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PART II

Average Seasonal Variations in Selected Groups in Industry and Trade

CHAPTER III

FOOD PRODUCTS
(Group I)

A. General Characteristics of Group I

The first group of industries to be discussed covers those whose supply of raw materials is subject to marked seasonal variations while consumers' demand for the finished products is more or less constant seasonally. This different susceptibility of raw materials and finished products to the influence of seasonality at once raises the question as to how the stream of goods which enters productive processes at a highly variable rate is transformed into a relatively steady outflow of finished commodities. The problem becomes complicated if the manufacturing activity intervening between the raw materials and the finished goods presents its own demands as to the most advantageous rate of flow of commodities through the productive process.

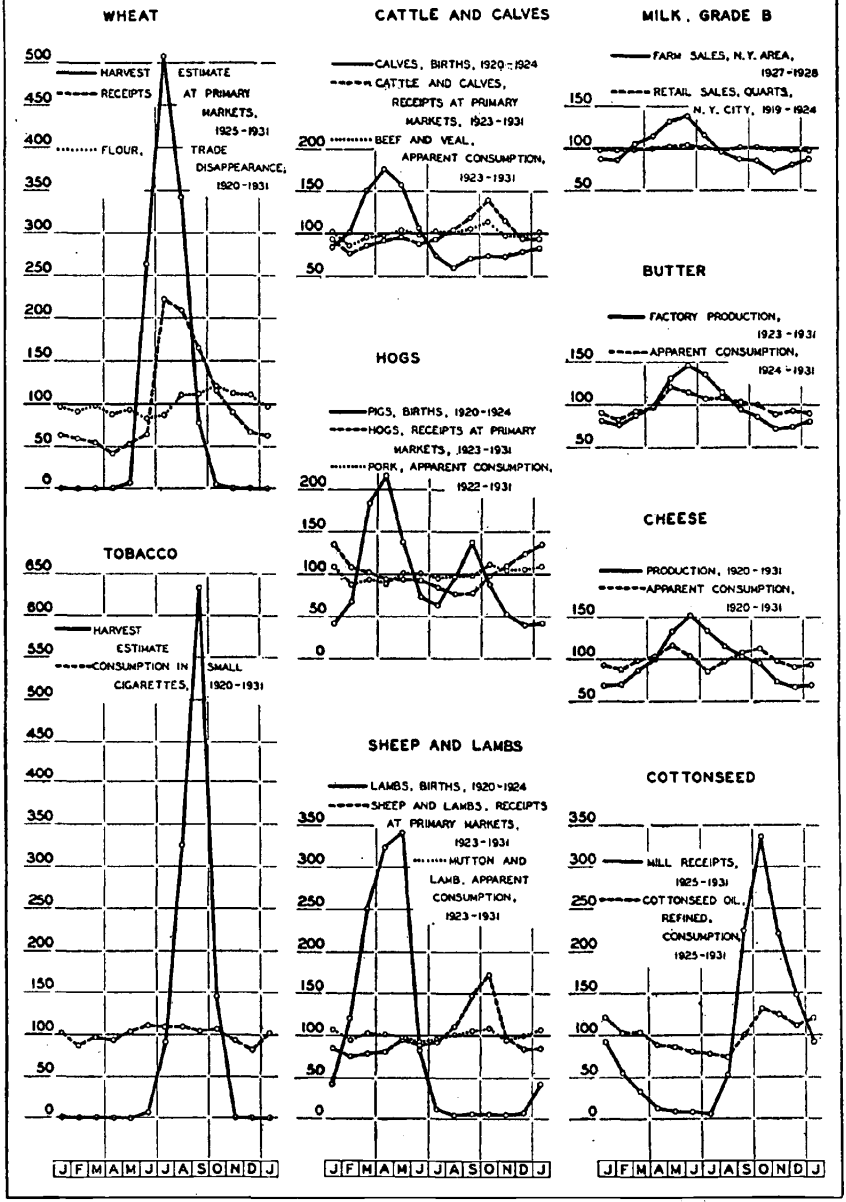
Group I includes many products; for only a few do the statistics available admit measurement of typical seasonal variations. Indexes were calculated for nine commodities to reflect the seasonal swings in both the inflow of raw materials and the outflow of the finished product. It was rarely possible to measure directly the flow of goods into the hands of ultimate consumers and in most instances lack of data forced a stop a few links short of the final stage. But for the products discussed the mildness of seasonal variations in a series such as disappearance into trade [1] only under-estimates the mildness of the seasonal swing in demand by final consumers.

Chart 1 presents graphically these groups of seasonal indexes for the nine commodities. It reveals clearly the differences between the size of the seasonal swing in the inflow of raw materials and that in the outflow of finished products.

[1] Trade disappearance usually denotes the outflow of finished commodities from producers to wholesalers, retailers and sometimes even to final consumers.

CHART I

SEASONAL MOVEMENT OF COMMODITIES IN GROUP I



This may be expressed numerically by two coefficients that measure the amplitude of the seasonal swing: (1) the average deviation of the seasonal index; (2) the range, that is, the difference between the highest and the lowest month in the index. The former measures the average departure of the index from the level at which no seasonal change is recorded; the latter measures the maximum variation involved in the seasonal swing.

Table I indicates differences so large as to preclude all doubt as to their significance. In all series the inflow of the

TABLE I

AMPLITUDE OF SEASONAL VARIATIONS: COMMODITIES IN GROUP I

Series	Average Deviation	Range
Wheat and Flour		
Wheat, Harvest Estimate	135.4	508
Wheat, Receipts at Primary Markets, 1925-31	51.7	181
Wheat Flour, Trade Disappearance, 1920-31	10.5	37
Cattle and Beef		
Calves Born, 1920-24	31.7	116
Cattle and Calves, Receipts at Primary Markets, 1923-31	13.2	63
Beef and Veal, Apparent Consumption, 1923-31	4.8	28
Sheep and Lambs		
Lambs Born, 1920-24	106.1	337
Sheep and Lambs, Receipts at Primary Markets, 1923-31	21.6	97
Mutton and Lamb, Apparent Consumption, 1923-31	4.2	17
Hogs and Pork		
Pigs Born, 1920-24	46.1	177
Hogs, Receipts at Primary Markets, 1923-31	13.3	58
Pork Products, Apparent Consumption, 1922-31	5.9	24
Milk		
Grade B, Sales by Farms, N. Y. Area, 1927-28	17.3	65
Grade B, Retail Sales in Quarts, N. Y. C., 1919-24	1.7	6
Butter		
Factory Production, 1923-31	21.2	74
Apparent Consumption, 1924-31	9.4	39
Cheese		
Production, 1920-31	23.1	86
Apparent Consumption, 1920-31	7.8	31
Cottonseed		
Receipts at Mills, 1925-31	88.1	328
Refined Cottonseed Oil, Consumption, 1925-31	15.7	58
Tobacco		
Harvest, Estimate	133.8	632
Consumption in Small Cigarettes, 1920-31	8.2	30

raw material is clearly more subject to seasonal influences than is the outflow of the final product.

