

## Results

A summary of the weight gains is given in Table 1. In the 81-day period between November 13 and February 3, which was the date of the last weighing before the first calves were born, the cows fed an average of 5 lbs. of pelleted cottonseed meal every other day lost 100 lbs. per head. When the feeding interval was increased to four days (Lot 2) the cows lost only 59 lbs. When fed every six days (Lot 3) the loss was 95 lbs. Although there was considerable variation among the cows, the losses were greatest for those fed every two days and those fed every six days. The least loss was for those fed every four days. Weight losses of the cows during the remainder of the winter, weight gains during the summer, and weaning weights of calves will be available for use as measures of the value of the feeding system in October, 1962. Recommendations should not be made on the basis of the preliminary data available at this time.

**Table 1.—Weight Gains of Cows Fed Pelleted Cottonseed Meal at Two, Four, and Six-Day Intervals (Preliminary Results 1961-62).**

Lot Number	1	2	3
Interval Between Feedings	Two Days	Four Days	Six Days
Pounds Cottonseed Meal per Head per Feeding	4	8	12
Number of cows per lot	20	20	20
Average weight per cow, lbs.			
Initial 11-17-61	961	971	991
Winter 2-3-62	861	912	896
Gain (81 days)	-100	-59	-95

## Fattening Cattle on "All Barley" Rations in Oklahoma

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Drylot fattening of steers and heifers has increased sharply in Oklahoma to the point where we now feed about 160,000 head yearly. Two types of feeding operations are most important to Oklahoma; the large commercial feedlot, with a capacity of over 1000 head, and the small farmer-feeder. The large feeder specializes in cattle feeding and usually purchases all grain and roughage. The small feeder makes use of his home-grown feeds, but may work through a "grain bank" where his feed can be stored and processed. Some feeders have a complete mixed ration from a local feed mill delivered to the self-feeder.

Whether large or small, cattle feeders often find that roughage is relatively costly to obtain, store, and process. Thus, highly concentrated rations have become popular, not because the cattle do better than where conventional rations (65 percent or so concentrate) are fed, but because less feed is required per pound of gain by eliminating most of the roughage from the ration.

Since fattening cattle in drylot is the most costly phase of beef production, involving more risk and investment than nearly any other system, costs of gain must be watched carefully. In the usual fattening ration fed in the Southwest, about 8 to 10 lbs. of feed are required for each pound of gain. Of this, about 20 to 25 percent is roughage, which is thought to be necessary to provide bulk or "ballast" to the ration. If this expenditure for roughage can be reduced by steam rolling grains to increase the bulkiness of the mix, for example, part of the feed cost can be reduced. Experiments at other stations have shown that steam-rolled barley, plus a proper supplement, can be fed as the sole ration to fattening steers.

### Feed Grains Available in Oklahoma

Since cattle feeding is highly competitive and the operator works on a very narrow margin, the choice of grain to feed is often an important item. This is especially true if all feed is to be purchased off the farm. In most fattening rations used in the Southwest, grain makes up 60 percent or more of the ration and contributes over 70 percent of the total feed cost. Obviously, the choice of grain to feed can greatly affect profits. This is even more important if a wide difference in feeding value exists between grains.

A look at the feed grains available to the Oklahoma feeder provides some interesting comparisons. The 1961 estimates of feed grains produced in Oklahoma are shown in Table 1. The past year, 1961, was an exceptionally good crop year, and nearly all yields of grain were at, or approached, record highs. This was certainly true of corn, which in most parts of the state is a risky crop during an average season.

Of most interest is a comparison of grain sorghum and barley, two of our most important feed grains. It should be pointed out that in 1961, the acreage of grain sorghum was cut back nearly 30 percent from the previous year due to the government's feed grain program. Thus, 1961 production of grain sorghum represents the smallest output in the past four years, and grain sorghum and barley were closer in total yield than normally occurs.

Note that oats ranked third as a feed grain, a trend which is continuing to be more unfavorable for oats each year. Not only is the total acreage much lower for oats than for barley or grain sorghum, but the yield in lbs. per acre is only about 80 percent and 55 percent, respectively, of these grains. Add to this the lower energy value of oats (about 85 per-

Table 1.—Total Production and Per Acre Yields of Oklahoma Feed Grains in 1961<sup>1</sup>.

Grain	Acres Harvested	Total Production		Avg. Yield per Acre	
		Bushels	Tons	Bushels	Pounds <sup>2</sup>
Barley	770,000	19,250,000	444,000	25.0	1200
Grain Sorghum	553,000	16,866,000	472,248	30.5	1708
Oats	469,000	13,836,000	221,376	29.5	944
Corn	154,000	5,390,000	150,920	35.0	1960

<sup>1</sup>Oklahoma Crop Reporting Service estimates for 1961.

<sup>2</sup>Calculated from bushel basis using 48, 56, 32, and 56 lbs. per bushel for barley, grain sorghum, oats, and corn, respectively.

cent of the energy of milo for example) and its relative importance is further reduced.

