rarily checked in 1932 because of the short corn crop in the western Corn Belt in 1931. Indications are that the increase in hog production is now being resumed. Low prices for cows have resulted in the holding back of dairy and beef cows, and breeding stock on farms is now at the highest level in the history of this country. Sheep numbers, which reached a new high record in 1931, were reduced somewhat by the unfavorable winter of 1931-32 but it is still uncertain how far this decrease will continue. Low feed prices have encouraged the use of horses and mules, but the supply of breeding stock is so low that horse numbers are sure to continue to decline for several years. The extent to which this increase in feed-grain and livestock production will continue is uncertain and depends largely upon the relationship that will come about in the next few years between livestock and livestock-product prices and the prices of cash crops.

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The outstanding developments in the feeding of cereal grains in recent years have had to do with feeding wheat and oats to cattle and hogs in order to make use of surpluses. Since 1910 the consumption of wheat per person in the United States has been decreasing. This decrease, together with a loss of export trade, has resulted in a wheat surplus which could advantageously be fed to livestock. A surplus of oats has resulted largely from the displacement of horses by automobiles, trucks, and tractors.

Feeding experiments with wheat have been chiefly in methods of preparing the grain and in comparing its value with that of corn. Several Corn Belt experiment stations have proved that wheat is practically equal to shelled corn for fattening cattle. In some studies, especially hog feeding, wheat has given slightly better results than corn. However, for hogs as well as cattle, coarse grinding or rolling is necessary. Wheat fed to horses should not constitute over half of the grain ration. At the United States Animal Husbandry Experiment Farm, Beltsville, Md., two lots of steers have been successfully self-fed on coarsely ground and rolled wheat.

At the United States Range Livestock Experiment Station, Miles City, Mont., two lots of weanling colts were fed with good results on a ration of good alfalfa hay and whole wheat, the wheat serving as a substitute for oats. At the same station good results were obtained from feeding range ewes one-half pound of hard winter wheat per head daily before lambing and 1 pound per head daily after lambing.

At the Belle Fourche Field Station, Newell, S. Dak., wheat, barley, and oats showed practically the same value when fed with pressed beet pulp and alfalfa to fattening lambs. In the same experiments, each of the three grains was about 90 per cent as valuable as corn for fattening lambs.

Oats may constitute one-third of the concentrate in the rations of beef calves that are being creep-fed and fattened, when oats are as cheap per pound, as corn, or cheaper. While coarse grinding of grain generally is far superior to fine grinding for livestock feeding, oats ap-
parently should be very finely ground for hogs. It has been found that practically one-half more crushed oats than very finely ground oats are required in hog feeding to obtain the same result. Oats seldom require grinding for other livestock.

When Grinding Is Desirable

The Wisconsin Agricultural Experiment Station has shown conclusively that medium to coarse grinding is better than fine grinding so far as actual nutrition of the livestock is concerned. Coarse grinding is economical, because doubling the size of perforations in the screen of a hammer mill may cut the cost of power 40 to 50 per cent.

Additional experimental work conducted recently by the Minnesota station shows that roughage should not be ground for fattening cattle and that corn need not be ground if enough hogs are kept with the cattle to clean up corn in the droppings. Barley, however, should be ground to medium fineness, according to the Minnesota experiments, even though hogs are following the cattle. In general, grinding corn and oats for farm livestock is not profitable. In no case, except that of very flinty grain, should grains or roughages be ground or chopped for sheep that have good teeth.

The Kansas, Oklahoma, and Texas stations have conducted numerous experiments which prove that the grain sorghums such as milo, kafr, feterita, and hegari are practically equal to corn and other cereals for fattening livestock. Texas experiments in cooperation with the Bureau of Animal Industry of the United States Department of Agriculture have shown that grain-sorghum heads should be ground but not threshed for fattening cattle. However, the heads may be fed to hogs without being ground, because the hogs are forced to eat them slowly and consequently chew the grain sufficiently for efficient digestion. The grain sorghums, especially kafr, are being used extensively for poultry. Good results have been reported in replacing a large percentage of the corn in the ration with yellow milo, red milo, or hegari, provided green feed or cod-liver oil is included in the diet.

