UNITED STATES DEPARTMENT OF AGRICULTURE
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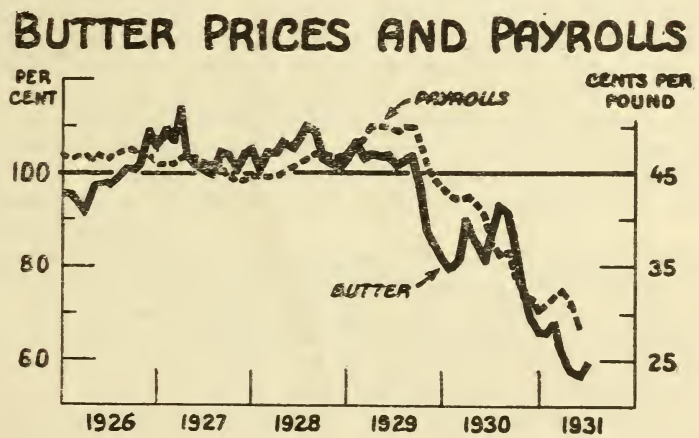
THE OUTLOOK FOR THE DAIRY INDUSTRY

and Some Essentials of

A NATIONAL DAIRY PROGRAM

Prepared by the Staff of the Bureau of Agricultural Economics



BUTTER PRICES HAVE RECENTLY BEEN GREATLY INFLUENCED BY CHANGES IN CONSUMERS' INCOMES

U. S. GOVERNMENT PRINTING OFFICE: 1931

FOREWORD

The dairy industry, in common with other agricultural interests, is sharing in the world-wide economic depression. Prices of dairy products have fallen below pre-war levels, and incomes of dairymen as well as of other farmers have been drastically reduced. The economic depression and the resulting reduction in buying power account for much of the price decline, but increasing competition and large supplies at home and abroad also have played a part. As economic conditions improve the demand for dairy products undoubtedly will improve. On the other hand, the relatively low prices for dairy feeds and low returns from farm enterprises other than dairying point to continued high production of dairy products for some time in many parts of the world.

Far-reaching adjustments in the dairy industry are essential. Fortunately the dairy industry in the United States is in a good position to adjust itself to the changing conditions and fortunately, also, its leaders recognize the need of a national dairy program upon which all can unite.

The dairy industry represented by producers, processors, and distributors, took a forward step when it called a national dairy conference at St. Louis, Mo., March 11–12, 1931, to consider the problems of the industry and a program of action. Some of the essentials of such a program are generally recognized and must be regarded as part of a general agricultural policy. Reduction in costs of production, herd improvement, control of animal diseases, and adjustments to changing economic conditions stand out as pivotal. Much may be done to broaden the demand for dairy products and develop greater skill and economy in merchandising them. Adjustments also are needed in land-utilization policies, taxation, and other phases of public policy. Finally, a sound program for the dairy industry must be based on research to furnish the information upon which proper adjustments in the industry can be made in the light of ever-changing economic problems.

In the development of this program the dairy industry is drawing heavily upon the resources of the United States Department of Agriculture and the land-grant colleges. The industry, in fact, at the St. Louis conference authorized the appointment of standing committees to advise with these public agencies on the development of their dairy work. A closer coordination of the economic with the technical production activities of the United States Department of Agriculture and the State institutions, strengthened and pointed to the practical needs of producers, consumers, and distributors, will materially assist the dairy industry in realizing its objectives.

This publication, which deals largely with the economic phases of the dairy industry, is an outgrowth of the recent national dairy

conference at St. Louis. Publications bearing on herd improvement, feeding for milk production, the utilization of dairy by-products, disease-control work, and other phases of dairying are issued from time to time by the Bureau of Dairy Industry, the Bureau of Animal Industry, and other bureaus.

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GENERAL PROSPECTS

The severe declines in the prices of dairy products in the last two years are causing dairymen to reconsider their production programs. In deciding whether to change his program the individual dairyman must weigh the declines in the prices of his products against the declines in the prices of things he buys, particularly feeds. Further, he must compare the income he can derive from dairying with the incomes he might obtain from alternative enterprises. More important still, the dairymen needs a clear appreciation of the conditions that are likely to prevail in the next few years, for he should adjust to the future and not to the past.

Prices for butterfat in April, 1931, were 43 per cent lower than they were two years earlier. The index number of farm prices for dairy products was 99 per cent of the 1910–1914 average. Against this the index number of prices paid by farmers for the things they buy was estimated to be 134 per cent of the 1910–1914 average. The

dairy farmer, therefore, finds his products will buy only 74 per cent of what they did prior to the World War. On the other hand, the general index number of farm prices on April 15, 1931, was 91 per cent of the 1910–1914 average, and that of grain prices was 74 per cent. Although the prices of dairy products have fallen greatly, feed costs, particularly in the surplus feed-producing States, have been reduced, and the prices of other products that the dairyman might produce are also low.

The outlook is for continued high dairy production. Cattle numbers in the United States started on the upward phase of their cycle in 1929. Although the increase to the beginning of 1931 was small, further increases are to be expected in the next few years. Some further increase in numbers of milch cows is also likely. Increasing numbers will make it comparatively easy to expand dairy production. Low feed prices encourage feeding, and if feed supplies are normal in 1931 and incomes from grain production continue low, the prospects are for comparatively heavy feeding, especially in sections having locally produced supplies.

The demand for dairy products has had an upward trend over a period of years, but the present depression has reduced consumer incomes, and this in turn has restricted demand. Since surpluses go mostly into butter, the restriction in demand has fallen particularly heavily upon the butter market. As usual in such periods, butter prices have fallen most, but cheese prices have also fallen, and fluid milk prices have been reduced. With improvement in business and consumer income, however, demand can be expected to improve.

The decline of butter prices in the United States to the world level has reemphasized the foreign dairy situation. Are domestic prices to remain low in comparison with foreign prices? Will the United States become an important exporter? Europe has been the only foreign market able to absorb any large quantities of butter. Supplies for European markets have risen rapidly and appear to have kept fully abreast of increases in foreign demand. In fact foreign supplies have been pressing upon the markets of the United States for most of the past decade, and only repeated increases in the tariff have kept imports in check. The United States would therefore meet severe competition in foreign butter markets. On the other hand, a material improvement in domestic demand can be expected as business recovers. The United States may not, therefore, become a regular butter-exporting country of importance, even though exports may become significant during our heavy production season, which comes when supplies from Southern Hemisphere countries are low. Other products, such as condensed and powdered milk, may be exported in larger volume than in recent years. Reduced imports of some dairy products as a result of tariff increases may make it possible to manufacture domestically more of the dairy products that heretofore have been imported.

In judging price prospects it will be well for the industry to recognize that dairy production is likely to continue high for some time. The principal cause of the present low prices of dairy products, however, is the reduced buying power of consumers resulting from the present business depression. With a recovery in business, an increased demand and some improvement in prices is to be ex-

pected, although a marked increase in production could easily offset a part of the influence of an improvement in demand.

Low prices have a tendency to discourage production, causing some to leave the business and others to curtail drastically. Dairy producers should consider carefully the incomes from dairying in comparison with those from possible alternative enterprises. Where labor is adequate and feeds are cheap, dairying will probably continue to be a strong competitor among farm enterprises.

PRICES OF DAIRY COWS

The price of dairy cows has an important influence on subsequent numbers. When prices are high, as they were in 1929, farmers tend to save a larger proportion of their heifer calves and develop them for dairy purposes, but low prices of dairy cows discourage the

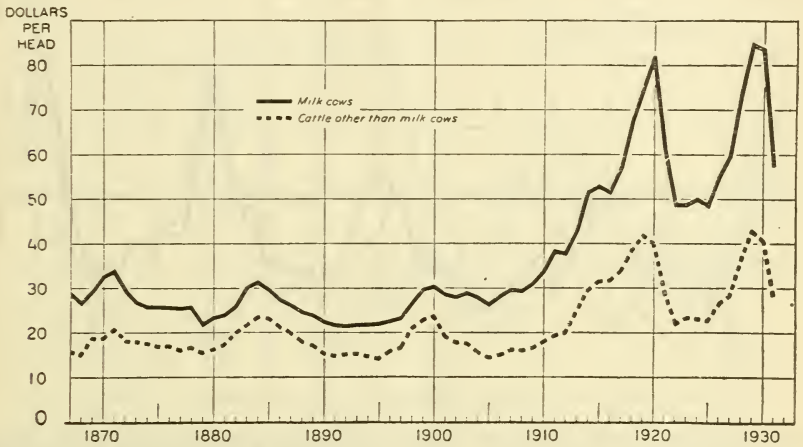

FIGURE 1.—VALUE PER HEAD OF MILK COWS AND OF CATTLE OTHER THAN MILK COWS, JANUARY 1, 1867 TO 1931

Prices of milk cows and of cattle other than milk cows have corresponding cyclical movements. Since 1915 cattle prices have averaged much higher than they did prior to 1905, principally because of a rise in the level of commodity prices generally. The sharp drop in cattle prices since 1929 and 1930 has been due to a decline in the level of commodity prices and the beginning of the downward phase of the cattle price cycle.

raising of calves. An understanding of the probable future trend of cow prices is needed in deciding whether to raise more or fewer calves. It should be an important factor in determining when one should go into dairying or make changes in the dairy herd. Frequently cows are purchased at high prices when the buyer could have delayed the purchase a year or so and bought at much lower prices. Areas in which dairying is introduced by the purchase of cows at peak prices have an obstacle to success in dairying. On the other hand, farmers frequently overlook the opportunity of making desirable additions to or changes in their herds when prices are low.

One of the most important characteristics of prices of milk cows is that they move in cycles. Years of peak prices were 1871, 1884, 1900, 1920, and 1929. (Fig. 1.) Rather long periods of generally low prices usually follow these peaks. These movements in prices of milk cows are closely related to the movements in prices of other

cattle. This is partly because the milk cow has considerable beef value and partly because the total production of milk is influenced by the total number of cattle on farms, for some cows are kept primarily for milk purposes at one time and for beef purposes at other times. Since milk cows are all 2 years old or over, the average of their prices is higher than the average of prices of other cattle (including calves). The increase in the spread between these two classes of cattle apparently is to be explained primarily on the basis of a lowering in the average age of cattle other than milk cows.

Among the most striking features of prices for milk cows is the fact that they rose rapidly and almost continuously from 1905 to 1920 and that since the World War they have averaged much higher than they did prior to the war. These features reflect the combined influences of the cattle price cycle and the general level of commodity

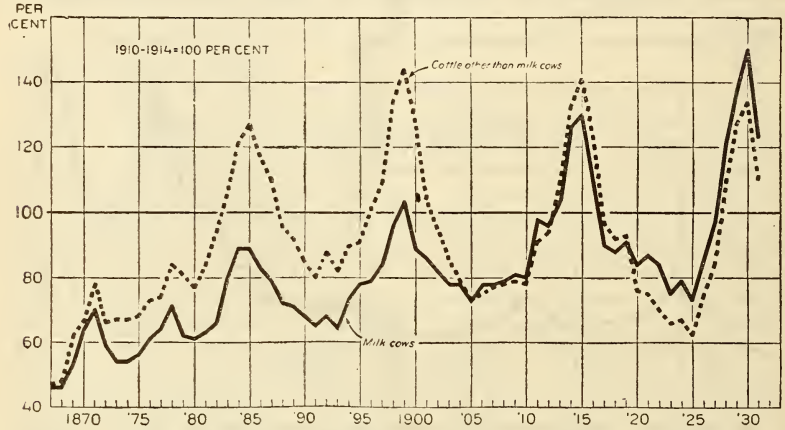

FIGURE 2.—ADJUSTED VALUE PER HEAD OF MILK COWS AND CATTLE OTHER THAN MILK COWS, 1867–1931. (INDEX ADJUSTED FOR CHANGES IN THE GENERAL PRICE LEVEL)

The cycles in prices of milk cows and other cattle stand out more clearly when the actual prices are adjusted to eliminate the effects of changes in the general price level. These adjusted prices have peaks about 14 to 16 years apart. The last January peak came in 1930. Despite sharp declines in 1930, cattle prices in January, 1931, were still comparatively high.

prices. The high average of milk-cow prices since 1915 is to be explained almost entirely by the general price level, as is the trend of cattle prices from 1915 to 1922. The sharp drop in prices of milk cows in 1930 and 1931 marks the beginning of the downward phase in the cattle price cycle, but it also reflects the falling level of commodity prices. In order to see the cattle price cycle most clearly it is necessary to eliminate the influence of the general price level.

After adjusting prices of milk cows and other cattle for changes in the general price level it is found that the years of peak cattle prices were 1871, 1885, 1899, 1915, and 1930. (Fig. 2.) These peaks were from 14 to 16 years apart. In each cycle there tends to be a short period in which prices rise to a sharp peak and then fall sharply, and this is followed by a long period of low prices. There was a marked decline in prices during 1930, but on January 1, 1931,

prices were still well above the price at the low point of the previous cycles. During the last three cycles dairy-cattle prices have declined through periods ranging from 5 to 10 years. The sharp drop in cattle prices which has already occurred might furnish some temporary check to the expansion in numbers, but it is not likely to retard the upward swing in the cattle-production cycle very long. Low supplies and a strong consumer demand have been responsible for the high prices of recent years.

Prices of milk cows in New York State and in Wisconsin, and of steers at Chicago, have cycles corresponding to those observed in the prices of milk cows and other cattle for the United States. (Fig. 3.) Since milk cows in these States are so uniformly of dairy type, this emphasizes the relation between prices of beef cattle and dairy cows. The fact that the upward swing in beef-cattle production did not

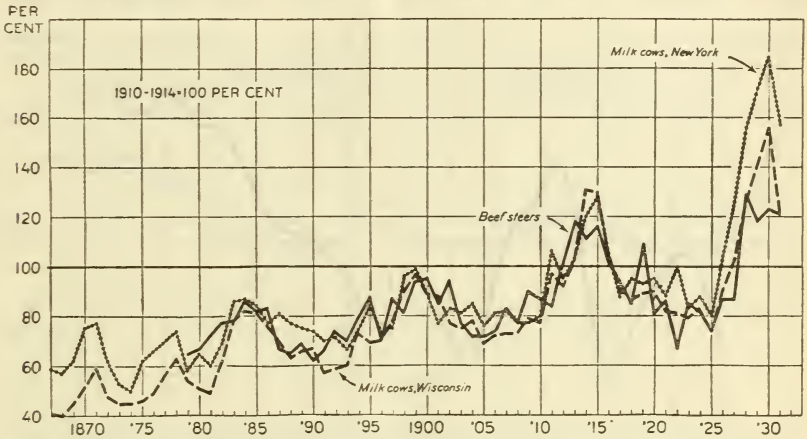

FIGURE 3.—VALUE PER HEAD OF MILK COWS IN NEW YORK AND WISCONSIN AND VALUE PER POUND OF STEERS IN CHICAGO, 1867–1931. (INDEX ADJUSTED FOR CHANGES IN GENERAL PRICE LEVEL)

Price cycles for milk cows in typical dairy States, as New York and Wisconsin, are closely associated with the price cycles for beef steers at Chicago. The short-time fluctuations in prices of steers, however, differ from those in prices of milk cows, and the fluctuations in prices of milk cows in New York State differ from those of Wisconsin, because of influences that prevail in the particular markets over short periods.

begin until 1928, therefore, is of considerable importance in anticipating the course of dairy-cattle prices for the next few years.

Despite the similarity in cyclical movements, the year-to-year variations in prices of milk cows in New York and Wisconsin differ considerably. In 1930 prices of butter and cheese fell materially, whereas prices of fluid milk were relatively stable. This is probably the reason that prices of milk cows declined much more in Wisconsin in 1930 than they did in New York.

NUMBERS OF DAIRY CATTLE

During recent years milk cows have constituted about 40 per cent of all cattle on farms. The trend in dairy-cow numbers has been upward since 1900, whereas total cattle numbers have had only a slight upward trend. (Fig. 4.) With the exception of those for 1926 and 1927, estimates of the number of milk cows on farms have

been higher each successive year since 1900. The pronounced cycles in total cattle numbers correspond in general to the cycles in prices of milk cows and cattle. Since farmers check their marketings when they begin to build up their herds, the peak in cattle prices tends to occur somewhat later than the low point in cattle numbers. Conversely, when the producers decrease their cattle numbers they increase marketings, and this causes the low point in cattle prices to be reached somewhat later than the high point in cattle numbers. In the last cycle, cattle numbers reached a low point in 1912, and cattle prices reached a high point in 1915. The high point in cattle numbers came in 1918 and the low point in cattle prices in 1925. In the present cycle cattle numbers were at a low point in 1928, and cattle prices reached the peak in late 1929. On January 1, 1931, the number of all cattle on farms was estimated at 59,000,000 head, or 5 per cent higher than on January 1, 1928. Any liquidation caused

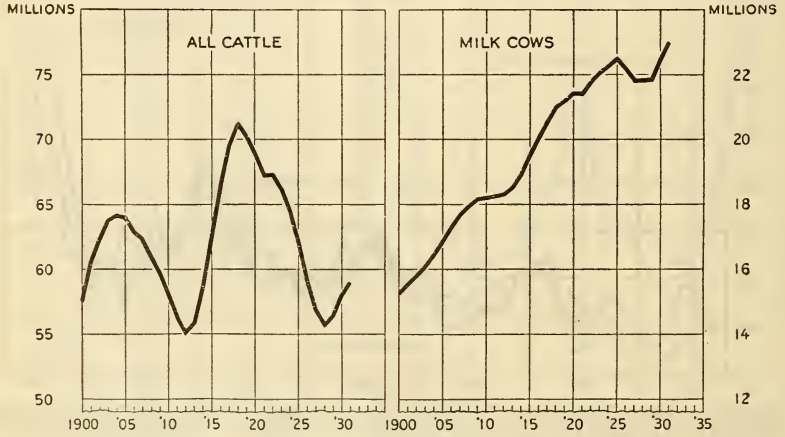

FIGURE 4.—NUMBER OF ALL CATTLE AND MILK COWS ON FARMS, JANUARY 1, 1900–1931

The estimated numbers of milk cows on farms have had a marked upward trend since 1900. Total numbers of cattle have marked cyclical movements, the peak in numbers frequently preceding the low point in prices and the low point in numbers preceding the high point in prices. The upward phase of the present cycle in numbers of cattle started in 1929. In the last cycle numbers increased for six years.

by present low prices would probably be of minor importance since cattle numbers are still near the bottom of their cycle.

A more detailed examination of changes in numbers of milk cows shows marked difference in their trends in different sections of the country. (Fig. 5.) These trends reflect fairly closely the economic position of the dairy industry in the respective sections. Conditions in the surplus-feed-producing States differ greatly from those in sections where feed must be shipped in, and as a result of the responses of dairymen to changes in prices are different in different sections. The trends that have taken place in numbers of cows in sections of the country since 1920, therefore, indicate the way these sections may respond to present conditions.

