FEED GRAINS and FORAGE

FEED Crops Since 1929 Worth Relatively More Than the Cash Grains

Producing feed grains, hay, and forage and converting them into livestock and livestock products, is the major enterprise of American agriculture. Approximately two-thirds of all the land in crops in the United States is devoted to the production of feed crops, of which only a small proportion is marketed as grain or hay. In addition, nearly one-third of the land in farms is pasture land used largely in raising livestock or in producing livestock products.

The proportion of the total land that is used in growing feed grains and hay is affected somewhat by the relation between the prices of feed grains and livestock and the prices of cash crops, such as wheat and cotton. When prices for cash crops are relatively high there is a tendency to shift from the production of feed grains and livestock to the growing of cash crops. On the other hand, relatively low prices for cash crops cause a curtailment of cash-crop acreage and an increase in feed-grain and livestock production. During the last 20 years prices of agricultural products have fluctuated widely and crop shifts have been frequent. In most of the years from 1920 to 1929 the acreage in cash crops was a larger proportion of the total cultivated acreage than in pre-war years. Since 1929 there has been a marked shift in acreage from cash crops to feed grains. The increase in feed-grain production has been accompanied by unusually low feed-grain prices that have been encouraging to rapid expansion in livestock production.

The rapid advance in prices of agricultural products from 1915 to 1920 was accompanied by expansion in nearly all lines of agricultural production. The acreage of the principal crops increased from approximately 303,000,000 acres in 1909 to 348,000,000 acres in 1919. Since 1920 the general price level has been declining, with agricultural prices declining faster than prices of other products. There has been little expansion in crop acreage but more than the usual amount of crop shifting. Before the current depression, prices of cash crops such as cotton, wheat, flax, tobacco, and fresh vegetables were relatively high in comparison with the prices of feed grains, and this encouraged shifting to cash crops. The acreage in the principal cash crops increased from 29 per cent of the total acreage in important crops in 1909 to 35 per cent of that total in 1929. In other words, nearly all the expansion in crop acreage during that 20-year period was in the acreage devoted to cash crops. The acreage in cash crops increased about 43 per cent whereas the acreage in feed grains and hay increased

only 4 per cent. No doubt the displacement of work animals by mechanical power had much to do with the decreased acreage planted to feed grains.

New forces came to bear on the feed-crop situation when the world crisis developed in 1929. As usual in similar circumstances the prices of agricultural products declined more than the prices of other goods. Prices of cash crops declined much more sharply than the prices of livestock and livestock products. This change made feed crops, when marketed through livestock, worth relatively more than cash grains and resulted in a marked increase in the acreage of feed grains. The short corn crops of 1930 and 1931 also encouraged the growing of more feed grains. From 1929 to 1932 the acreage planted to feed grains increased 6.3 per cent or more than during the entire period of 1909 to 1929, whereas the acreage of cash crops declined 13.6 per cent.

Production of Feed Grains and Hay

The areas of production of the different feed grains and hay have changed materially in the last 20 years, but this has caused no noticeable trend in the yields of the different crops. Consequently the total production of all feed grains in recent years has been similar to that of the time before the World War. Production of corn, oats, barley, and grain sorghums in recent years has averaged about 102,000,000 tons or only 5 per cent more than in the 10 years before the war. There was approximately the same percentage increase in production as in acreage devoted to these crops. In 1930 the production of feed grains declined somewhat because of the very short corn crop and amounted to only 87,000,000 tons. Increased acreage and better yields in 1931 and 1932 resulted in a marked increase in production. The production of 113,000,000 tons of feed grains in 1932 was the largest on record, with the exception of that of 1920.

The total acreage devoted to corn showed little change from 1909 to 1929, but there has been a tendency for the corn acreage to move westward and northward. Fifty-seven per cent of the corn acreage was west of the Mississippi River in 1929, as compared with 52 per cent in 1909. All this increase occurred in the West North Central States and in the Mountain and Pacific Coast States, since the total acreage in the West South Central States was smaller in 1929 than in 1909. A decrease in acreage occurred in all other areas, the greatest reduction taking place in the Southern States. There was a tendency during this period to concentrate oat production in the Great Plains area between the Mississippi River and the Rocky Mountain States. In 1909 the oat acreage in this area was 48 per cent of the total crop acreage, but by 1929 it had increased to 58 per cent. All other areas show a marked decrease in oat acreage during this period.

