattle were turned on the four pasture lots on about May 26 each year. At this time there was considerable growth of forage, and cattle could get a fill readily. Climatic conditions were favorable for producing ample pasture for the cattle during the grazing trials, except that a drought in July 1949 threatened a shortage in that year. Consequently it was deemed advisable to start the soy-

bean oilmeal supplement for Lots VII and VIII, and the corn and soybean oilmeal supplement for Lots V and VI, 8 weeks after they went on pasture instead of 10 weeks as was done in 1947 and 1948.

Lots VII and VIII, which received corn with pasture the complete grazing season, reached sufficient weight and finish to be marketed about October 5 of each year. Lots V and VI,

which were grazed for 8 to 10 weeks and then had corn added to the ration, were sent to market about November 1 of each year. The full-fed cattle in dry lot (Lot I) were marketed on about September 5. The dry-lot cattle reached suitable weight and finish to be marketed four weeks before the pastured and corn-fed cattle. Eight weeks after the dry-lot cattle were sold, the late-fed cattle on pasture were sent to market.

Tables 5, 6, and 7 give data on the summer phase for 1947, 1948, and 1949. Each year, daily gains in Lots VII and VIII, which were fed corn on pasture the complete season, were greater than in the dry lot. Greatest three-year, average daily gain of 2.59 pounds was made on brome and alfalfa pasture and a full feed of corn. Cattle which were on native pasture and received a full feed of corn throughout the summer made a three-year, average daily gain of 2.26 pounds. The cattle on brome and alfalfa pasture, fed corn and supplement only during the latter part of the grazing season, had daily gains of 1.99 pounds, and those fed in a similar manner on native pasture gained 1.91 pounds daily.

Corn consumed per hundred pounds of gain during the summer period was highest in the dry lot, with an average of 724.2 pounds required. Lot V, on native pasture and a delayed feeding of corn, required 430.9 pounds of corn to produce one hundred pounds of gain. Corn requirements for Lot VI, on brome and alfalfa and then a delayed feeding, were 417.0

pounds. Lot VII, which received a full feed of corn all season plus brome and alfalfa pasture, consumed an average of 553.7 pounds of corn per hundred pounds gain. Lot VIII, on native pasture plus a full feed of corn, required 612.9 pounds of corn.

Carcasses of the cattle fed on pasture did not grade as high as indicated by their live market grade. Seldom were any of the carcasses of the pasture cattle good enough to grade "choice." The greatest percentage graded "good," with a few grading "commercial." The most important single factor reducing the carcass grade on the pasture-fed cattle was the yellow color of the fat. In addition, the carcasses from pasture-fed cattle were not as evenly and thickly covered as the dry-lot carcasses, and the inside rib showed lack of high finish. The carcasses were not as firm from the pasture cattle as from the dry-lot cattle, and a relatively small amount of marbling was found in the eye muscle, which in many cases was soft and darker than that of the full-fed lot.

The average shrink for the 60 miles to market was calculated by difference in weight when cattle were loaded on the truck and when sold at the market. Dry-lot cattle showed an average shrink of 26.5 pounds and pasture-fed cattle, 26.7 pounds. It was necessary to move the pasture cattle some distance to the experiment station scales for weighing which caused an initial shrinkage that could not be measured.

Table 5. Data From Summer Feeding Phase for 1947

Lot No.	I Dry lot, alfalfa hay, corn full-fed, soybean oilmeal	V Native grass for 71 days, then fed 94 days	VI Brome- alfalfa 71 days, then fed 85 days	VII Brome- alfalfa and full- fed 142 days	VIII Native grass and full- fed 142 days
No. animals in lot	12	8	9	9	9
No. days total phase	104	165	156	142	142
Av. initial weight (lbs.)	712	640	644	632	634
Av. final weight	938	951	940	967	944
Total gain per animal	226	311	296	335	310
Av. daily gain	2.17	1.89	1.90	2.36	2.18
Av. daily ration (lbs.)					
Corn	16.54	7.75	7.07	12.48	12.48
Soybean oilmeal	1.21	0.98	0.88	0.79	0.79
Salt	0.06	0.05	0.06	0.05	0.05
Silage	0.64				
Alfalfa hay	5.00				
Brome hay			0.56	0.59	
Feed per cwt. gain (lbs.)					
Corn	760.4	410.0	372.5	529.0	572.1
Soybean oilmeal	55.6	52.1	46.2	33.7	36.4
Salt	2.7	2.9	3.1	2.1	2.3
Alfalfa hay	229.9				
Silage	29.5				
Brome hay			23.8	30.5	
Acres pasture per cwt. gain					
		0.35	0.19	0.13	0.29
Feed cost per cwt. summer gain (\$)					
	31.57	18.76	16.88	21.45	23.48
Cost per head to summer phase (\$)					
	115.53	101.38	101.94	100.11	100.38
Feed cost per head, summer (\$)					
	71.41	52.78	45.56	68.31	68.31
Pasture charge per head* (\$)					
		5.56	4.44	3.56	4.44
Av. marketing costs (\$)					
	3.93	3.89	3.86	3.92	3.87
Total costs† (\$)					
	190.87	163.61	155.80	175.90	177.00
Av. selling price per cwt. (\$)					
	31.07	26.08	27.00	28.17	28.38
Selling price per head (\$)					
	286.39	241.73	247.05	265.07	261.28
Profit per head‡ (\$)					
	95.52	78.12	91.25	89.17	84.28
Av. shrink (lbs.)					
	16.8	24.2	25.4	26.1	23.2
Av. dressing percent					
	58.0	56.4	56.6	58.1	58.5
Carcass grade					
Choice	9			4	3
Good	3	5	8	5	6
Commercial		3			