Although numbers of milk cows increased gradually from 1920 to 1925, numbers in the Eastern States had a general downward trend from 1923 to 1927. In the Northeastern States the number of cows

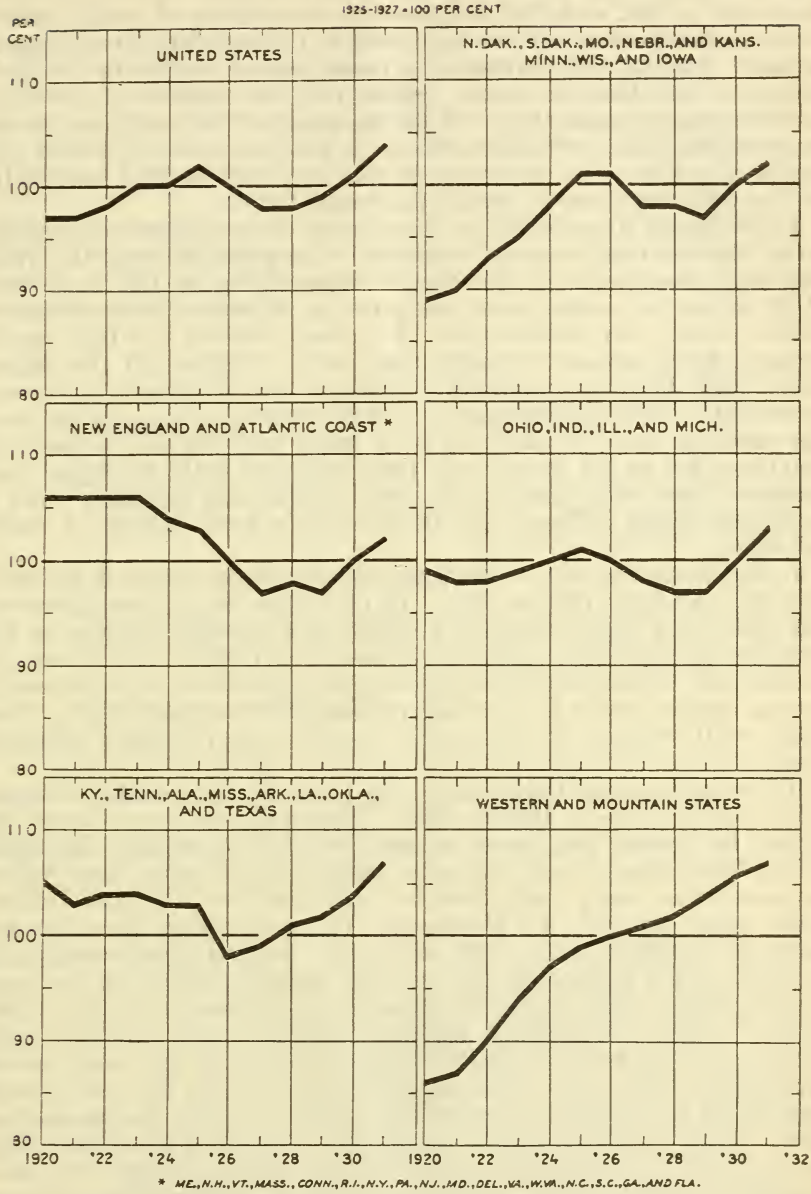

FIGURE 5.—NUMBER OF MILK COWS 2 YEARS AND OVER, JANUARY 1, 1920–1931

The trends in the number of milk cows have been different in the several sections of the country. For the whole period since 1920, the trends have been strongly upward in the western and west North Central States, where feed has been relatively cheap, but the trends have been downward in the Atlantic Seaboard States. Recently the trends have been upward in all sections of the country.

declined slightly from 1920 to 1923 and then declined more sharply. This probably reflected the decline that took place in the prices of fluid milk in 1921 and 1922, the growing competition of other sections in butter production, and the high costs of transportation on shipped-in feed. In addition it reflected a more general decline in the agriculture of the Eastern States. Since 1927 the number of cows has been increasing moderately. With the prospect for continued severe competition from the Western States in the production of butter and cheese it is likely that dairying in this area will be held essentially in line with requirements of the fluid-milk trade.

In the South Atlantic States the number of cows increased slightly from 1920 to 1923, then fell sharply. Competition from the West was only one factor in the decline in dairying in the Southeast. High prices for cotton made the growing of cotton more attractive where yields were satisfactory. In other sections the boll weevil reduced farm incomes so much that many families left the farms. Since 1927, however, numbers of cows in the Southeast have been increasing. With growing industrialization in this area and expanding markets there is likely to be a large proportional increase in dairying; but as yet dairying in these States is little developed, and increases that may come in the near future will probably have a relatively small influence on the country's total output of dairy products.

In the South Central States there was almost no change in numbers of milk cows from 1920 to 1925. In 1926 there was a sharp decrease, but since then there has been a steady and marked increase in the number of cows each year. As a result of present low prices for cotton and efforts to diversify southern agriculture to a somewhat greater extent, there is a strong probability that dairying in these States will continue to increase in districts able to supply adequate feeds.

The western Corn Belt States added most to the country's expansion in dairying from 1920 to 1925. With a period of continued low prices for grains and meat animals and comparatively favorable prices for butter, many farmers shifted to dairying, and others expanded their dairy enterprises to supplement their reduced incomes from other sources. In Minnesota, Wisconsin, and Iowa the expansion continued until 1926, and after declining moderately for three years the expansion was resumed again in 1929. In the more western States of this group the expansion continued until 1925. The number of cows declined in 1926 and 1927 and then turned upward again. In the eastern Corn Belt States numbers of milk cows varied somewhat as they did in the rest of the Corn Belt, but the changes were much less marked. In 1930 and 1931, however, the numbers in these States increased also. Despite the drouth, grain prices have been low even as compared with butter prices, and incomes from cash crops have been reduced. It is therefore to be expected that dairying will increase in the Corn Belt for the next few years.

The greatest proportional increase in dairying since 1920 has come in the Western States. The expansion came somewhat sooner in the three States of Washington, Oregon, and California, and from 1924 to 1927 there was no change in the numbers of milk cows in these States, but since then the numbers have been rising again. In the

Mountain States numbers of milk cows have risen each year from 1920 to 1931, although the rate of increase was partially checked after 1925. The expansion of dairying in these States represents a general agricultural development and is likely to continue.

The number of heifers being kept for milk cows gives another indication of the probable changes in numbers of milk cows over the next two or three years and indicates the reaction of the farmers to recent prices. On January 1, 1931, there were 20 heifers, 1 and 2 years old, per 100 milk cows. This was the same proportion that existed in 1929, and the number of milk cows increased in 1930. From the standpoint of the number of heifers available, therefore, there is a possibility of a continued increase in the number of cows in 1931. (Fig. 6.) Here again the situation varies greatly in different parts of the country.

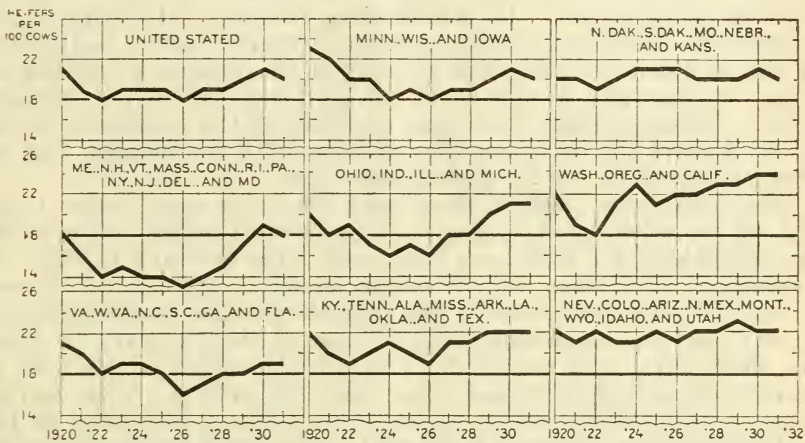

FIGURE 6.—HEIFERS 1 TO 2 YEARS OLD BEING KEPT FOR MILK PER 100 COWS 2 YEARS OLD AND OVER

The number of heifers 1 to 2 years old being kept for milk cows declined from 21 to 100 milk cows in 1920 to 18 in 1926. Since 1926 the proportion of heifers to milk cows has increased, indicating a tendency to expand herds. The number of heifers under 1 year old being kept for milk, however, was small in 1931.

In the Northeastern States relatively few heifers are kept. The number of heifers 1 and 2 years old being kept for milk per 100 milk cows had a downward trend in the Northeastern States from 1920 to 1926, and the number of milk cows declined from 1920 to 1927. From 1926, when there were only about 13 heifers per 100 milk cows, the number rose until on January 1, 1930, there were roughly 19 heifers per 100 cows. The increase in milk cows was significant, but less pronounced. By January 1, 1931, the number of heifers had fallen to 18 per 100 cows, but was still high for this section.

In the South Atlantic States the number of heifers in this age group relative to the number of cows declined from 1920 to 1926, and the decline from about 19 in 1924 to 16 per 100 milk cows in 1926 was followed by a considerable decrease in the number of cows. Since 1926 the numbers of heifers have been increasing relatively, and this has been followed by an increase in the number of cows, but the supply of heifers in January, 1931, was still moderate.

The expansion in dairying in the South Central States from 1926 until 1929 was accompanied by a relative increase in the number of heifers, and since then they have remained at the rather high level of 22 heifers per 100 milk cows. In Minnesota, Wisconsin, and Iowa the decline in the heifer population was followed by a checking of the increase in the cow population, and subsequently cow numbers declined. After 1926 the trend in the number of heifers turned upward again, and despite some falling off, by January, 1931, the number still was 20 per 100 milk cows. In the eastern Corn Belt States the expansion in the heifer population has been more rapid since 1926, and in 1930 and 1931 stood at about 21 per 100 milk cows or above any other year since 1920. In the western Corn Belt States the proportion of heifers to milk cows is characteristically rather high and stable. In the Mountain and Pacific Coast States a high proportion of heifers has accompanied the marked expansion in the number of milk cows. In Washington, Oregon, and California the proportion of heifers has risen to 24 per 100 milk cows. In the other Western States there has been no marked trend in the heifer population, but the ratio continues at the high level of 22 per 100 milk cows. Although there were some decreases in the number of heifers 1 and 2 years old being kept for milk in 1931, the number was still above the average for the period since 1920.

The number of heifers being kept for milk cows under 1 year old, on the other hand, is small. Estimates of heifer calves of this age being kept for milk have been made since January 1, 1925. On January 1, 1931, there were 20 heifers under 1 year old per 100 milk cows. This was considerably less than the number in this age group in 1930 and was the lowest ratio for any of the six years for which the data have been collected. The actual number as well as the ratio of these heifers to milk cows decreased in 1931. This decrease points to a smaller number to come into milk in 1932 than in 1930 or than there are likely to be in 1931. The small number of heifers under 1 year old being kept for milk should not be taken as conclusive evidence that the dairy-cow population will have a downward trend for the next few years, although it does reflect farmers' immediate response to the low prices of 1930.

In the longer time trend of the number of cows the relation of prices of dairy products to feed, and other costs and the comparative incomes to be derived from dairying and other enterprises will probably be of dominating importance rather than the level of prices of dairy products alone. Considerations of prospective developments in these situations lead to the conclusion that numbers of milk cows are likely to be kept at high levels during the next few years, particularly in areas of surplus feed production, although numbers may not be entirely maintained in deficit feed producing areas.

PRODUCTION AND SALE OF MILK PER COW

The quantity of milk and butterfat appearing in commercial channels depends not only on the number of milk cows on farms, but on the quantity of milk produced per cow and the proportion of the total production that is sold. Over a period of years there has been a gradual increase in production of milk per cow. Recently this in-

crease has been most marked in parts of the western Corn Belt. As there continues to be an increase in the number of heifers of improved dairy breeds, this upward trend will probably continue to be important.

The high level of production of milk per cow in the fall of 1930 and the early months of 1931 was due in part to the low price of grain, which encouraged feeding, especially in sections that have a surplus of grain. As the production of grain was greatly reduced by the drought in 1930 a substantial increase in production is to be expected in 1931. In the summer of 1930 milk production was reduced sharply by very poor pastures. (Fig. 7.) The hay shortage was also acute. For this reason the full effect of the increasing number of cows was not felt. With prices likely to remain favorable to feeding and with an increase of about 2½ per cent above last year in the number of cows on farms, it is to be expected that production will

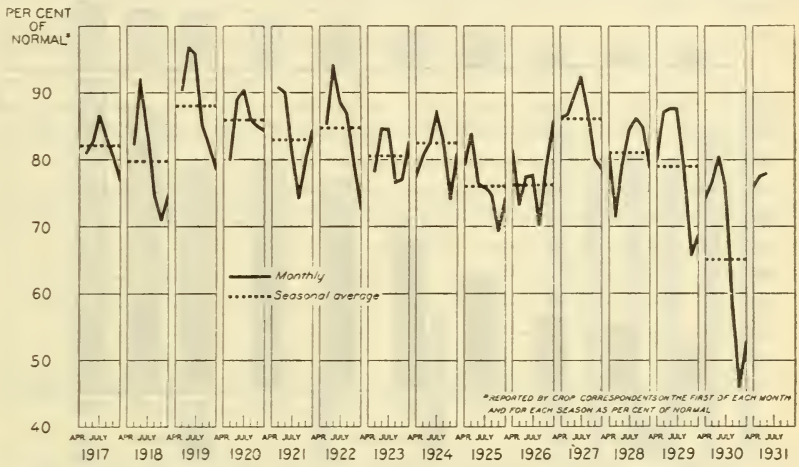

FIGURE 7.—CONDITION OF PASTURES IN DAIRY STATES, SEASONS OF 1917–1930

Summer milk production is strongly influenced by pasture conditions. In 1930 pasture conditions were exceptionaly unfavorable.

continue on a fairly high level unless pastures become unusually poor.

An important proportion of the total milk goes to calves. In this country about 9,000,000 cows are kept for beef production only. These are usually allowed to raise their calves, but many of them are milked whenever the price of butterfat is sufficiently high or whenever the returns from other farm products are so low that farmers are pressed for additional revenue. In addition there are nearly 22,000,000 cows that are milked for at least a part of each year. Many of these have calves running with them for a portion of each season and in many cases the cows are only partially milked by hand, the remainder of the milk being secured by the calves. Reports from special dairy correspondents to the Bureau of Agricultural Economics showed that on June 1, 1931, about 15 per cent of the milk secreted by milk cows was being sucked by calves and in addition about 4 per cent of the drawn milk was being fed. With beef prices

on the downward phase of the cycle and with incomes from other farm enterprises greatly reduced, it is to be expected that a larger than average proportion of all cows will be milked in the next few years.

OUTPUT OF DAIRY PRODUCTS

Dairy production in the United States generally has had a marked upward trend during the last 30 to 50 years as indicated by estimates of production in census years. (Figs. 8 and 9.) Milk production has increased from slightly over 5,000,000,000 gallons in 1889 to about 9,000,000,000 gallons in 1924, the greatest absolute increases occurring in the periods 1889 to 1899 and 1919 to 1924. Total butter production in census years increased steadily from 1849 to 1909, and,

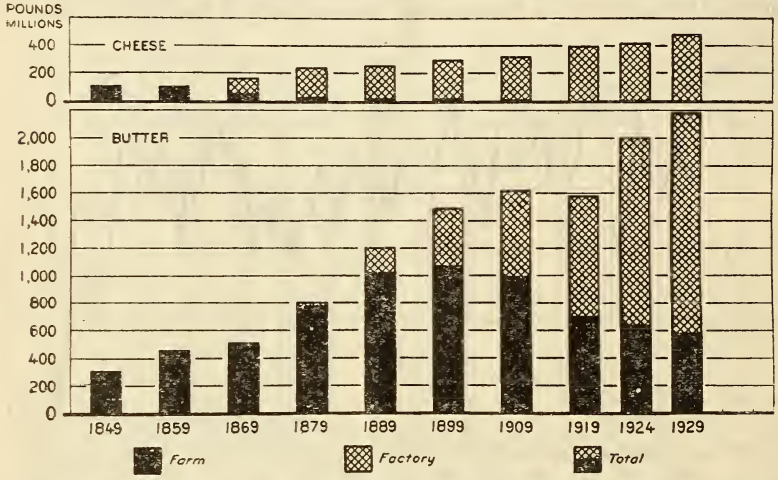

FIGURE 8.—PRODUCTION OF FARM AND FACTORY CHEESE AND BUTTER, UNITED STATES, 1849–1929

Total butter production in the United States according to census data has shown a steady upward trend. The peak of farm butter production was reached in 1899; since then farm production has been declining. Factory butter production has increased throughout the period. Farm cheese production, as indicated by census data, has shown a downward trend, and in comparison with factory production is now negligible. The production of factory cheese, as indicated by census data, has shown an upward trend. The magnitude of the upward trend in factory production is much greater than the decline in farm production.

after a decrease for 1919, it again turned upward. Production of cheese increased gradually during the period 1879 to 1929. Total production of condensed and evaporated milk was greater for each successive census period from 1899 to 1919, a large increase taking place in the period 1914 to 1919. Production dropped sharply in the period 1919 to 1925, then increased to 1929.

Annual estimates of the Bureau of Agricultural Economics also indicate that the trends of factory production of butter, cheese, condensed and evaporated milk, and ice cream have all been upward since 1918. Butter, cheese, and condensed and evaporated milk, for which data are available, all showed decreases in production in 1930. Although the annual estimate shows that butter production was less in 1930 than in 1929 (fig. 10), monthly data show that production

of butter in January, May, November, and December of 1930 was higher than in the corresponding months of 1929. Indications are, therefore, that 1930 production of butter, and probably the production of other dairy products also, would have exceeded the production of 1929 had it not been for the curtailment caused by the drought.

The upward trend in the production of dairy products has been associated with the upward trend in numbers of milk cows, though the increase in production of dairy products has been at a more rapid rate, indicating an increasing output per cow. Deviations from trend in the output of dairy products are probably attributable mainly to changes in feeding.

Although the output of dairy products generally has shown an upward trend, variations are apparent in the production of specific products. Of the various types of cheese, American whole-milk cheese is by far the most important and dominates variations in

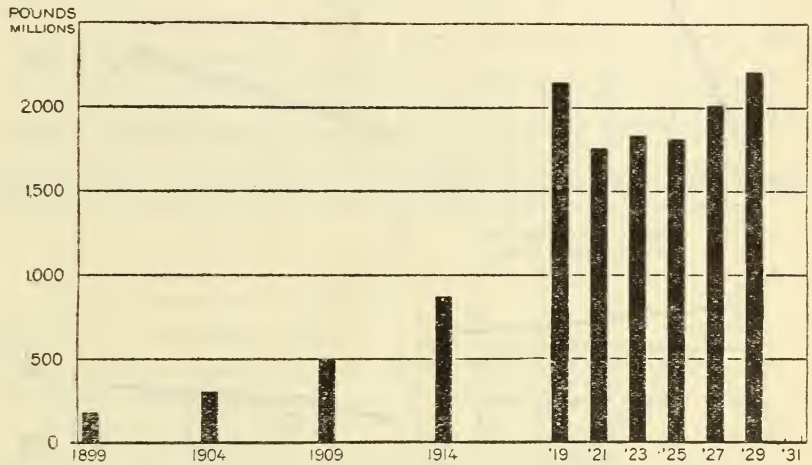

FIGURE 9.—CONDENSED AND EVAPORATED MILK PRODUCTION IN THE UNITED STATES

Total production of condensed and evaporated milk, as indicated by census data, increased through 1919. Production dropped sharply 1921–1925 and then increased through 1929.

total cheese production. (Fig. 11.) The production of cottage and cream types of cheese has had the same upward trend since 1918 as has American. (Fig. 12.) On the other hand, the production of brick-type cheese has had a steady downward trend during this period, and the production of Italian types had a downward trend to 1925, but a marked upward trend in the period 1925 to 1929. The production of Swiss-type cheese had an upward trend to 1923 and a downward trend from 1923 to 1929.

The production of evaporated whole milk has shown an upward trend since 1918, as has the production of evaporated and condensed skimmed milk, while the trend of production of condensed whole milk has been downward. (Fig. 13.)

The production of ice cream has practically doubled since 1918. A pronounced seasonal variation is one of the characteristics of ice cream production. (Fig. 14.)

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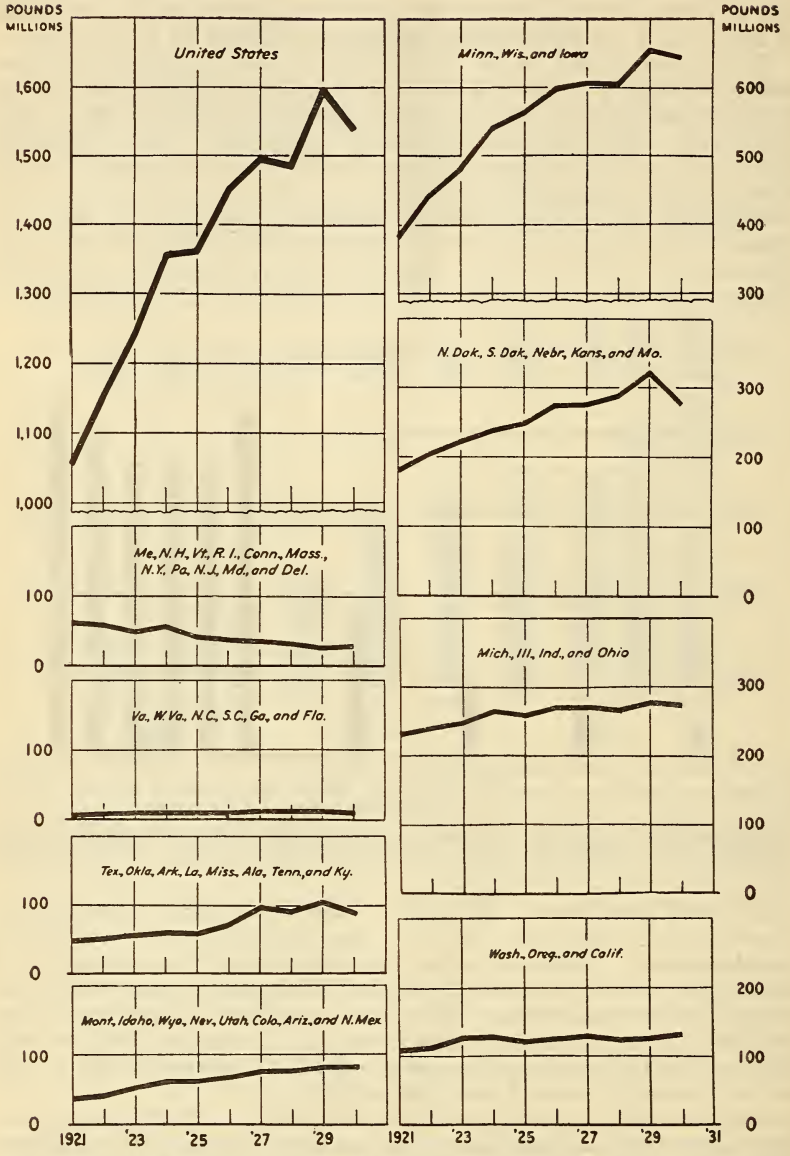

FIGURE 10.—PRODUCTION OF CREAMERY BUTTER BY REGIONS, 1921–1930

Factory production of butter has increased since 1921 in all regions of the country except the northeastern States.

