sents the land brought up, and is not like nitrogen brought into the soil from the air by clover growing. People who particularly advocate dairying and cattle raising advise the feeding of the clover, rather than the turning of it down with the plow. Either plan is good, and only the circumstances in which we find ourselves must be our guide, for it is all-important that we adopt the most profitable method. If we plow the clover down, and it has found sufficient phosphate in the soil to satisfy it, we will get the full benefit of having atmospheric nitrogen converted into plant food and added to our soil, and all the mineral elements taken from the soil returned directly, to serve for following crops of grain, roots or grass. If we feed it to cattle they will use up most of the phosphate of the clover, and the manure will principally represent a considerable portion of the nitrogen and potash, the phosphate having been largely used for bone building and maintenance. In the matter of perfect utilization of nitrogen by plants when well supplied with available phosphoric acid, the clover only follows the ordinary law of nature, as, even with abundance of nitrogen present in a soil, grains and other crops will not make the use of the nitrogen unless well supplied with phosphoric acid, and it has been very fully demonstrated that the produce of soils most richly prepared with barnyard manure, or clover manure, can be doubled and trebled in feeding value by the application of pure phosphate.

Valuable as our barnyard manures are, and without seeking to in the least underrate them, we must now recognize that clover and phosphates are the sources by which we can most economically, and therefore profitably, add to the fertility of lands already impoverished, and keep up fertile soils.

Fattening Steers in Winter

By Prof. Thomas Shaw

This paper is a condensation of the facts contained in Bulletin No. 58, Section 1, recently issued by the Animal Industry Department of the Minnesota University State Farm. It relates to the fattening of steers reared upon the farm, and under circumstances most untoward, so far as concerns the prices of meat, as steers were selling high at the commencement of the regular feeding season, but before it was over prices were unprecedentedly low. That any profit was possible under such circumstances was surprising. It could not possibly have been secured had it not been that the prices of feed were way down also.

The feeding period commenced January 6th, 1896, and ended June 4th, thus covering a period of 150 days. The delay in entering upon the work was caused by the difficulty experienced in getting steers. It was the aim to feed three lots, consisting of Galloway, Shorthorn, and Hereford grades. Though the first lot was secured as early as September 1st, the last lot was not secured till January 1st. The average of cost was $3.70 per 100 lbs. live weight unshrunken, and the price for which they were sold when finished was $4.10 per 100 lbs. shrunken weight. Those who understand about feeding cattle will know that under these conditions, with feeds dear, there would have been much loss, but as it happened the experiment resulted in a small profit.

Those familiar with western feeding know very well that, in the open feed lot in the West, it is customary to feed not less than 25 lbs. or 30 lbs. of corn per day to one animal that is being fattened. But the animal is followed by a pig which would probably consume not less than 5 lbs. per day. The quantity utilized by the cattle beast, therefore, if it were all digested, would be not less than 20 lbs. to 25 lbs. This to the writer has always seemed most wasteful feeding, and the experiment was undertaken with the object of getting some information regarding the amount of meal a cattle beast can utilize per day, with suitable adjuncts. It was thought wise to use steers of different grades in the experiment, although breed capabilities were not considered an important factor of the same.

The steers were placed in stalls, those of each grade standing side by side. The animals which stood at the right, in each instance, are spoken of as lot 1. Those standing in the centre are spoken of as lot 2, and those standing at the left hand are spoken of as lot 3. There was, therefore, one steer of each grade in each lot. The steers in lot 1 were fed, what is termed, a light meal portion; those in lot 2 an intermediate quantity, and those in lot 3 a heavier meal portion. When put under experiment, the steers in lot 1 were fed 5 lbs. meal per head per day, those in lot 2, 7 lbs., and those in lot 3, 9 lbs. This was to be increased 1 lb. per animal every four weeks, but, for reasons not quite in consonance with the judgment of the writer, it was increased a little faster than that. On February 10th, a pound of oil cake was added per animal per day to the other meal, and on March 16th a second pound was added. On May 11th the maximum amounts of meal fed had been reached. These were 10, 12, and 14 pounds respectively per animal per day.

The average amounts of meal fed per day per animal throughout the experiment were, for the steers in lot 1,8.58 pounds; for those in lot 2,10.48 pounds; and for those in lot 3,11.94 pounds. But it must be borne in mind that some corn was fed in the ensilage given as mentioned below, but probably not more than 2 pounds or 3 pounds per day. The meal fed consisted of bran, oats, barley and corn, equal parts by weight, until March 16th. It was then changed to bran, barley and corn, in the proportions of 1, 1 and 2 parts respectively. The fodder consisted of corn ensilage of somewhat less than medium quality, and native hay of a very inferior quality.

The feed was charged at average market values in the state, which were very low at the time. These were as follows: Bran $6.50 per ton, oil cake $14.00, native hay $3.00, corn ensilage $1.00, oats 14 cents per bushel, barley 16 cents and corn 18 cents. But the charges for grinding raised the oats to 16½ cents, the barley to 18½ cents and the corn to 20½ cents per bushel.

These prices, low as they are, are more, in some instances, than was actually paid for the feed. Bran, for example, was bought at the Minneapolis mills for $4.50 per ton, and, in some remote parts of the state, it was being used at the same time for fuel. Market values on the feed, therefore, must have been dangerously near the line of the cost of production.

The average weights of the steers in the different lots, when put under experiment, were 1037, 1055 and 1047 pounds respectively. The average weights, at the close of the feeding period, were 1284, 1314 and 1277 pounds respectively. The maximum of gain made by the steers in lot 1 was 741 lbs., by steers in lot 2, 776 lbs., and by steers in lot 3, 692 lbs. The average daily gain made by the steers in lot 1 was 1.65 lbs., by those in lot 2, 1.72 lbs., and by those in lot 3, 1.54 lbs. These were only moderate gains but they are as much, probably, as may be looked for from feeding when the hay is inferior and for so long a period of feeding. In any event, the fact is significant, first, that the steers in lot 1 made a net increase of 49 lbs. more than those of lot 3, although the latter were fed daily 3.36 lbs. more meal per animal.

The feed fed to the steers in lot 1 cost $2.49 less than that fed to those in lot 2, and $3.66 less than that fed to the steers of lot 3. Had the prices of feeds been normal the contrast in the cost would have been much greater. The average daily cost of the feed fed was 5.80c. with the steers in lot 1, 6.40c. with those in lot 2, and 6.66 with those in lot 3. These figures contrast strangely with the cost of feeding steers in Ontario and certain of the eastern states as detailed in bulletins in years gone by, when, in some instances, the daily ration fed cost from 18c. to 21c. The average cost of making 1 lb. of increase was 3.55c. with the steers in lot 1, 3.72c. with the steers in lot 2, and 4.37c. with the steers in lot 3. As the selling price was 4.10c. per pound, each pound of increase made by the steers in lots 1 and 2 was worth more than it cost to make it, notwithstanding the abnormally low price obtained for the meat.