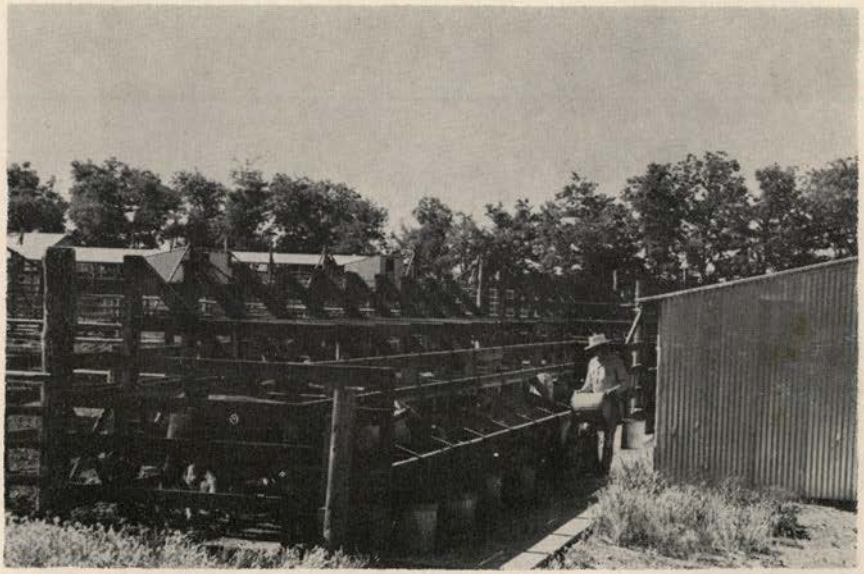
UNIVERSITY OF IDAHO
College of Agriculture

Steer Feeding Research

by the

IDAHO AGRICULTURAL EXPERIMENT STATION

T. B. KEITH, T. DONALD BELL, AND J. J. DAHMEN



IDAHO Agricultural Experiment Station

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COVER PHOTO — Individual stall feeding greatly increases research speed and efficiency in studies at the Caldwell Branch Station.

Steer Feeding Research by the Idaho Agricultural Experiment Station

T. B. KEITH, T. DONALD BELL, AND J. J. DAHMEN*

THE MAIN objective of the beef cattle feeding research program at the Idaho Agricultural Experiment Station has been concerned with obtaining the maximum returns from home-grown roughages. This work was initiated in 1919 at the University of Idaho Branch Experiment Station, Caldwell, Idaho.

The experimental cattle feeding work from 1919 to date has been concerned with (1) the influence of shelter and warm drinking water upon gains and feed requirements of yearlings and 2-year-old steers; (2) the value of alfalfa hay in different forms when fed alone and in combination with other feeds for fattening 2-year-old steers; (3) the efficient use of alfalfa in combination with other feeds for fattening yearling steers and calves; (4) the influence of age upon gains and feed requirements when alfalfa hay is fed in abundance; (5) the value of protein supplements; (6) the influence of mineral (phosphorus) supplements for fattening steer calves.

All steer feeding experiments have been conducted under controlled conditions at the University of Idaho Agricultural Experiment Station, Caldwell, Idaho. The Caldwell Branch Station is near the center of the Boise Valley at an elevation of 2372 feet. The winters are generally open, with the greater portion of the moisture coming in the form of rain during the autumn and winter months on through February.

Open Lot Versus Shed

Data relating to gains and feed requirements of steers fed in open lot and with shelter are given in Table 1. The total feed requirements were slightly greater for the steers fed in the open lot. The differences in rate of gain and feed requirements were too small to denote any actual significance. The steers of the two lots fed the same ration had the same finish, all selling for the same price on the market, with dressing percentage and carcass grading practically the same. This is a summary of work conducted with yearling and 2-year-old steers.

* Animal Husbandman; Head, Department of Animal Husbandry, University of Idaho College of Agriculture; and Superintendent, Caldwell Branch Station, respectively.

Table 1.—Comparative gains and feed requirements of steers fed in open lot and in shed.