A brief consideration of the seasonal pattern, that is, of the relative position of months in the seasonal index, clearly reveals the causes of marked seasonal variation in supply. In wheat, tobacco and cottonseed the patterns reflect the familiar fact that in the temperate zones products mature only once a year. In livestock the birth cycle is connected with climatic and planting seasons. The mating of sheep, cattle and hogs is timed so that lambs, calves and pigs are born in the spring and can be fed on cheap outdoor pasture. A secondary peak in the birth of pigs is timed to occur in September, probably for the purpose of utilizing corn (in hogging down a field) and whatever indoor feed is to be had advantageously.

While the seasonal peak in livestock births is in the spring, the peak in receipts of the product at primary markets is in the autumn or winter. Thus, receipts of cattle, calves, sheep and lambs are at seasonal peak in October, of hogs in January, because of the advantage of marketing livestock after rather than before the end of the outdoor feeding season.

The same set of factors determines the season in dairy products. Since spring is the high point in the birth of calves, more milk is produced in the summer. The availability of outdoor pasture as a cheap feed further augments the supply. The resulting surplus of milk is reflected in a seasonal peak of sales even by farms that specialize in providing fluid milk to city consumers. Butter and cheese factories naturally find it advantageous to buy up cheap fluid milk during the summer for conversion into more durable commodities which will later be absorbed gradually by final demand. Thus, as in the case of livestock, climatic and planting seasons determine the variability in the supply of the raw material.

The factors conducive to mild seasonal variations in demand for the final product are no less obvious. Being perishable, food products must be bought more continuously than such more durable articles as automobiles or clothing. Although the demand for these products is somewhat affected by weather (for example, consumption of meat and flour tends to be greater during cold months, consumption of milk by adults during the summer), or by holidays (demand for poultry tends to be heavy during the Christmas holidays), it is

comparatively regular, since all these products satisfy stable needs, modified but slightly by the succession of seasons.

The list of commodities might be augmented considerably beyond the nine presented above. Thus in both beet and cane sugar the supply of the raw material is decidedly more affected by seasonal factors than is the demand for the finished product. Fruits, vegetables, poultry and eggs, and most products that are derived from the culmination of a process of organic growth are similarly affected. To increase the list would add but little of interest. Instead, in order to describe more precisely the solution of the problem created by the disparity between the seasonality in demand and in supply, it seemed advisable to trace in greater detail changes in seasonal variations in the sequence from raw materials to finished commodities.

Such an analysis is presented for three subgroups of Group I: (1) wheat and wheat flour; (2) dairy products; (3) fruits and vegetables. Wheat is representative of durable raw materials that can be stored. In dairy products the raw material (milk) is perishable but can be converted into such comparatively durable products as butter and cheese. Among fruits and vegetables, however, there are perishable commodities that are neither storable nor easily convertible into durable products. These differences in technical properties of the raw materials in Group I have, obviously, direct bearing upon the solution of the seasonal problem.

B. Wheat, Wheat Flour and Their Products

GENERAL CHARACTERISTICS

Charts 2 and 3 and Table II [2] present in a summary fashion a graphical and quantitative picture of seasonal movements of wheat from the harvest to the outflow of the finished commodity to final consumers. The picture is simple but significant. From the harvesting of grain in various states to the con-

[2] The charts give an exact picture of the seasonal swing and make possible graphical comparison of seasonal patterns. Because of changes in the vertical scale of the charts, necessitated by considerations of economy of space, graphical comparisons of amplitude are valid only within each chart, or between separate charts with an identical vertical scale. Comparison of amplitude is given more precisely in tables that present the average deviation and the range of each seasonal index. In the following discussion no direct citation of these measures is made, but the reader will find them easily in such summaries as Table II and in Appendix I.

sumption of its major finished product, bread and baked goods, wheat is subject to seasonal variations. A substantial identity of pattern characterizes all the indexes from harvesting through flour production; but the swing decreases materially as wheat passes through the successive stages, reaching its narrowest amplitude in the relatively stable demand for the finished product. This indicates clearly that the origin of seasonal disturbances is in the organic processes of wheat cultivation. Coincident with this damping of amplitude are minor shifts in pattern. The peak in wheat flow from the fields is in July, in flour milling in October, in flour consumption during the winter. But the shift in timing from one link to the next is not as consistent as the damping of amplitude.

Such changes in seasonality at successive, and hence cooperatively related, stages of production are possible only if stocks are kept and if they are allowed to fluctuate seasonally. Since the most conspicuous declines in seasonal amplitude from one link to the next are shown from harvesting to marketing, and from receipts at or shipments from primary markets to the grinding of wheat by flour mills, it is obviously at these two points that considerable stocks are being held by one of the links involved. Further investigation reveals that it is the farmers who hold stocks of wheat and thus make the flow of wheat to primary markets much more even than harvesting; and that it is largely the flour mills that hold considerable, seasonally variable stocks of wheat and thus carry the burden involved in a variable supply of raw materials to an evenly functioning industry.

Between flour production and the passing of finished goods to final consumers there is undoubtedly a further decline in seasonal amplitude and a shift in timing. The available data do not admit of a more precise study of the changing seasonal swing and of its incidence on the various links. It is obvious, however, that seasonally variable stocks of wheat flour are carried not by the flour mills but by wholesalers and large bakers.

DETAILED COMMENTS

A closer inspection of the charts and a more minute quantitative analysis of the seasonal measures make possible numerous observations that are of interest and provide details supplementary to the essentials summarized above.

1. Harvesting

The estimate of wheat harvest for the country as a whole (Chart 2) understates the extent of seasonality, in so far as it combines areas in which the harvest occurs at different times of the year. The earliest date given by the Department of Agriculture (*Wheat and Rye Statistics,* Statistical Bulletin no. 2, 1926, p. 23) for the beginning of the winter wheat harvest is May 29 in Texas and the latest, July 15, in Michigan. The general harvesting dates extend from June 9 in Texas to July 23 in Michigan. The duration of the winter wheat harvest period in single states averages only two and a half weeks; 26 days is the longest period, 13 days the shortest. Thus for each state the seasonal index of harvesting runs as follows: the month of harvest—index of 1200; all other months—0. For the country as a whole, however, the harvest estimate indicates that three months, June, July and August, account for substantial portions of the annual harvest, and that in three other months, May, September and October, some fraction is harvested.

