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Fattening Steers

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By

E. L. POTTER and ROBERT WITHYCOMBE

CORVALLIS, OREGON

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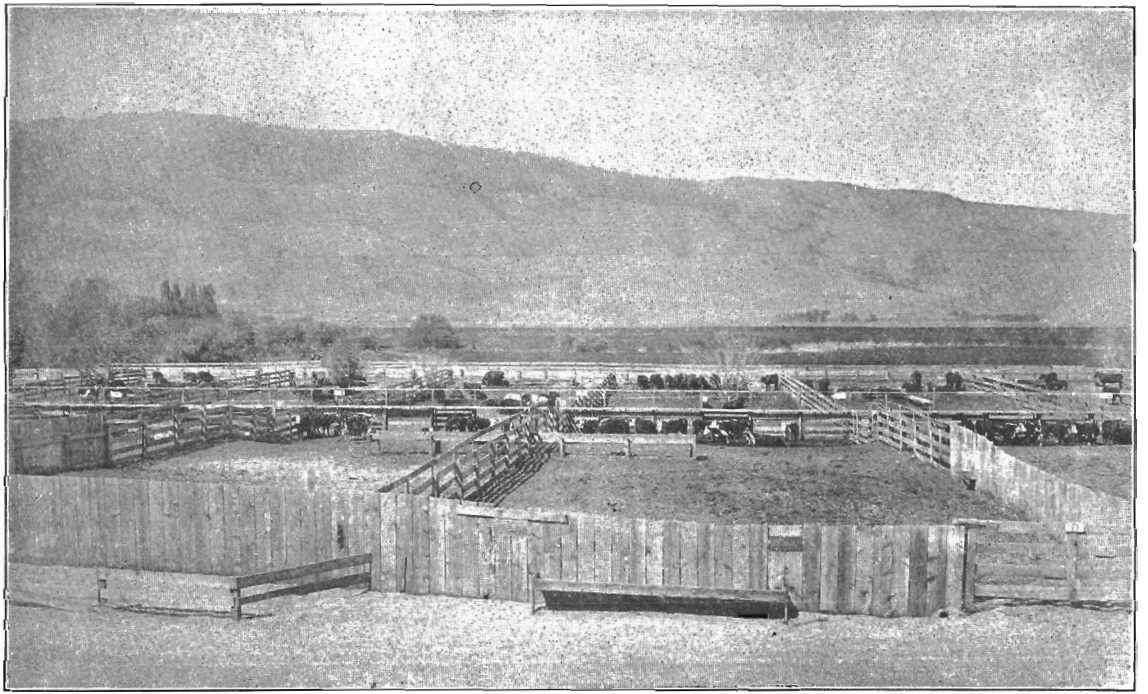


FEED LOTS, EASTERN OREGON BRANCH EXPERIMENT STATION

SUMMARY

Alfalfa Hay alone produced a daily gain of .97 pound when fed to two-year-old steers. The steers were given a daily ration of 37 pounds, of which they refused 5 pounds.

Chopping Alfalfa Hay for fattening steers increased the gains and saved waste. One ton of chopped hay made 13 percent more gain than one ton of long hay. The cost of chopping in these tests was about $3.00 a ton. Under normal conditions this amounts to more than the increased value of the chopped hay.

Alfalfa Hay and Grain produced 30 percent more daily gain than hay alone. One pound of rolled barley replaced three pounds of alfalfa hay. It made but little difference whether a small ration of grain was fed throughout the entire feeding period or a heavy feed of grain during the latter part of the period.

Alfalfa Hay and Silage produced 64 percent more gain than hay alone, while the daily feed cost was approximately the same. The steers fed hay and silage were fatter and dressed out more than those fed hay alone. Alfalfa hay and corn silage, or peas and barley silage, make the most economical and satisfactory ration for fattening two-year-old steers for the Western market.

Meadow Pasture produced a daily gain of 1 pound during the first month, 2.39 pounds the second month, 2.31 pounds the third month, and .7 pound the fourth month. Steers finished on pasture topped the market.

Management of Fattening Steers to produce good gains requires that one handle the cattle gently, make feed-yard conditions comfortable, use a good quality of feed stuffs, feed regularly, use care in the selection of the feeder cattle, and feed nothing but good, thrifty individuals of beef breeding.

Fattening Steers

By

E. L. POTTER and ROBERT WITHYCOMBE

INTRODUCTION

(This bulletin is a revision of Bulletin No. 174 published in August, 1920, and which is now out of print. This publication includes all of the data from Bulletin No. 174, together with additional data from experiments conducted between August, 1920, and August, 1922.)

At the time this work was first planned (1912) the general practice of fattening cattle during the winter months throughout the Northwest was on hay alone. Very few farms were equipped with stock scales, hence the feeders had but a very hazy idea of the gains actually made or the cost of gain. With a view to investigating this whole problem a series of tests was inaugurated at the Eastern Oregon Branch Experiment Station at Union, Oregon.