Barley and grain sorghums are produced in different areas of Oklahoma, with nearly all of our production of grain sorghums in the western one-third of the state and most of the barley in the middle belt counties. Consequently, the two grains are not really competitive in most areas of the state, and each has its place in cattle feeding. Bear in mind, however, that with present means of transporting feed grains, the area in which the grain is produced has less bearing on where it will be used to fatten cattle than in the past.

In many areas, barley has a bright outlook as a feed grain because:

1. New winter-hardy varieties with high yields have been developed by the Oklahoma Experiment Station representing a real "break-through" in potential barley production for both grain and winter pasture.
2. Costs of production are somewhat lower for barley than for grain sorghum and harvesting and storage problems are often less with this grain.
3. New varieties of barley provide good winter pasture, greatly increasing the returns per acre above the grain alone.
4. A new concept of cattle feeding, based on the use of steam-rolled or crimped grains to supply the necessary bulk in the ration, fits barley ideally.

When due credit is given to both the fiber and energy contents of barley (i.e., when it substitutes for both roughage and grain in a fattening ration) it may have much higher feeding value relative to other grains than we have given it in the past. With these considerations in mind, a series of experiments have been undertaken at the Ft. Reno station to study some of the problems involved in feeding "all-barley" rations. Chiefly, these have centered around the nutritional deficiencies of an "all-barley" ration and the best supplement to use.

### Supplementing Barley Rations

Even though the roughage used in the typical fattening ration makes up less than 25 percent of the total feed, it contributes significant amounts of protein, minerals, and carotene, providing it is of good quality. A look at the nutrient intake of a 700 lb. yearling steer from a conventional ration, with dehydrated alfalfa meal and cottonseed hulls, and an all-barley ration is illustrated in Table 2.

Table 2.—All Concentrate Vs. a Conventional Fattening Ration for a 700 Lb. Yearling Steer\*.

	All Concentrate	Conventional Ration
<b>Avg. Daily Ration, lbs.</b>		
Steam Rolled barley	18	16
Cottonseed meal	1.5	1.5
Dehydrated alfalfa meal		1
Cottonseed hulls		3
<b>Percent of Daily Requirements</b>		
Digestible protein	148	143
TDN	103	106
Crude Fiber	? (1.3 lb.)	? (2.7 lbs.)
Calcium	33	75
Carotene	---	105
Phosphorus	210	204

\*Feed composition and requirements from Morrison, Feeds and Feeding, 22nd edition.

Note that in both types of rations, digestible protein, and TDN (energy) are ample. In this respect, we can expect equal performance. Also, both rations are more than ample in phosphorus because of the high levels of grain and protein supplement they contain.

When it comes to fiber, minerals, and provitamin A (carotene), the two rations differ significantly. The "all-barley" ration contains a lower fiber level, although the actual amount supplied may not be as important as the "bulkiness" of the ration itself. In terms of calcium and total minerals, the "all-barley" mixture is decidedly low. Furthermore, there is no source of provitamin A in this ration, thus cattle on feed for more than 75 to 100 days should have a source of carotene (35 to 50 mg. per head daily) or dry, stabilized vitamin A (3,000 I. U. per 100 lbs. body weight.)

Not indicated in this comparison are the trace minerals supplied by each type of ration. Normally, if we feed even a small amount of good

roughage such as alfalfa hay or dehydrated alfalfa meal, or add molasses to the mix, much of the trace mineral needs of fattening cattle may be taken care of. With a simple barley-oil meal mixture, such may not be the case.

The effect of minerals on feedlot performance is illustrated by the results of a feeding trial conducted during the winter of 1961-62 at Ft. Reno. Five lots of six yearling steers each (three replicates of two steers in each treatment) were fed steam-rolled barley plus the following supplements:

Lot 1—(Basal)—1.5 lb. pelleted soybean meal plus .15 lb. ground limestone (Ca) and 20,000 I.U. vitamin A per head daily.

Lot 2—Basal plus .75 lb. dehydrated alfalfa meal.

Lot 3—Basal plus .5 lb. molasses mixed with the barley supplement.

Lot 4—Basal + 3 grams of trace minerals and B vitamins, or the approximate amounts supplied by 4 lbs. alfalfa.