Barley production, in contrast to that of corn and oats, has shown wide fluctuations in the last 20 years. From 1909 to 1918 it increased gradually, but prohibition caused a sharp falling off in the market demand for barley. Production declined sharply in 1919 and remained low until 1924. In recent years the value of barley as a feed has been recognized more widely than formerly. Since 1924 production has increased rapidly until in 1932 the acreage was nearly twice as large as that for 1909. Production has remained concentrated largely in the West North Central States and in California. During the recent expansion in barley acreage there has been a marked increase

in all the area west of the Mississippi River except in California where the acreage has been less in recent years than in 1909.

The production of grain sorghums, which are grown principally in northwest Texas, western Oklahoma and Kansas, and southeastern Colorado, was relatively unimportant before 1909. Since then production has steadily increased from about 18,000,000 bushels in 1909 to 106,000,000 bushels in 1932.

The acreage of hay increased slightly from 1909 to 1919 but then declined until the acreage was about the same in 1929 as in 1909. Unfavorable weather for both new and old seedlings during the drought of 1930 and 1931 further reduced the acreage in hay in 1932. Since 1909 there has been a decrease of hay acreage of 25 per cent in the Northeastern States, 5 per cent in the North Central States, and 10 per cent in the Pacific Coast States, whereas acreage in the Rocky Mountain States has increased 55 per cent and in the Southern States east of the Mississippi River, 28 per cent.

The principal change in hay production has been the shift from grass hays to legume hays. The acreage of alfalfa hay increased from 4,707,000 acres in 1909 to 11,516,000 acres in 1929 and during the same period the acreage of clover hay increased from 2,443,000 acres to 5,612,000 acres. There has also been a marked increase in the use of annual legumes such as soybeans, cowpeas, and vetch as hay. In 1929 the acreage of annual legume hays amounted to over 3,000,000 acres, and as a result of the drought of 1930 and 1931 was greatly increased as an emergency crop to replace the shortage of clover and alfalfa hay in 1931 and 1932.

In addition to the coarse grains and hay, some wheat and rye is fed to livestock in areas where feed grains are scarce. The amount varies considerably from year to year and depends largely upon the level of wheat and rye prices and the relation of these prices to those of feed grains. In recent years prior to 1930, between 29,000,000 and 55,000,000 bushels of wheat was fed on farms and the rye fed averaged about 6,000,000 bushels a year. The short corn crops of 1930 and 1931 and the relatively low prices of wheat and rye resulted in a marked increase in the amount of wheat and rye fed to livestock. In the 1930–31 feeding season, farmers fed 159,142,000 bushels of wheat and 18,762,000 bushels of rye. In the 1931–32 season they fed 184,158,000 bushels of wheat and 14,306,000 bushels of rye.

Production of By-product Feeds

The feeding of by-product feedstuffs (bran, middlings, cottonseed meal, etc.) has developed in the last 50 or 60 years. Little or nothing about the feed value of these products was known before that time. In the eighties farmers in the vicinity of flour mills and breweries began using the by-products as a feed and the demand gradually increased as more information regarding their value as feed became available. By 1910 the by-products of mills and breweries and those from the manufacture of cottonseed and linseed oils had become an important source of feed. The rapidly advancing prices of feed grains during the war greatly increased the use of these by-product feeds.

In recent years the production of by-product feeds has been about 10,000,000 tons or one-tenth the production of feed grains. The virtual stoppage of the manufacture of distilled and fermented liquors in

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1920 resulted in a marked decrease in the available supply of high-protein feeds and greatly increased the market for cottonseed and linseed meal and corn-gluten feed and meal. From 1920 to 1927 the production of these feeds increased rapidly. The production of wheat offal fluctuates but little from year to year. The production of by-product feeds depends largely upon the demand for the main products. Consequently the smaller flaxseed and cottonseed crushings, the reduced wet-process corn grindings, and the slow demand for export flour in 1931 and 1932 have limited the outturn of by-product feeds.

The increased use of by-products as feed and the demand for balanced rations in the dairy industry have resulted in a marked increase in the manufacture of ready-mixed feeds. These feeds not only contain by-product feeds but also a large proportion of feed grains; therefore the manufacture of mixed feeds has provided a market for a large part of the feed grains shipped to the central markets.