The Union Station includes 620 acres of land in addition to rented range and pastures. Its location is typical of the higher, cooler valleys of the Blue Mountain and Rocky Mountain regions. The winters are cold and windy. The lots in which the tests were conducted were without shelter other than a six-foot board fence around one corner which served as a windbreak. The lots were 90 by 230 feet and accommodated 25 steers to the lot for the first two years. Then they were divided into lots 45 by 115 feet and used to accommodate 10 to 12 steers each. Water from a small stream was diverted through the lots by means of a wooden trough. This trough carried a stream of water one foot wide and about eight inches deep, which flowed rapidly enough to give little difficulty from freezing except in extreme weather.

The feeds used were all produced at the Station. The alfalfa hay was cured and stacked in the field as carefully as possible, but of course varied in quality from year to year. It was all fed, however, just as it came. In our judgment it was fairly representative of the class of hay generally used in the Northwest for steer-feeding purposes. The corn used for silage had been frosted and was usually put into the silo before it was quite mature. The mixture of peas and bald barley was in very good condition and made a very good quality of silage. As a whole, however, the quality of the silage was certainly not above average and perhaps a little below. The chopped hay was prepared by running the alfalfa through a cutter, which cut it from one-fourth to one inch in length. During the last two years the hay was hauled from the field in the fall, chopped, and blown into a barn. Previous to that the hay was chopped in the field.

The cattle used were two-year-old steers varying in weight in different years from 928 to 1100 pounds at the beginning of the tests. They were representative of the steers generally used in the Northwest for feeding purposes. They were not fancy but were fairly free from dairy or scrub blood. Each animal was branded with a serial number when

first placed in the feed yards and individual weights were taken of all the cattle at the beginning and end of each test. The lots were weighed also at the close of each thirty-day period. Much detail has been omitted in this bulletin, however, in order that the discussion might be reasonably brief and readable. The tables are nearly all averages of several tests. The omitted data, however, are all on file in the office of the Eastern Oregon Branch Experiment Station, and may be obtained on request.

PART I. COMPARISON OF HAYS

Our first year's work was a comparison of the three different kinds of hay. Seventy-three head of two- and three-year-old grade Hereford steers, part native and part Utah cattle, were divided into three lots, twenty-five in each of the first two and twenty-three in the third.

The alfalfa hay was of poor quality, and the bald barley hay was coarse and too well matured to make good cattle feed. The wild hay, however, was quite typical of the hay harvested from our native meadows in this section.

Since there was some grain in the bald barley hay, eighteen pigs were allowed to follow the cattle in Lot. 2. These pigs averaged 80.5 pounds at the time they were placed in the yard, January 4, 1914. At the close of the test, April 11, 1914, they averaged 94.4 pounds, showing an increase in weight of 13.9 pounds a head.

TABLE I. ALFALFA HAY, BALD BARLEY, AND WILD HAY

Lot 1, 25 steers fed alfalfa hay
Lot 2, 25 steers fed bald barley hay
Lot 3, 23 steers fed wild hay

Feeding period—December 27, 1913 to April 11, 1914—105 days

Lot No.	Weight at beginning	Weight at close	Daily gain	Daily ration
	lbs.	lbs.	lbs.	lbs.
1	968	1071	0.99	38.8
2	1032	1060	0.27	36.4
3	1066	1112	0.44	30.7

From the results given in Table I, it will be noticed that the cattle in Lot 1 on alfalfa hay made a very satisfactory gain, while those in Lots 2 and 3 did not do so well.

The steers in Lot 1 were given an average of 39 pounds of alfalfa hay a day and made an average daily gain of .99 pound. Those in Lot 2 received 36 pounds of bald barley hay a day and made an average daily gain of .27 pound. The steers in Lot 3 were given 31 pounds of wild hay and made an average gain of .44 pound a day.

While these cattle were in very good flesh at the close of the winter feeding period, yet they did not have enough finish to justify putting them on the market; hence the 73 head averaging 1076 pounds were turned out on good meadow pasture April 11, 1914. The results of the gains made while on pasture are given later in Part V, pp. 12-13.

No further work was done with bald barley hay or wild hay, but during subsequent years several other lots were fed on alfalfa hay alone.

The results of all these tests with alfalfa hay alone, excluding those fed chopped hay, are shown in the following summary:

Weight at beginning	1039 lbs.
Weight at close	1155 lbs.
Daily gain	.97 lb.
Daily ration—	
Hay offered	37 lbs.
Hay refused	5 lbs.
Hay consumed	32 lbs.

The daily gain shown above is not as large as is claimed by many feeders, but it is a true average of our results for two-year-old steers. The calves and yearlings we have fed have done slightly better than this, and if they were averaged along with the two-year-olds the average would be 1.00 pound a day. Of course gains vary greatly. There are authenticated instances where steers on alfalfa alone have gained 2 pounds a day and other cases where good steers on good hay have made no gain.