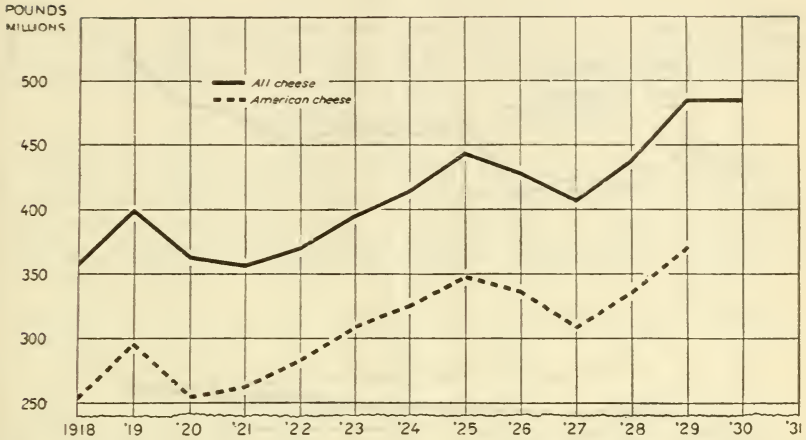

FIGURE 11.—FACTORY PRODUCTION OF ALL CHEESE AND OF AMERICAN (WHOLE-MILK) CHEESE IN THE UNITED STATES, 1918–1930

American whole-milk cheese is the most important type produced in the United States and constitutes about 75 per cent of total cheese production. Production of American whole-milk cheese had an upward trend in the period 1917 to 1929.

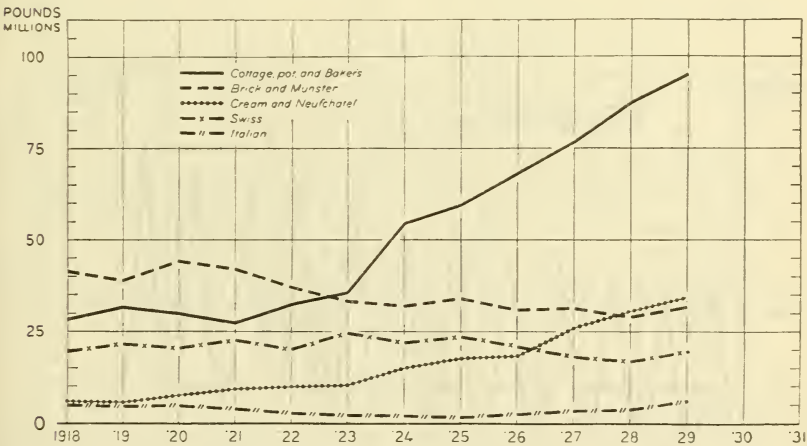

FIGURE 12.—FACTORY PRODUCTION OF CHEESE BY SPECIFIED VARIETIES, UNITED STATES, 1918–1929

Factory production of cottage cheese and cream and Neufchatel cheese has had upward trends since 1918. The production of brick and Munster cheese has decreased slightly. The production of Swiss cheese has remained relatively constant during the whole period since 1918, but declined from 1925 through 1928 and increased in 1929. The production of Italian types of cheese declined until 1924, but has increased steadily since then.

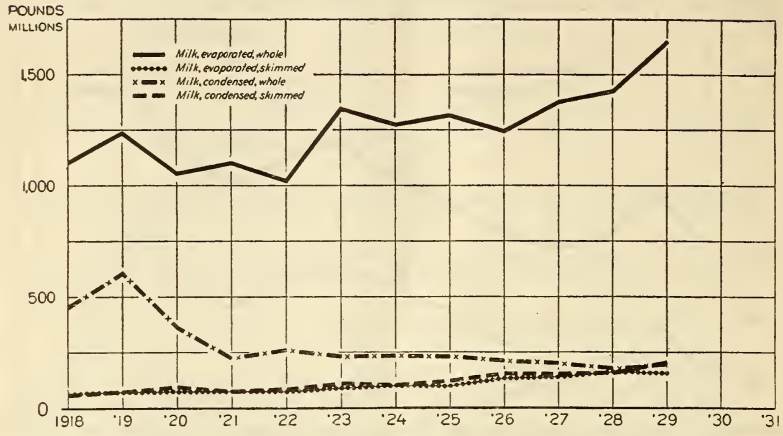

FIGURE 13.—EVAPORATED AND CONDENSED MILK PRODUCTION IN THE UNITED STATES, 1918–1929

The production of evaporated whole milk has been irregularly upward since 1922, but the production of condensed whole milk has been downward since 1919. Production of condensed and evaporated skimmed milk has had steady upward trends throughout the period since 1918.

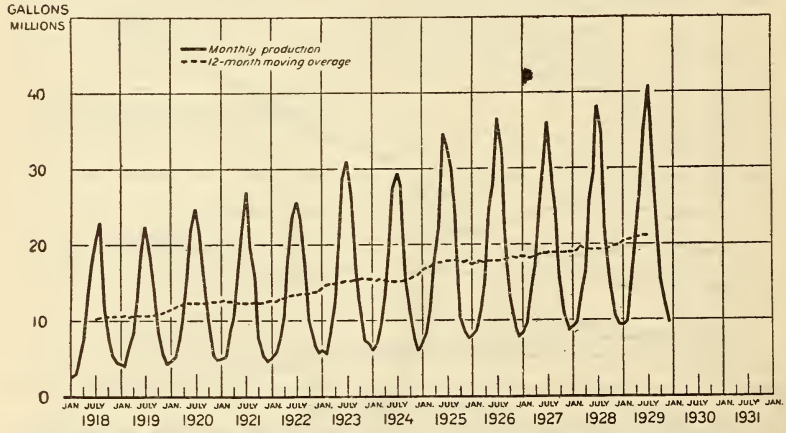

FIGURE 14.—ICE CREAM PRODUCTION, UNITED STATES, 1918–1929

Ice-cream production since 1918 shows a definite upward trend with extreme seasonal variations.

Receipts of fluid milk and cream at New York, Philadelphia, and Boston have had upward trends, but in 1930 receipts at New York decreased materially, and receipts at Philadelphia decreased slightly. Data for Boston are incomplete, but receipts in 1930 were well above those in 1926. (Fig. 15.) The decrease in receipts at New York and Philadelphia is probably to be explained mainly by decreased demand accompanying the decreased consumer incomes.

LONG-TIME TREND OF PRICES

Prices of dairy products declined sharply from late 1929 well into 1931. This decline is the most severe that has occurred since 1921, and in comparison with it the decline in retail prices of commodities farmers buy has been slight. (Fig. 16.) Price declines such as occurred in 1930 emphasize the necessity of considering the

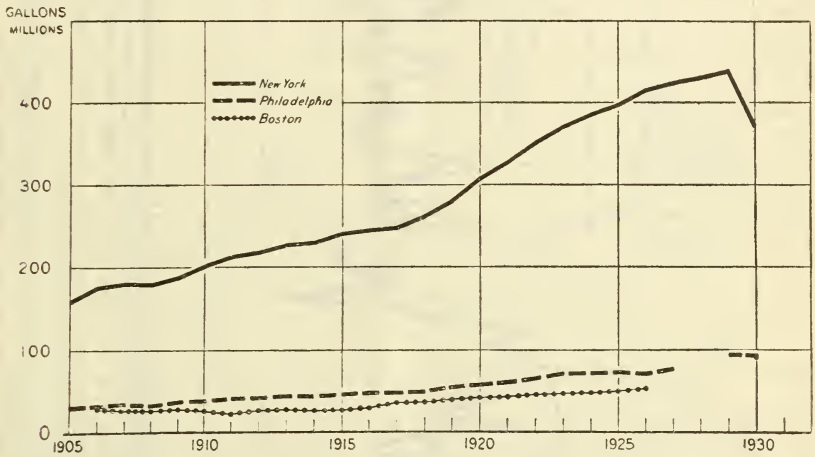

FIGURE 15.—MARKET MILK RECEIPTS IN NEW YORK, PHILADELPHIA, AND BOSTON, 1905–1930

Market receipts of milk and cream at New York, Philadelphia, and Boston have shown steady upward trends since 1905, but receipts at New York dropped sharply in 1930, apparently reflecting the lower consumer demand for the year.

probable future course of prices in adjusting dairy production. Ordinarily adjustments in dairy production must be gradual if losses are to be avoided. For this reason it is necessary for dairy producers to consider the probable course of prices for a period of years ahead.

A review of prices since 1840 shows certain characteristics of their long-time movements. The long-time trends in the prices of butter and cheese are similar to those in the level of commodity prices in general. (Fig. 17.) During the Civil War period commodity prices rose to high levels, and this was associated with a rise in prices of both butter and cheese. Following that time war commodity prices fell sharply until 1879 and then declined more gradually until about 1896. Prices of butter and cheese had similar movements through this period. From 1897 to the World War period the trends of these prices were upward, and during the war period

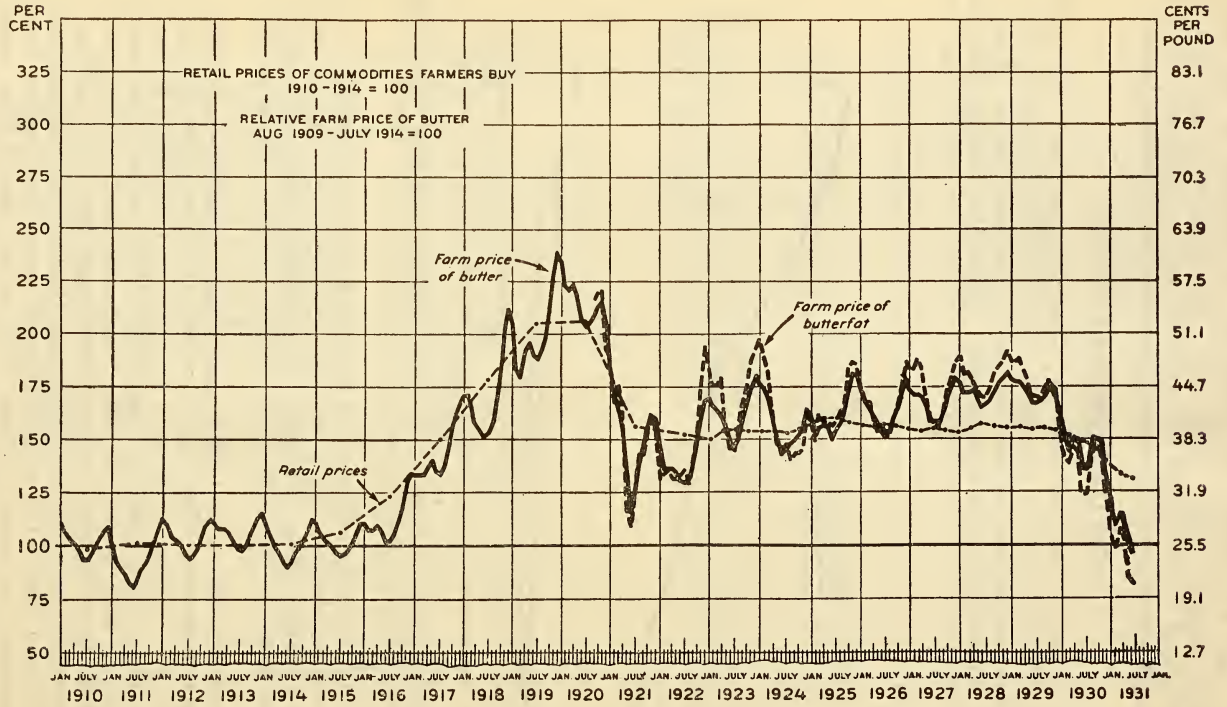

FIGURE 16.—FARM PRICES OF BUTTER AND BUTTERFAT AND INDEX NUMBERS OF RETAIL PRICES OF COMMODITIES FARMERS BUY

From the depression period of 1921 until 1929 farm prices of butter and butterfat rose gradually, whereas the retail prices of commodities farmers buy were relatively stable. In 1930 prices received for butter and butterfat fell sharply, but prices farmers pay for the things they buy fell only slightly. This has curtailed farmers' buying power severely.

prices of butter and cheese, as of other commodities, rose to high levels. In 1920 drastic declines in the prices of butter and cheese accompanied the drastic decline in the general level of commodity prices. With the period of business prosperity following 1921 commodity prices recovered moderately and then turned downward again. When the world business depression got under way in the latter part of 1929 commodity prices began another sharp decline. This decline has of course affected prices of butter and cheese. By June, 1931, the index of general commodity prices was down practically to the 1910–1914 average, whereas from 1921 to 1929 the index was about 40 to 50 per cent above this level. If commodity price levels continue

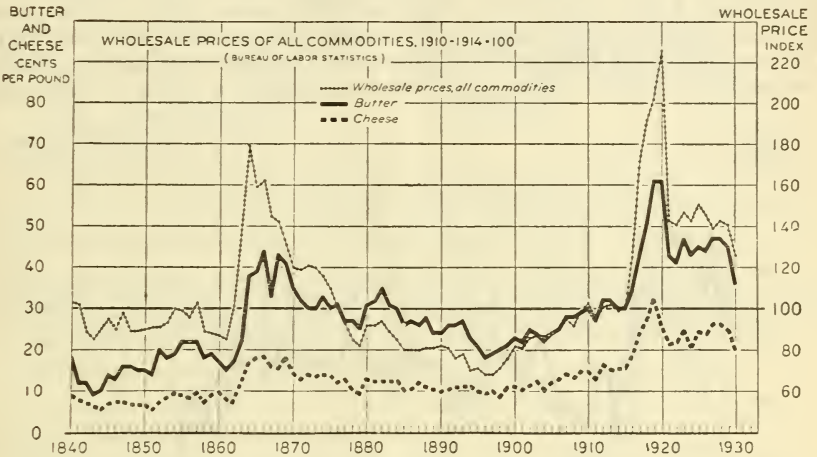

FIGURE 17.—PRICES OF BUTTER AND CHEESE AT NEW YORK AND INDEX NUMBERS OF WHOLESALE PRICES OF ALL COMMODITIES, 1840–1930

The long-time trends in butter and cheese prices result from long-time trends in the general price level. Following the Civil War, prices of both butter and cheese fell sharply, as did the general price level, until 1879, and then gradually until 1896. Since the World War commodity price levels have had a downward trend.

to have a long-time downward trend as they did for a number of years following the Civil War, this will influence the trends in prices of dairy products. Some improvement in commodity prices is to be expected when business improves.

EFFECT OF CONSUMERS' INCOMES ON PRICES

For short periods, incomes of consumers have a strong influence on the prices of butter. This is evident from Figure 18, in which the price of butter is compared with an index number of pay rolls, by months from 1919 to date. The moderate decrease in payrolls resulting from the business recession in 1924 and the severe declines in pay rolls accompanying the depressions of 1921 and 1929–30 had corresponding influences on the price of butter. When the recovery in business gets under way and pay rolls increase, it is to be expected that prices of butter will improve even though butter production should make some moderate increase.

COMPARISON OF PRICES OF DAIRY PRODUCTS WITH PRICES OF FEED AND PRICES OF MEAT ANIMALS

Changes in the price relationship between feed and dairy products affect the profitableness of dairy production. Changes in the relationship between prices of dairy products and meat animals reflect the relative profitableness of dairying and meat production. During the World War farm prices of grain and meat animals rose earlier and more rapidly than did prices of dairy products, and butter production remained constant. (Fig. 19.)

In 1920 and 1921, when the decline in prices occurred, farm prices of meat animals and grain declined earlier and fell further than did the prices of dairy products. For the three years 1921 to 1923 prices of dairy products were low as compared with prices in the war years, but were high as compared with prices of grain and meat animals. During this period dairy production increased rapidly. The price

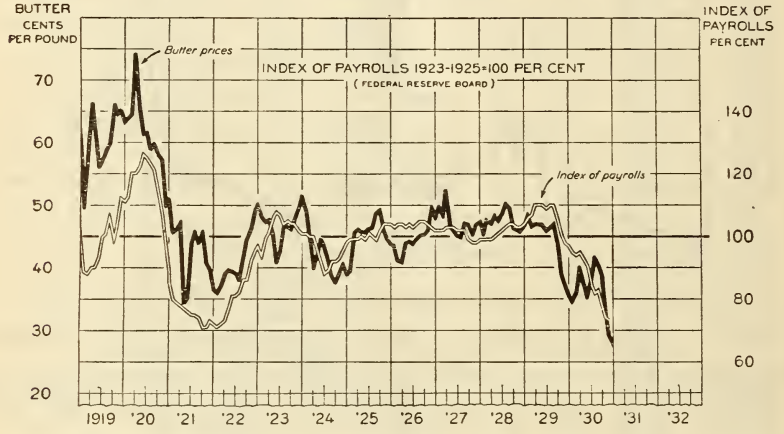

FIGURE 18.—PRICES OF 92-SCORE BUTTER AT NEW YORK AND INDEX OF PAY ROLLS, 1919–1931, BOTH CORRECTED FOR SEASONAL VARIATION

The decline in consumer incomes, reflected by a decline in pay rolls, was largely responsible for the decline in butter prices in 1930. When pay rolls increase following the present depression the butter market will probably improve somewhat.

declines in 1929 and 1930 were somewhat similar to those in 1920. Grain prices declined earlier and further than prices of dairy products.

For the next few years it is probable that even though prices of dairy products continue low in comparison with prices from 1925 to 1929, they will still be relatively high in comparison with farm prices of grain.

The number of pounds of butter equal in value to 100 pounds of live steer and 100 pounds of live hog are shown in Figure 20. The cyclical movement in the number of pounds of butter equal in value to 100 pounds of steer is explained almost entirely by the cycle in steer prices. From 1921 to 1926 steer prices were low as compared with butter prices, but in 1928 steer prices rose to unusually high levels in comparison with butter prices. The number of cattle is now increasing. As market supplies increase the incentive to shift from dairy to beef production is likely to diminish. The relation

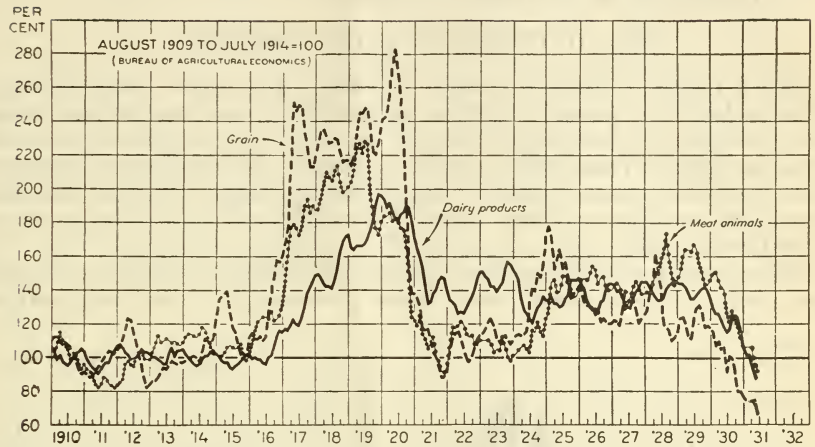

FIGURE 19.—FARM PRICES OF DAIRY PRODUCTS, MEAT ANIMALS, AND GRAIN, 1910–1931

When prices of dairy products are high in relation to grain prices there is a tendency to expand dairy output. There is also a tendency to shift between dairy and other livestock enterprises as one or the other becomes more profitable. At present prices, both meat animals and dairy products are high in comparison with prices for grain, and this will tend to encourage dairying.