\*Pasture charges at rate of \$5 per acre for native, and \$8 per acre for brome-alfalfa.

†Costs include only cost of cattle, feed, and marketing, and not such factors as interest, insurance, labor, etc.

‡Profit above costs listed.

Table 6. Data From Summer Feeding Phase for 1948

Lot No.	IV Dry lot, alfalfa hay, corn full-fed, soybean oilmeal	V Native grass for 70 days, then fed 90 days	VI Brome- alfalfa 70 days, then fed 90 days	VII Brome- alfalfa and full- fed 129 days	VIII Native grass and full- fed 129 days
No. animals in lot .....	10	9	9	9	8
No. days total phase .....	109	160	160	129	129
Av. initial weight (lbs.) .....	740	650	641	639	651
Av. final weight .....	959	965	970	974	948
Total gain per animal .....	219	315	329	335	297
Av. daily gain .....	2.00	1.97	2.06	2.60	2.31
Av. daily ration (lbs.)					
Corn .....	14.12	7.78	7.76	15.31	15.51
Soybean oilmeal .....	1.00	0.67	0.67	0.43	0.46
Salt .....	0.08	0.06	0.08	0.08	0.10
Alfalfa hay .....	5.02	—	—	—	—
Brome hay .....	—	—	0.55	0.23	—
Feed per cwt. gain (lbs.)					
Corn .....	707.0	395.6	377.1	589.4	672.7
Soybean oilmeal .....	50.3	34.0	32.5	16.7	19.8
Salt .....	4.0	2.8	4.0	3.0	4.2
Alfalfa hay .....	251.5	—	—	—	—
Brome hay .....	—	—	26.7	8.7	—
Acres pasture per cwt. gain .....	—	0.35	0.17	0.13	0.30
Feed cost per cwt. gain (\$) .....	27.93	14.28	13.87	19.81	22.56
Cost per head to summer phase (\$) .....	183.09	145.48	143.71	143.50	145.60
Feed cost per head, summer (\$) .....	61.08	44.91	45.62	66.38	67.10
Pasture charge per head* (\$) .....	—	5.56	4.44	3.56	4.44
Av. marketing cost (\$) .....	2.64	2.70	2.70	2.68	2.68
Total costs† (\$) .....	246.81	198.65	196.47	216.12	219.82
Av. selling price per cwt. (\$) .....	35.47	28.76	28.50	33.77	33.66
Selling price per head (\$) .....	332.03	270.02	267.88	321.73	316.23
Profit per head‡ (\$) .....	85.22	71.37	71.41	105.61	96.41
Av. shrink (lbs.) .....	22.7	25.8	29.8	21.7	8.6
Av. dressing percent .....	58.75	58.16	58.32	58.75	58.68
Carcass grade					
Choice .....	9	—	1	2	—
Good .....	1	7	7	7	8
Commercial .....	—	2	1	—	—

\*Pasture charges at rate of \$5 per acre for native, and \$8 per acre for brome-alfalfa.

†Costs include only cost of cattle, feed, and marketing, and not such factors as interest, insurance, labor, etc.

‡Profit above costs listed.