The information we have been able to gather from experienced feeders corresponds closely with the figures obtained at the Experiment Station, and we feel quite certain that the average gain on alfalfa-fed cattle one year with another and without counting any fill is just about one pound a day.

PART II. COMPARISON OF HAY AND GRAIN

Since we were looking for something better than alfalfa alone, and not something inferior, the next step was to try alfalfa alone against alfalfa with five pounds of barley a day and also alfalfa alone for the first sixty days with the addition of ten pounds of barley during the last sixty days. The test started with a car-load of steers in each lot. During the second and third years, however, each of these lots was divided and one half fed long hay and the other cut hay. The results of the work for three years are combined and summarized in Table II.

TABLE II. ALFALFA HAY AND GRAIN

A summary of three years' work 1915, 1916, and 1917. The results include data for 217 head of cattle, fed 120 days.

Lot 1, Alfalfa hay.

Lot 2, Alfalfa hay and 5 pounds rolled barley.

Lot 3, Alfalfa hay and 10 pounds rolled barley during last half of the feeding period.

Lot No.	Weight at beginning	Weight at close	Daily gain	Daily ration— Alf. hay Offered	Alf. hay Refused	Alf. hay Eaten	Rolled barley
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	1088	1200	0.92	36.23	3.99	32.51	.....
2	1090	1239	1.24	32.72	3.77	28.95	4.80
3	1091	1231	1.17	31.21	3.50	27.69	*8.72

*For half of the time only.

The steers on hay alone gained .92 pound; those on hay and 5 pounds of barley gained 1.24 pounds; and those on hay with 10 pounds of barley during the last half of the feeding period gained 1.17 pounds a day. The difference in finish was hardly noticeable and none of the lots were in good marketing condition at the end of the 120 days' feeding.

The steers in Lot 3 made slightly less gain than those in Lot 2, but since there were a few steers in Lot 3 that were not very good feeders,

we believe that it really makes very little difference whether barley is fed at the rate of 5 pounds a day from the beginning or whether it is saved until the last half and then fed at the rate of 10 pounds a day.

A study of the amount of feed required to produce 100 pounds of gain shows that one pound of rolled barley took the place of three pounds of alfalfa hay. The economy of feeding this small barley ration would therefore depend upon whether one pound of barley costs more or less than three pounds of alfalfa hay.

PART III. COMPARISON OF CHOPPED HAY WITH LONG HAY

In 1916 and again in 1917 chopped alfalfa was compared with long alfalfa in three ways: (1) Hay alone; (2) Hay with 5 pounds of rolled barley a day; (3) Hay with 10 pounds of barley during the last half of the feeding period. Since methods (2) and (3) gave results similar to those described in Part II, these lots are averaged together in our summaries.

In 1918 and also in 1919 chopped hay was compared with long hay when fed in combination with silage instead of with rolled barley. The results of all these tests are summarized in Table III.

TABLE III. LONG ALFALFA AND CHOPPED ALFALFA HAY

Lot 1, Long hay.
Lot 2, Chopped hay.

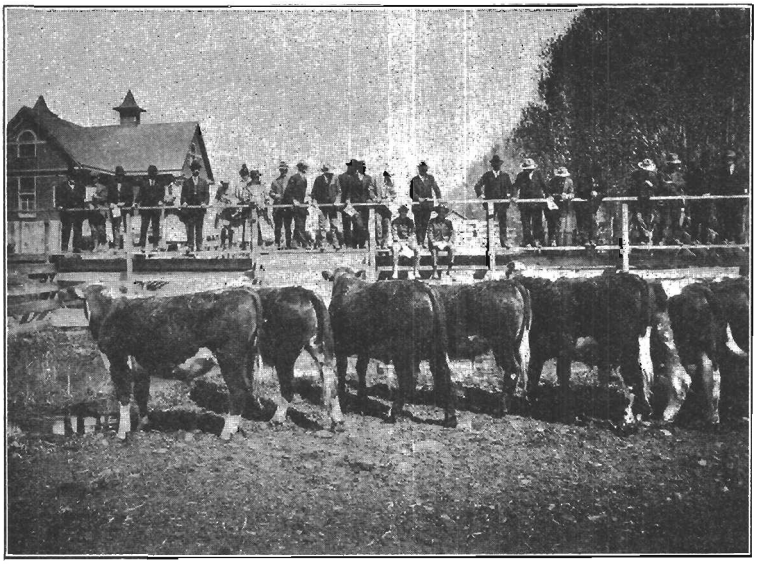
Averages of two years' results

Lot No.	Weight at beginning	Weight at close	Daily gain	Daily ration		
				Offered	Refused	Eaten
		A. When fed alone				
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	1042	1137	0.79	34.15	4.16	29.97
2	1042	1179	1.15	34.50	1.31	33.20
	B. When fed with an average ration of 4.67 pounds of rolled barley					
1	1042	1192	1.25	30.48	4.02	26.46
2	1042	1209	1.39	29.58	1.19	28.39
	C. When fed with silage (24.88 to Lot 1, and 21.92 to Lot 2)					
1	1026	1179	2.02	23.25	2.44	20.81
2	1036	1191	2.07	23.93	0.99	22.95