In this and the four following chapters, only the national aspects of the seasonal problem are considered; the regional aspects are reserved for detailed treatment in Chapter VIII where indexes by states are discussed at length. But even in the present context, the under-estimates involved in national measures of seasonal variations should be kept in mind, especially since they may reduce the differences in seasonal amplitude or timing at successive links of a related group of processes. Thus, while both harvesting and marketing by farmers show regional differences, these diversities appear less conspicuous in marketing than in harvesting (see state indexes for marketing in Appendix I). Hence, the national index for wheat harvesting serves to dampen the intensity of the seasonal swing more than does the national index for wheat marketing by farmers; and, when reduced to smaller regional units, the drop in seasonal amplitude from harvesting to marketing is still sharper than it appears in the present comparison in Table II.

CHART 2

SEASONAL MOVEMENT OF WHEAT

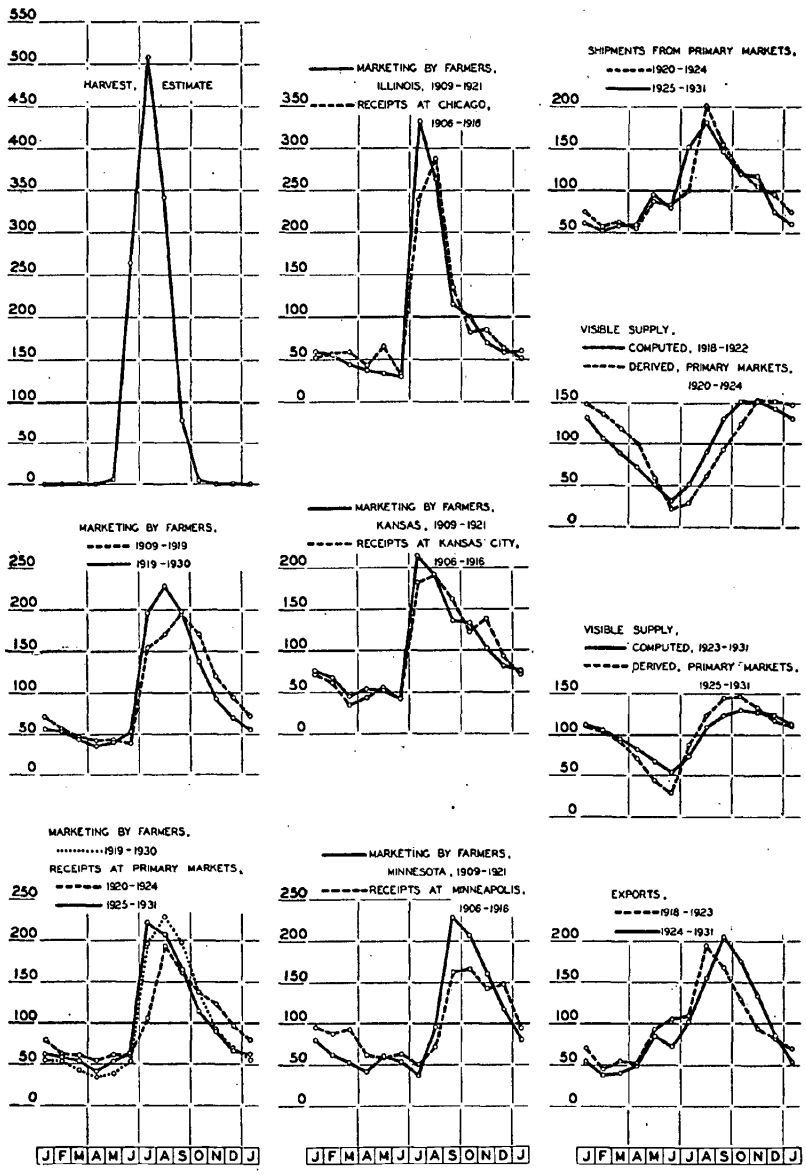


TABLE II

AMPLITUDE OF SEASONAL VARIATIONS: WHEAT, WHEAT FLOUR AND THEIR PRODUCTS

Series	Average Deviation	Range
WHEAT		
Harvest Estimate	135.4	508
Marketing by Farmers, 1909-19	51.5	157
1919-30	59.9	194
Marketing by Farmers, Selected States, 1909-21		
Illinois	68.3	301
Kansas	46.6	173
Minnesota	52.7	191
Receipts at Primary Markets, 1920-24	36.8	138
1925-31	51.7	181
Receipts at Selected Markets, 1906-16		
Chicago	60.0	256
Kansas City	49.3	156
Minneapolis	36.8	116
Shipments from Primary Markets, 1920-24	30.5	146
1925-31	36.2	130
Visible Supply, 1918-22	36.0	120
1923-31	22.3	76
Visible Supply at Primary Markets, Derived, 1920-24	39.2	132
1925-31	30.2	119
Exports, 1918-23	35.0	150
1924-31	45.8	168
Stocks held by Flour Mills, Quarterly, 1926-31		
In country elevators	38.5	101
In transit	25.5	76
In terminal elevators	43.5	116
At mills and in mill elevators	30.0	87
Total	33.0	88
Borrowing by 121 Flour Mills, 1919-21	25.2	86
Wheat Grinding by Flour Mills, 1923-31	7.7	28
WHEAT FLOUR		
Production, 1918-24	12.6	46
1924-31	7.8	29
Stocks held by Mills, Quarterly, 1926-31	7.0	25
Stocks, All Positions, 1920-31	8.6	29
Trade Disappearance (Consumption), 1920-31	10.5	37

TABLE II (CONTINUED)

Series	Average Deviation	Range
Employment		
Flour Mills, 1919	5.4	18.4
1925	3.6	14.1
1930	2.1	8.5
Baking Industries, 1919	1.8	6.9
1925	1.4	6.0
1930	1.4	5.6
Sales by Federal Bake Shops, 1928-31	6.3	25

2. Marketing by Farmers

The Department of Agriculture considers as marketed only the part of the crop that is shipped out of the county in which it is grown. On this basis farmers marketed only about 68 per cent of the total crop during the crop years 1919-29 (average crop, 841 million bushels, average amount shipped out of the county where grown, 568).[3] Thus, farmers retained on the average over 30 per cent of the crop.