Utilization of Feed Grains and Hay

Many farmers raise more feed than their own livestock can consume. They sell the surplus either to neighbors who have a shortage of feed or to dealers in local markets who ship it to the central markets or into areas where not enough feed to maintain the livestock is produced. Most of the grain and hay sold locally is fed. The amount of grain shipped out of the county where it is grown may be used as a measure of the amount of grain shipped to central markets or into deficit feed-producing areas. In the years before the World War about 52 per cent of the barley crop, 30 per cent of the oats crop, and 22 per cent of the corn crop were shipped out of the counties where the crops were grown. In the last 20 years there has been a reduction in the proportion of all grain shipped out of the counties where it was grown. During the years 1924 to 1928 the proportion of the barley crop shipped out of the counties where it was grown averaged about 35 per cent, that of oats 24 per cent, and that of corn 18 per cent.

Not only is a smaller amount of grain being shipped out of the counties where it is grown, but a larger proportion of that which is shipped is being fed to livestock on farms in other areas. The amount of barley used by the brewing industry has declined from about 55,000,000 bushels annually before the World War to less than 5,000,000 bushels in recent years. This sharp drop has been partly offset by increased exports and by use of barley in the manufacture of malt. In recent years a much larger proportion of the barley crop has been fed because the livestock-feeding enterprise has been moving northward and westward into areas where the production of corn is limited by a short growing season or the lack of adequate moisture. This westward movement of feeding has been accompanied by the marked expansion of the barley acreage since 1925.

Oats are used extensively only as a feed for livestock. Cereal breakfast foods take barely 3 per cent of the crop. Before the World War a large part of the oats shipped out of the counties where they were grown was used for feeding horses and other livestock in cities. The numbers of livestock in towns and cities have declined rapidly since 1920, so that the amount of oats consumed as feed by animals not on farms is no longer an important part of the total consumption. Consequently a greater proportion of the oats produced is used as a feed on farms. There has been a marked increase in the amount of oats

used in the manufacture of mixed feeds, but most of the oats shipped out of counties where they are grown go to feed livestock on farms elsewhere. Exports of oats have never been a large proportion of the total production, and in ordinary years amount to only 1 or 2 per cent of production.

Over half of the corn shipped out of the counties where it is grown is shipped into deficit corn-producing areas to be used as a feed, the remainder being exported or used in manufacture or in mixed feeds. Before the prohibition act was passed, from 20,000,000 to 25,000,000 bushels of corn were used annually in the manufacture of distilled liquors, but in recent years the amount of corn so used has been negligible. The use of corn in the manufacture of corn starch, corn sugar, and other products of wet-process grinding has increased greatly in the last 15 years, reaching a total of 88,000,000 bushels in 1929. Small amounts of corn are also consumed as a human food in the form of corn meal, corn grits, and hominy. Compared with those of the pre-war period, our exports of corn are small. The average for the years 1924 to 1928 was 21,000,000 bushels against an average of 40,000,000 bushels in the period 1910 to 1914. The grain-sorghum crops are used almost exclusively on farms as feed for livestock. Farmers in recent years have sold only about half as much hay as they sold before the war. The smaller numbers of livestock in towns and cities, and the increased production of hay in deficit-producing areas have greatly curtailed the market movement of hay.

In summarizing, the following points in the supply situation for feed crops are noted: (1) Feed-grain and hay production in the last 20 years has increased much less rapidly than the production of crops grown for cash; (2) production has increased west of the Mississippi River, especially in the West North Central and Rocky Mountain States, and has decreased in other areas; (3) a larger proportion of the feed grains and hay produced is consumed on farms.

Relation of Livestock Numbers to Feed Production

The principal use of feed grains and hay is for the feeding of livestock on farms. Hence, any change in livestock numbers is reflected in the demand for these crops. When allowance is made for the variation in the amounts of feed required by different animals it is found that the feed requirements of livestock on farms averaged about 10 per cent higher during the years 1925 to 1930 than during the years 1905 to 1914. The production of feeds increased about 5 per cent in the years 1925 to 1930 compared with the period 1905 to 1914. The smaller increase in feed-grain production has been offset in recent years by the fact that a smaller proportion was used for industrial purposes or was fed to animals not on farms. Thus, the amount of feed per animal available was not greatly different in the later years from what it was before the World War. However, marked changes with an important bearing on feed consumption and on the outlook for feed-grain and hay production, have taken place both in the proportions of the different types of livestock and in the ages of each kind of livestock on farms.