Table 7. Data From Summer Feeding Phase for 1949

Lot No.	I Dry lot, alfalfa hay, corn full-fed, soybean oilmeal	V Native grass for 56 days, then fed 96 days	VI Brome- alfalfa 56 days, then fed 96 days	VII Brome- alfalfa and full- fed 126 days	VIII Native grass and full- fed 126 days
No. animals in lot	12	9	9	9	9
No. days total phase	90	152	152	126	126
Av. initial weight (lbs.)	757	651	651	650	651
Av. final weight	926	953	956	1005	941
Total gain per animal	169	302	305	355	290
Av. daily gain	1.87	1.99	2.01	2.81	2.30
Av. daily ration (lbs.)					
Corn	13.25	9.30	10.06	15.26	13.67
Soybean oilmeal	0.99	0.66	0.66	0.52	0.53
Salt	0.03	0.03	0.02	0.03	0.03
Alfalfa hay	4.97				
Brome hay			0.34	0.23	
Feed per cwt. gain (lbs.)					
Corn	706.9	467.3	501.3	542.6	593.9
Soybean oilmeal	53.1	33.0	32.9	18.8	22.9
Salt	1.5	1.5	1.1	0.9	1.5
Alfalfa hay	265.4				
Brome hay			17.1	8.2	
Acres pasture per cwt. gain		0.37	0.18	0.13	0.31
Feed cost per cwt. gain (\$)	19.36	10.69	11.52	11.68	12.82
Cost per head to summer phase (\$)	146.10	133.25	133.25	133.11	133.25
Feed cost per head, summer (\$)	32.72	32.28	35.14	41.46	37.18
Pasture charge per head* (\$)		5.56	4.44	3.56	4.44
Av. marketing cost (\$)	2.45	2.52	2.54	2.68	2.52
Total costs† (\$)	181.27	173.61	175.37	180.81	177.39
Av. selling price per cwt. (\$)	25.25	25.64	25.17	26.51	26.13
Selling price per head (\$)	223.63	234.29	231.47	258.01	238.53
Profit per head‡ (\$)	42.36	60.68	56.10	77.20	61.14
Av. shrink (lbs.)	40.0	39.4	36.1	31.6	28.6
Av. dressing percent	58.80	58.10	58.60	59.00	58.30
Carcass grade					
Good	11	6	7	9	4
Commercial	1	3	2		5

\*Pasture charges at rate of \$5 per acre for native, and \$8 per acre for brome-alfalfa.

†Costs include only cost of cattle, feed, and marketing, and not such factors as interest, insurance, labor, etc.

‡Profit above costs listed.

A summary of the data for the three years' summer phases is in Table 8.

Table 8. Summary of Data for Summer Feeding of Yearling Herefords in Dry Lot and on Pasture 1947, 1948, and 1949

Lot No.					
	Dry Lot, alfalfa hay, corn full-fed, soybean oilmeal	V Native grass 8 to 10 week, then fed	VI Brome-alfalfa 8 to 10 week, then fed	VII Brome-alfalfa and full-fed	VIII Native grass and full-fed
No. animals .....	34	26	27	27	26
Av. no. days summer phase .....	101	159	156	132	132
Av. initial weight (lbs.) .....	736	647	645	640	645
Av. final weight (lbs.) .....	941	956	955	982	944
Av. total gain per animals (lbs.) .....	205	309	310	342	299
Av. daily gain .....	2.01	1.95	1.99	2.59	2.26
Feed per cwt. gain (lbs.)					
Corn .....	724.8	424.3	417.0	553.7	612.9
Soybean oilmeal .....	53.0	39.7	37.2	23.1	26.4
Salt .....	2.4	2.4	2.7	2.0	2.7
Alfalfa hay .....	248.9	—	—	—	—
Brome hay .....	—	—	22.5	15.8	—
Acres pasture per cwt. gain .....	—	0.36	0.18	0.13	0.30

## What do the Results Mean?

The first objective of the experiment was to test various roughages and a limited feed of corn for wintering beef calves to be fattened on pasture as yearlings. The results showed that any of the three roughages, corn silage, brome hay, and alfalfa hay, commonly produced in eastern South Dakota were satisfactory for wintering calves and when supplemented with three pounds of corn per head daily would produce gains of from one to one and one-half pounds per day. It should be noted that a limited amount of alfalfa hay was fed with the silage and the brome hay to provide the necessary level of protein. If alfalfa is not available for this purpose, some other protein supplement should be used. The results indicated that the relative quality of the different roughages had an effect on the average gains made by the calves.