In case of the hay fed alone the improvement brought about by cutting was quite marked. The steers fed chopped hay made a daily gain of .36 pound more, ate 3.23 pounds more, and refused 2.85 pounds less hay than did those which were fed long hay. This difference in daily gain, however, is possibly a little greater than should be expected normally, and was due probably to heavy snow drifting into one of the long hay lots. The steers in this particular lot made a daily gain of .66 pound, whereas the average gain made by all the lots on long hay was .97 pound. From these tests it would appear that the value of the hay fed alone was increased 43 percent by chopping, but if the long-hay lots had all made normal gains the improvement would have been only 18 percent. This we believe to be more nearly the correct figure.

When fed with a small grain ration the steers on chopped hay consumed 1.93 pounds more, refused 2.83 pounds less, and gained .14 pound more than did those on long hay, an improvement of 14 percent. When fed silage the steers on cut hay made slightly greater gains on a little

less feed; but the difference was less marked than when fed cut hay alone or with grain, and the actual improvement amounted to only 7 percent. The average improvement from chopping in these experiments would therefore be 13 percent. The Idaho Experiment Station in similar tests obtained better results with chopped hay when fed with grain or silage but poorer results when fed alone than those secured at the Union Station. The average of their tests with fattening steers showed an improvement in value of 21 percent, while with lambs, chopping, for some



VISITORS INSPECTING SILAGE-FED CATTLE

reason, failed to effect any improvement whatever. The improvement due to chopping will naturally vary with the quality of the hay and the way in which it is handled. It is quite safe to say, however, that chopping will save waste, will make larger gains, and will require less feed per 100 pounds gain. The actual improvement will be probably between 10 and 20 percent.

So far we have discussed only the effect of chopping on the feeding value of the hay without considering the costs. The following statement shows the cost at the Experiment Station in 1919 of chopping 60.1 tons of hay.

2 men and 2 teams 5 days @ $8.00 a day	$80.00
2 men 5 days @ $5.00 a day	50.00
1 man 1¼ days @ $5.00 a day	6.25
Gasoline 30 gal. @ 34c	10.20
Distillate 60 gal. @ 22c	13.20
Cylinder oil 3 gal @ $1.10	3.30
Machine oil 3 gal. @ 65c	1.95
Hard oil 5 lb. 85c a pail	.85
Total cost	$165.75
Cost per ton	2.75

Power used, 15x27 Gas Tractor.
Cutter used, 20 in.

In the above account no charge has been made for interest or depreciation on machinery. These figures should, of course, be included in the cost, but since our engine was bought for other purposes and the cutter used also for cutting silage, we have no accurate data on interest and depreciation. The expense items listed, however, are quite accurate. The machinery was in good order. The men were busy. With a larger machine the labor costs might be somewhat lessened; with smaller machinery or with machinery not in good running order the labor costs would be higher.

Comparing these figures with the feeding results given above it will be seen that it is only under rare conditions that chopping will pay its cost.

PART IV. ALFALFA HAY AND SILAGE

While rations of alfalfa hay and a small amount of grain, as well as chopped alfalfa, gave somewhat larger gains than were obtained from the feeding of long alfalfa alone, yet the increased gains were not sufficient to make much difference in the final finish of the cattle, and furthermore the cost of production was in most cases increased. We were looking for something that would give more finish and more rapid gains than we had been getting from the feeding of the above rations without going to the expense of feeding a full grain ration. This led us to try silage along with the alfalfa. Our first test was in the winter of 1916-17 and included only one lot. The results were so good that we could scarcely believe the figures. We therefore continued the work on a more extensive scale. Five lots have been fed on hay and silage with the results shown in Table IV.

TABLE IV. ALFALFA HAY AND SILAGE

Lot 1, Alfalfa hay.
Lot 2, Alfalfa hay and 23.7 lbs. silage.

Lot No.	Weight at beginning	Weight at close	Daily gain	Daily ration		
				Offered	Refused	Eaten
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1	1039	1158	1.02	35.6	3.9	31.7
2	987	1151	1.67	22.8	2.8	20.0

The results given in Lot 1 comprise an average of seven tests and include experimental data for 108 steers; those in Lot 2, ten tests and 110 steers. Twenty-four cattle in Lot 1 and twenty-three in Lot 2 received chopped hay. All others received long hay.

Table IV speaks for itself. The hay-and-silage cattle made 60 percent more gain than was made by the cattle fed hay alone. The cattle were all well filled before the tests began so there is no fill involved. The silage-fed cattle not only made larger gains as shown by the scale weights, but they took on a much better finish and looked better in every way. At the end of the tests, the cattle which had received a ration of hay and silage were in good killing condition and ready for market, while those on hay alone were not, and required a further finishing on pasture. (See Part V, pp. 12-13.)