	Open Lot	Shed
Average daily gain, lb.	1.98	2.05
Average daily ration,		
chopped alfalfa, lb.	17.8	17.3
ground barley, lb.	7.9	7.9
corn silage, lb.	8.3	8.4
Feed per 100 lb. gain		
chopped alfalfa, lb.	895	844
ground barley, lb.	399	387
corn silage, lb.	418	410
Percent hay waste:	5.9	5.7

Warm Water Versus Cold Water for Fattening Steers

Data relating to the value of warm water for fattening yearling and 2-year-old steers are presented in Table 2. The feed requirements of steers drinking the cold water were greater by 7 percent for hay, 1.7 percent for barley, and 4.4 percent for corn silage than the steers in the warm water lot. The cattle graded, dressed, and sold for the same price in both lots at the end of the test.

Table 2.—Comparative gains and feed requirements of steers given cold and warm water.

	Warm Water	Cold Water
Average daily gain, lb.	2.08	2.02
Average daily ration		
chopped alfalfa hay, lb.	16.9	16.9
ground barley, lb.	8.0	7.9
corn silage, lb.	10.3	10.4
Feed per 100 lb. gain		
chopped alfalfa hay, lb.	815	842
ground barley, lb.	385	391
corn silage, lb.	496	518
Percent hay waste:	5.0	5.6

Long Versus Chopped Hay

Table 3 gives a summary of all the work of the Station from feeding long, chopped, and ground alfalfa to fattening steers. The rate of gain was increased, feed requirements per unit of gain lowered, and finish of cattle improved by feeding chopped or

ground alfalfa hay. Steers have eaten more chopped hay than long hay and more ground hay than chopped hay, consequently gaining more. This has been true only when the hay is of good quality.

The variable quantities of waste hay, ranging from 4 to 23 percent for long hay, and from 1 to 11 percent for the chopped hay were largely due to variation in quality of the hay. The percentage of hay waste was increased during stormy weather or by poor quality hay.

Table 3.—Comparative value of long and chopped hay for fattening 2-year-old steers, 1919 to 1928.

	Average daily gain	Waste hay	Feed per 100 lb. gain		
			Alfalfa	Silage	Grain
	lb.	percent	lb.	lb.	lb.
Alfalfa Hay alone:					
Long	1.19	10.0	2450		
chopped	1.32	5.9	2142		
ground	1.57	0.0	1993		
Alfalfa Hay and silage:					
long hay	1.39	15.3	1973	1429	
chopped hay	1.60	6.1	1732	889	
Alfalfa Hay and barley					
long hay	1.72	19.6	1524	423	423
chopped hay	1.89	9.9	1272		382
Alfalfa Hay, barley, and silage:					
long hay	1.78	19.0	1114	1102	427
chopped hay	1.90	9.1	1065	803	364

Comparing Different Quantities of Corn Silage

Table 4 gives a summary of the work on the feeding of various levels of corn silage. There has been an increase in the production of corn silage for feeding purposes all along the Snake River region of southern Idaho. A yield of 20 to 35 tons per acre under irrigation makes it a valuable source of roughage.

The feeding of 49 percent corn silage in all-roughage ration increased the gains 18 percent over the all-roughage ration, which contained only 35 percent corn silage.

The feeding of the 49 percent corn silage ration decreased the alfalfa requirement 18 percent, but required 47 percent more silage. The heavier silage ration required 8 percent less total nutrients to produce 100 pounds gains, indicating that a larger quantity of corn silage improved the balance of the corn silage-alfalfa ration.

Table 4.—Comparative rate and economy of gains of steers fed 38.5 to those fed 49.6 percent corn silage.

	Average		Feed			Feed per 100 lb.
	Initial weight	Daily gain	Hay	Silage	Waste	gain
	lb.	lb.	lb.	lb.	lb.	lb.
Alfalfa hay 61.5 percent) Corn silage 38.5 percent)	979	1.47	27.2	14.9	8.0	2925
Alfalfa hay 50.4 percent) Corn silage 49.6 percent)	983	1.73	25.2	24.7	10.6	3069

Beans, A Supplement to Alfalfa Hay and Barley

Table 5 presents the value of beans as a supplement to long alfalfa hay and barley. The beans (Great Northern variety) were grown in Twin Falls County and consisted of the immature, discolored, small, and split beans. They were free of foreign material.