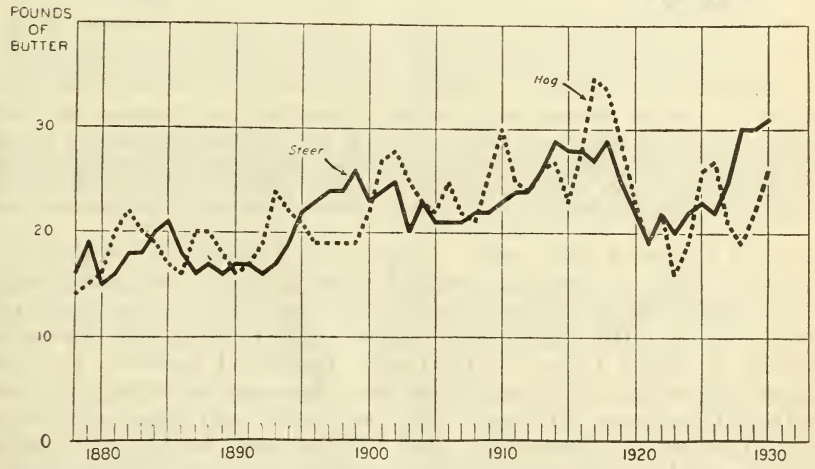

FIGURE 20.—BUTTER EQUIVALENT IN PRICE TO 100 POUNDS OF LIVE STEER OR LIVE HOG, 1878–1930

Throughout most of the last decade steer and hog prices were low in terms of butter. With the rise in beef prices in 1928 and the sharp drop in butter prices in 1930 the relationship was reversed. The increase in the number of cattle now under way makes it doubtful that steer prices will continue sufficiently high, as compared with those of butter, to cause any long-continued shift from dairying to beef production.

between butter prices and hog prices is less regular than that between butter and steer prices, and the influence that hog prices may have on dairy production in the future is not clear.

RETAIL PRICES OF DAIRY PRODUCTS

Retail prices of butter, cheese, and fluid milk have behaved very differently in the present depression, and their movements have been quite different for several years. (Fig. 21.) In the general upward price movement from 1913 to 1920 the trends of retail prices of these three products were similar. For 1920 the index number for the retail price of milk was 188, butter 183, and cheese 188, in comparison with 100 for 1913.

When retail prices declined during the deflation period of 1920 and 1921, prices of butter and cheese declined first and fell further

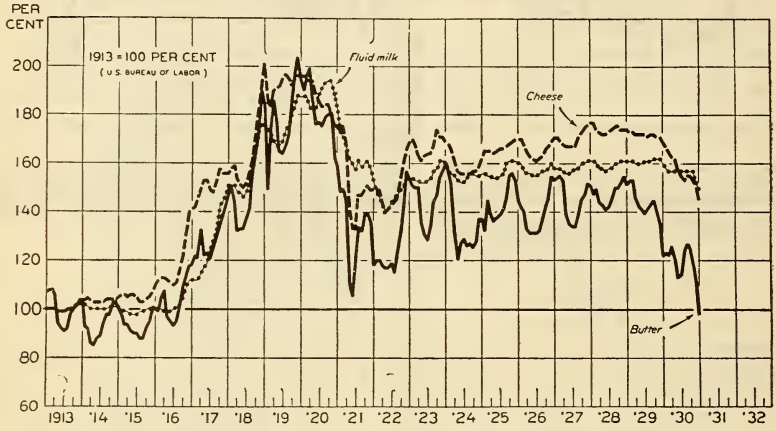

FIGURE 21.—RETAIL PRICES OF FLUID MILK, BUTTER, AND CHEESE, 1913–1931

Retail prices of fluid milk were relatively stable in 1923 to 1930 and were high in comparison with butter prices, but not so high relative to pre-war relationships as were cheese prices. In the present depression butter prices fell first, then cheese prices, and finally fluid-milk prices. This was the same order in which they fell in 1920. At the beginning of 1931 the margin between milk prices and butter prices was unusually wide.

than did prices of fluid milk. Cheese prices recovered in 1922 and continued high, as compared with fluid-milk prices, until the latter part of 1930. Retail prices of butter have remained low as compared with prices of milk. During the seven years 1923 to 1930 the index number of retail prices of fluid-milk fluctuated between 152 and 162 per cent of the 1913 level while the index number of butter prices fluctuated between 111 and 160 per cent, and that of cheese prices fluctuated between 150 and 177 per cent of the 1913 level. Comparatively high retail prices of meats, increased import duties on foreign cheese, and the sustained business prosperity of the period were probably factors helping to maintain the comparatively high prices for cheese.

Butter prices behave quite differently from prices of other dairy products, and this difference deserves particular attention. In view of the comparative ease of transporting and storing butter and the

large quantity consumed, dairy surpluses tend to be converted into butter. The result is that the butter market must bear the brunt of excess supplies caused by overproduction or by depressions that reduce consumer demand. This is the reason butter prices react so soon and to such a degree in periods of depression. Other manufactured products such as cheese tend to react next, and prices of fluid milk react still more slowly and in some cases not at all. In the present depression the index number of butter prices fell from over 150 in late 1928 to less than 100 by the beginning of 1931. The cheese index number was around 175 in late 1928, and it held nearly steady until the beginning of 1930, then fell to around 145 by the beginning of 1931. The fluid-milk index number, which had been 160 in late 1928, rose a little in 1929, and was still almost 150 by the beginning of 1931. Eventually these prices get into adjustment

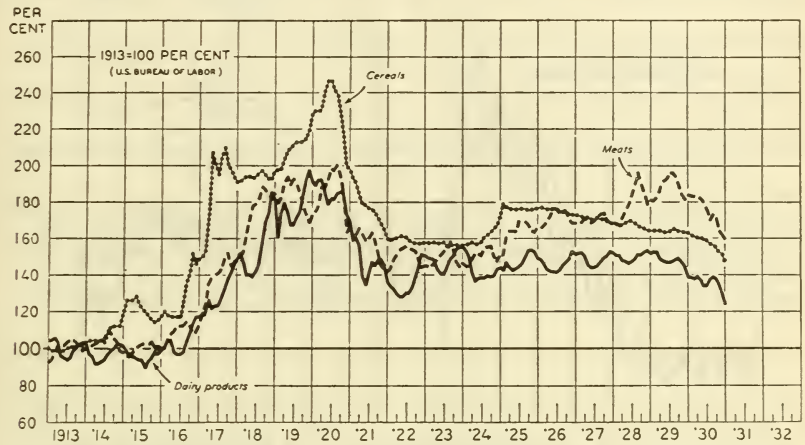

FIGURE 22.—RETAIL PRICES OF DAIRY PRODUCTS, MEATS, AND CEREALS, 1913–1931

Since 1924 retail prices of dairy products have been lower in comparison with retail prices of cereals and meats than they were in the pre-war period. Production of dairy products increased while the total number of cattle was decreasing and causing meat prices to rise. Retail prices of cereals are probably influenced to a large extent by prices paid for branded cereal foods. Changes in the charges for retail distribution of these commodities since the pre-war period are apparently responsible in part for differences in the relative levels of these retail prices as compared with the prices of dairy products, meat animals, and grains.

again, but after the 1920–21 decline the cheese index number did not reach the milk index number until 1922, and the butter index number did not overtake the other two until almost the beginning of 1923.

As compared with that of retail prices of meats and cereals the combined index number of retail prices of dairy products has been low since the early part of 1924. (Fig. 22.) This probably reflects in part the expansion in dairying since the World War and the high price of meat animals during recent years, but there appears to have been a change in the retail margins of these products as compared with those during the pre-war period. The relation between prices of dairy products and cereals is probably to be explained in part by the influence that branded products have on the index number of retail prices of cereal products. A comparison between the retail

prices of butter, all dairy products, and all food products (fig. 23), shows that during most of the postwar period prices of dairy products were low in comparison with all items of food and that butter prices were lower than the average of all dairy products.

TREND OF PER CAPITA CONSUMPTION OF DAIRY PRODUCTS

Per capita consumption of dairy products is materially higher than it was during the World War and during the following depression. This increase appears most marked when consumption in recent peak years is compared with that in the war years or in the depression years of 1920 and 1921. Undoubtedly the period of business prosperity with high consumer incomes in the last decade has contributed in an important degree to this rise, but per capita consumption in recent low years has been substantially higher than in

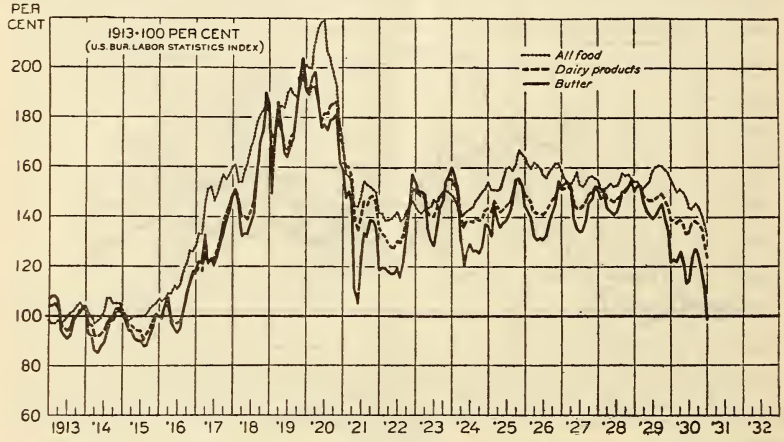

FIGURE 23.—RETAIL PRICES OF ALL FOOD, DAIRY PRODUCTS, AND BUTTER, 1913–1931

Retail prices of all dairy products have been low in comparison with retail prices of all food during most of the postwar period. Butter prices have been lower than the average of all dairy products.

the previous low years. The extent to which per capita consumption may have been decreased in the war period is not clear, however, so it is not certain to what extent the subsequent increase may represent a long-time trend that can be expected to continue and to what extent it may represent a recovery from a subnormal level of consumption.

EFFECT OF INCOMES ON EXPENDITURES FOR DAIRY PRODUCTS

Expenditures for dairy products increase when industrial activity is high and decline when it is low. This is clearly shown in Figures 24 and 25, in which an index of industrial production is compared with estimates of expenditures arrived at by multiplying monthly average retail prices by trade output (apparent consumption) of butter, cheese, and condensed and evaporated milk. Normal seasonal variations have been eliminated from each of the series used in these comparisons.

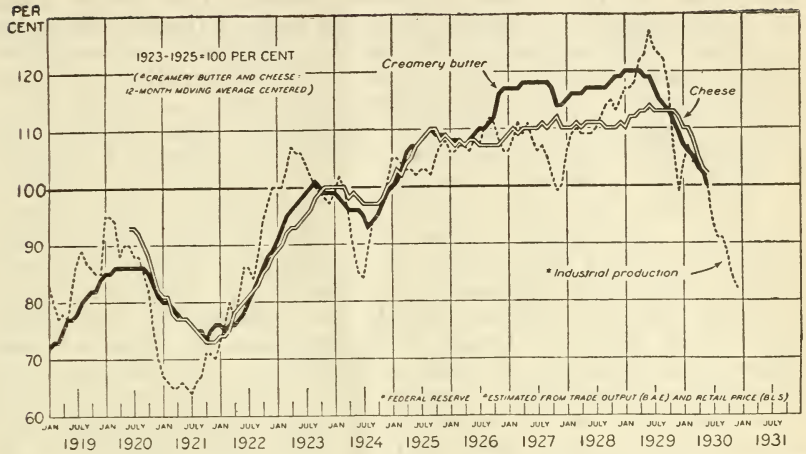

FIGURE 24.—MONEY SPENT BY CONSUMERS FOR CREAMERY BUTTER AND FOR CHEESE, AND INDUSTRIAL PRODUCTION, 1919–1930

In times of depression, when incomes of consumers are low, expenditures for butter and cheese are reduced. Prices must be reduced if the same volume is to be moved into consumption. Prior to the depression, expenditures rose more rapidly for butter than for cheese, and when the depression came expenditures for butter declined first. When business improves consumers can be expected to increase their expenditures for these commodities, and either to take larger quantities at the same price or be willing to pay higher prices for the same quantities.

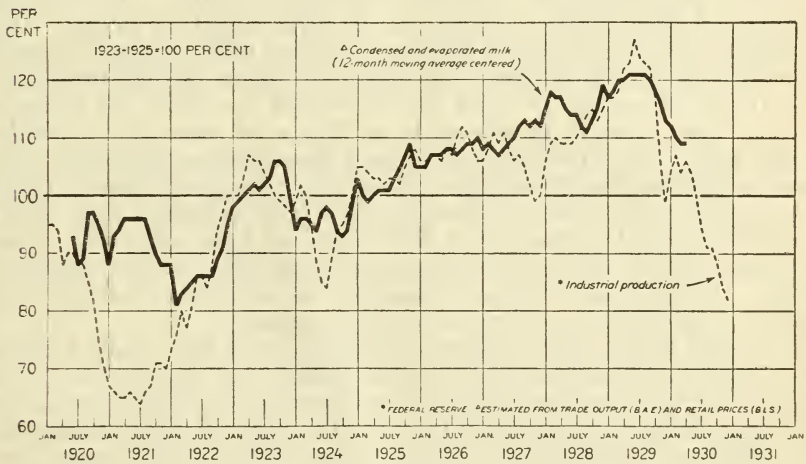

FIGURE 25.—MONEY SPENT BY CONSUMERS FOR CONDENSED AND EVAPORATED MILK, AND INDUSTRIAL PRODUCTION, 1920–1930

The amount of money spent by consumers for condensed and evaporated milk varies somewhat with changes in business conditions as reflected by the index of industrial production. Expenditures for these commodities were not reduced so much proportionately in the depression of 1921 as were expenditures for butter.

Fluctuations in expenditures for creamery butter are greater than those in expenditures for either cheese or condensed and evaporated milk. In part these differences appear to be due to differences in the amounts of money spent for each of these commodities and in part they appear to be due to differences in consumers' reactions respecting each of the products during periods of prosperity and depression. Total expenditures for butter are much larger than for cheese or condensed and evaporated milk. When their incomes are high consumers increase their expenditures for butter, but when their incomes are low they tend to curtail their expenditures for butter and either reduce their purchases or buy only at lower prices. During the period from 1926 through 1929 expenditures for cheese did not increase proportionately with expenditures for butter, and as the depression got under way in 1930 expenditures for cheese did not fall so rapidly as expenditures for butter. Prior to 1926, however, changes in expenditures for these two commodities were similar. In 1921 expenditures for condensed and evaporated milk held rather constant until the depression had passed its low point, and in the present depression expenditures for these products did not start downward so quickly as expenditures for butter. Studies of consumer demand show that consumers with low incomes tend to use more condensed and evaporated milk than do consumers with high incomes. When incomes are reduced, many consumers who in prosperous times use fluid milk and cream turn to condensed or evaporated milk.

EFFECT OF PRICES AND INCOMES ON CONSUMPTION

With the probability of continued large production of milk, the problems of distribution require increasing attention. Part of the problem of distribution consists in the adjustment of prices. If a lowering of prices of certain products, such as milk, will not increase consumption, then producers will gain nothing from such procedure. But if the lowering of milk prices would be likely to increase consumption, it might be advisable to dispose of some of the surplus in this way. The attitude of dairymen toward price changes should therefore be based on the effects of these price changes on consumption.

A number of studies have been made which indicated that within ordinary limits the demand for fluid milk has been relatively inelastic; that is, prices have appeared to have little effect on the quantities taken. Possibly, however, such conclusions need modification when applied to periods of reduced consumer incomes.

In a joint study of the Bureau of Agricultural Economics and the New Jersey Agricultural Experiment Station, as well as in several other studies, it was found that the consumption of milk among the different groups varied directly with the size of family incomes. The effect on consumption was more noticeable in the lower than in the higher ranges of consumers' incomes. In a study that the bureau is now making of consumption in Baltimore it appears that consumption, at least in the form of milk used for children, varies according to consumer incomes. These findings suggest that reactions to price may not be the same when incomes of a large proportion of the consumers have been lowered as they were when incomes were on a higher level.

Further evidence on this point is being gathered in a study being made in metropolitan Boston through the cooperation of the New England Dairy and Food Council, the Massachusetts Agricultural College, the Massachusetts State Department of Agriculture, the University of New Hampshire, the New England Research Council, and the Bureau of Agricultural Economics. Observations of the data made prior to the complete tabulations indicate that the consumption of milk has been adversely affected by unemployment, and are suggestive at least that this influence may have been offset to some extent in November and December of 1930 by reductions in the retail price of fluid milk.

These studies have not progressed far enough to be conclusive, but they emphasize the necessity in such a time as the present for examining carefully the bases for distribution practices in order that the various avenues of distribution may be kept in the most satisfactory balance. In addition, it is necessary to have a more comprehensive understanding of the numerous factors other than price which influence consumption if efforts to improve the outlet for dairy products are to be most effective.

FOREIGN COMPETITION AND DEMAND

Production and consumption of dairy products are on the whole more closely balanced in the United States than in any other important dairy country. Nevertheless, each branch of the dairy industry is affected to some extent by foreign competition and demand. The domestic producer is interested in the foreign situation from three points of view. Do foreign markets provide a promising outlet for our surplus products? Are foreign producers likely to compete seriously in the domestic market? Finally, with the recent tariff in effect, is there an opportunity to increase materially the domestic output of those dairy products that heretofore have been imported to a large extent? The problems are different for each class of products.

The long-time trend of exports of dairy products has been downward since about 1880. (Fig. 26.) Imports became larger than exports in the 10 years prior to the World War, and since 1920 imports have again exceeded exports. In the war period imports fell, and exports, particularly those of concentrated milk, were large. The peak of the butter-export movement was reached in 1879–80, when exports amounted to 39,237,000 pounds. Exports of cheese reached a peak the following season, when they amounted to 147,996,000 pounds. Imports exceeded exports of cheese in 1902–3 (fig. 26), and of butter in 1913–14. In the war period exports rose rapidly, and the total exports of condensed milk, butter, and cheese in terms of milk equivalent was higher in 1919 than at the peak of the export movement that came about 1880. Since 1920 there has been a persistent tendency toward increasing imports. In the long-time trend, then, exports have on the whole, been falling, and imports have been tending to increase.

Imports of all dairy products in 1930 were equivalent to approximately 933,000,000 pounds of milk, and exports were equivalent to 216,000,000 pounds of milk. The excess of imports over exports amounted to 717,000,000 pounds, or less than 1 per cent of the

domestic production. In terms of their milk equivalent, cheese constituted 73 per cent of the 1930 imports, milk and cream 19 per cent, butter 5 per cent, and condensed, evaporated, and powdered milk 3 per cent. Exports from the United States were principally condensed, evaporated, and powdered milk. These products amounted to over 60 per cent of the total exports in 1930. Butter amounted to 30 per cent and cheese to 10 per cent of the total.

The foreign butter situation needs to be examined from both the export and import points of view. Foreign supplies have been increasing very rapidly. Exports from 16 principal countries constitute an index to foreign commercial production. (Fig. 27.) Exports from these countries rose steadily from 1880 to the beginning of the World War. The war caused exports to fall, but since 1920 the trend has been upward even more sharply than it was in the

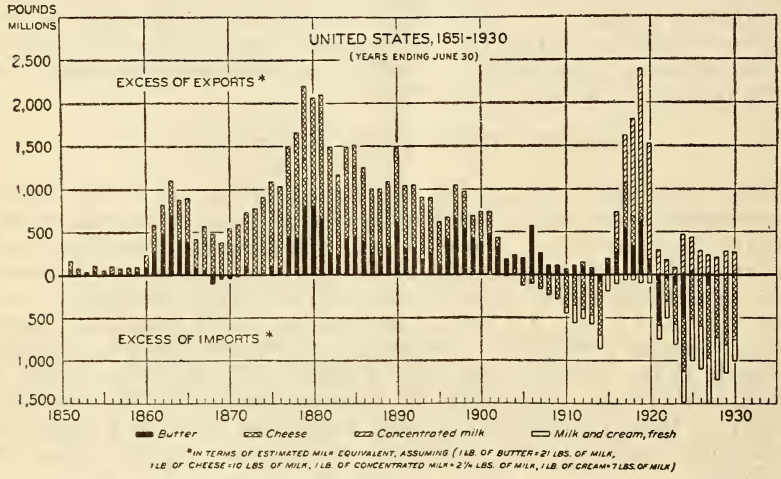

FIGURE 26.—EXCESS OF EXPORTS OR IMPORTS OF DAIRY PRODUCTS

Total exports of butter and cheese reached a peak about 1880, then declined gradually until 1914. Large quantities of dairy products, predominantly of concentrated milk, were exported during the war. Since the war imports have exceeded exports. Concentrated milk has comprised the bulk of the exports. Imports have been mainly of cheese, although imports of fresh cream and milk were important until recently.

pre-war period, and in 1929 exports of butter were approximately 50 per cent higher than in the period 1910–1915. The United Kingdom and Germany are the two largest markets for butter from foreign surplus-producing countries. The United Kingdom takes a great deal more butter than Germany, but imports into both countries have grown rapidly in recent years and are far above their pre-war peaks. (Fig. 28.) With most of the world's surplus production being sent to these two countries, however, their demands have been amply supplied.