That there was considerable seasonal movement in these stocks held by farmers is evident from a comparison of the seasonal indexes for harvesting and for marketing. But still more direct evidence lies in the reports on the size of wheat stocks held on farms on March 1 and July 1 of each crop year; for the crop years 1919-29 these averaged 143 million and 34 million bushels.[3] Thus, as late as six months after the harvest, about 17 per cent of the old crop was still in the hands of farmers. Four months later the stocks dropped to 4 per cent of the old crop. These figures suggest that the seasonal movement of farmers' stocks is a rapid and rather consistent decline from the peak immediately after one harvest to the trough immediately preceding the next.

3. Receipts at Primary Markets

Average annual receipts at primary markets amounted during the years 1919-31 to 426 million bushels. This constitutes over two-thirds of the amount reported as shipped out of the county where grown. A part of the discrepancy is ac-

[3] See *Yearbook of Agriculture, 1931,* pp. 583, 592.

counted for by stocks at country elevators, a part by direct shipments from country elevators to points other than primary markets. But the agreement between farmers' marketings and receipts at primary markets is rather close in volume and in the character of the seasonal variations. Thus, there is only a slight decline in seasonal amplitude between these two links.

The Federal Trade Commission's *Report on the Grain Trade,* 1924 (VI, 83) provides figures that throw some light on the regional differences between the three most important terminal points, Chicago, Kansas City and Minneapolis. For the crop years 1906-07 to 1916-17 the report publishes the average percentage received each month. In converting these percentages into seasonal indexes no correction for trend was made, since this would have introduced only a minor change. These three seasonal indexes for receipts are plotted with the indexes of marketing for the corresponding states on Chart 2.

These comparisons support the conclusions drawn from the analysis of the corresponding series for the country as a whole. In each series receipts at the primary market show a somewhat smaller seasonal swing than marketing for the state as a whole. The only exception is in the average deviations for Kansas City and the State of Kansas. Were data available on receipts at all the primary markets within the state rather than at one center only, the difference in amplitude would have been still more considerable. Another interesting showing is in timing. In all three series the peak in receipts at the center lags one month behind the peak in marketing by farmers.

The greatest difference between marketing and receipts appears in the comparison between Minneapolis and Minnesota, and the closest similarity between Kansas marketings and Kansas City receipts. The differences between the first two series are obviously due to the position of Minneapolis as a flour-milling center. In addition to the wheat that it receives from Minnesota, large quantities are also sent in from other wheat-growing states. On the other hand, Kansas City receives most of its wheat from the huge granary of the State of Kansas itself.

4. Shipments and Visible Supply

The average annual volume of shipments from primary markets amounted during 1919-31 to 284 million bushels, that is, about two-thirds of receipts. This outflow is chiefly to secondary markets and consuming units. The decline in seasonal amplitude from receipts to shipments indicates that considerable stock-carrying for purposes of seasonal adjustment takes place at the primary or terminal markets. This is generally recognised to be one of their most important functions. A portion of the wheat retained at primary markets is kept in stock, while some is consumed in flour mills and other establishments but it is impossible to distinguish between the two parts. As we shall see later, wheat is consumed at a much more even rate than it is received or shipped. Therefore, in an attempt to derive seasonal variations in stocks at primary markets as successive discrepancies between receipts and shipments, consumption may be assumed to be seasonally constant.[4]

An index of seasonal variations in wheat stocks at primary markets was constructed upon the assumption that shipments constitute two-thirds of receipts and that average stocks are equal to average monthly receipts. These derived measures may be compared with the indexes computed from the series of ' visible supply ' of wheat. Visible supply refers to stocks at interior and seaboard points of large accumulation, as well as to grain in transit by canal, lake and rail. The series covers a varying, ever increasing number of points, and for recent years includes an area much wider than that covered by the primary markets. The latter, however, probably account for a very large percentage of the total volume.

Comparison of the derived and computed indexes for stocks of wheat at primary markets (see Chart 2) is possible for two periods, 1920-24 and 1925-31, into which all the series involved were divided for the purpose of seasonal analysis. In both periods there is a close and reassuring similarity of seasonal pattern in the two sets of indexes. For the earlier period the sizes of the seasonal swing also are almost the same. But in the recent period the derived index shows a much wider amplitude than that which was computed. This may be because the assumption of equality between average volume of stocks and

[4] An example showing how a seasonal index for stocks may be derived from indexes relating to in- and out-flow of the commodity is given in Appendix I.

average monthly receipts was true of the years before 1925 but not of the period since 1925. During recent years stocks of wheat have expanded and their ratio to monthly receipts has risen very sharply. Thus, average monthly receipts increased 14 per cent from the first to the second period, while visible supply increased 116 per cent. Were a larger ratio of stocks to receipts allowed in our derivation of the index for the later period, the derived index would have shown a milder swing with an amplitude close to that of the index computed for visible supply.

5. Stocks of Wheat Carried by Flour Mills and Flour Production

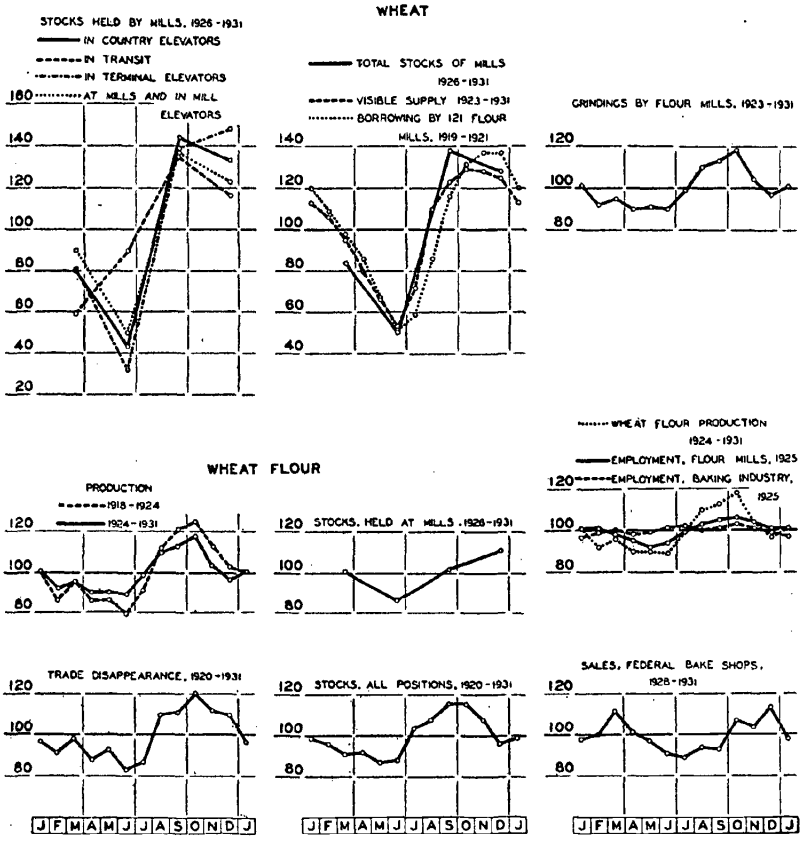
Quarterly data on wheat grain owned by the flour mills classify total stocks into those: (1) in country elevators; (2) in transit; (3) in private terminal elevators; (4) in public terminal elevators; (5) at mills and in elevators attached to the mills. For the present purpose stocks in private and public terminal elevators may be treated as one. The relative importance of the four groups is indicated by the average number of bushels of wheat at each point in 1930: in country elevators 7 million; in transit 12.6 million; in terminal elevators 17.9 million; at mills and in mill elevators 76.1 million. Thus about three-quarters of total mill stocks were held at mills and in elevators attached to the mills.