The beans were fed at an average rate of 16 percent, ranging from 15 to 20 percent of the grain ration. This was equivalent to about 1.25 pounds per day per steer. When fed in larger quantities, there were some digestive disorders, resulting in scouring. The beans did not increase the value of the alfalfa-hay-barley ration. The rate of gain of the two rations was practically the same.

Table 5.—Value of beans in a ration of long alfalfa and barley.

	Long alfalfa ground barley	Long alfalfa ground barley ground beans
Average initial weight, lb.	876	876
Average daily gain, lb.	1.59	1.56
Average daily ration:		
long alfalfa, lb.	21.3	19.5
ground barley, lb.	7.8	6.6
ground beans, lb.		1.3

Feeding Potatoes to Steers

Large quantities of low-grade potatoes are available for livestock feeding each year in Idaho, although this source of livestock feed is becoming less abundant due to recent development of the potato processing industry. The total digestible nutrient content of potatoes averages about 18 percent. They contain approximately 78 percent moisture. Potatoes are palatable to ruminants, and therefore cull or surplus potatoes make excellent feed.

Potatoes have about twice as much dry matter as rutabagas. However, they contain more water, less dry matter and less total digestible nutrients than well-matured corn silage. On the dry basis, they are rich in starch and relatively low in protein. They are devoid of vitamins A and D. For this reason, cattle should be fed a supplemental mixture containing vitamins A and D. Alfalfa hay supplies these deficiencies when fed with potatoes. However, when alfalfa hay is fed with potatoes, there is a tendency for an increase in the incidence of bloat.

COMPARATIVE VALUE OF POTATOES AND CORN SILAGE FED WITH ALFALFA HAY AND BARLEY

Table 6 gives the comparative values of corn silage and potatoes. The potatoes were fed raw, coarsely chopped with a spade. They were sound, somewhat misshaped, and graded mostly No. 2. They were fed at the rate of 15 to 20 pounds per head daily. When fed in quantities over 20 pounds there were some digestive disorders, resulting in scouring.

Table 6.—Comparative value of potatoes and corn silage when fed with alfalfa hay and barley.

	Long alfalfa ground barley	Long alfalfa ground barley potatoes	Long alfalfa ground barley corn silage
Average initial weight, lb.	876	882	867
Average daily gain, lb.	1.50	1.91	1.82
Average daily ration:			
long alfalfa, lb.	21.3	18.1	16.2
ground barley, lb.	7.8	7.8	7.8
cull potatoes, lb.		16.9	18.5
corn silage, lb.			
Feed per 100 lb. gain:			
long alfalfa, lb.	1345	945	894
ground barley, lb.	489	407	427
cull potatoes, lb.		883	
corn silage, lb.			1018
Percent waste hay:	12.5	18	16.8

When added to long alfalfa hay and ground barley, each ton of potatoes replaced 906 pounds of alfalfa hay and 186 pounds of barley. Each ton of corn silage replaced 886 pounds of alfalfa hay and 122 pounds of barley.

Potatoes may be made into silage, fed in a chopped form, or whole, or they may be dried and fed.

It requires about 400 to 450 pounds of potatoes to supply as much total digestible nutrients as there are in 100 pounds of grain. Stated in another way 100 pound potatoes for fattening steers are worth about one-fifth as much as 100 pounds of barley.

Storage of potatoes for feeding purposes is a serious problem for many feeders. Potatoes stored in piles outdoors freeze and become dangerous as a food. If potatoes are kept in cellars until late spring they sprout and these sprouts are poisonous to animals.

FEEDING POTATO SILAGE

The Caldwell Branch Station conducted some experimental studies on the value of potato silage for steers. Four experiments were conducted using yearling Hereford steers in two tests and Hereford calves in two tests.

The potatoes were crushed and ensiled in a trench silo. Dry chopped hay and grain were placed in alternate layers with crushed potatoes. The hay was used as an absorptive agent and the grain was added as a combined absorptive agent and preservative. The purpose in adding the grain and hay was to bring the moisture level down to about the same level as that of corn silage. The quantities of grain and hay used in processing potatoes for silage are shown in Table 7.

The silage of Test 2, Table 7, contained only three parts grain for the combined absorptive and preservative agent. It fermented rapidly, producing a very sour smell. It was of poor quality and was consumed slowly.