It will be noted that each pound of silage fed reduced the amount of hay fed approximately one-half pound. Lot 2 receiving 23.7 pounds

of silage received 13 pounds less hay. At $7.50 a ton for hay and $6.00 a ton for silage the daily feed cost of Lot 1 was 13⅓ cents and of Lot 2, 15⅔ cents. This would amount to $2.78 a head on a four months' feed. In other words the cost per day is increased very little with hay and silage over hay alone, but the gains are 64 percent greater and of course correspondingly cheaper. The real financial meaning of this is shown by the fact that a 1000-pound steer costing 7 cents, fed for 120 days on hay alone and sold for 8 cents would return $7.63 a ton for the hay after paying all expenses including interest and labor. Under similar conditions a steer fed hay and silage would return $8.73 a ton for the hay, $6.58 for the silage. In reality, however, the silage-fed steer would be a better steer than the hay-fed steer, and if the former brought 8 cents the latter would at least bring a quarter more, in which case he would return $9.44 a ton for the hay and $7.57 for the silage above all expenses.

It is often assumed that cattle fed on silage will not dress out well and that they shrink badly going to market. We have conducted but one experiment planned to throw any light on this question. The results were as follows:

TABLE V. SELLING PRICES OF SILAGE-FED AND HAY-FED CATTLE

Method of feeding	Shrink Union to Portland	Dressing percentage	Selling price
	lbs.	%	
Hay alone	44.0	55.1	$7.86
Hay and light feed of silage	24.4	57.0	7.85
Hay and full feed of silage	28.3	57.0	8.12
Hay and silage for 120 days and hay and barley for last 30 days	33.5	57.7	8.44
Hay and silage for 75 days and hay and barley for last 75 days	34.3	59.9	8.40
Hay and silage together with 5 pounds of barley for entire 150 days	32.5	60.6	8.65

From this test it will be seen that the silage-fed cattle were fatter and dressed out better than those fed hay alone. Those having had grain were still fatter and gave a better dressing percentage. The more grain they had the better they were, of course. The cattle were sold to Swift and Company, and each lot was appraised without knowledge of how they had been fed.

The shrinkage en route to Portland seemed to follow no regular rule, but the silage lots certainly showed up well. The shrinkage for all lots was lower than what we usually expect on such shipments.

Further tests along these lines will be necessary, but we can be sure that silage makes fatter cattle than hay alone and that the cattle dress out better. We cannot, of course, expect cattle fed only silage and hay to be as fat as cattle receiving a grain ration, but they can be made good enough for the Western markets. The question of economy and profit of using grain to finish steers fattened largely on silage and hay seems to depend on the relative prices of hay, silage, and grain, and there was nothing in this test to disprove the conclusions of Part II; that is, that one pound of rolled barley is worth three pounds of alfalfa for fattening steers.

The amount of silage fed varied in different lots from 10 to 34 pounds a day. There is so far no conclusive evidence that the rate of

gain is affected by the amount of silage fed providing it is within these limits. When the silage portion of the ration is decreased, the cattle, of course, consume more hay. Our results with the lighter feed of silage so far, have been rather less satisfactory than where the larger amounts were fed, but the Idaho station obtained the opposite result so we will have to withhold conclusions until we make further tests.

It has been our practice to feed the silage in bunks the same as grain. The silage was weighed and fed in quantities that the cattle would clean up without waste. In every case, however, they were given all the alfalfa hay they would eat even at the expense of a little waste.

In general, we believe that cattle fatten so much better on hay and silage than on hay alone that it will be but a short time until the greater portion of the cattle fattened in the Northwest during the winter months are fed on hay and silage and that the man who attempts to fatten cattle on hay alone is working against an impossible handicap.

Some may say that the ranchman cannot make as good gains as the Experiment Station, but this is not the case. The cattle used in these tests were average feeders such as can be bought anywhere; in fact, on two different years feeders were hard to buy and we had to use some inferior cattle that did not make satisfactory gains. Our feed lots are cold and badly exposed. Our hay was average, but the silage on account of frost was rather below average. It is our judgment, therefore, that in general the farmers will obtain rather better results than those shown in this bulletin. Not many cattle have been fattened on hay and silage in Oregon; but there are a good many fed in this way in Idaho and Colorado, and the feeders in those states are getting slightly better results than those quoted, usually around 1¾ pounds on hay and silage and 1 to 1¼ pounds on hay alone.

It must be borne in mind, however, that the figures given here are for fattening two-year-old steers. The use of silage for wintering stock cattle has been made the subject of other tests, and it may be stated that thus far silage for stock cattle has not given such phenomenal results as are shown for fattening purposes; nevertheless it has proved to be a very satisfactory feed.

PART V. FINISHING ON PASTURE

In our discussion of fattening steers we have stated that with the exception of those fattened on hay and silage the steers were not really in marketable condition at the end of the tests. At the close of the winter feeding period, in order to give them more finish, the steers were turned out on alfalfa and blue-grass pasture. This pasture consisted of a rather uneven and spotted piece of meadow land, the better portion of which had at one time been seeded to alfalfa but had largely gone to blue-grass and other grasses. For three seasons this piece of meadow pasture was used to finish the cattle, which had been on feed during the preceding winters at the Station.