In addition to the rapid increase in supplies of butter, the production of margarine now exceeds that of commercial butter in Europe as a whole. Apparently the production of margarine and the production of butter were about equal in 1924, but since then production of margarine has risen the more rapidly of the two. In Europe outside of Russia the production and consumption of margarine is

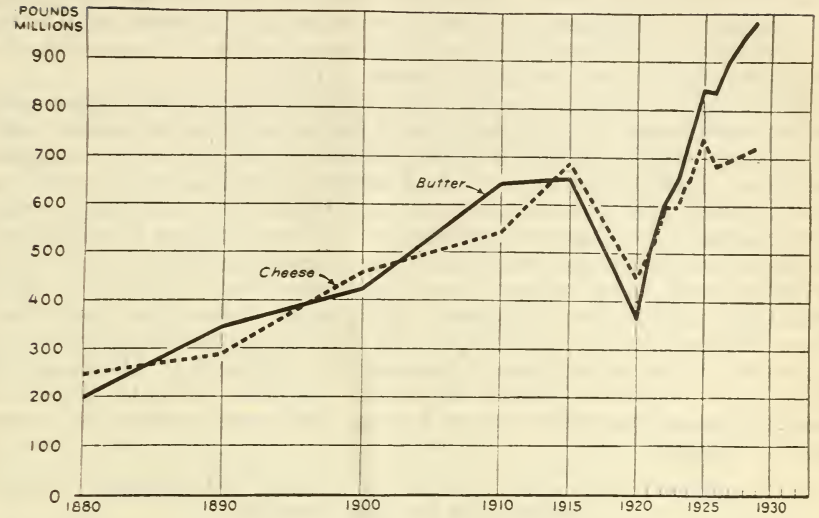

FIGURE 27.—BUTTER AND CHEESE EXPORTS OF 16 PRINCIPAL COUNTRIES

Total exports of butter and cheese from 16 principal countries furnish an index to foreign commercial production. These exports have a pronounced upward trend. Since the interruption caused by the war, the trend has been sharply upward, especially for butter. Since 1920 the rapid increase in foreign production has caused foreign supplies to press almost continuously on the American market.

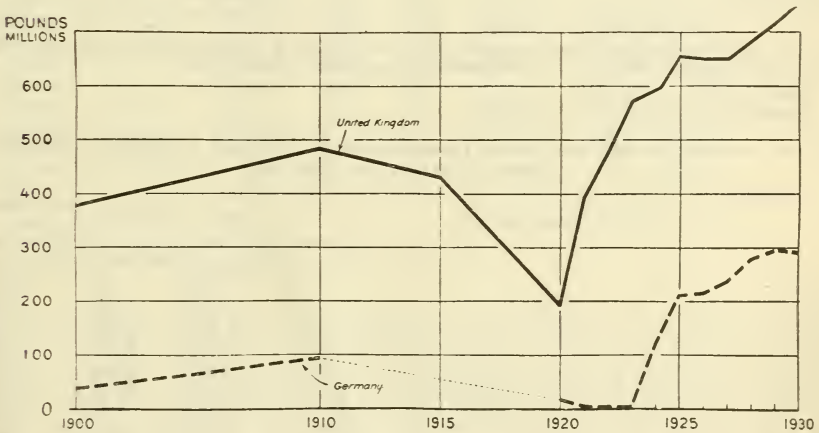

FIGURE 28.—IMPORTS OF BUTTER INTO THE UNITED KINGDOM AND GERMANY

The United Kingdom and Germany are the principal deficit butter-producing areas of Europe, and their imports closely reflect the world's commercial supply. For a time during and after the war, Germany was virtually out of the market for foreign butter, but has since recovered to a new high level of importation. Imports into the United Kingdom are also far above the pre-war level.

approximately equal to the production of butter plus imports from the Southern Hemisphere and from Russia. In the Scandinavian countries and the butter-exporting countries of Europe generally, consumption of margarine greatly exceeds that of butter, and even in Germany and Great Britain the consumption of margarine is becoming about equal to that of butter. (Table 1.)

With the European markets so well supplied with butter and butter substitutes, it is not surprising that American producers have found they could sell their butter to better advantage in the domestic markets. Ordinarily exports to Europe have been very small in recent years, and this country has not been able to develop other foreign markets of great importance. In fact, it was Europe that attracted the increased exports in the years from 1916 to 1920, and in other years when exports have been more than usual, as in 1923 and 1925, the increase has gone to Europe. Countries other than those of Europe have provided a fairly regular but limited outlet for some of the butter from this country. (Table 2.) Obviously if these other countries offered important markets we could expect to meet as severe competition from foreign producers in them as is now met in Europe.

TABLE 1.—*Estimated per capita consumption of butter and margarine in specified countries for years indicated*

Country	Year	Butter	Margarine
		Pounds	*Pounds*
Denmark	1927	12.2	45.2
Sweden	1926	18.6	15.4
Norway	1927	9.6	34.3
Netherlands	1927	12.6	17.9
Germany	1928	19.7	15.9
Great Britain	1927	16.0	[1] 13.3
Canada	1928	29.3	[2]
Australia	1928	29.8	[2]
New Zealand	Av. 1926–1928	34.1	[2]
United States	1928	17.3	2.7

Supplement to Handbook of Dairy Statistics, U. S. Department of Agriculture, April, 1930, and "The Margarine Industry of Europe," U. S. Department of Commerce, February, 1930.

[1] Figure for 1928.
[2] Negligible or, as in the case of Canada, nil.

TABLE 2.—*Total exports of butter from United States, and to Europe and other countries, 1912–13 to 1929–30*

Year beginning July 1	Total	To Europe	Other countries
	1,000 pounds	*1,000 pounds*	*1,000 pounds*
1912–13	3,586	1	3,585
1913–14	3,694	737	2,957
1914–15	9,851	3,340	6,511
1915–16	13,487	6,622	6,865
1916–17	26,835	20,955	5,880
1917–18	17,736	14,253	3,483
1918–19	33,740	29,675	4,065
1919–20	27,156	19,696	7,460
1920–21	7,829	89	7,740
1921–22	7,512	577	6,935
1922–23	9,410	3,412	5,998
1923–24	5,425	65	5,360
1924–25	8,384	2,679	5,705
1925–26	5,280	1	5,279
1926–27	5,048	3	5,045
1927–28	3,965	20	3,945
1928–29	3,778	9	3,769
1929–30	2,954	39	2,915
July–March, 1929–30	2,780		
July–March, 1930–31	1,698		

Division of Statistical and Historical Research, Bureau of Agricultural Economics.

Not only has the United States failed to maintain its position in supplying butter to foreign markets, but, prior to the recent marked decline in domestic prices, foreign butter has pressed almost continually on the American market. (Fig. 29.) Throughout the post-war period it has required repeated increases in the tariff to hold imports in check. The imports that do come in are largely of high-quality butter from Denmark and New Zealand. (Table 3.) The United States market ordinarily demands high-quality butter, and requirements as to quality have probably increased during recent years. The successive increases in the tariff alone, however, would have tended to keep out the lower grades of butter, which have a low value per pound. Imports from Denmark and New Zealand that amounted to only 25 per cent of the total for the period 1910–1914 rose to almost 80 per cent by 1929–30. During recent years imports from New Zealand have been larger than those from Denmark. The New Zealand exporting season comes when production is low in this country and domestic prices are at the high point of the year.

TABLE 3.—*Total imports of butter into the United States and percentage from Denmark and New Zealand, average, 1910–1914 and annual, 1919–20 to 1929–30, with tariff rates per pound in effect during the period*

Year beginning July 1	Total imports	Percentage of total			United States tariff rates per pound with dates of change		Approximate ad valorem rate [1]
		From Denmark	From New Zealand	From Denmark and New Zealand			
Average:	*1,000 pounds*	*Per cent*	*Per cent*	*Per cent*	*Cents*	*Date effective*	*Per cent*
1910–1914	2,480	15.2	10.0	25.2	2.5	Oct. 4, 1913	11.0
1919–20	20,771	33.8		33.8			4.8
1920–21	34,344	66.5	3.9	70.4	6.0	May 28, 1921	5.4
1921–22	9,551	30.2	8.8	39.0			17.6
1922–23	15,772	47.0	24.6	71.6	8.0	Sept. 22, 1922	21.7
1923–24	29,466	35.5	17.1	52.6			22.0
1924–25	7,189	11.7	27.6	39.3			22.5
1925–26	6,440	13.6	34.7	48.3	12.0	Apr. 1, 1926	21.9
1926–27	10,710	14.3	34.4	48.7			35.5
1927–28	4,955	15.3	48.4	63.7			34.5
1928–29	3,299	27.4	50.7	78.1			32.0
1929–30	2,851	39.0	40.0	79.0	14.0	June 18, 1930	34.3
July-December:							
1929	979						30.8
1930	600						44.4

Division of Statistical and Historical Research.

[1] Calculated from declared value of imports.

Summarizing the foreign situation for butter, it is found that the foreign markets are limited and that they have been amply supplied with butter and butter substitutes. As a result, foreign prices have not been attractive to American producers, and exports have been insignificant in comparison with total production. Moreover, it has taken repeated increases in the tariff rates to hold the imports of foreign butter in check. Although domestic prices have fallen to the world level recently, the prospect of regularly exporting butter is not promising. (Fig. 30.)

It is clear that American producers must face more severe competition than they have been willing to face in recent years if this country is to export butter as a regular practice. The foreign

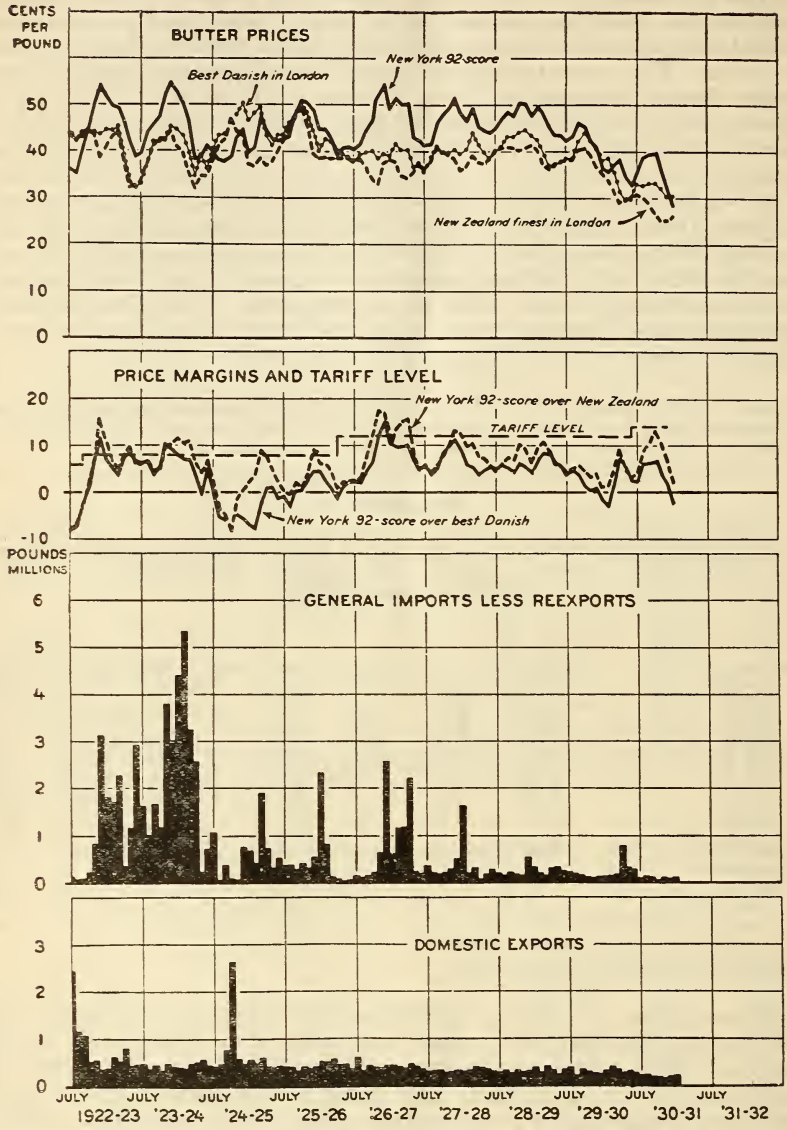

FIGURE 29.—PRICES, PRICE MARGINS, TARIFF LEVEL, IMPORTS, AND EXPORTS OF BUTTER

Butter imports and exports tend to fluctuate in volume directly with the relative prices in domestic and foreign markets. Since the war butter has been imported whenever the price margin of domestic over foreign prices has been about equal to or in excess of the prevailing tariff rate. Butter has been exported when foreign prices materially exceeded domestic prices.

market appears to offer nothing more than an outlet for temporary surpluses. From this point of view it is very significant that our season of surplus production comes at a time when supplies from countries of the Southern Hemisphere, particularly New Zealand, are seasonally low. When domestic demand is unusually low it may be found advisable to export butter in our surplus-producing months. When domestic demand improves, however, producers will probably find their best markets in the United States.

It is from the standpoint of competition that the domestic cheese producer is interested in the foreign situation. This country became a net importer of cheese in 1902–03. For the year 1929–30, cheese constituted only 10 per cent of the small exports of dairy products, but it constituted 73 per cent of the imports of dairy products.

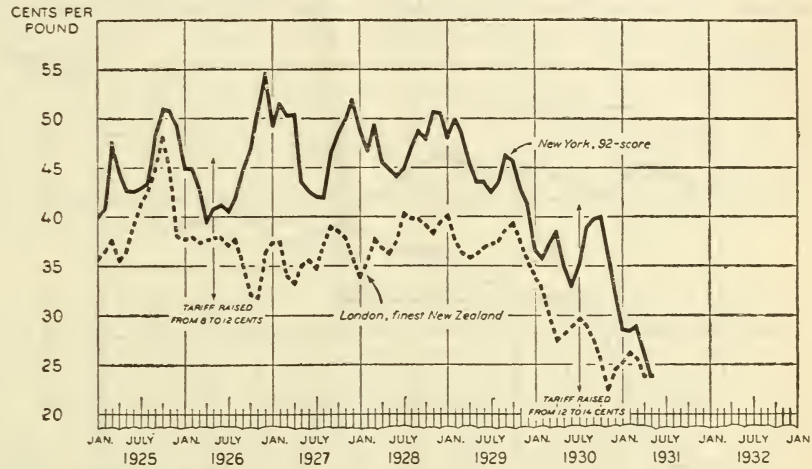

FIGURE 30.—MONTHLY AVERAGE PRICES OF BUTTER IN NEW YORK AND LONDON, 1925–1930

As compared with prices of finest New Zealand butter in London, New York prices for a similar grade have been higher by a considerable part of the import duty. The declines in 1929 and 1930 were more marked in New York than in London, and the margin between domestic and foreign prices nearly disappeared.

Imports of cheese are of the various foreign types, particularly Italian and Swiss. Even though imports have persisted despite repeated increases in the tariff, the tendency has been toward some reduction. Up to 1927 imports of Swiss cheese were increasing, and from 1925 to 1927 a part of this increase appeared to be at the expense of the domestic production of similar type cheese. (Fig. 31.) The 50 per cent increase in the tariff on Swiss cheese, levied in 1927, checked the increase in imports of this type, and in 1929 domestic production increased without a comparable increase in imports. In 1930, imports declined about 5 per cent. On Italian cheese the recent tariff changes have so far influenced imports little if at all. Imports were unusually light for several months following the change, but this probably reflected only the accumulation of excessive shipments made prior to the date of change in anticipation of the increased duty.

The important consideration from the standpoint of the domestic producer is whether there may be sufficient influence on prices over a period of years to make the production of this type of cheese more profitable. Under the present depressed conditions it is difficult to determine what influence the recent tariff change may have in the future. With the tariff checking the increase in imports, domestic producers may find it desirable to emphasize somewhat the production of foreign types of cheese.

Condensed, evaporated, or powdered milk are the principal dairy export products from this country, but the volume of exports of these products has been declining. The United States also imports dairy products of this class. Each product is in a different competitive position. The bulk of the domestic production of powdered milk is made from skimmed milk, and presumably this type furnishes the bulk of our exports of powdered milk. Whole-milk powder is

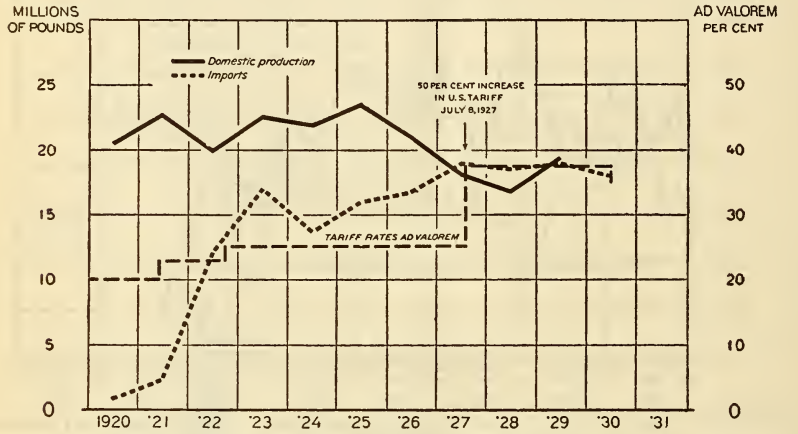

FIGURE 31.—UNITED STATES PRODUCTION, IMPORTS FROM SWITZERLAND, AND IMPORT DUTY OF SWISS CHEESE, 1920–1930

Cheese imported from Switzerland is directly competitive with production of the Swiss or Emmenthal variety in the United States. Importation tended to increase somewhat at the expense of domestic production until the import duty was raised in July, 1927. Importation appears now to have been checked, and domestic production apparently has begun to recover.

imported. With domestic prices for dairy products lower than usual in relation to foreign prices, the exportation of various forms of preserved and dehydrated milk may be stimulated. In fact exports of powdered milk have already shown an increase since prices have declined.

Imports of milk and cream were equivalent to about 20,000,000 pounds of butterfat annually for the period 1926 to 1928. These came almost entirely from Canada and have been largely eliminated by the recent upward revision of the tariff.

Domestic production of casein was increasing under the 2½ cents per pound tariff rate in effect prior to 1930. From 18,033,000 pounds in 1927, production of casein in the United States rose to 22,151,000 pounds in 1928, and to 30,537,000 pounds in 1929. In the tariff act of 1930 the duty on casein was placed at 5½ cents per pound. Imports fell from 27,583,339 pounds in 1929 to 18,499,656 pounds in

1930. The effect of the tariff was apparently much greater, however, for imports in the second half of 1930, when the new tariff was in effect, amounted to only 2,404,194 pounds, and in the first four months of 1931 they amounted to only 1,464,223 pounds. It seems obvious that the recent tariff rate will further stimulate the production of casein in the United States.

READJUSTMENTS IN THE DAIRY INDUSTRY IN UNITED STATES

The present low prices of dairy products may be expected to result in some significant readjustments in dairy production in the United States. Since conditions vary so greatly in the different sections of the country, it is necessary to consider the problems of readjustments by regions.

The developments and trends of dairying indicate the present situation and the adjustments that have already taken place and that are now taking place. An analysis of these trends shows the effect that certain situations are likely to have in the future. However, as the adjustments are made by individual farmers it is necessary to consider the problem from the individual's point of view and determine the rational readjustment that should be made in each locality in view of all the elements in the present and the prospective situation.

RECENT TRENDS

Before the local problem is discussed, the trends in dairy production in the United States in the past decade will be outlined. Farmers increased the number of cows rather regularly from 1920 to 1924 and then, after decreasing them moderately until 1927, increased them again. (Fig. 32.) Production of creamery butter increased in all but two years from 1920 to 1929 but decreased in 1930 because of the drought. The period from 1921 to 1929 was one of generally increasing prosperity, and, with improving demand, butter prices continued firm except in 1924. It was the low prices of 1924, apparently, that caused the temporary check in production.