The silage produced in Lots 1, 3, and 4, as shown in Table 7, was sweeter and the cattle ate it more readily. This would indi-

Table 7.—Quantities of potatoes, hay, and grain used in making potato silage (parts per 100)

	Lots			
	1	2	3	4
Total cull potatoes	94	97	81.2	90.8
Chopped alfalfa hay	3	0	16.4	6.5
Ground grain	3	3	2.4	2.7

cate that the total dry material including hay and grain should be 6 percent or more. It is recommended that the total dry material added to potatoes for silage production should be at least 10 but not over 20 percent.

The most rapid gains were made by the calves fed the silage mixtures of Lots 3 and 4. These gains were about the same as the steers fed corn silage.

The steers fed the potato silage of Lot 1 made more rapid gains than those fed corn silage, while the steers fed the potato silage of Lot 2 made slower gains than the steers fed corn silage.

Potato silage, when included in the fattening ration, tended to eliminate the hazards of bloat, digestive disturbances, choking and poisoning that occurs with the feeding of whole potatoes.

Potato silage is not limited to the danger of freezing or the length of practical storage time as whole potatoes are limited.

FEEDING SUN-DRIED POTATOES

A test on the feeding value of sun-dried potatoes was conducted at the Caldwell Branch Station during the summer months of July and August, 1948.

Cleaned, washed No. 2 potatoes were sun-dried on the deactivated air field at Mountain Home, Idaho, by J. R. Simplot Company.

The potatoes were windrowed on landing strips of the air base, crushed with a roller, and agitated with road grading equipment until dried. It required about 3 pounds of whole potatoes to produce 1 pound of sun-dried potatoes. The dried potatoes were clean and uniform. These were easily stored in bulk near the feeding pens.

The feeding value of the dried potatoes was compared with the feeding value of dried molasses beet pulp.

Concentrate mixtures composed of 25 parts and 50 parts dried potatoes were compared with concentrate mixtures composed of 25 parts and 50 parts of dried molasses beet pulp and a concentrate mixture of 100 parts ground barley. The steer calves fed the dried potatoes made approximately the same gains as those fed barley alone or barley and dried molasses beet pulp. There were no observed cases of bloat among the steers fed the dried potatoes.

The results of these tests have demonstrated that one pound sun-dried potatoes is equal to one pound of ground barley or one pound of dried molasses beet pulp.

Most Economical Level of Concentrate to Roughage

The studies during 1948-1951 at the Agricultural Experiment Station dealt with most efficient levels of concentrate and roughage for the optimum returns. The results of these studies are reported in Idaho Experiment Station Research Bulletins 26, 32, and 40. The findings clearly indicate that a balance between concentrate and roughage is important for specific feeding conditions and certain price relationships.

These results indicated that the rate and economy of gains are not increased after the ration mixture has reached 66 percent concentrate. Apparently the digestion and metabolic system of the steer is unable to function with any greater efficiency with any higher TDN or net energy than a mixture of more than 66 percent concentrate. The maximum capacity of a 700-pound steer is about 12 pounds of TDN per day. However, the quantity a steer is capable of consuming varies considerably with each individual.

The average daily gains of steers fed the various ratios are shown in Table 8.

Table 8.—Comparative average daily gains of steers fed the six ratios.

Ratio C : R*	Average daily gain
	lb.
4 : 1	1.90
3 : 1	1.90
2 : 1	1.91
1 : 1	1.80
1 : 2	1.64
1 : 3	1.49

* concentrate-roughage ratio.

Further studies indicated that additional sources of protein other than that present in barley, oats, and dried molasses beet pulp were not required if alfalfa constituted more than one-half the roughage on the dry basis.

The replacement value of corn silage has been studied. These studies indicated that corn silage increased the efficiency and returns in gains when it constituted more than 50 percent of the roughage portion of the ration, regardless of ratio of concentrate to roughage feed.

Diethylstilbestrol

During the last two years the Caldwell facilities have been devoted to the study of diethylstilbestrol treatments of fattening steers fed four different ratios of concentrate to roughage and two levels of protein. A summary of the results are shown in Table 9. The studies on the feeding of diethylstilbestrol to steers have indicated that the hormone does not have a sparing or summation effect on the protein needs. The work at the Idaho Station has shown either oral or implanting of the diethylstilbestrol increased the gains of high roughage rations.