There is an interesting contrast between the seasonal swings in stocks held at the elevators attached to the mills and in stocks in other elevators (Chart 3). Mill elevator stocks and stocks in transit show an amplitude appreciably lower than that in stocks at country and at terminal elevators. Obviously, the portion of wheat stocks that is retained by mills in elevators other than their own represents the auxiliary and hence most variable elements in their holdings. This is especially true of stocks at terminal elevators, whose seasonal index shows the highest amplitude of all four, and whose pattern suggests that these stocks are kept high only as long as stocks at mills are large. Thus, volumes at terminal elevators continue to rise from the third quarter to the last quarter of the year, part of the new wheat arriving for the mills being stored outside of the overloaded mill elevators. On the other hand, mill holdings in terminal elevators decline to their lowest at the end of the second quarter.

That flour mills carry large seasonal stocks of wheat may be seen from the seasonal index of their total stocks of wheat grain. Immediately after the harvest they buy wheat heavily and allow their stocks to fluctuate with the inflow of wheat as

CHART 3

SEASONAL MOVEMENT OF WHEAT AND WHEAT FLOUR



measured by farmers' marketings. Of course, their holdings do not vary to the full extent that would be inferred from farmers' marketings. But from a comparison of their stocks with the visible supply of wheat, which reflects holdings also by the grain trade, it is clear that the mills as well as the trade

itself carry seasonal stocks, thus taking the burden from the farmer or any middlemen that may intervene between him and them.

This importance of the mills as grain traders is reflected also in the fact that the milling concerns make the grain trading function a separate and autonomous part of their business.

Apart from side-lines such as breakfast cereals and compounded feeds, the profits of a milling concern proceed separately from the grain division and the milling division. In a sense, these are antagonistic, that is, a season favorable to larger profits on wheat is likely to show smaller profits on flour and vice versa. The crop year 1929-30 in the United States was one unusually favorable to profit on handling wheat and not conducive to profit on merchandising flour, so much so as to lead to the exaggerated but illuminating declaration in an editorial in the *Northwestern Miller* of July 9 that milling concerns with large storage facilities would have done better if they had shut down the mills and operated solely as wheat dealers. In most large mills the milling division buys its wheat from the grain division day by day, at the prices of the day.[5]

Seasonal variations in wheat stocks held by mills do not appear to be necessitated by similar variations in the demand for flour. Consumption of flour may be said to be fairly constant; if it varies at all it is to rise slightly in cold weather. If a substantial seasonal swing exists in flour production and wheat grinding, it is imposed by seasonality in the wheat supply.

This impression is confirmed by a comparison of the seasonal index for wheat grindings with that for total stocks kept by mills. While the seasonal swings are similar in pattern, the size of the former is appreciably less. From a seasonal peak twice as high as that for grindings, stocks decline to a trough about five times as low. This is in no way attributable to the small volume of stocks as compared with grindings. For 1929 the mills reported average stocks of about 125 million

[5] Wheat Studies of the Food Research Institute, Stanford University, VII, no. 1, November 1930, *The United States Wheat Flour Export Trade*, pp. 42-3. Another substantiation of the wheat stock carrying function of flour mills, and one that throws light on the credit side of the business, lies in the monthly borrowings by flour mills to finance their wheat purchases and the carrying of stocks. In its report on the *Wheat Flour Milling Industry* (May 1924), the Federal Trade Commission quotes data for monthly borrowings by one hundred and twenty-one flour milling concerns for the years 1919-21 (p. 30). The index computed from these data is plotted on Chart 3, together with those for quarterly stocks and monthly visible supply. The similarity of the three indexes is a further indication of the stability of the seasonal pattern in wheat stocks carried by flour mills.

bushels, while grindings averaged about 44 million bushels a month. In other words, the average volume of holdings was about three times as large as that of monthly grindings. The consideration of seasonal indexes for the production of wheat flour yields the same conclusion, these indexes repeating the showing of wheat grindings.

6. Wheat Flour Stocks and Their Disposition

Wheat flour is either shipped immediately to the purchaser or retained by the mill. The data on flour stocks kept by mills show that, in contrast to wheat grain stocks, they are not large. The mills that supplied data on wheat stocks and milling (representing 90 per cent of the industry) held average stocks of flour during the last five years of about four million barrels. As their monthly production was above nine million barrels, their holdings of flour were equivalent to at most half a month's production. The seasonal indexes for the two series on wheat flour stocks reflect a similar type of movement, tracing a pattern that is almost an exact duplication of that in output itself. In view of what was just said concerning the nature of these stocks, this was to be expected. These stocks are not an accumulation of flour in a pool, in which discrepancies between inflow and outflow may gather. They are merely the level of the flow of flour from production through the mill warehouses almost directly into other hands. If there is any discrepancy between the seasonal in the final consumption of flour and that in output, it is obviously not the mills but some other economic agents who carry the seasonal burden of large stocks of flour.

Accordingly, the series commonly labeled flour consumption, which is usually computed from output, stocks, net exports and shipments to possessions of the United States, is not a series of actual consumption of flour either by commercial bakers or housewives. It reflects, disregarding export and shipments by flour wholesalers and dealers, the movement of flour from the mills to domestic dealers, bakers and retail outlets.