Although the drought was undoubtedly a more important factor than the low prices in decreasing production in 1930, low prices appear to be reflected in the decreased ratio of heifers 1 to 2 years old to the number of dairy cows. The decrease shown for this ratio in 1931 suggests that farmers will not continue the expansion in numbers of dairy cows at as great a rate as they have done in the immediate past.

The ratio of the price of feeds to the price of butter and other dairy products also influences the volume of output of dairy products. Figure 33 indicates this relationship as it has worked out during the last 10 years in terms of the ratio of butter prices to a roughly approximated grain ration. When the price of feeds has been low relative to the price of butter, production of butter has increased, and when the price of feeds has been high relative to the price of butter, production has tended to decrease. Were it possible to measure this in terms of fluid-milk output, an even closer relationship would probably be disclosed, inasmuch as in the leading fluid-milk producing areas feed costs are much more a matter of direct cash outlay than they are in the butter territory. It is sig-

nificant that although prices of butter and other dairy products are low, feed prices are also low, and the conversion ratio is still not unfavorable to dairy production.

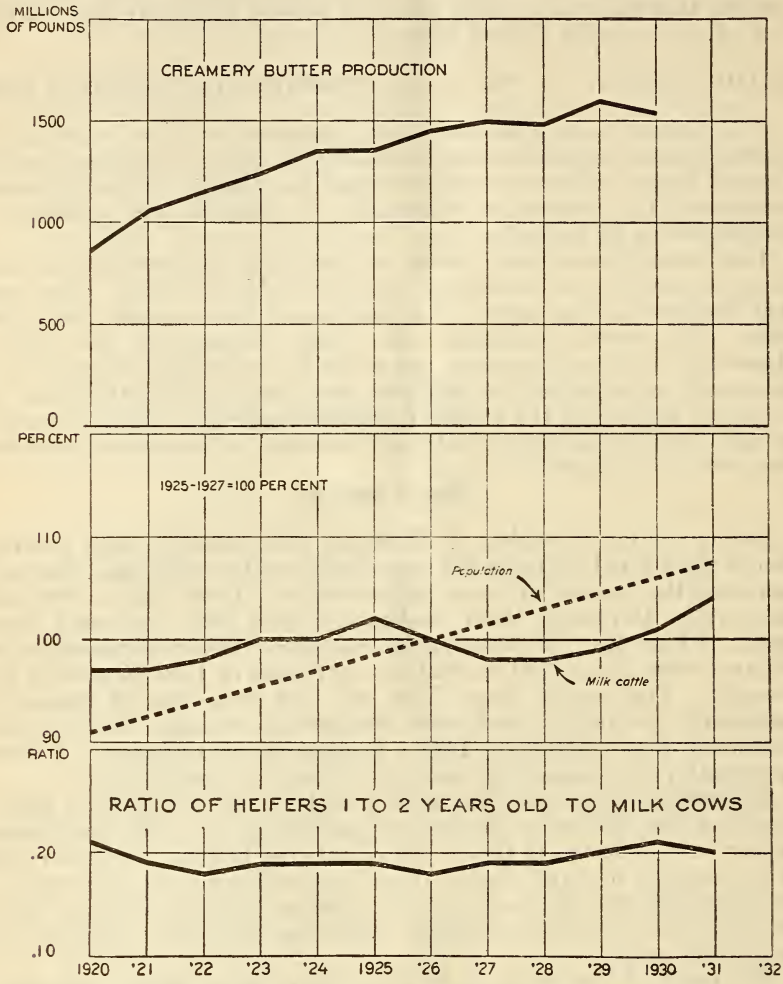

FIGURE 32.—UNITED STATES CREAMERY-BUTTER PRODUCTION, NUMBER OF MILK COWS AND HEIFERS, JANUARY 1, AND POPULATION, 1920–1931

From 1920 through 1930 the trends in United States creamery-butter production and in the number of milk cows were upward. Lower butter prices appear to have checked the increase in butter production in 1924 and to have caused a decrease in the proportion of heifers kept to the milk-cow population in 1930.

EFFECT OF GROSS FARM INCOME ON DAIRY PRODUCTION

Actual or potential gross income of farmers is another important factor governing changes in dairy output. This is brought out in Figure 34, which represents a rough calculation of farmers' gross income for the United States as a whole and for Iowa. Over against this, in the lower part of the chart, is set a representation of the

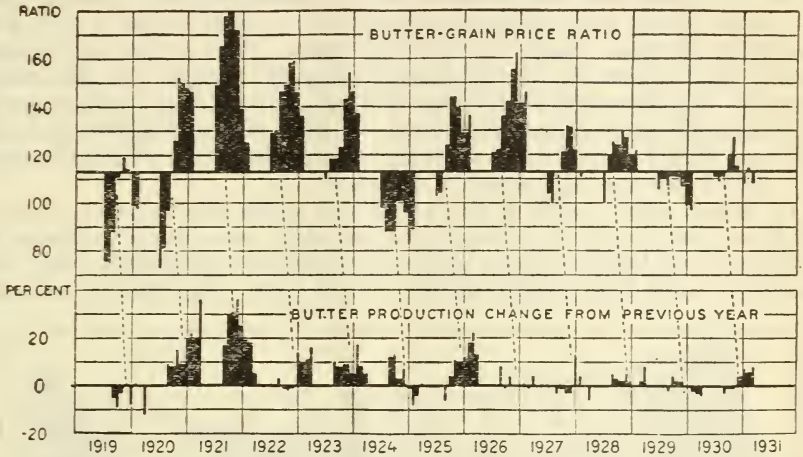

FIGURE 33.—BUTTER-GRAIN PRICE RATIO AND THE RATE OF CHANGE IN UNITED STATES CREAMERY-BUTTER PRODUCTION, 1918–1930

When the price of feed has been cheap relative to the price of butter, as in 1921–22, creamery-butter production in the United States has tended to increase at a rapid rate; but when the price of feed is high relative to that of butter, as in 1924–25, production has tended to remain unchanged or to decrease.

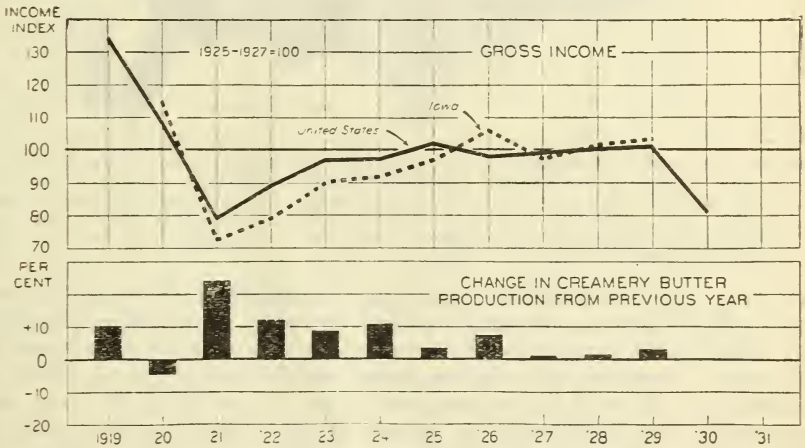

FIGURE 34.—GROSS INCOME FROM UNITED STATES AND IOWA FARM PRODUCTION AND RATE OF CHANGE IN CORN BELT CREAMERY-BUTTER PRODUCTION, 1919–1930

The marked increase in the Corn Belt creamery-butter production in 1921–22 came during a very low farm-income period. Many farmers, when hard pressed for cash income, tend to increase their dairy output.

percentage increase or decrease from each preceding year in the output of creamery butter in the important butter-producing regions represented by 10 Middlewestern States. For every year since 1918 there has been an increase in the output of creamery butter from this region with the exception of 1920, when there was a slight decrease from the 1919 volume. When the purchasing power for farmers reached its lowest point, there came the maximum increase in creamery-butter production over the preceding year. This rate of increase has, in general, declined during the period from 1921 on, which period until recently was marked by a gradual recovery in the purchasing power of farmers.

In other words, with a much reduced gross income, the farmers of this western butter region have found it necessary to depend to a larger and larger extent upon dairying to supplement their reduced incomes from other sources. This is an important considera-

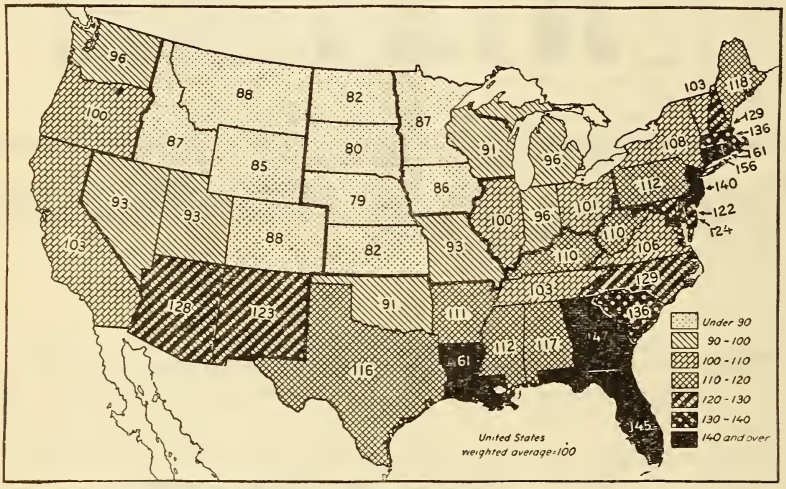

FIGURE 35.—INDEX NUMBERS OF COMPOSITE PRICES PAID PRODUCERS FOR MILK DURING THE PERIOD 1924–1928

The composite price that producers receive for milk depends upon the proportion of their milk used as market milk, upon their distance from the consuming market, and upon their volume of production. The western Corn Belt is a low-price area, and the industrialized Northeast is a high-price area.

tion in gaging the probable reactions of farmers to dairy production and to dairy prices. It appears that dairying, more generally than any other farm enterprise, is resorted to in times of depression as a means of meeting current expenses and bridging over periods of depression. It will be remembered that the milking of cows was resorted to very generally by grain farmers during the decade of the nineties, when all grain prices were at a minimum. A similar general resort to dairying was one of the conspicuous developments in States like Nebraska, Iowa, and North Dakota during the depression following 1920.

MILK PRICES BY REGIONS

Turning to the regional aspects, it is well to develop a picture of the geographic differences in the farm price of dairy products. Figure 35 shows by States the index numbers of approximate milk

prices to producers, based on the average for the period 1924 to 1928, in which 100 represents a weighted average for the United States as a whole. The minimum price was received in Nebraska and the maximum in certain Eastern and Southern States. On the whole, the lowest prices were to be found in those States in which butter production dominates the dairy industry and the highest prices in the highly specialized fluid-milk territory and in the South, where most of the sales are for fluid-milk consumption. The division of the country into groups of States in this map will be made the basis of further discussion to bring out regional trends.

REGIONAL TRENDS IN DAIRYING

Trends in production by different groups of States as reflected by the estimated numer of dairy cows during the decade under consideration are presented in Figure 36. In the upper left-hand portion of

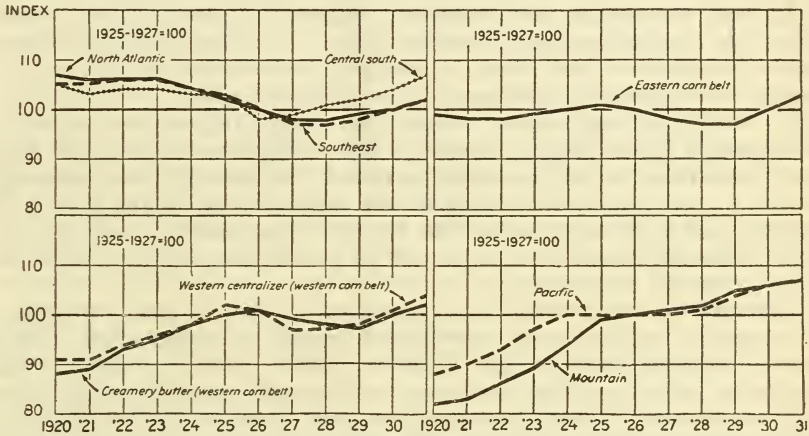

FIGURE 36.—SECTIONAL INDEX NUMBERS OF NUMBERS OF MILK COWS, JANUARY 1, 1920–1931

In this chart comparative sectional index numbers of the number of milk cows on January 1 are shown. Decreases in the index numbers in the North Atlantic and Southern States from 1920 until 1927 are in contrast to the marked increases in the index numbers in the western Corn Belt, Mountain, and Pacific States from 1920 through 1931.

this figure are charted by simple curves the changes in number of dairy cows for three regions in which the movement has on the whole been similar. The North Atlantic region includes all of the New England and Middle Atlantic States. It embraces by far the most important fluid-milk areas of the United States and includes the densest concentration of nonagricultural population. Although changes in the dairy industry as reflected by the number of cows on farms is not quite the same in all of the States of this region, the exceptions are minor, and the general trend is evident. From 1920 until 1927 there was a distinctly downward trend in the number of dairy cows, after which there was an upward movement. The same data for individual States indicate that this movement characterized approximately all of the States of this region except Maryland, Delaware, and Connecticut.

The southeastern region shows an approximately similar movement. The high point in number of cows was reached in 1922 and

the low point in 1927, and there has been a substantial increase since that time.

The central-south region including the States of the eastern half of the lower Mississippi Valley, together with Oklahoma and Texas, roughly approximating the western and northwestern portion of the Cotton Belt, shows a movement different from that of the other two regions inasmuch as the drop in the earlier part of the period was not so marked and the low point was reached a year earlier. It will also be noted that the increase has been at a higher rate and that the number in 1931 is higher than at the beginning of the decade, which is not true of the other two regions.

In the lower left-hand corner of Figure 36 two regions are represented which manifest distinctly different trends. They embrace the butter-producing phase of the dairy industry. In contrast to the regions already cited these two showed a marked upward trend during the first half of the decade, reaching highest points in 1925 and 1926; thereafter they showed a slight decline ending in 1929; after this the upward trend was resumed. Evidently quite different sets of influences have been at work in these two regions as contrasted with those in the three regions first described.

In the upper right-hand corner the single region designated as the eastern Corn Belt is shown. The variations there have been much less than in all the other parts of the country and, although showing more similarity to the butter regions than to the fluid-milk regions, the movement shows the results of a combined set of influences, some of which are important in production of fluid milk and some in butter production.

The last set of curves, those representing the Western States, is represented in the lower right-hand corner of Figure 36. These curves indicate that in the Western States dairy production has expanded more rapidly and more consistently than in other parts of the country. This expansion has been greater in the Mountain States than in those of the Pacific coast.

With these regional differences in the trend in the number of cows as a basis, as they reflect perhaps better than any other single figure the differences in the shifts of dairy production between 1920 and 1930, an effort has been made to account for the varying regional developments that have been indicated. In 1925 it looked as though there was a significant and probably permanent shift in the dairy industry out of the Eastern and Southern States and into the Middle States and the far West. The rapid rise in the number of dairy cattle from Chicago west and the tendency more and more to supply each consuming center from the western portions of the respective milk sheds seemed to indicate that competitive conditions were, for the most part, against the dairy producer in the hay and pasture portions of the country and in favor of the producer in the important grain States. Developments beginning with the middle of the decade, however, indicated that this might be only a temporary shift. In fact, the Eastern and Southern States have shared fully as conspicuously in the dairy expansion since 1927 as have the other portions of the country. They were, indeed, expanding the number of their dairy cattle in years when the butter-producing areas were slightly decreasing theirs.

The first question to ask is, Why did New England, the Middle Atlantic States, and the South decrease their production during the first half of the decade while the middle West and far West were increasing theirs? A complexity of forces was at work in different parts of the country. One or two factors in the East and South which were probably of dominant importance may be isolated. The years of the World War saw a spectacular development of the manufacture of condensed and evaporated milk in this country. Several new factories were established in the New England and Middle Atlantic States and with a very favorable export outlet, about 1919 this industry was at the height of its prosperity. Thereafter, with the shrinkage of the export outlet, this industry had to wane, and it was natural that the areas with highest feed costs should suffer most severely.

Condensed and evaporated milk manufactures in the New England States fell away rapidly following 1920. Likewise creamery-butter manufacture, which was of some importance in most of these States up to 1920, and which probably utilized more milk from that region than did the milk-canning industry, also felt the effects of serious competition in the cheap-feed areas, and the output of creamery butter in these States was rapidly reduced. Farming near the industrial sections felt the competition of high industrial wages, and the increasing demand for fluid milk and cream took an increasing proportion of the total milk production of the area.

In other words, under the conditions of prices and costs that established themselves in the early years of the decade, the Northeastern States found it necessary to restrict their dairy operations more and more to the basis of the fluid-milk and sweet-cream requirements of their urban population. The contrary situation prevailed in the Western States. There, with cheap feed and with need of supplementing income from usual sources with increased sales of dairy products, the industry had a rapid expansion. Later, when the prices of beef cattle, hogs, and other important farm commodities of this region improved, the emphasis upon dairy production was reduced, and cows kept for milking were reported in somewhat smaller numbers after 1926.

The situation in the South, where dairying has always been of minor importance, was affected largely by the dominant crop, cotton. In the earlier years of the decade, when the boll weevil was most destructive, the number of dairy cows in the South neither increased nor decreased to any noticeable extent. With readjustments in the location of cotton acreage, the improved price of cotton, and the discovery of methods of weevil control, cotton asserted itself as the main source of income, and the number of dairy cattle began to decline. With the increase in cotton acreage in the western part of the Cotton Belt and the consequent decline in price of cotton, the eastern South found it necessary to look for other enterprises, with the result that the number of dairy cattle was again increased.

The eastern Corn Belt is a region of relatively cheap feed, but it is tributary to a considerable urban population and contains such centers as Detroit and Cleveland, where the population has grown rapidly. The dairy industry in this region has become more and more dominated by the fluid-milk trade; hence although the trend in

the number of dairy cattle resembles more nearly that in the butter regions than that in the fluid-milk regions of the East, the upward trend in number of cows has not been so great.

The dominant element determining the trend of dairy cattle in the Western States is probably the growth of urban population in the Pacific Coast cities. Because of great distances and high transportation costs, this region as a whole tends to be self-sufficing in terms of dairy products. Not only do the near-by dairy areas supply the necessary fluid milk and cream for the rapidly growing cities of the coast States, but the region as a whole finds a market for its butter in these cities, and very little is either shipped in or shipped out of this region.

INFLUENCE OF FEED PRICES ON DAIRY PRODUCTION

Changes in the trends of dairy production are due, of course, to changes in plans made by individual farmers. Change in the price of the product is only part of the motive for such changes. Since the producer is primarily interested in the profit he can make, the price factor to which the farmer might be expected to react is the price of milk relative to the cost of producing milk. Since the most important variable factor in the cost of milk production is the cost of grain and concentrated feed, the producer may be expected to react in a more definite manner to changes in the milk-grain ratio than to changes in the prices received for his products or the relative price of less important factors.

The results of three studies that show the producers' reaction to changes in a milk-price grain-feed ratio are given in Figure 37. In this chart the vertical scale represents the quantity of milk shipped per shipper or individual producer in terms of an average normal to a central receiving plant through the winter season. The horizontal scale represents a 24-month average milk-grain ratio as a percentage of an average normal. The three diagonal lines represent the average relationship which has been found to exist between the relative price ratio and the quantity of milk shipped per shipper in the three regions studied.

In general, when the price of milk or butterfat is high relative to the price of grain, the quantity of milk shipped per shipper increases; when the ratio is low the quantity of milk shipped decreases. This means that the producers in these three regions watch their feed costs in relation to milk prices and vary the intensity of their feeding somewhat as the price ratio changes from time to time. The relationship as charted is the total influence of changes in the price ratio upon changes in production. This total, however, can be broken down into three rather distinct influences: (1) A short-time influence; (2) an intermediate influence; and (3) a long-time influence.

When the price of milk or the milk-grain ratio suddenly changes the producer is likely to adjust by a partial cut or increase in the quantity of grain fed, so that the influence through the first two or three months is relatively small.

If the situation continues, the farmer may make certain decided shifts within five to nine months. He may markedly change his rate of feeding and he may change the number of cows milked. Through a still longer period of time, a still more marked adjustment

may be made, since the farmer may save a larger number of young calves than usual and thus increase the size of his herd two years later.

The three curves of relationship charted in Figure 37, representing the combined short, intermediate, and long-time influences of changes in the feed ratio upon changes in milk production, will now be considered more in detail. The most elastic of the three is the Richmond curve; the least elastic is the Twin Cities curve. Why these differences?