Table 9.—A summary of gains of steer calves given four treatments of diethylstilbestrol.

Diethylstilbestrol treatment	Average daily gain
1957-58	
mg.	**lb.**
0	1.85
12 mg. implant	2.09
36 mg. implant	2.14
10 mg. oral	2.04
1958-59	
0	2.03
12 mg. implant	2.14
36 mg. implant	2.16
10 mg. oral	2.15

The ratios of concentrate to roughage fed in the 1957-58 trials were 1:2 and 2:1 and in 1958-59 were 1:1 and 3:1.

The feedlot performance and carcass information of the treated and untreated steers are compared in Tables 10 and 11.

Table 10. Contrast of responses of steers treated by oral administration and the implanting of diethylstilbestrol and fed a 1:2 and 2:1 ratio of concentrate to roughage. (1957-58).

Variable	Oral treatment compared with untreated	Implant compared with untreated
Rate of gain	Increased	Increased
Feed per 100 lb. gain	Not much difference	Decreased
Feed intake	Not much difference	No difference
Carcass grades	No difference	Not much difference
Cooler shrinkage	Increased	Increased
Carcass yields	No difference	No difference
Rib-eye area	Less	Less

Table 11. Contrast of responses of steers treated with diethylstilbestrol and fed a 1:1 and 3:1 ratio of concentrate to roughage. (1958-59)

Variable	Oral treatment compared with untreated	Implant compared with untreated
Rate of gain	Increased	Increased
Feed per 100 lb. gain	Decreased	Decreased
Feed intake	Not much difference	Not much difference
Carcass grade	No difference	No difference
Cooler shrinkage	Decreased	Decreased
Carcass yields	No difference	No difference
Rib-eye area	Increased	Increased

The Performance of Steers on Pasture and in the Feedlot as Affected by Stilbestrol Implants

Cooperative studies have been conducted since 1957 with cattlemen in Idaho and Washington to determine the value of stilbestrol implants in their feeding and grazing programs.

The results of the studies conducted by the Animal Husbandry Department with the help of the University of Idaho Extension Service, involving some 1500 head of cattle, and summarized in Tables 12, 13, 14, and 15.

Table 12. Effect of stilbestrol implants upon the winter gains of calves and yearlings to be pastured during the following summer an fattened the following winter in the dry lot.

	Number of tests	Number of cattle in tests	Av. daily gain of implanted Cattle	Av. daily gain of cattle that were not implanted
Calves	6	453	1.05	.89
Yearlings	1	336	.63	.46

Table 13. Effect of stilbestrol implants upon the gains of yearling steers, steer calves, and suckling steer calves during the summer grazing period.

	Number of tests	Number of cattle in tests	Av. daily gain of implanted Cattle	Av. daily gain of cattle not implanted
Calves (Short yearlings)	4	400	1.75	1.59
Yearlings	4	620	2.44	1.99
Suckling calves	1	50	1.53	1.27

Table 14. Effect of implanting during the wintering period upon the subsequent summer pasture gains of calves and yearlings.

	Number or tests	Number of animals in tests	Av. daily gain of cattle implanted at beginning of summer grazing period	Av. daily gain of cattle not implanted during grazing period
			lb.	lb.
Calves				
Previous winter Implants	3	150	1.67	1.54
No previous implants	3	150	1.70	1.60
Yearlings				
Previous winter implants	1	150	2.22	1.87
No previous implants	1	170	2.26	1.82

Table 15. Feedlot gains as affected by previous implantation with stilbestrol.

	Number of cattle	Av. daily gains of steers implanted when placed in feedlot	Av. daily gains of controls (no implants)
		lb.	lb.
No previous implants	50	2.69	2.18
Implants previous winter	50	2.69	2.28
Implants previous summer	50	2.76	2.31
Implants both previous winter and previous summer	50	2.77	2.30

The following conclusions can be drawn from the results of these tests:

The gains of both steer calves and yearling calves wintered on a ration consisting of roughage with a small amount of grain were increased in virtually all of the tests by the stilbestrol implants. A single 12 mg. implant was the customary dose for the calves and two 12 mg. implants were usually given the yearling steers. Increased daily rates of gain for the implanted calves ranged from .23 pound per day down to virtually no increased rate of gain. The average increase as shown in Table 12 was .16 pound per day. The implanted yearlings gained .16 pound more per day than the steers that were not implanted.