In 1914 all of the seventy-three steers that had been fed on various hay rations the preceding winter were turned out on grass April 11. In 1915 all of the seventy-five head that had been fed on hay alone, and on hay and small barley rations, were turned out April 18. In 1916 the

best twenty-four head were shipped to Portland at the close of the winter feeding period, and the remaining forty-eight head were turned out April 25. Some of the steers had received hay alone during the winter, while some had received an average of not over five pounds of barley in addition to their hay.

The cattle each year were in a half-fat condition, with not sufficient finish to sell satisfactorily, yet too good and too large to turn out on the range. The first two years the cattle were on pasture nearly four months, but the third year the cattle were sold at the end of the third month.

TABLE VI. GAINS ON PASTURE

(Three-year average)

Month	Number of steers	Weight at beginning	Weight at close	Monthly gain	Daily gain
		lbs.	lbs.	lbs.	lbs.
First	196	1184	1215	31	1.00
Second	196	1215	1288	73	2.39
Third	196	1288	1359	71	2.31
Fourth	148	1364	1379	15	0.70

The first month that the cattle were on pasture their average gain was one pound a day. The pasture was extra good and the cattle were not turned out until late in the season, but steers do not do so well when first turned on grass. The second and third months the gains were very good; the cattle put on a great deal of weight and finish. The fourth month was unsatisfactory, the pastures being dry and the weather hot. Due to the low gains made the fourth month during the first two years, the cattle were sold the third year before the pasture failed. Since the cattle were already in good marketable condition, however, and there was no advantage in holding them longer even if the pastures had been good, this failure of the pasture was not a drawback of any importance. The first year the steers sold in Portland for an average of 40 cents per 100 pounds over the quoted top. The second year we were offered the top price in Portland, but shipped the steers to Kansas City, where we sold them for $8.80, the top quotation for Western cattle on the day of sale. The third year they brought the quoted top in Seattle. Since these cattle were average Eastern Oregon feeder steers and not fancy in any way, it will be apparent that the finish obtained was very satisfactory.

This pasture was considered to have a value at this time of $1.00 a head a month, but this is an estimated value only. Due to a lack of uniform conditions and the spotted nature of the land, no figures that would be of any general application can be given as to its value or carrying capacity per acre. The quality of the pasture, however, may be considered as about the same as average blue-grass and mixed pasture throughout the Northwest. The use of such pasture for finishing steers for the midsummer market proved, on the whole, satisfactory and economical.

PART VI. FINANCIAL DISCUSSION

"Is there any money in feeding steers, and if so, how much?" This is a question which cannot be answered definitely, due to the fact that the answer is different for every farmer and for every season. We can give data, however, which will enable the feeder to estimate as accurately as is possible his probable profits or losses when feeding cattle under normal conditions. The exact profits or losses of the Experiment Station or of any feeder for any one particular feeding period form no criterion of what may be expected from feeding cattle year after year; conditions are rarely the same two years in succession. The information which is most useful and important to the feeder, therefore, is that which pertains to the amount of the various feeds required to fatten a steer, and the gains the steer will make under normal conditions. With this information at hand, knowing his feed cost, and with a reasonable knowledge of the market, the feeder is able to estimate with a fair degree of accuracy what he can do feeding cattle under his own conditions.

Hay Alone. In determining the cost of feeding steers on alfalfa hay alone, the following data, which are averages of five years' work, may be used as a basis for calculation.

Wt. at beginning	1000 lbs.
Wt. at close	1116 lbs.
Gain	.97 lb. per day, or 116 lbs. in 120 days
Hay offered	37 lbs. per day, or 4440 lbs. in 120 days
Hay refused	5 lbs. per day, or 600 lbs. in 120 days
Hay consumed	32 lbs. per day, or 3840 lbs. in 120 days

Table VII gives these figures in usable form.

TABLE VII. FATTENING ON HAY ALONE

	Price per 100 pounds at which the finished steer must be sold in order to pay for feed, interest, and labor		
	If feeder steers cost 5c a pound	If feeder steers cost 7c a pound	If feeder steers cost 9c a pound
With alfalfa at $ 5.00	$5.92	$7.76	$9.60
With alfalfa at $ 7.50	6.41	8.25	10.09
With alfalfa at $10.00	6.91	8.75	10.59
With alfalfa at $12.50	7.41	7.25	11.09
With alfalfa at $15.00	7.91	9.75	11.59

The costs given in this table include feed, interest on the cattle at 8 percent, and labor at the rate of $0.03 a steer per day. The labor cost is derived by allowing $4.50 a day for a man and team to feed one hundred fifty head of cattle. It will be noted that the figures given are not for the cost of the gain put on during the feeding period, but represent the final cost of the finished steer, or in other words, the price at which the steer must be sold in order to break even. For instance, a 1000-pound steer bought for $7.00 in the fall and fed 120 days on alfalfa at $10.00 a ton, must be sold for $8.75 in order just to cover the cost of hay, interest, and labor. Anything above $8.75 that he may bring will be clear profit. These prices are farm prices, and where the cattle are either bought or sold at other market points allowance must be made for transportation charges and shrinkage.