A part of this difference is probably due to the number of shippers included in the study. In the Richmond study the shipments of 50 continuous shippers through a 10-year period was considered. In the Baltimore district the shipments of 1,200 shippers through a 7-year period was studied, and in the Twin Cities study the ship-

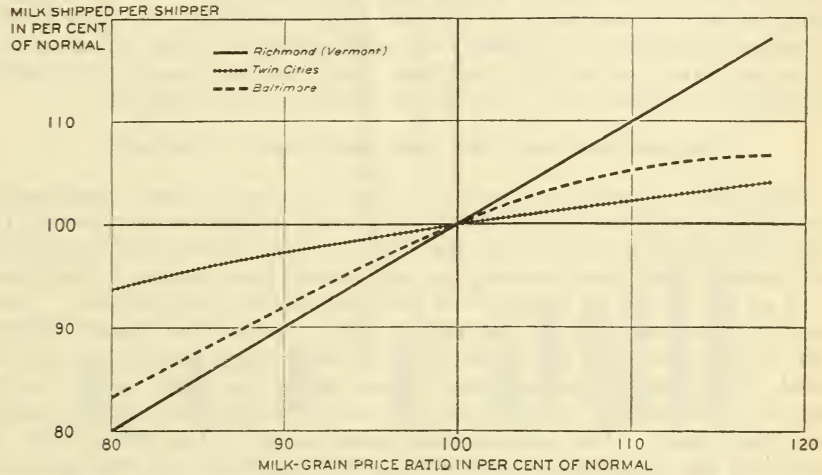

FIGURE 37.—MILK-GRAIN PRICE RATIO AND THE QUANTITY OF MILK SHIPPED PER SHIPPER IN THE WINTER SEASON IN THREE SELECTED AREAS

When the price of milk is high relative to the price of feed dairymen increase production, and when the relative price is low they decrease production. This relation is especially important through the winter season and is more marked in Vermont, where feed is shipped in, than in Minnesota, where many dairymen raise their own feed.

ments of all members of the Twin Cities Milk Producers Association through a 7-year period was considered. Since the variation in smaller units is likely to be more marked when expressed in terms of normal than the variation in much larger groups where the smaller-unit variations will tend to offset to some extent, the general order of elasticity shown by the three curves is to be expected.

A second reason for the different slopes of three curves may be found in the fact that in the Richmond area the greater portion of the grain is purchased and the type of dairying is distinctly commercial; in the Twin Cities area a great many of the farmers raise their own feed; in the Baltimore area an intermediate situation prevails.

Another question may now be asked: What proportion of the variation in milk supplies can be explained through the milk-grain price ratio? When the milk shipments considered in these three

studies were corrected for average seasonal changes, approximately 75 per cent of the remaining variation was explained by the ratio analysis when the winter period alone was considered. When the summer period is analyzed, however, the relation is not so close since milk production per cow during the summer depends not so much on the quantity of concentrated feed received as upon the kind and extent of pasture available.

Trends in dairy production, both in the past and presumably in the future, also are closely related to what is happening in the production and values of other farm commodities with which they are associated or may be associated in the farm-production program. Some of the effects of changes and regional differences in the price relationships between feeds and dairy products have been cited. Quite as important are the relations between dairying and other lines of production which might take the time of the farmer or the land he uses in producing dairy feeds and handling the dairy herd. In some instances, less of dairying means more of some other enterprise, and vice versa. In other cases the relation is such as to make dairying and some other enterprises rise and fall together.

RELATIONSHIP BETWEEN BEEF AND DAIRY ENTERPRISES

Beef-cattle production and dairying are very closely associated The degree of this association varies greatly as between regions. In the New England States, and for the most part throughout the fluid-milk areas, beef cattle occupy a very minor position, and the great bulk of the cattle on farms is of the specialized dairy breeds. This tends to be true also in the more highly specialized butter States like Wisconsin. On the other hand, a very large percentage of the total dairy output comes from areas in which there is no sharp line of demarcation, at least on the use basis, between dairy cattle and beef cattle. The usual assumption is that in the latter type of territory the relationship between dairy production and beef production is necessarily a competitive one. The farmer, it is assumed, tends to shift the use of his cattle from the production of young stock to sell as beef to their use primarily for milking, or vice versa, depending largely on the relative prices of beef and of dairy products. It is assumed that when beef prices are favorable the dual-purpose herds of the Middle West will not be used to a great extent for milking, or at any rate the milk flow from those regions will be decidedly smaller than when beef-cattle prices are low relative to butterfat prices.

The actual relationship between these two closely associated uses of the cattle is shown in Figure 38 for the country as a whole, from 1898 to 1930. The total number of cattle on farms is indicated by the curve at the top of the chart. The bars at the bottom indicate factory-butter production for the United States as reported by the census.

This period includes two major cycles in numbers of cattle. From 1900 to 1904, while numbers of cattle were increasing rapidly because of a stimulating price situation, the increase in butter output was relatively low. In the following years, however, when numbers of cattle were decreasing because of overproduction, lower prices, and

a consequent liquidation process, there was a somewhat higher rate of increase in butter production. The second cycle, beginning with 1912, shows this tendency in a more striking way. From 1912 to 1918 cattle were increasing in numbers in response to favorable prices. At the same time butter and cheese production was increasing very slowly. Following the peak, however, there was a long period of liquidation induced by falling cattle prices and during that period there was a very rapid increase in the national output of butter and cheese.

Thus far the examination seems to bear out the common assumption that if beef-cattle prices are favorable a reduced emphasis will be given to dairy production, particularly by those who are in position to produce beef. But it should be noted that while the curve representing the number of cattle rises and falls, reflecting substan-

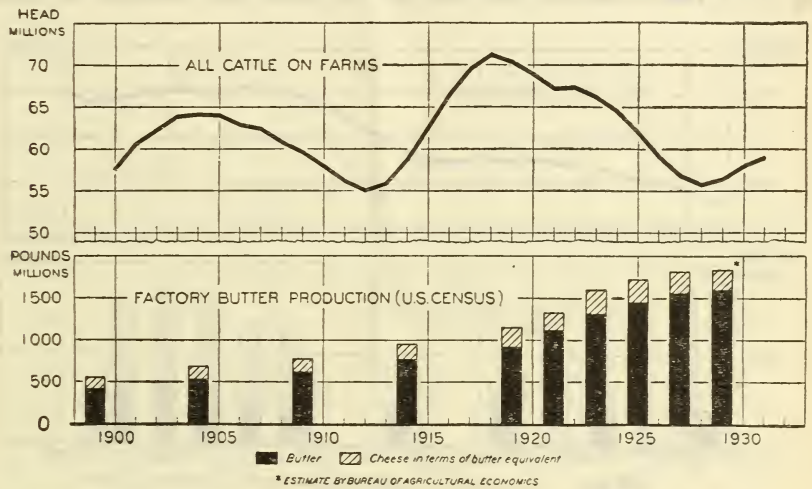

FIGURE 38.—ALL CATTLE ON FARMS AND UNITED STATES FACTORY PRODUCTION OF BUTTER AND CHEESE, 1899–1931

Although there have been two distinct cycles in cattle numbers since 1899, United States creamery-butter production has steadily increased. There is a tendency, however, for the rate of increase to slow up when cattle prices are high and cattle numbers are beginning to increase.

tial changes in the total number of cattle in the country, butter and cheese production has been higher at each successive census period, although the rate of increase has varied. Each successive cattle cycle has evidently left dairy production at a permanently higher level.

Similar comparisons may be made on the basis of certain important butter-producing States. Figure 39 shows for Wisconsin the same things as were shown in Figure 38 for the country as a whole. It is a specialized dairy State, outside the region of most abundant corn production, and it has a pasture and cropping system particularly conducive to dairy production. The number of cattle in the State has not followed the national trend but has established, rather definitely a trend of its own. There have been no major reductions in numbers; instead a fairly steady upward climb is evident. Likewise the production of butter and cheese

in this State has been more steadily upward than for the country as a whole. The levelling off, indicated since 1923, coincides with the cessation of increase in the number of cattle, and was affected in all probability by an increasing demand for fluid milk occasioned by the growth of population in the Chicago and Milwaukee metropolitan areas.

Iowa, on the contrary, displays quite a different cattle trend and a somewhat different showing in the production of butter and cheese. (Fig. 40.) The number of cattle in this State is evidently affected by about the same set of factors that determines the rise and fall in the number of cattle for the country as a whole. At least in the past it has been predominantly a beef-cattle rather than a dairy State. There was a marked liquidation during the declining phase of the cycle, beginning about 1900; and although following 1912 there was not the marked increase and decrease in num-

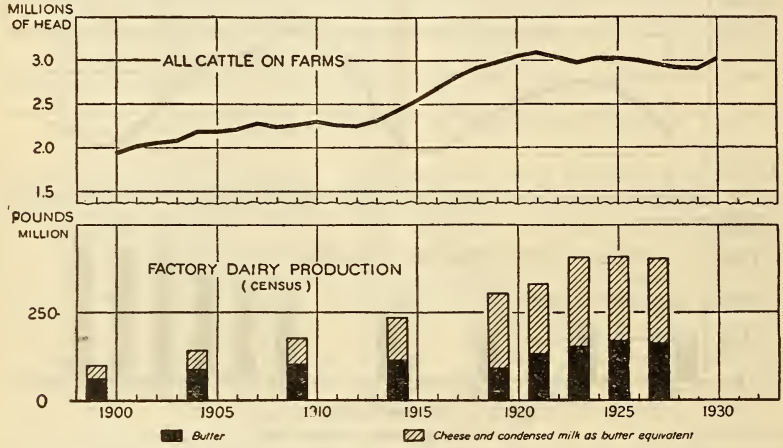

FIGURE 39.—ALL CATTLE ON WISCONSIN FARMS AND WISCONSIN FACTORY PRODUCTION OF BUTTER, CHEESE, AND CONDENSED MILK, 1899–1930

In a specialized dairy State like Wisconsin, with a farm pasture and cropping system especially conducive to dairy production, the trends in the number of all cattle and in dairy production have both been upward since 1899.

bers displayed in the country as a whole, nevertheless the cycle is clearly discernible. Here, again, the increase in butter output was least marked in periods of rising cattle prices. In fact, in both the early cycle and the later one, there was a slight actual decline as shown by the census figures. The striking thing is the substantial increase in butter production during the past period of beef-cattle liquidation, roughly from 1921 forward.

The question still to be settled relates to the repetition of these relationships in the future. Evidence points to a growth in the number of beef cattle during the next few years. Will this check the expansion in butter production for the country as a whole? This must be answered in terms of what is likely to happen in the various regions.

FUTURE READJUSTMENTS

The fluid-milk region will have its output gaged largely by increase in population and per capita rate of consumption. It would

seem reasonable to expect Wisconsin to continue its expansion on the basis of butter, cheese, and fluid milk to the extent that agriculture in general may expand in that State. It is not so clear what is likely to happen in Iowa and similar butter-producing States where dairying, up to the present, has occupied a minor position as compared with meat-animal production. It is hardly to be expected that there will be a reduction in butter output in view of all of the elements in the present and prospective future situation. Prices of alternative products are not so favorable as to make for a gross income large enough to relieve the pressure upon dairy production as an important supplementary source of income. It is characteristic not only of the western Corn Belt but of the older portions of the Wheat Belt that when depressed prices of the more important commodities reduce incomes alarmingly, dairying has been resorted to as an emergency measure. To a considerable extent the future volume of dairy pro-

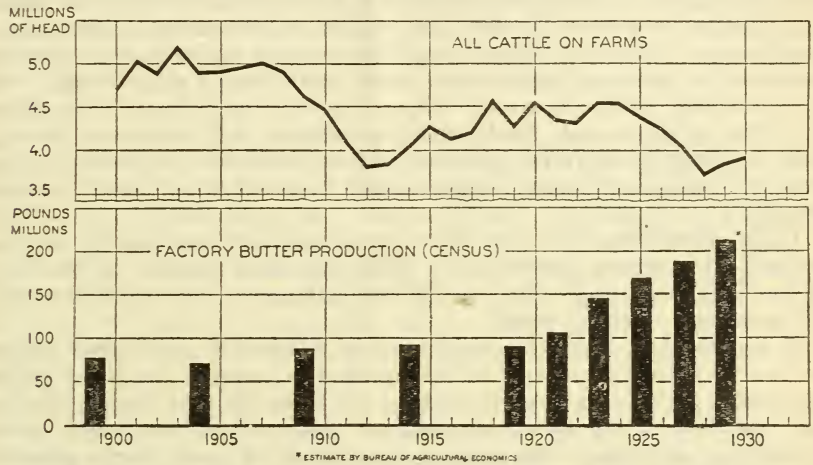

FIGURE 40.—ALL CATTLE ON IOWA FARMS AND IOWA FACTORY PRODUCTION OF BUTTER, 1899–1930

In Iowa, where beef cattle are as important as dairy cattle, factory-butter production since 1899 has remained unchanged or decreased during periods of high beef prices and increasing cattle numbers and has increased during periods of low beef prices and decreasing cattle numbers.

duction in these regions depends upon the extent to which readjustments in other parts of the country and in other important farm enterprises, bring about a readjusted price situation that will relieve the farmer of his present urgent need of income from whatever emergency source is available.

Somewhat outside the above considerations, although closely related to them, is another set of conditions having to do with changing farm practices and cropping programs. The Middle West and the South contain large acreages of land which up to this time has been used for cropping and which because of low prices of products and depleted soil fertility, will in the future probably be used to a much larger extent for pasture and hay. In addition, there are large areas of permanent and semipermanent pasture now of very low productivity which can be improved substantially by methods well known and demonstrated to be successful. Moreover, in the

areas in which the very best soil and surface predominate, an increasing need of legume crops to restore organic matter and prevent the depletion of the soil is leading to the introduction of highly productive legume crops such as sweetclover, which may be utilized incidentally as very productive pasture.

All of these changes, both actual and potential, carry with them the possibility of a substantially expanded general cattle enterprise. This in turn makes, potentially at least, for a generally expanded dairy production through the dual use of a larger number of cattle. How far this development will go and how much it will affect the volume of dairy output will depend upon the economic pressure exerted through prices.

Another important influence on the future expansion of dairying is the price of grains, particularly the feed grains. Despite low prices of dairy products, grain prices have been favorable to dairy production, and a continuation of such relations is likely to figure as an influence toward further expansion, particularly in the cheap-grain areas. There is little in sight at present to indicate a general decrease in feed-crop production relative to that of other crops. On the contrary, with improved crop-production technique it is likely that the pressure of feed-crop production will continue strong. This is likely to exert the pressure already referred to toward measurably expanding dairy output along with that of other animal products.

With conditions in the various regions approximately as described, the urgent question is, What can be expected in the way of readjustments and price conditions in these various regions within the next two or three years?

It seems clear that the northeastern fluid-milk-producing region can not retain its present status under the present levels of prices and costs. The increase in number of cows in this region during the last few years seems to indicate that prices were such as to encourage dairying. Increasing quantities of milk have gone to the fluid milk and cream trade and for ice cream, leaving a diminishing surplus for butter, cheese, and condensed and evaporated milk. With the reduced retail price of milk in various cities of this region, together with the increased surplus due to declining consumption of cream and milk, average prices to farmers have been greatly reduced. This will inevitably lead to adjusting production closer to the demands for the highest-priced uses.

On the other hand, the Middle West, with cheaper feed and a much lower proportion of the total costs of dairy production in the form of actual cash outlay, is in a much stronger competitive position for the production of butter and cheese. Further, the reduced income from other sources is putting additional pressure upon farmers for increased milk production. Wisconsin, Minnesota, Illinois, Iowa, and portions of the surrounding States, where feed normally is abundant and where excellent pastures can be provided, will probably continue to expand their dairy output during the present period of depressed farm income. Such expansion is made easy by the large amount of dairy stock on farms and the ability to increase this stock substantially by holding back the marketing of aged cows and by saving additional heifers.

Indications are that the number of beef cattle will increase throughout the Middle West, particularly in the western portion of the Corn Belt, where grain and roughage are most abundant. If relations between this development and the dairy industry were to parallel past experience, there would be at least a marked slowing up in the increase in dairy output in these areas, particularly in such States as Iowa and Nebraska. But the present situation is not normal. The low prices of other products, including hogs and grain, put the farmers in real need of supplementary income. It may be expected that at least as high a proportion as at present of the cows of beef and dual-purpose breeding will continue to be milked until farm income from other sources shows improvement. Further, the changes already cited, which characterize western Corn Belt cropping systems, are likely to change the nature of the cattle enterprise from less emphasis upon commercial feeding to more emphasis upon a combination of cattle growing and milking. Although there is probably no reason to believe that the rate of increase in dairy output through this region will be as rapid in the next three years as it was between 1922 and 1928, a substantial increase may well be expected.

Almost certainly the farmers of the wheat regions, so hard pressed by the declines in wheat prices, will turn to the milking of more cows. Practically the total net increase from this source will be in the form of butter and will not be great. Nevertheless, it may be significant in view of the present condition of the dairy market.

In view of the continued low price of cotton and the urgent demand for more income in the South that region is likely to continue in a moderate expansion of its dairy output. Here, again, production from this source is not of great volume, but it may have its effect upon the price of butter.

Dairying in the Western States, including both the Mountain and Coast States, will probably continue to expand somewhat more rapidly during the next few years because of the low prices of other products including wheat, sugar beets, beans, fruit, and sheep. It is to be expected, however, that they will continue to keep their dairy output in somewhat close adjustment to the consumer demand within their own borders.

All in all, the increases to be expected from the various southern and western regions are likely, more or less evenly, to balance the decreases in the highly specialized fluid-milk territory of the Northeast. Any improvement in price therefore within the next year or two is likely to depend almost entirely upon a strengthened demand arising out of whatever improvement may be looked for in business conditions, bringing with it a reduction in unemployment and a higher per capita expenditure for dairy products.

All of the foregoing suggestions as to future development in the dairy industry have reference to the two or three years just ahead. The important problem in terms of long-time developments is to be found in the relation of total supply to domestic demand for all dairy products, as this relation may affect future dairy prices. The country just now (June, 1931) is virtually on an export basis for butter in high contrast with the conditions existing during the last

10 years, when domestic butter prices, with minor exceptions, have ranged well above London prices for comparable grades. Diminished demand and a continued high production within our own borders have brought about a condition which has eliminated, for the time being, the advantage secured from tariff protection. Is our dairy industry to stay in this position or are we to have an adjusted output such as to bring back our price advantage on butter with its tendency to affect favorably the whole dairy industry?

Much depends upon the degree to which demand is restored with changes in employment and business improvement. Much depends upon recovery in other phases of American agriculture which may to a greater or less degree remove the pressure from the dairy industry. All things considered, it would seem that modest though appreciable recovery of prices may be looked for within the next three years. But taxes, interest, and other fixed charges will probably remain high and continue to exert pressure on the farmers of many of the agricultural areas in the direction of milking more cows. All in all, the long-time outlook for dairying seems not to be dark; but there is call for the adoption of economical and efficient practices to the end of meeting moderately low prices with low production costs.

SOME ESSENTIALS OF DAIRY-FARM EFFICIENCY

The foregoing discussion shows how dairy production has varied in response to economic changes. It also points to the probable future shifts in dairy production by regions within the near future. It is worth while to discuss briefly some ways in which the individual farmer may modify his own plans to meet the new situation. If prices are not going back to their old levels under which dairy farming experienced its developments during the last 10 years, those farmers who can find no better alternative and therefore will continue dairy production, or those who, because of depleted income from other sources, find they must increase their dairy production or take on dairying as a new enterprise, must meet the situation by greater efficiency and lower costs of production.

Research workers in the fields of dairy husbandry, agronomy, and farm engineering have pointed the way to methods and adjustments designed to enable farmers to lower costs. It is the function of the farm management worker to point out how, under specific conditions, these various methods may be incorporated in the organization of individual farms in the most effective manner. A few illustrations of specific improvements with suggestions as to how farmers may take advantage of them are here presented.

Results of experiments which show that a maximum volume of production from good dairy cows can not be maintained through the use of ordinary clover hay are reported by Hart and Humphrey (*6*).[1] It is shown that in comparison alfalfa hay is much more effective in maintaining maximum output. Since maximum output per cow is one of the most important considerations in low costs, this bulletin suggests one way of meeting present-day price conditions. It calls for a consideration of possible adjustments of cropping systems on such farms as are not already producing alfalfa, with a view to replacing other hay with alfalfa.

[1] Italic numbers in parentheses refer to Literature Cited, p. 59.