Summer pasture gains were increased in all of the tests by hormone implantation. The greatest response was shown in heavy, long yearling steers where the implanted cattle gained .66 pound more per day than the big steers that were not implanted. The average difference for all the yearling steers amounted to .55 pound per day in favor of the implanted cattle. The response of the calves (short yearlings) was smaller as shown in Table 13. The comparative gains in the individual tests were quite variable, and the differences in favor of the implanted calves ranged from .28 pound down to only .02 pound. In the one test with 50 suckling calves the implanted calves gained .26 pound per day more, or approximately 20 percent more, than the calves that were not implanted.

In two of the three tests with calves designed to determine the effect of implanting during the wintering period upon subsequent summer gains the previously implanted calves did not gain quite as well on pasture as calves that were not implanted previously—nor did they respond quite as well to hormone implantation on pasture as the calves that had not been implanted during the feeding period the previous winter. In the other test, previous implantation had virtually no effect upon subsequent summer gains. These results are probably complicated by the fact that increased rates of gain during the wintering period may result in lowered rates of gain on pasture the following summer.

In the tests with the long yearlings, previous implantation during the wintering period had little effect upon subsequent summer gains.

It can be seen from Table 15 that steers that had been implanted with stilbestrol the previous winter, or during the summer grazing, or during both periods responded as well or better to implantation during the subsequent fattening period than steers that had never been implanted. The control steers (those not implanted during the fattening period) that had been previously implanted gained as well or better during the finishing period as the steers that had never been implanted previously.

Most of the calves and yearlings were graded on the basis of feeder grades at the end of the summer grazing periods and the implanted steers, on an average, graded higher than those that had not been implanted.

Urea

Urea is being used for cattle feeding in some areas of the United States as a source of protein where the rations are composed of low-grade roughages, such as corn cob meal, corn fodder, and straws.

A steer, by virtue of the presence of microflora in the stomach system, is capable of converting simple nitrogen compounds to proteins.

Urea is a pure white crystalline, odorless substance containing 42 percent nitrogen. This is equivalent to 262 percent protein. Since protein contains 16 percent nitrogen $\left(\frac{100}{16} = 6.25\right)$, $42 \times 6.25 = 262$ percent protein.

Three series of trials were conducted at the University of Idaho Branch Experiment Station at Caldwell, Idaho, and those were as follows:

1. Four groups of steers were used to study the value of urea as a source of protein for fattening.
2. Three groups of steers were used to study the value of urea as a source of protein for wintering when fed with wheat straw.
3. Seven groups of steers were used to study the value of urea when used in combination with beet molasses.

RESULTS FROM FEEDING UREA

Rations containing as little as 3.8 pounds of alfalfa per day per steer were not enhanced by the feeding of urea.

Urea did not replace an equivalent quantity of protein from alfalfa hay or soybean oil meal for the wintering of steer calves when wheat straw was used as a roughage.

Urea may be conveniently used to replace a portion of the steer fattening ration in areas of limited quantities of legume hay and during periods of legume hay shortages.

Delaying the Concentrate Mixture Allowance

In these studies high roughage rations were fed for varying periods of time before increasing the concentrate allowance.

The results of 4 years of experimental work have shown the following:

Delaying the concentrate mixture feeding to the last 28 days of a 168-day feeding period reduced the feed costs per steer 49.2 percent.

The feeding of 1100 pounds of a concentrate mixture per steer during the last 77 days of a 154-day fattening period saved 14.1 percent of the cost of 100 pounds gain when compared to the feed cost of steers fed 1184 pounds of the concentrate mixture for the entire 154 days.

Market grades from steers fed the concentrate mixture at the beginning of the fattening period and fed at a constant daily rate graded slightly higher.

The difference between the market price for choice and good steers should be relatively high to offset the difference in feed costs of steers fed a high intake of the concentrate mixture during

the latter part of the fattening period as compared to those fed a high level of the concentrate mixture the entire fattening period.

Carcass observations of steers fed according to the experimental plan are shown in Tables 17 and 18. The monetary evaluation is summarized in Table 19.