No definite statistical information is available on the flow of flour once it leaves the mills. But the Food Research Institute [6] made an attempt to estimate the changes in total stocks

[6] Wheat Studies, IV, no. 2, December 1927, *Statistics of American Wheat Milling and Flour Disposition since 1879,* pp. 63-102.

of flour. The assumption upon which the estimate is based is that flour is consumed in fairly even quantities throughout the year. While it is admitted that consumption may be slightly heavier during the winter than in summer, this difference is disregarded. With allowances for changes in the number of days in the month and for the trend from year to year in per capita consumption, final flour consumption is then computed for an increasing population.

The comparison of consumption thus computed, with output, adjusted for net exports and shipments to United States possessions, indicates the monthly additions to or subtractions from total flour stocks. From these net changes in total stocks it is possible to subtract the net changes in producers' stocks, and thus obtain net changes in stocks kept by wholesalers, bakers, retailers and final consumers.

Such a series of net changes in total stocks, primary and non-mill, is given by the Food Research Institute for the four years 1923-27. We have no definite base to which these changes could be related (with the exception of the mill stocks), but it is still possible to average them for the four years and compare both the magnitude and the timing of the seasonal variations.

Four years is a rather brief period for which to compute seasonal indexes, but stability of the seasonal in the series is conspicuous, as shown by the following means of the two and four (three and five for some months) central items. In each instance the means were corrected to make the algebraic sum for the year equal zero.

The comparison thus afforded reveals interesting differences. In terms of absolute amplitude the largest seasonal variations are in total flour stocks, although those in non-mill stocks are almost equally violent. The variations in mill stocks are only from one-third to one-half as large as those in the other groups. Whether this difference in amplitude would persist were the absolute figures related to the average size of stocks is, of course, a question. As was noted above, mills carry quite small stocks; therefore, the small absolute variations may arise partly from the small absolute volume. Wholesalers and bakers may carry much larger stocks of flour than do the mills, and in that event the large absolute variations would appear much smaller when converted into percentages.

However, it is obviously the wholesalers, bakers and retailers who carry the stocks and take the speculative risks as well as assume the task of reconciling fluctuating output with constant demand. Looking at the seasonal pattern of their stocks, we find significant differences from the swing in mill

ARITHMETIC MEAN OF CENTRAL ITEMS, NET CHANGES IN NON-MILL AND TOTAL FLOUR STOCKS 1923-1927

	Non-Mill Stocks		Total Stocks		Mill Stocks Difference Between Col. (4) and Col. (2)
	2 or 3	4 or 5	2 or 3	4 or 5	
	(in thousands of bushels)				
End of Month	(1)	(2)	(3)	(4)	(5)
January	1733	1830	1792	1828	— 2
February	1639	1939	1274	1599	— 340
March	1651	1487	774	672	— 815
April	— 115	— 91	— 714	— 665	— 574
May	— 930	— 867	— 1845	— 1812	— 945
June	— 1936	— 1884	— 2777	— 2679	— 795
July	— 3238	— 3066	— 2942	— 2799	267
August	— 2156	— 2286	— 1817	— 1909	373
September	— 1625	— 1753	— 195	— 425	1328
October	605	647	1990	1982	1335
November	1852	1788	2429	2373	585
December	2521	2255	2030	1840	— 415
Range	....	5321	....	5172	2380
Average deviation from 0..	....	1658	....	1764	648

stocks, which have a flat peak in September and October and a trough in May. (Note that the index for these net changes in mill stocks is almost identical in pattern, as it should be, with the index of wheat flour stocks, all positions.) But the stocks in the hands of wholesalers, bakers and consumers have a trough in July, that is, two months later, and a peak in December, also two months later.

7. Flour Milling, Baking and Bakery Sales

Flour sales in the United States may be divided into six groups with considerable overlapping and varying widely from region to region, as follows: (1) flour passing into household consumption, distributed through chains or individual retailers; (2) flour sold to institutions, public and private, including the Army and the Navy; (3) flour sold to

large bakeries; (4) flour sold to small bakeries and pastry shops; (5) flour sold to public eating places, directly or indirectly through middlemen; and (6) flour passing to export.[7]

Monthly series on employment are the only ones available to throw light on the similarities and differences in the seasonality of the flour milling and the baking industries. A comparison of the seasonal swing in flour output with those for employment in 1919, 1925 and 1930 reveals an essential similarity in pattern but a significant difference in amplitude (Chart 3). Thus, for 1930 the range in employment was only 8.5, while that in output was 29. But the decline in amplitude revealed during the period by employment agrees with the showing of the seasonal indexes for flour milling.

The seasonal pattern in employment in the baking industries differs materially from that in flour milling, but the significant feature is the narrower amplitude of the swing in the former. Throughout, the range in the baking series is appreciably lower than in flour milling (Table II). We may infer that in output also the baking industry is subject to milder seasonal swings than the flour industry. The gradual damping of the seasonal swing from the raw material to the finished product may be expected to continue through baking, which shows a milder swing than does flour milling.

No data are available on the movement of flour or of bakery products through the hands of wholesalers and retailers, nor any precise information on their stocks. The recorded series of wholesale and retail trade represent sales by grocery wholesalers and retailers. Since in these series flour and bakery products are more than outweighed by a variety of other goods, it would be inappropriate to compare seasonal indexes for total grocery sales with the movement of flour and bakery products only. Some information, however, is contained in a series of monthly sales by a large concern, the Federal Bake Shops, which operates directly or through subsidiaries as a chain of about 100 retail bake shops in eastern, southern and middle western sections of the United States. The company

[7] Wheat Studies of the Food Research Institute, VII, no. 1, November 1930, p. 43. According to the census report on the distribution of sales in 1929 of the manufacturing plants in the flour and other grain-mill products industry, 9 per cent of sales went to the manufacturers' own wholesale and retail branches, 40 per cent to wholesalers, 27 per cent to retailers and 24 per cent directly to users (bakeries, manufacturers of food products, institutions, farmers, etc.).

specializes in the production of sweet bakery goods, such as cakes and pastries. Also, lunch departments have been installed in several stores.[8]

The sales figures are available for only 1928-31, but the seasonal swing is so clear-cut and stable that a significant measure may be obtained in spite of the brevity of the period. The ratios (to the thirteen-month moving average) are as follows:

	Middle Ratio	Average of Three		Middle Ratio	Average of Three		Middle Ratio	Average of Three
January	98	99	May	98	97	September	93	93
February	100	100	June	91	91	October	108	107
March	113	111	July	90	89	November	103	104
April	101	101	August	93	94	December	114	114

In evaluating the significance of this seasonal index of retail sales it must be remembered that these sales are in dollar volume and that shifts in demand between standard cheap goods, such as bread, and the more expensive pastries may account for a large part of their seasonal movement. Thus the two peaks, in March and in December (Chart 3), are undoubtedly associated with larger purchases of cakes and pastries for the Easter and Christmas holidays. Also, part of the summer drop is explained by a considerable decline in demand for sweet baked goods. The decline in the demand for bread, if any occurs during hot weather, is probably not as large. In terms of commodity units of the simpler type, such as bread, the seasonal swing in retail sales must undoubtedly be much milder than that shown by the sales of the Federal Bake Shops. But even as the index stands, its swing is smaller than that of any production index encountered heretofore.