No allowance is made for the 600 pounds of refused hay, which, however, has a value for wintering stock cattle about half that of good hay.

The value of manure is also not included in this statement. Manure will usually amount to about three tons a steer.

These two items, namely, refused hay from the feed bunks and the manure, should be valued by the feeder according to his own local conditions.

The stockman who can and does make good use of the refused hay and manure has an advantage of several dollars a steer over the man who is unable to make use of these otherwise waste products.

Hay and Silage. As has already been shown, steers fed on hay and silage made 64 percent more gain than those fed on hay alone. The gains, too, are not only much greater but are more economical as well.

Market prices for silage are not well established, and the cost of production is exceedingly variable.

At this Station, where conditions are exceptionally favorable to growing cheap alfalfa while frost makes silage more expensive, the cost of one ton of silage is almost as much as the cost of one ton of hay; while on the other hand farm management surveys in Malheur county only show one ton of silage costing 40 percent as much as one ton of alfalfa. In this discussion we have rated the silage at 80 percent of the cost of one ton of alfalfa, but this is a purely arbitrary figure.

In calculating the cost of fattening steers on hay and silage the following data may be used as a basis.

Wt. at beginning				1000 lbs.
Wt. at close				1200 lbs.
Gain	1.67 lbs.	per day, or	200 lbs.	in 120 days
Hay offered	22.8 lbs.	per day, or	2736 lbs.	in 120 days
Hay refused	2.8 lbs.	per day, or	336 lbs.	in 120 days
Hay consumed	20 lbs.	per day, or	2400 lbs.	in 120 days
Silage	23.7 lbs.	per day, or	2840 lbs.	in 120 days

Table VIII further illustrates the importance of this ration of hay and silage in connection with the actual cost of fattening two-year-old steers.

TABLE VIII. FATTENING ON HAY AND SILAGE

	Price per 100 pounds at which the finished steer must be sold in order to pay for feed, interest, and labor		
	If feeder steers cost 5c a pound	If feeder steers cost 7c a pound	If feeder steers cost 9c a pound
With alfalfa @ $5.00 and silage @ $4.00	$5.62	$7.35	$9.04
With alfalfa @ $7.50 and silage @ $6.00	6.14	7.85	9.57
With alfalfa @ $10.00 and silage @ $8.00	6.66	8.38	10.09
With alfalfa @ $12.50 and silage @ $10.00	7.19	8.90	10.61
With alfalfa @ $15.00 and silage @ $12.00	7.71	9.42	11.14

The figures in Table VIII represent the actual costs in the feed yards and do not include any marketing expense. The cattle were weighed on a fill both at the beginning and at the close of the test. By comparing Table VIII with Table VII it will be observed that the final

cost of silage-fed steers ranges from $0.20 to $0.56 per hundred less than the final cost of steers fed hay alone.

Many feeders measure their financial returns in terms of the price received for the feed. The following table, therefore, gives the probable returns for the feed under various conditions.

TABLE IX. NET PRICE RECEIVED FOR FEED IN THE STACK OR SILO

	Hay fed alone	—Hay and silage*— Hay	Silage
If steers cost 5c and sell for 6c	$ 5.42	$ 6.85	$ 5.48
If steers cost 5c and sell for 7c	10.45	11.65	9.32
If steers cost 7c and sell for 8c	6.22	8.23	6.58
If steers cost 7c and sell for 9c	11.25	13.03	10.44

*In determining the relative prices received for the hay and silage the totah received for the feed is divided on the basis of the silage being worth 80 percent as much per ton as the hay.

Since the gains made during the winter feeding period in all cases cost more than the market price of beef, it is therefore necessary to sell the finished steer at a higher price per hundred than he cost as a feeder. In other words, there must be a suitable margin between the cost and selling price in order to break even. We expect this higher price because the finished steer dresses out a larger percentage and the meat is of higher quality. The increase in price per hundred, or "margin," which we will actually get depends upon two factors: the finish of the steer and the fluctuations of the market. If the steer has gained slowly he may be no fatter than he was at the start, although heavier. On the other hand, if he has gained rapidly he will be much fatter and will demand a higher price. We usually expect a good steer that has gained two pounds a day for 120 days to be worth $1.00 to $1.50 per hundred more than he was worth in feeder condition, providing, of course, that the market has remained unchanged. A steer that has gained only one pound a day for 120 days will not be very fat and would probably bring only $0.50 to $0.75 more per hundred than he did as a feeder. This margin is usually greater when cattle prices are high than when prices are low.