Table 16. Experimental plan.

Lot	No. steers	Feed mixture first 28 days	Daily concentrate allowance for 135 days	Feed allowance last 33 days
			lb.	
1	10	Alfalfa hay	6	All lots received 10.7 lb. concentrate mixture, 14.7 lb. corn silage and all the hay they could consume
2	10	Alfalfa hay plus 2 lb. concentrate	6	
3	10	Alfalfa hay	8	
4	10	Alfalfa hay plus 2 lb. concentrate	8	
5	10	Alfalfa hay	10	
6	10	Alfalfa hay plus 2 lb. Concentrate	10	

Table 17. Live grades after 140 days of feeding.

Lot No.	Choice	Good			Standard
	Low	High	Medium	Low	High
			Number per lot		
1	2	1	4	1	2
2	1	2	4	3	–
3	1	5	3	1	–
4		3	3	4	–
5	4	1	3	2	–
6	1	3	3	2	1

The most rapid gains were made by the steers fed only alfalfa hay for 28 days and 10 pounds of the concentrate mixture during the intermediate period of 135 days. These steers had the highest market grade at the end of 140 days of feeding.

The slowest gains were made by those steers fed only alfalfa hay for 28 days and 6 pounds of the concentrate mixture for 135 days.

The highest carcass value, cheapest gains, and the greatest net returns were made by the steers fed 2 pounds of the concentrate mixture with alfalfa hay for the first 28 days. These steers were

Table 18. Carcass grades and cold dressing percentages at the end of the feeding test after being fed 13.6 lb. of concentrate the last 33 days.

Lot No.	Choice			Good			High Standard	Dressing percentage
	High	Medium	Low	High	Medium	Low		
	Number per lot							
1	4	1	–	3	–	1	1	57.8
2	1	3	1	4	1	–	–	58.2
3	2	2	1	4	1	–	–	57.7
4	2	1	1	5	1	–	–	57.1
5	2	3	1	3	1	–	–	57.6
6	2	1	1	5	1	–	–	55.7

Table 19. Monetary evaluations of carcasses, live weights, gains, and net returns.

Lot No.	Carcass (1) value per 100 lb.	Live wt. value (2) per 100 lb.	Feed costs per 100 lb.	Total cost of gains per steer	Net return per steer
	dollars	dollars	dollars	dollars	dollars
1	43.75	25.50	18.79	57.50	62.91
2	44.22	25.27	17.59	58.40	67.68
3	44.10	25.46	17.74	61.74	65.51
4	43.92	25.12	18.64	57.50	65.05
5	44.12	25.50	18.22	67.05	65.93
6	43.98	24.49	19.56	68.07	49.46

(1) cold carcass weights
(2) value at feed pens

fed 6 pounds of the concentrate mixture with the alfalfa hay during the intermediate period of 135 days, and 13.6 pounds of the concentrate mixture with the roughage during the last 33 days.

Feeding a low concentrate mixture allowance during the early part of the feeding period tended to increase the carcass value in all ration treatments.

Wintering, Pasturing and Finishing Beef Calves for Idaho

The prime objective of the work on this subject was to develop a system of producing finished 1000-pound beef animals within a year from the time they are weaned as calves. This system of production fits in with the operations of the range cattleman who wishes to limit his operations to handling only a cow herd without the necessity of carrying over calves and selling yearlings.

Any program on the production of beef cattle that would offer a means of utilizing pastures and available feeds would contribute to a greater profit from the feeds as well as to maintaining the organic fertility of the soil.

PASTURE RETURNS

The contribution of a pasture will depend upon the quantity of forage grown and the length of the season. The results of these studies showed that, as measured by average daily gains and the number of pasture days, an acre produced an average of 418 pounds of beef.

The lowest acre production of 368 pounds was the result of a short season, the highest production of 511 pounds was due to unusually high daily gains of steers after being wintered on straw.

ROUGHAGE RETURNS

The average total gain per steer was 596 pounds of which 172 pounds were produced during the wintering phase, 208 pounds during the pasturing season, and 216 pounds during the finishing period. Eighty-six percent of the nutrients were from roughages during the winter period, 100 percent from the grass during the grazing season when no grain or hay was fed, 50 percent of the nutrients were from roughages while on the finishing ration. Under this system of beef production an average of 77.6 percent of the beef was produced with roughage or grass.