On many dairy farms clover and timothy mixtures are sown with small grain and allowed to carry over as a hay crop the following year, after which the field may be used for pasture for a year or two before it is put back into corn, followed again by small grain. Thus the hay crop is a part of the general crop rotation. Frequently it seems desirable to change this system to take hay out of the regular rotation by setting aside a portion of the land for a semipermanent alfalfa hay meadow since it is not usually desirable to plow up an alfalfa field after one or two years of use. Another consideration is the condition of the soil. Soil which shows an acid reaction will not produce alfalfa successfully. The farmer therefore has the question of an added cost in the purchase of lime. He must weigh these additional costs and the trouble of readjusting his cropping program against the fairly long-time advantages of having a better hay. In all probability this adjustment to alfalfa production would be a paying one for large numbers of dairy farmers over considerable portions of the dairy producing regions.

The selection of sources of concentrates, particularly the protein in the ration, becomes a consideration of added importance when dairy products prices are low. If the higher priced protein feeds tend to carry the costs to a figure too high to be compensated for by the lower priced product, frequently adjustments can be made by selecting protein-bearing feeds of lower cost which will meet the emergency and enable the farmer to continue producing at some slight margin. Due consideration, of course, must be given to the effectiveness of these feeds and the way in which they will combine with the other elements in the ration. Another important consideration is the rate of feeding. It has been found that on most farms there is a tendency to overfeed low-producing cows and to underfeed those of high capacity. Greater care in adjusting the size of the ration to the physical productive capacity of the individual cow will mean greater efficiency.

The Federal Bureau of Dairy Industry and the State experiment stations have been working for many years on the rates of production of individual cows. Upon the results of this work they have based policies of effective selection and culling of dairy herds. In this period of low-priced dairy products it is of utmost importance that those who plan to enter the dairy industry or to expand their present dairy enterprise utilize fully the results of these studies in culling out low producers and in purchasing cows.

Throughout large areas of the western Corn Belt and the wheat regions, where indications are that dairying will be maintained at its present volume or even expanded, there are major problems of readjusting the whole farming system in order that this enterprise may bring maximum returns. For the most part, farmers of this region must still continue to devote most of their attention during the growing season to the production and harvesting of crops. The dairy enterprise tends to interfere with this through a conflict in labor demands. Many of the most enterprising farmers are avoiding this difficulty by having most of their cows freshen in the fall after the heavy rush of crop work is over. This enables them to concentrate their attention on the dairy enterprise during the late fall and winter when, because of abundant labor, they are able to make dairying an effective enterprise for the utilization of cheap feed. No

doubt very much more needs to be done on many farms in this direction.

There is need in these same areas for adjusting the cropping system to provide a better basis for the cattle enterprises. This means introducing high-class hay crops such as alfalfa, cutting down probably on the proportion of small grain in favor of highly productive legume pastures in rotation, and in some instances, as available capital will permit, the provision for silage to be included not only in the dairy ration but in the more effective production of the young stock for beef.

A further problem in these regions has to do with the type of cattle to fit the double demand of meat and dairy production. It is probably true that in the long run the specialized dairy breeds will not serve the farmer of this region to best advantage. With the abundance of corn and other high carbohydrate content feeds, meat production will probably continue to be the first livestock consideration. However, the selection of cattle that will combine in best proportions the two sets of characteristics will continue to be an important measure toward greater efficiency and lower costs.

CONDITIONS INFLUENCING THE DEMAND FOR DAIRY PRODUCTS

Until near the close of 1929 the trend of consumption of dairy products increased, and prices were rising or were holding closely to a general level. The major business depression of 1930 has resulted in a decreased demand, and prices of many dairy products have been depressed to or below those of the pre-war years.

The general tendency to increase total production of dairy products has not greatly slackened as a result of the present business depression. With a high level of production and a restricted demand, the dairy industry must give close attention to the problem of distribution. Prices, services, and methods of sales promotion need examination from the standpoint of obtaining the most effective distribution of the industry's total output.

Results obtained from research studies indicate some of the factors that influence the demand for dairy products. Such results should be of use in guiding efforts to improve distribution. As yet, unfortunately, research studies of demand for dairy products are rather limited. The field has not been thoroughly covered, nor have many of the studies been as broad in scope as might be desired. The following statement reviews briefly the results obtained so far in the various research studies, grouped according to commodities.

MILK

Effect of price on consumption.—On the basis of studies in New York and Chicago it appeared that aside from consumers becoming accustomed to a given retail price over a long period of time, a 1-cent change in the retail price of milk had an almost negligible effect on sales and that such a change in price influenced sales only over a short period of five or six weeks. An increase in price appeared to decrease consumption slightly, while decreases in price stimulated consumption even less. There is some indication, however, that a 2-cent change in price may have more than a proportionate effect on

the sales. Likewise it is possible that after a given price level is reached, an increase in price may reduce sales materially. Indications are, then, that within limits the demand for milk is inelastic. However, when a high price level is reached the demand may be highly elastic. Studies to date do not indicate whether high elasticity would appear with very low prices (*18, 19*).[2]

Effect of income on consumption.—Studies in Philadelphia, Austin, Tex., Detroit, four Illinois urban markets, and selected rural areas of New Jersey show that consumer purchases of milk are associated with income. In general, per capita consumption varies directly with income, though after a given level of income is attained there appears to be no corresponding increase in consumption (*2, 7, 8, 24*).[3 4]

A New York study indicates that all grades of milk are not affected to the same extent (*19*).

Effect of availability on consumption.—In a study of consumption in a rural area of New Jersey, results indicate that the most important factor influencing consumption of fluid milk was availability, per capita consumption being highest for families having cows and not selling milk, next highest in families possessing cows, and lowest in families not keeping cows (*24*).

Results of an urban study in Illinois indicated that over a given 5-year period, sales of retail quarts increased on an average of 5 per cent each year, while sales of wholesale quarts increased only 1.7 per cent. This difference was attributed to an improvement in retail service and to an increase in the use of household refrigeration (*2*).

Effect of quality on consumption.—In discussing consumption in southern cities, it is said "Were people able to get a high-grade milk in the quantities desired, consumption likely would increase" (*5*).

In connection with a study of per capita milk consumption in Chicago and two other Illinois cities, results indicated that the high rate of milk consumption in Chicago was indicative of the effect which public confidence in milk quality had upon market demand, it being noted that higher quality appeared to have been associated with an increased per capita consumption (*2*).

Results of a Philadelphia urban study indicated that prices, quality, and purpose for which used, were important factors influencing grade selection, the higher qualities being used for drinking and lower qualities for cooking.[5]

Effect of size and composition of family on consumption.—Studies of milk consumption in Washington, Austin, Tex., and a rural section of New Jersey indicate that per capita consumption decreases

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[2] VAN CISE, R. E., MARCUSSEN, W. H., and ROSS, H. A. SUPPLY AND POTENTIAL DEMAND FOR MILK IN NEW YORK CITY. U. S. Dept. Agr., Bur. Agr. Econ., and N. Y. Food Marketing Research Council. 36 p., illus. 1926. [Mimeographed.]

[3] ADAMS, L. A., and SMITH, G. O. CONSUMER DEMAND FOR MILK IN PHILADELPHIA. U. S. Dept. Agr., Bur. Agr. Econ., in cooperation with Penn. Dept. Agr., Bur. Markets. Prelim. Rpt. 51 p. 1924. [Mimeographed.]

[4] BUECHEL, F. A. REPORT OF A SURVEY OF DAILY PER CAPITA CONSUMPTION OF MILK AND CREAM IN FAMILIES WITH CHILDREN IN THE FOURTH AND FIFTH GRADES OF THE ELEMENTARY SCHOOLS IN AUSTIN, TEXAS. Tex. Univ., Bur. Business Research. 5 p., illus. [Mimeographed.]

[5] ADAMS, L. A., and SMITH, G. O. (See footnote 3.)

as size of family increases (*24*),[6] [7] though the Washington and New Jersey studies indicated that the decreases might have been due to decreases in per capita incomes, as size of family and income were inversely related.

Philadelphia and New Jersey studies indicated that, in general, per capita consumption appears to decrease as the age of the consumer increases, at least until maturity is reached (*24*).[8]

Effect of season on consumption.—Most of the studies made in conjunction with seasonal variation on milk consumption or demand are studies of the demand in a particular area.

In general, results show that consumption of milk is relatively stable when considered from month to month, though there is a wide fluctuation as between various types of container. Bulk-milk sales reflect seasonal demand for ice cream; wholesale pints, that of the factory workman; wholesale half-pints, that of restaurants and schools; wholesale quarts, that of home consumption through retail stores; and retail quarts direct route deliveries (*21*).

Ordinarily, from January to June, there are somewhat irregular increases in the quantity of milk consumed. With most of the schools closed and with the coming of vacation periods, urban sales ordinarily reach their low point in August. The return of school children and vacationists begins about the first of September and causes a second peak in October. In general, it is thought that this seasonal variation is caused chiefly by two factors, vacations and major temperature changes (*18*, *19*).[9]

Changes in temperature apparently affect demand to a greater extent in summer than in winter, having, roughly, three times as much effect in summer as in winter.

A New York study indicated that sales of certified milk show little seasonal fluctuation. Quarts of Grade A milk, while showing a greater fluctuation than certified milk, do not show as great a fluctuation as quarts of Grade B milk (*19*).

Factors causing daily fluctuations in demand and consumption.—Total daily milk sales are usually low on holidays (*21*). In a Chicago study it is noted that in sales of quarts of milk, Sunday and Monday are the only days which show significant variation from normal, Sunday being high and Monday low; for pints of milk, sales are smallest on Sunday, although Saturday also shows low consumption through wholesale channels (*18*).

A New York study indicated that sales of quarts of Grade B milk are slightly higher on Sunday, varying, however, with the section of the city. In business sections sales are lower. Pints are lower on Saturday and Sunday than on other days, the greatest decrease occurring in business sections.[10]

Daily sales are affected by fluctuations in temperature, the relationship being closer for retail milk than for wholesale. The sale of retail quarts is less affected, and that of pints is more affected. Temperature changes have a marked effect on sales of bulk milk.

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[6] BUECHEL, F. A. (See footnote 4.)

[7] ——— REPORT OF A SURVEY OF THE PER CAPITA CONSUMPTION OF FLUID MILK AND CREAM IN FAMILIES WITH CHILDREN IN THE JUNIOR HIGH SCHOOLS AND UPPER GRADES IN WASHINGTON, D. C. U. S. Dept. Agr., Bur. Agr. Econ. 5 p., illus. 1929. [Mimeographed.]

[8] ADAMS, L. A., and SMITH, G. O. (See footnote 3.)

[9] VAN CISE, R. E., MARCUSSEN, W. H., and ROSS, H. A. (See footnote 2.)

[10] ——— MARCUSSEN, W. H., and ROSS, H. A. (See footnote 2.)

The effects of temperature are particularly striking when there is a sudden drop of 15 or 20 degrees (*18*).

Effect of advertising on consumption.—A Philadelphia study indicated that the principal medium through which advertising seems to reach the housewife is the schools, though there was some indication that lectures were effective. As to the features which housewives remembered, food value ranked first, quality second, and dealer's name third.[11]

Another Philadelphia study indicated that from an advertising standpoint quality appeals most to native whites, health to colored housewives, and quality and health to the Jewish housewife. In this study, 15 per cent of all housewives reported that they had heard the use of milk advocated through schools, while only 8 per cent of the housewives were able to recall other sources of information (*8*). A Philadelphia study also indicated that people drink milk because it is a pleasing beverage rather than because it has food value or was good for them.[12]

CREAM

Such studies as have been made in regard to cream relate to the variation in demand for cream in the home.

Effect of income.—The per capita consumption of cream appears to be directly related to income according to the results secured in two Philadelphia studies (*8*)[13]. A study of consumption in four Illinois market areas indicated that sales of quarts at both wholesale and retail and half pints at retail appeared to be closely related to employment (*2*).

Effect of availability.—In a study of consumption in 29 southern cities it is indicated that consumption of light cream might be increased were cream of good quality available (*5*).

Studies in New York and four Illinois market areas, including Chicago, indicated that there is a peak of consumption in May and June, with a second minor peak in October. This was particularly true of heavy cream. Light cream showed less seasonal variations, though consumption was found to be heavier in winter than in summer, presumably because of its use in connection with coffee and cereals (*2*, *19*).[14]

Daily variation.—Studies in New York and four Illinois market areas indicated that consumption of both light and heavy cream are high on Sundays and holidays (*2*, *18*, *19*).[15]

BUTTERMILK

Studies in New York and Chicago indicated that retail sales of buttermilk reach a maximum in the summer; June, July, and August are the months of heavy consumption. This variation was attributed to the effect of temperature. Retail sales were decreased decidedly on Sundays, particularly in business sections (*18*, *19*).

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[11] Adams, L. A., and Smith, G. O. (See footnote 3.)
[12] ——— and Smith, G. O. (See footnote 3.)
[13] Van Cise, R. E., Marcussen, W. H., and Ross, H. A. (See footnote 2.)
[14] ——— Marcussen, W. H., and Ross, H. A. (See footnote 2.)
[15] ——— Marcussen, W. H., and Ross, H. A. (See footnote 2.)

BUTTER

It has been estimated by food industries that 95 per cent of the factory butter made is retailed. The following studies are related to home consumption only.

Effect of income on consumption.—Studies in New York, Philadelphia, and selected rural areas of New Jersey indicated that as income rises per capita consumption of butter rises (*8*, *24*), though the New York study pointed out that sales of butter appear to be fairly well maintained, even under conditions of unusually low pay rolls and they expand rapidly as pay rolls become unusually good. The New York study also indicated that the demand for butter was less elastic among people of high income, demand in low-income groups being quite elastic.

Effect of price.—Results of a New York project indicated that sales decrease as prices rise and that "when price reaches a point about 10 per cent above the average for the year, sales start to fall abruptly." [16]

Effect of availability on consumption.—Per capita consumption of butter on farms, as indicated in a New Jersey study, is materially higher when butter is made than when purchased (*24*).

Effect of quality on consumption.—In a Washington study, reasons given by housewives for buying given brands of butter, in order of importance, were: Taste or quality, price, and uniformity and reliability.[17]

Effect of temperature.—In a New York study it is pointed out that there appears to be some relation between monthly temperature and butter sales, as they decreased with increases in temperature. This was attributed, however, to the seasonal movement of residents from particular city districts, as it was found that the variation was especially true in high-income districts.

Effect of size and composition of family.—A New Jersey rural study indicated that per capita consumption of butter decreases as size of family increases and that consumption appears to be less per capita in families with children (*24*).

CHEESE

Effect of income.—Philadelphia studies indicate that per capita consumption of cheese is related to income, although as higher incomes are attained the effect on consumption becomes less (*8*)[18].

Effect of size of family.—Results secured in a New Jersey rural survey indicated that there appears to be a decline in the consumption of cheese per capita as size of family increases (*24*).

Effect of competition.—Cottage cheese appears to compete with other types of cheese. In a rural study in New Jersey results indicated that families with cows used less store varieties of cheese, presumably because of the availability of milk for cheese-making purposes. It also appeared that more cottage cheese was sold on Friday, presumably to replace meat. (*24*).

[16] VAN CISE, R. E., MARCUSSEN, W. H., and ROSS, H. A. (See footnote 2.)
[17] ADAMS, L. A. USE OF BRANDS IN SELLING BUTTER IN WASHINGTON, D. C. U. S. Dept. Agr., Bur. Agr. Econ. Prelim. Rpt. 6 p. 1925. [Mimeographed.]
[18] ADAMS, L. A., and SMITH, G. O. (See footnote 3.)

ICE CREAM

Per capita consumption of ice cream appears to be related to income, though after a given income level is attained further increases in income have less effect on consumption.

CONDENSED AND EVAPORATED MILK

Approximately 80 per cent of the condensed and evaporated milk and buttermilk manufactured in the United States is retailed, according to the market research department of food industries.

Effect of income.—A Philadelphia consumer study indicates that family consumption is inversely correlated with income.[19]

Effect of competition.—A Philadelphia study indicates that relative price is probably an important factor in determining consumption of condensed and evaporated milk, though convenience is listed as being of importance.[20]

Studies in Philadelphia, New York, and selected rural areas of New Jersey indicate that condensed and evaporated milk are used as substitutes for fluid milk and cream (*19, 24*).[21] [22]

New York studies indicate that evaporated milk is apparently used as substitute for cream in coffee and that seasonal variation in demand for evaporated milk is similar to that for coffee cream, being high in winter and low during hot weather (*19*).[23]

Day of the week fluctuation in demand is likewise similar for that of light cream (*19*).

POSSIBILITIES OF EXPANDING THE DEMAND FOR DAIRY PRODUCTS

In considering the possibilities of expanding the demand for dairy products, it is of interest to note the present utilization of milk in the form of fluid milk and cream and the various manufactured products. This is shown in the following table:

Approximate percentage of total milk utilized in various products:

	Per cent
Market milk and cream	47.8
Creamery butter manufacture	25.4
Farm usage, including butter and waste	16.4
Factory cheese	3.5
Condensed and evaporated milk	3.4
Ice cream	3.4
Powdered milk	.1
Total	100.0

There is no doubt but that quality is a factor that has an influence on the consumption of dairy products. Per capita consumption of products that are of satisfactory and dependable quality appears to be higher than that of those products which do not possess these characteristics. The improvement in the quality of city milk supplies has undoubtedly been most helpful in winning consumer confidence. Standardization of city milk supplies from the standpoint

[19] Adams, L. A., and Smith, G. O. (See footnote 3.)
[20] ——— and Smith, G. O. (See footnote 3.)
[21] ——— and Smith, G. O. (See footnote 3.)
[22] Van Cise, R. E., Marcussen, W. H., and Ross, H. A. (See footnote 2.)
[23] ——— Marcussen, W. H., and Ross, H. A. (See footnote 2.)

of butterfat content, bacteria, and other quality factors has also won consumer confidence for this product. The educational effort and advertising of milk by the dairy councils and milk-distributing organizations have been important factors in increasing milk consumption.

Similar effort to acquaint the consuming public with the characteristics of other dairy products would probably tend to expand the demand for them. New uses for dairy products in the preparation of various food articles and the merchandising of dairy products so that they would be more readily available for use in the household offer possibilities for expanding the demand.

NEED FOR RESEARCH TO PROVIDE A BASIS FOR BROADENING THE DEMAND FOR DAIRY PRODUCTS

It is evident from studies that have been made that the demand situation is complex. If efforts to increase demand and improve distribution are to be successful such efforts must be based on a thorough understanding of the factors affecting demand and the quantitative effect of each.

Further research, therefore, is necessary to determine more exactly the factors affecting the demand for various dairy products and to secure more exact quantitative measures of these influences. Basic data necessary for a comprehensive analysis of domestic or world prices are perhaps not available, but an attack on the problem can be made through an expansion of studies of prices in particular areas. The studies that have been made of the demand for specific dairy products in given areas have yielded valuable results. In many instances, however, the periods covered and the areas selected have not exhibited wide variation in such factors as price, consumption, and employment or income. Consequently the results found in such studies have serious limitations. The most feasible means of removing these limitations is probably through extending similar studies into other areas with different characteristics, and a continuation of studies in particular areas.

Two current projects of the Bureau of Agricultural Economics are of interest. The first is a study of milk consumption in metropolitan Boston, in cooperation with the New England Dairy and Food Council, the Massachusetts Agricultural College, the Massachusetts State Department of Agriculture, the University of New Hampshire, and the New England Research Council on Marketing the Food Supply. The purpose of this study is to determine milk consumption and the factors influencing consumption in a way similar to that employed in surveys previously made in Philadelphia (*8*). In the light of results of these earlier surveys, attention is being directed towards securing information as to particular factors that they indicated were of importance. Also, data were secured from distributors regarding daily sales over a 2-year period in a manner somewhat similar to the procedure followed in the New York, Chicago, and Detroit studies. In addition, an attempt is being made to make this study of daily sales continuous. The second current study is concerned with consumption of dairy products and factors affecting consumption in Baltimore. This study is similar to those made in Philadelphia.

A field in which practically no research work has been undertaken, is the determination and measurement of the factors influencing the usage of dairy products in the manufacture of other products such as baking and confectionery products. The total volume of milk utilized indirectly in this manner for human consumption is relatively small as compared with the volume going into direct consumption through such products as fluid milk and cream, butter, cheese, and condensed and evaporated milk, but this volume is significant, and determination of factors affecting the demand for dairy products in the manufacture of other products would undoubtedly be of value both in explaining demand for all dairy products and in indicating probable trends.

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