The market seldom remains steady for any length of time but is constantly fluctuating. There is a common belief that fat cattle are much higher at the end of the winter than at the beginning, but this is often exaggerated. Through a long series of years there is little difference at Chicago between prices in November and December and prices in March and April. The Portland market on the average strengthens a little in the late winter, but there are many exceptions. There are years when even the best feeders lose money, and then again there are years when even the poorest feeders make some profit. In the long run, the ups and downs of the market very largely counterbalance each other.

The steer that has gained from 175 to 225 pounds during the winter feeding period and sells for $1.00 to $1.50 per hundred more than his cost price, should in general make the feeder some profit. When the costs of feed are such that the finished steer cannot be profitably sold for this margin, about the only chance for profit lies in a rise in the market, which is of course uncertain.

The fattening of steers is a good method of marketing hay and silage. The feeder should buy his cattle carefully, however, feed carefully, and utilize the waste hay and manure.

The dealer and trader often finds it profitable to maintain a feed yard in which he may place any thin cattle which can be bought cheap and from which he can take fat cattle whenever prices are right. Such a feed yard may show a handsome profit through the buying and selling ends, even though the actual gains put on may cost all they are worth.

Feeding cattle on a speculative basis where both feed and cattle are bought and fed under conditions such that neither the refused hay nor the manure can be utilized may show a profit during favorable seasons, but often shows a loss.

It is neither necessary nor desirable that the Northwest should winter-fatten more steers, but it is very important that the steers now being fed return greater profit. This can fortunately be obtained by the use of home-grown silage. The results tabulated in this bulletin conclusively show that by the use of silage along with alfalfa hay, very much larger and cheaper gains can be made than were possible under the old methods, and that the profits can be correspondingly increased.

PART VII. HINTS ON MANAGEMENT OF FATTENING STEERS

Buying Steers. In order to avoid excessive shipping charges steers should be bought as near the feed yard as possible; they commonly cost about as much in one place as another. While we do not buy fat cattle for feeding purposes, yet we want them in good flesh; the thinner they are, the longer it takes to finish them and the less we can afford to pay for them. A steer to be finished during 120 days of winter feeding should weigh about a thousand pounds at the beginning. The younger he is the better, providing he is up to weight. Dairy-bred stuff, high flanked, or rough unthrifty individuals should be avoided. If it is necessary to take such cattle with a bunch, they had better be sold to the local butcher at once for whatever they will bring, rather than keep them longer and invest good feed in them. Breed is immaterial so long as it is a beef breed.

Since we expect fat cattle to be worth more than feeders, it is of course necessary to buy feeders at around $1.00 per 100 pounds less than the current price of good beef. Many of the losses made in cattle feeding have been the result of paying fat-cattle prices for feeders.

Fall Pasture. There is often good pasture around the field and meadows in the fall that will produce good gains at much less cost than can be obtained in the feed yards. Fattening steers will cease to gain, however, long before the feed is entirely gone, and if the fields are to be well cleaned, the steers must be taken off before the feed gets short, stock cattle being turned in to clean up the remainder. If no stock cattle are available, it is better to waste some feed than to force the steers to eat it all, for they will shrink considerably in doing so.

Feeding Hay. Hay should be fed at least three times a day. Feed consumption is encouraged by frequent offerings of fresh hay. The

refused hay should be cleaned out once a day, preferably while the steers are eating their silage. A large hay consumption is essential from the beginning and the hay must therefore be of good quality and carefully fed.

Feeding Silage. Silage is fed in bunks the same as grain. The cattle are fed at the rate of about 10 pounds a head the first day. Within two or three days this amount can be increased to 20 or 30 pounds as desired. There is very little danger of cattle going off feed on silage. A ration of 15 pounds may be fed all in one feed but with larger amounts it should be fed in two feeds, morning and evening.

Water and Shelter. Steers must have plenty of clean water where they can walk up and drink their fill at any time they wish without slipping on ice or wading in deep mud. Tank heaters to prevent ice are recommended. The feed yards should be well drained and sheltered as much as possible. The use of barns and also of warm water in connection with winter feeding have not so far proved profitable. (See Bulletin 183.)

Quiet and Regularity. Fattening steers must be handled as quietly and gently as possible, and any excitement which makes them leave their feed even for only a minute must be carefully avoided. An exact schedule should be worked out and carefully adhered to. Cattle appreciate having their meals on time as much as human beings. The feed yards should be provided with plenty of bedding and conditions in general should be made as comfortable as possible.

Season for Feeding. Winter feeding should begin early in the fall before the pasture begins to fail. The feeding should end when the cattle are fat, which is usually in from three to five months, depending largely upon the ration fed and the condition of the cattle at the beginning. Feeding should end, however, before spring weather comes, when cattle are inclined to become restless and consequently do not gain well. Cattle that have been on heavy feed during the winter should not be turned out on grass unless the pasture is extra good and even then not unless they are to stay there for at least two months. During the first month on spring pasture cattle do not make satisfactory gains, especially if already in fairly good condition.