Since the census of 1910 and that of 1930 were both taken during April, a comparison of livestock numbers shown by these two censuses should give an indication of some of the changes that have taken place in livestock numbers during the 20-year period. Hog numbers in the two periods were not greatly different. The numbers of hogs, 6 months

old or over, however, were somewhat greater in 1910 than in 1930, indicating that hogs are now being marketed at earlier ages. There has been a marked change in the number and ages of horses and mules. Between 1910 and 1930 the number of all horses and mules declined from 24,149,000 to 18,886,000, a decrease of 22 per cent. It is extremely significant that in horses and mules, 2 years old and over, the decline was only 14 per cent, whereas the decline in the number of colts and yearlings was 74 per cent.

Significant changes in the types and ages of cattle and sheep on farms have also taken place. The number of all cattle on farms was only 3.4 per cent larger in 1930 than in 1910, but there was a marked shift from beef cattle to dairy cattle. The number of dairy cows and heifers increased 17.6 per cent whereas the number of beef cows and heifers decreased 17.5 per cent. In both 1910 and 1930 there were about 30,000,000 cattle other than cows and heifers on farms. In 1910 about two-thirds of these were calves and yearlings and one-third were steers and bulls 2 years old or over. In 1930 about four-fifths were calves and yearlings and only one-fifth were steers and bulls 2 years old or over. Sheep numbers were slightly larger in 1930 than in 1910. The number of rams and wethers on farms in 1930, however, was less than half as great as in 1910, whereas the number of ewes in 1930 was about 38,000,000 as compared with 32,000,000 in 1910.

It is therefore evident that, except for horses, there has been a considerable increase in the proportion of breeding stock on the farms and a marked decrease in the proportion of older animals being fed for market. This increase in breeding stock and the marketing of livestock at earlier ages have made it possible to market a larger number of livestock annually without increasing the number of livestock on farms. Young animals generally utilize feed more efficiently than older animals. Hence, the change increases the output of meat and dairy products per unit of feed consumed. However, the relatively larger proportion of mature horses and mules on farms and the increase of dairy cows in contrast to the decrease of beef cows, tend to increase the feed requirements per head of horses and cattle. Adult horses and mules use more feed than colts; dairy cows commonly get more grain than beef cattle.

The Effect of Price Relationships on Feeding

The amount of feed grains fed per animal varies materially from year to year, not only because of fluctuations in the production of feed grains, but also in response to the relationship between the prices of feed grains and the prices of livestock and livestock products. Feed is the raw material of meat and milk. When it is relatively high in price, producers market their livestock at lighter weights, and feed dairy cows a smaller amount of grain and more roughage. On the other hand, when feed prices are relatively low, producers market their animals at greater weights and milk cows are fed more grain.

Comparison of feed-grain prices and the prices of meat animals and of dairy products over a period of years is significant. A measure of changes in feed-grain prices over a period of years can be arrived at by combining the average yearly prices of corn, oats, and barley according to their importance as feeds, and then using the average of these combined prices for the years 1910 to 1914 as equal to 100 per cent. When thus combined and converted to a percentage, the percentage of 70 for

1906 means that the prices of feed grains in 1906 were 70 per cent as high as they were in the years 1910 to 1914. Similarly the prices of cattle, hogs, and sheep can be combined to represent livestock prices, and the prices of butter and of fluid milk can be combined to represent dairy-product prices. When all of these combinations are made and converted into percentages with the average prices of the years 1910–1914 equal to 100, it is possible to say whether feed prices were relatively high or low at any time in comparison with the prices of meat animals or with dairy products.

For example, in 1906, livestock prices were 67 per cent, dairy product prices 77 per cent, and feed prices 70 per cent, of those of 1910–1914. Comparing these percentages it is evident that in 1906 dairy-product prices were relatively higher than feed-grain prices, whereas livestock prices were relatively lower than feed-grain prices. The relationship of feed-grain prices to prices of meat animals and of dairy products can be shown still more easily by dividing the 77 per cent for dairy products and the 67 per cent for meat animals by the 70 per cent for feed grains. Thus, we find that in 1906 the prices of dairy products were 110 per cent as high as feed-grain prices and the prices of meat animals