C. Dairy Products

GENERAL CHARACTERISTICS

Wheat is a comparatively durable raw material. Its loss of weight in storage is quite small, and for the purpose of milling, wheat kept in stock under proper conditions is as good as grain just received from the fields. But not all raw materials in Group I are so durable. There are also perishable raw materials, some not capable of preservation, others equally per-

[8] From the description of the business in the Corporation Records of the Standard Statistics Co.

ishable but convertible into durable goods. For perishable raw materials, of course, an entirely different solution of the seasonal problem must be sought. Unlike wheat, they cannot be kept in stock. Either final demand must adapt itself to the seasonal swing in supply, or, if possible, raw materials must be converted into durable goods before they can be stocked for eventual absorption by final consumers.

Milk and cream, whose seasonal movements are summarized briefly in Charts 4, 5, 6 and Table III, are typical of perishable raw materials in Group I that may be converted into durable goods. Fluid milk is perishable, and the demand for it by final consumers is relatively constant through the year. The production of milk, on the contrary, is subject to marked seasonal variations, natural conditions of pasturage favoring increased milk production during the summer. It is true that with the development of urban demand for milk, recourse is had to the more expensive winter dairying to supplement summer dairying. This serves to overcome the winter shortage of milk that is created by the disparity between the influence of original seasonal factors on milk production and on demand by consumers. But at best a change from summer to winter dairying is a slow, costly process.

The problem of the surplus milk available in summer is solved by the conversion of milk into more durable goods, primarily butter. With the development of cold storage, such durable goods may be kept in stock until final consumer demand forges ahead of the output of the industry.

Thus, the seasonality in the supply of raw milk imposes marked seasonal variations upon the production of such durable dairy goods as butter, condensed and evaporated milk and cheese, their output being at peak during the summer, when fluid milk is abundant and cheap. In its own turn, the summer peak production of durable dairy goods tends to lower their prices and to exercise a marked effect upon the production of substitutes. For example, the seasonal swing in the production and consumption of oleomargarine, the most important butter substitute, shows seasonal peaks in winter and troughs in summer, a pattern attributable not to any factors in the production of margarine but to an adjustment to the seasonal swing in the production of butter.

The original seasonal factors in the output of raw milk thus

radiate their influence far along the sequence of production stages. At the source these original forces are only partly overcome by the development of winter dairying. Such an emancipation from the disturbing seasonal factors is, of course, true of a large dairying area taken as a whole rather than of the single farms, which usually specialize either in winter or in summer dairying. But even for large dairying areas a complete balancing of the summer and winter system and the consequent possibility of producing butter, cheese and other durable dairy products at an even rate appears more costly and less preferable than a preponderance of summer dairying with its consequent seasonality in the production of such durable goods.

DETAILED COMMENTS

1. Fluid Milk and Cream

a. *Sales at Retail and Wholesale and Total Receipts at City*

Of the total quantity of milk produced in the United States about 46 per cent is consumed for household purposes in the form of milk and cream, and about 47 per cent for manufacturing, the latter including diverse products, such as butter, cheese, condensed milk, ice cream.[9]

In studying seasonal changes in the supply of fluid milk and cream it seemed best to ascertain first whether ultimate demand fluctuates significantly and then to trace the seasonal movements to their origin in the supply of the raw material. Detailed data are available for two urban centers—New York and Chicago—while a less extensive study has been made for Los Angeles.[10] Only the data for New York City are presented; data for Chicago confirm on the whole the showing for New York.

Seasonal changes in consumers' purchases of different types of milk and cream are compared graphically on Chart 4

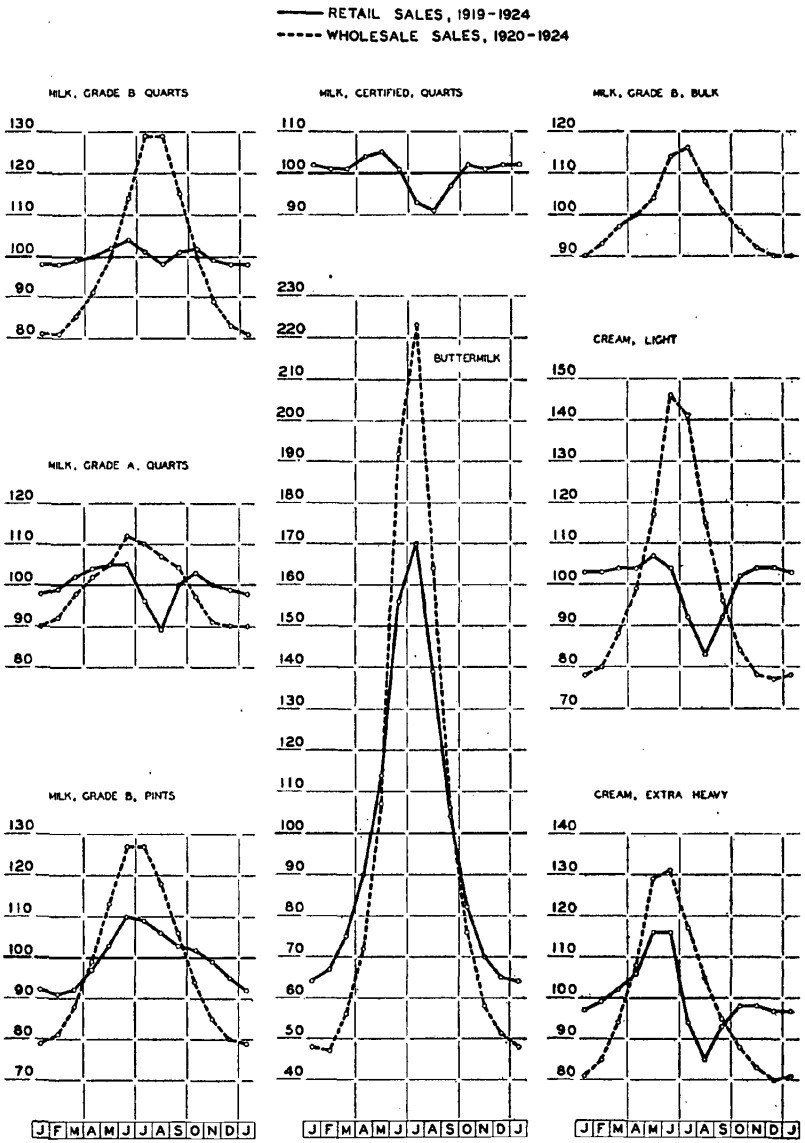
[9] U. S. Department of Agriculture, *Yearbook 1922*, p. 293.