A second objective was to measure the yielding ability of native pasture and a brome-alfalfa mixture. The results obtained were clear-cut in showing that the brome-alfalfa mixture was much superior to the native pasture. Only half as much acreage of the brome-alfalfa pasture was required as for the native pasture. In other words, the gains per acre were twice as great on the brome-alfalfa as on native pasture. When the cattle were full-fed corn on brome-alfalfa pasture for the entire season, they made gains of 769 pounds per acre, while on native pasture they gained only 333 pounds. When they were pastured without supplemental feed for 8 to 10 weeks and then full-fed, the cattle on brome-alfalfa gained 556 pounds per acre compared to 278 pounds per acre on native pasture.

Another important fact brought out by the data is the difference in the amount of corn required to finish cattle under the various systems. For full feeding calves in dry lot to a weight of about 925 pounds, 53 bushels of shelled corn were required per head. When the calves were wintered on roughage and three pounds of corn daily and then pastured, but full-fed on pasture, they required 41 bushels of shelled corn per head. When wintered on roughage and three pounds of corn per day, pastured for 8 to 10 weeks without corn, then full-fed to market weight, only 31 bushels of corn were required. Thus, if forage and pasture are in good supply and corn is in limited supply, a program of wintering on roughage and a light feed of corn and then fattening on pasture appears to be a practical program. Furthermore, the results indicate the possibilities of fitting this system of beef production into a program of cropping, in which more of the farm land is used for roughage and pasture and less for corn.

From a financial standpoint, it is difficult to make generalizations from

the data. The profits to be obtained from the various systems of fattening yearlings depend so much on price fluctuations for cattle and corn that the results will change from year to year. In calculating costs and profits in this study, only cash outlays for cattle, feed, and marketing were included in costs. Such items as labor, interest, depreciation, etc., were not included as they were about the same for all lots.

With this limitation in mind, the results for the three years showed the highest profit for the cattle wintered for limited gains and then full-fed grain on brome-alfalfa pasture. The second highest profit was for cattle treated the same way but grazed on native pasture. The cattle finished in the drylot were next, and then those wintered for limited gains, pastured on brome-alfalfa for 8 to 10 weeks without supplement, and then full-fed. The lowest profit was from cattle wintered for limited gain, pastured on native pasture for 8 to 10 weeks without supplement, and then full-fed. The same results were not obtained each year, but the three-year averages provide a reasonable basis for drawing conclusions.

## Summary and Conclusions

The results of wintering beef calves to make gains of 1.0 to 1.5 pounds daily, and then finishing on pasture, lead to the following conclusions:

1. Steer and heifer calves, weighing approximately 450 pounds in the fall, can be wintered on a full feed of roughage plus three pounds of shelled corn per head daily so as to make an average daily gain of 1.0 to 1.5 pounds

and be in desirable condition for finishing on pasture during the following summer.

2. Either brome hay or corn silage, with limited alfalfa hay to balance the ration, or alfalfa hay alone constitute satisfactory roughages for wintering the calves.

3. Corn silage, with limited alfalfa hay, produced slightly higher daily



gains than a mixture of brome hay plus alfalfa hay, or alfalfa hay as the only roughage, when each roughage was supplemented with three pounds of shelled corn per head daily. Average daily gains were 1.45, 1.24, and 1.38 pounds for the rations in the order listed.

4. Relative price and quality, as well as availability of these roughages, will be deciding factors in determining which to use.

5. Average daily gains for the three pasture seasons were: native grass plus supplement last part of season, 1.95 pounds; brome and alfalfa plus supplement last part of season, 1.99; brome and alfalfa plus supplement all season, 2.59; native grass plus supplement all season, 2.26.

6. Each lot of summer cattle on full feed on pasture made greater average daily gains than cattle continued on full feed in the dry lot.

7. Calves fattened on full feed in the dry lot required 53 bushels of shelled corn per head. Those full-fed on pasture all season required 41 bushels, while those fed supplement during the latter part of the grazing season required only 31 bushels per head.

8. Each year the total feed cost of finishing cattle was greatest for those on full feed in dry lot both winter and summer, but in one year the profit was greatest in this lot. The cost of feed as well as market value at time of sale were important factors in this connection. In two of the three years, the dry lot cattle had the highest average selling price.

9. The dry lot cattle were ready for market 31 days earlier than those full-fed on pasture throughout the grazing season, and 56 days earlier than those on pasture and full-fed only the latter part of the grazing season.

10. The cattle on brome-alfalfa pasture needed only about half as many acres per animal as those on native grass pasture.

11. The average carcass grade of the cattle finished on grass was not as high as those for cattle finished in dry lot. The most undesirable feature of the pasture-finished cattle was the yellow color of the fat, and, in addition, they were not so evenly and thickly covered and the inside rib showed less finish than the dry lot cattle.