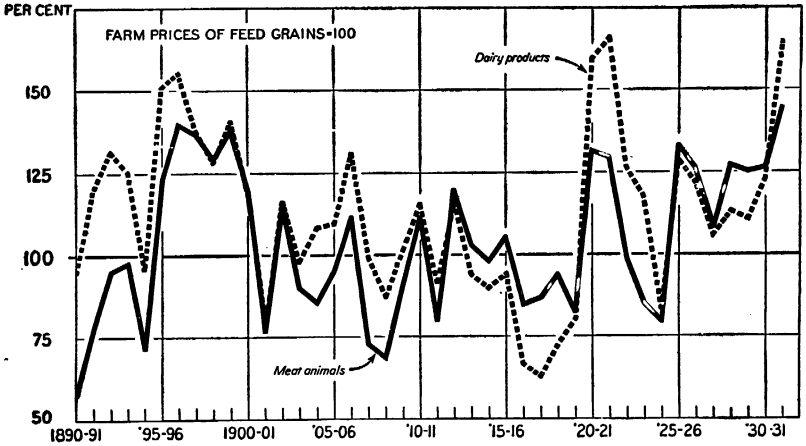

FIGURE 18.—Relation of farm prices of meat animals and dairy products to farm prices of feed-grains, 1892–1931. In years when the lines in the above chart have been above 100, feed-grain prices have been relatively low in comparison with prices of livestock or prices of dairy products. The periods of unusually low feed-grain prices, 1895–1900, 1920–21, and 1931 were the most favorable periods for the feeding of livestock. During the years 1916–1919, when feed prices were relatively high, conditions for feeding were least favorable

96 per cent as high as feed-grain prices. Such a comparison has been made for each year from 1890 to 1931, and the results are shown in Figure 18. The chart was extended back over the period of unusually low prices in 1895 and 1896 so that that period could be compared with the present period of unusually low prices.

During the last 42 years there have been three periods in which the prices of livestock and dairy products were unusually high in comparison with the price of feed grains. These were 1895 to 1900, 1920 to 1921, and 1931, with relatively the highest meat-animal and dairy-product prices occurring in 1931. Farmers respond promptly to these relatively high prices; they respond first by increasing the amount of feed fed per head of livestock. Eventually, if the relatively high prices for livestock and dairy products continue, they increase the numbers of livestock.

In periods when livestock and dairy-product prices are relatively low, as in 1916 to 1919, producers tend to feed less grain and in the long run to curtail the production of livestock.

Resemblances to Earlier Periods

The feeding situation in 1931 and 1932 has several features similar to those of 1895 and 1896, in addition to the relatively high prices for livestock and dairy products. The year 1894 was one of severe drought similar to 1930. In 1895 feed supplies were more plentiful than in the previous year and in 1896 were much above average—situations similar to those in 1931 and 1932, respectively. Still other resemblances may be noted. Prices of agricultural products in 1895 and 1896 were at unusually low levels, the same as at present. The hog-production cycle, as indicated by inspected hog slaughter, reached its low phase in 1893 and 1894, whereas the low phase in the present cycle was reached in 1930 and 1931. The low phase in the cycle of cattle numbers on farms came in 1895 and 1896, whereas the low phase in the present cycle was reached in 1928 and 1929. Both in 1895–96 and in 1931–32 livestock numbers were relatively low and the relationship of feed prices to livestock and livestock-product prices encouraged feeding.

In view of these similarities it is interesting to note what happened after 1895–96. Both feed-grain production and livestock production expanded at an unusually rapid rate. By 1900–1901 inspected slaughter of hogs had reached 30,000,000 as compared with about 17,000,000 in 1892–93. Cattle numbers on farms increased very rapidly and reached a peak in 1904. Sheep and lamb slaughter more than doubled from 1890 to 1902. The growing of lambs for market in the nineties, however, was just getting under way. Hence, the percentage increase appears large in comparison with the absolute increase.

It need scarcely be said that the course of the livestock industry after 1895–96 does not necessarily indicate what may be expected now. Present conditions, although similar to those of the nineties in some respects, are very different in others. In the nineties the farm area was expanding rapidly, so that the increase in livestock production was not only an expansion from a low point but also a continuation of a marked upward trend. At the present time there is not the possibility of expansion in farm area that there was in the nineties, therefore so prolonged an expansion in livestock production is unlikely. On the other hand, however, a much larger proportion of present livestock is breeding animals. This fact and the marketing of livestock at early ages permit a more rapid expansion or contraction of livestock production than was possible in the nineties. In the future, periods of increasing and decreasing numbers may be shorter but the fluctuations may be about as great.

Recent Adjustments in Feed-Grain and Livestock Production

Price changes as drastic as those that have taken place since 1929 tend to upset farmers' production and marketing plans. As already noted, the area devoted to cash crops has decreased and the area devoted to feed crops has increased in the last three years. In 1932 the production of feed grains was unusually large. Farmers will have to increase livestock numbers in order to find an outlet for the feed supply. The increase in hog numbers, which began in 1931, was tempo-

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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FEEDING Experiments With Cereal Grains Indicate Ways of Profitable Use

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-