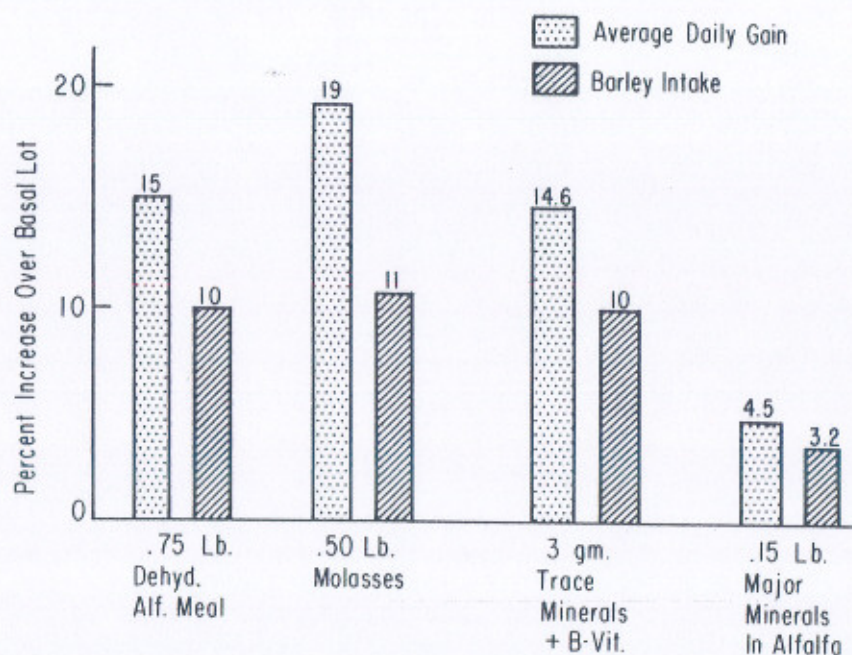


Figure 1. Increase in Average Daily Gain and Grain Intake Over the Basal Lot for 186 Days on Test.

Lot 5—Basal + the major minerals in alfalfa to "buffer" the acids produced from rumen fermentation of the feed.

The results in terms of the increase in average daily gain and grain intake over the basal lot for 186 days on test are illustrated in Figure 1. All supplements increased rate of gain and barley intake over the basal ration, but those containing trace minerals, or those feeds known to be good sources of trace minerals such as dehydrated alfalfa meal and molasses, were most effective. It is of interest that the inclusion of the major minerals contained in alfalfa in the Lot 5 ration had less effect on performance.

Is there a difference in oil meals used to supplement an "all-barley" ration? A comparison of the feedlot performance of yearling steers fed a 46 percent protein soybean meal supplement (plus added calcium and vitamin A) with a similar group fed 41 percent protein cottonseed meal. Both oil meals were solvent-processed, and the results were as follows:

	Soybean meal + Ca + Vitamin A	Cottonseed meal + Ca + Vitamin A
Avg. daily gain, lbs.	2.47	2.44
Avg. feed intake per day, lbs.		
Barley	15.9	16.0
Supplement	1.65	2.16
Feed per cwt. gain, lbs.		
Barley	642	657
Supplement	67	88
Feed cost per cwt. gain, \$	17.53	18.76
Carcass yield and grade	62.5% (Gd +)	62.8% (Gd +)

Note that average steer performance was essentially the same between the two groups and thus both supplements were equally effective in this type of feeding program. However, nearly 30 percent more cottonseed meal was needed to provide the same protein level as the soybean meal supplement. It then becomes a matter of cost per pound of protein in choosing the oil meal supplement.

### Factors To Consider In Feeding "All-Barley" Rations

From the results of several feeding trials, the following observations on feeding "all-barley" rations might be made at this time.

1. The initial "warming up" period is highly important in getting the cattle started off properly without founder or digestive upsets. If the cattle can be supplemented on pasture with 5 lbs. or more of steam rolled barley per head daily this will help them adjust to the high-

concentrate program. Often, a mixture of barley, molasses, and cottonseed hulls can be fed while on grass, so that the cattle will become accustomed to the mixture to be fed in drylot.

2. Once in drylot, a mixture containing at least 50 percent cottonseed hulls or other roughage should be used in the starter mix. Adding 3 to 5 percent molasses improves the palatability of the mixture. Roughage should be removed in stepwise fashion over a three-week period, until only steam rolled barley and supplement remain. The supplement can be pelleted in a "chicken size" cube ( $3/16$  inch) and mixed with the crimped barley. Again 3 percent molasses added to the mix improves palatability.

3. It is important to keep the cattle on a self-feeder at all times. Some scouring and "looseness" of the droppings can be expected, but this usually clears up if the roughage is gradually removed and the ration is properly supplemented.

4. The barley should be properly steam rolled. A barley with 48 lb. test weight should be reduced to at least 33 lb. per bushel after crimping. This takes a careful "crimping" job. Research at other stations on whether or not steam heating improves the feeding value of barley have been variable.

5. Adding a small amount of roughage to the mix may help in safely feeding the barley ration, but adds little to the performance of the cattle, and increases the feed required per cwt. gain. For example, in a recent test, adding 2 lbs. of cottonseed hulls to the "all barley" ration had little effect on rate of gain, but increased the feed required per cwt. gain.

6. A "balanced" supplement is essential. A mixture containing the following ingredients has given good results at Ft. Reno:

- 65 percent soybean meal,
- 25 percent dehydrated alfalfa meal,
- 10 percent molasses,
- 2 percent ground limestone,
- with 3 gm. trace minerals and 20,000 I.U. vitamin A per head daily.

The above supplement can be mixed as a meal with the steam rolled barley or pelleted (with slightly less molasses if pelleted).

Many good commercial protein supplements contain the above ingredients and can be used if reasonable in cost. Cottonseed meal can be substituted for soybean meal in the above formula, but more total supplement will be required because of its lower protein content.

7. The barley intake of cattle on full feed should exceed 2 lbs. per 100 lbs. body weight daily. About 7 to 7.5 lbs. total feed per pound gain with stilbestrol (10 mg. per day if fed or 24 implanted), will be required.