Since corn is so extensively used in livestock feeding, one of the foremost feeding problems is that of protein supplements. Livestock producers have been shown for years the advantages of feeding protein supplements such as cottonseed, linseed, and soybean meals. Such supplements have proved especially valuable in conserving corn where plenty of good legume hay is not available. But when corn is so plentiful that there is not crib room for it, and so cheap that it threatens to compete with coal as fuel, there seems to be little incentive to economize in its use. In most of the cattle-fattening experiments during the last 25 years a rather narrow ratio of protein meal to grain, ranging from 1 to 4 to 1 to 7, has been used. However, the few experiments in which wider ratios such as 1 to 10 were used, have given good results.

Addition of Concentrates

According to the results of a cooperative study by the Department of Agriculture and certain State stations on costs and methods of fattening beef cattle in the Corn Belt from 1919 to 1923, the addition of 1 to 1½ pounds of protein concentrates per head per day in fattening 800-900-pound cattle has no financial advantage when corn is 14 cents a
bushel, mixed hay $5 a ton, straw $2 a ton, silage $2 a ton, and protein concentrates $20 a ton, unless the supplement-fed cattle sell for more per pound than cattle fed no protein supplement. At the time of the experiments, such cattle fed a protein supplement sold for 7 per cent more per pound than did similar cattle that received no supplement. Probably the same is true now. On a 1,000-pound steer selling at 6 cents the gain would amount to $4.20. Therefore, even at present prices for corn and protein concentrates, feeding a little cottonseed meal, linseed meal, soybean meal, or soybeans to 2-year-old and younger cattle is likely to be profitable. In a ration containing plenty of good legume hay there is the least reason for feeding the concentrates, and the quantity fed may be as small as one-half pound per head per day. On the other hand, if the roughage consists principally of silage, straw, stover, or grass hay, as much as 1½ pounds of such supplements per head per day can be fed to advantage.

A common problem in fattening cattle is whether to substitute molasses for corn. Experiments have repeatedly shown that, pound for pound, corn is more valuable in a fattening ration than molasses. However, a small quantity of molasses, such as ½ to 1 pound per head daily, used as an appetizer, slightly increases feed consumption and rate of gain in weight, according to the Ohio station. If this can be accomplished without increasing the cost of a unit of gain, it is likely to be profitable. Molasses in the ration of creep-fed calves has been tried at Sni-a-Bar farms, Kansas City, Mo., without showing any advantage over a ration of mixed concentrates without molasses.

In fattening lambs on corn, wheat, or oats, and alfalfa hay at present prices, there is no financial benefit in adding protein-rich concentrates to the ration.

Corn continues to be one of the best, cheapest, and most-used grains for poultry feeding and makes up about half of most poultry rations. Recent experiments have shown that yellow corn, because of its vitamin A content, is especially desirable for feeding poultry that is confined to yards. It is not so important where the poultry has an outdoor range with plenty of green feed.

Rice bran, a by-product of milling rice for human consumption, has been found effective in preventing perosis or deforming leg weakness in poultry. Oat mill feed and barley also have some value in preventing perosis. Brewers' rice and rice polish have practically the same feeding value in a fattening ration as corn, except that the quantity of rice polish fed to hogs must be limited on account of its tendency to produce soft pork.

An experiment at the United States Animal Husbandry Experiment Farm, Beltsville, Md., in feeding scabby barley to poultry has shown that ground scabby barley gives as good results as sound barley, when fed in a laying mash. At the same station scabby barley was found to be quite as palatable and efficient as sound barley in fattening steers. Similar results were obtained at the Illinois station.

While rye has practically the same composition as other cereals, it is rather unpalatable to livestock and generally should not constitute more than one-third of the concentrates in the ration. The Wisconsin station reports that ground rye is not desirable as a feed for young chickens. It is generally considered an undesirable poultry feed.