Phosphorus Studies on Beef Cattle

A definite phosphorus deficiency was produced by feeding a ration containing .12 percent phosphorus with an average daily intake of 8.23 grams per steer. The blood phosphorus level dropped from 6.71 mg. to 4.40 mg. per 100cc. of blood plasma. A definite reduction in blood phosphorus was apparent after 100 days on this ration. Outward signs of a phosphorosus were manifested by poor condition, rough hair coat, chewing boards and eating a

considerable quantity of dirt. The addition of .66 percent bonemeal to the basal ration increased the average daily gain from 1.37 to 1.90 pounds, caused a 25.3 percent reduction in feed required per 100 pounds gain and maintained a normal blood phosphorus.

Summary

Under the conditions of these tests the following conclusions were made:

1. No differences were observed in gains and feed economy of steers fed in shed or without shelter.
2. Warming the water did not increase rate and economy of gains.
3. Chopping hay reduced the waste and increased the gains.
4. The feeding of an all-roughage ration with 40 percent corn silage increased gains 18 percent over the roughage ration containing 35 percent corn silage.
5. Raw beans did not increase the nutritive value of alfalfa-hay-barley rations.
6. Well-cured potato silage is about equal to corn silage. Potato silage tended to eliminate bloat.
7. One pound of sun-dried potatoes is equal to 1 pound of ground barley or dried molasses beet pulp.
8. The economical concentrate-to-roughage ratio for fattening steers is approximately 1:1.
9. The implanting of calves and steers wintered on a ration consisting of roughages with a small quantity of grain increased the rate of gain. Calves received a 12 mg. implant. Steers received two 12 mg. implants.
10. Urea did not replace an equivalent quantity of protein from alfalfa hay or soybean oil meal for the wintering of steers when wheat straw was used as a roughage.
11. Delaying the concentrate and feeding a high roughage ration reduced the costs of gain and tended to increase the carcass grades.
12. The system of wintering, pasturing and finishing steers yielded a 1000 pound steer with 77.6 percent of the total feed as roughage or grass.
13. A ration with less than .12 percent phosphorus produced phosphorus deficiency signs.

Other University of Idaho Publications on Steer Feeding

The Optimum Ratio of Concentrate to Alfalfa Hay for Fattening Steers. Experiment Station Bulletin No. 290.

A System of Wintering, Pasturing and Finishing Beef Calves for Idaho. Experiment Station Bulletin No. 292.

Sun-dried Potatoes for Fattening Steers. Experiment Station Bulletin No. 201.

Potato Silage for Beef Steers. Experiment Station Bulletin No. 293.

Optimum Ratio of Concentrate to Alfalfa Hay for Steers as Affected by Protein Level and Method of Feeding. Research Bulletin No. 26.

Beef Cattle Feeding Experiments With Urea. Experiment Station Bulletin No. 225.

Optimum Ratio of Concentrate and Roughage for Steers as Affected by Corn Silage and Protein Level. Research Bulletin No. 32.

Delayed Concentrate Feeding of Steers—As Affected by Time and Type of Roughage. Experiment Station Bulletin No. 291.

Two Ratios of Concentrate to Roughage, Four Protein Levels, Two Corn Silage Levels, and Two Oil Levels for Steers. Research Bulletin No. 40.

Formulation of Idaho Steer Fattening Rations. Experiment Station Bulletin No. 296.

Delayed Concentrate Feeding to Steers. II. Relation of Quantity of Concentrate Fed to Carcass Grade and Yield. Experiment Station Bulletin No. 308.

Diethylstilbestrol in Steer Fattening Rations. I. A comparison of Methods of Administering Diethylstilbestrol With Two Levels of Protein and Two Ratios of Concentrate to Roughage. Research Bulletin No. 49.

The Performance of Steers on Pasture and in the Feedlot as Affected by Stilbestrol Implants. Experiment Station Bulletin 334.

Copies of these and other University of Idaho agricultural publications may be obtained from your county agent or by writing the Mailing Room, College of Agriculture, University of Idaho, Moscow, or to the Agricultural Extension Service, University of Idaho, 317½ North 8th St., Boise. Ask for publication by name and number.