[10] For New York City, see H. A. Ross, *Some Factors Affecting the Demand for Milk and Cream in the Metropolitan Area of New York*, Technical Bulletin of the U. S. Department of Agriculture, No. 73, June 1928; for Chicago, H. A. Ross, *The Marketing of Milk in the Chicago Dairy District*, University of Illinois Agricultural Experiment Station, Bulletin No. 269, June 1925; for Los Angeles, Leland Spencer, *An Economic Survey of the Los Angeles Milk Market*, University of California, Agricultural Experiment Station, Bulletin No. 513, May 1931.

CHART 4

SEASONAL MOVEMENT OF MILK AND CREAM

NEW YORK CITY



with sales by wholesalers. The factors determining these changes for each specific commodity have been described fully by H. A. Ross.[11]

RETAIL

Quarts, Grade B

Retail sales of quarts of grade B milk increase slowly with the increasing temperature and reach a peak late in June. The temperature, of course, continues to rise, but schools close at this time, and the vacation migration causes an abrupt drop in demand. During July and August there is a continual movement of people to and from the city, but the out-of-city movement is the heavier, and sales continue to decline until the last of August. With the opening of schools, the cityward movement of population sends demand sharply upward. This trend continues until about the first of October, by which time practically all vacationists have returned, and the cold weather causes a falling-off in demand.

Quarts, Grade A

A somewhat similar seasonal variation is shown by the sales of quarts of grade A milk, although minor differences may be noted. Sales fall off much more in the summer, and the low demand begins before schools close and continues after they have opened, because a larger proportion of grade A milk is consumed by children not yet of school age, and many families can leave on their vacations without waiting for the close of school. Similarly, they are under no necessity of returning for the opening of school.

Quarts, Certified

Certified milk is consumed so largely by children under school age that, unless there are older children in the family, no attention need be paid to the opening or the closing of school. As a result the vacation decrease covers a still longer period. Neither grade A nor certified milk shows the sharply marked changes in demand which characterize the vacation period in the case of grade B milk.

There is a slight increase in sales of certified milk in the coldest part of the winter, when sales would naturally be expected to decline. This appears to be due to a distinct seasonal variation in the number of births in New York.

Pints, Grade B

The sales of pints of grade B milk present a different picture, because a much greater proportion is consumed by adults. Temperature affects the adult demand for milk much more than it does the children's demand, because children do not shift from milk to tea or coffee as do adults. The drinking of milk with luncheons has much to do with the high summer demand. Working people who lunch down town consume large quantities of milk when the weather is hot, but when the weather is cold they change to a hot drink, and the demand for pints is therefore much greater in

[11] The quotations are from *Some Factors Affecting the Demand for Milk and Cream in the Metropolitan Area of New York*, pp. 22, 24-30.

summer than in winter. Vacations tend merely to check the increase rather than to cause an actual decrease.

Cream

Retail sales of extra-heavy cream reach their peak about the first of June, when fresh berries are on the market and before the vacation migration has begun. Sales at this time are more than 40 per cent higher than they are at the lowest point, in the latter part of August, when the maximum number of persons are out of the city. With the return of vacationists the sales of cream rise, but the berry season is past, and the high point in the fall is 17 per cent below the early summer peak. Light cream, on the other hand, fails to show as high sales when the berries are on the market. It is used in the home largely for coffee, and the demand is therefore high in winter and low during the hot weather.

Buttermilk

Buttermilk is a popular summer drink, since many persons consider the acid taste very refreshing during hot weather. Retail sales of this product reach a maximum about the last week in June, at which time the demand is almost three times as great as in the coldest months.

WHOLESALE

The seasonal variation in wholesale sales differs from that in retail sales because a number of new factors of demand are introduced. . . . . In addition to the bulk and bottled products sold to stores for re-sale to the consumer, large quantities of these products are sold to hotels, restaurants, stands, schools, hospitals, prisons, and like places, where they are consumed on the spot instead of being taken into the home. Smaller quantities of milk, cream, and condensed milk are sold also at wholesale to confectioneries, where they are made into ice cream or served in various ways at the soda fountain.

In most of the wholesale outlets for dairy products the adult consumers predominate, whereas in the retail trade the greatest proportion of the milk consumption is by babies and young children. Because of the greater tendency of adults to change their consumption with the weather, wholesale sales of almost all dairy products rise in the summer and fall in the winter. Even the vacation migration, so pronounced in retail sales, is much less effective here because these employed adults ordinarily have but a brief vacation. Furthermore, it appears logical to assume that dipped-milk sales are little affected by vacations because of the economic status of the purchasers. It also seems probable that there is some shift from retail deliveries to store purchases during the hottest months by families who are too poor to keep ice, and by that increasing class of people who depend on delicatessen stores for meal-to-meal purchases.

Milk

. . . . With the exception of quarts of grade B milk, the summer increase in wholesale sales is checked by the vacation movement out of the city. Since sales of quarts of grade B milk continue to rise until about the first of August, when the temperature reaches its maximum, it

TABLE III

AMPLITUDE OF SEASONAL VARIATIONS: MILK AND CREAM

Series	Average Deviation	Range
MOVEMENT OF MILK AND CREAM, N. Y. C.		
Retail Sales, 1919-24		
Milk, Grade B, Quarts	1.7	6
" " A, "	3.2	16
" " B, Pints	5.6	19
" Certified, Quarts	3.2	14
Buttermilk	30.8	106
Cream, Light	5.7	24
" Extra Heavy	6.6	31
Wholesale Sales, 1920-24		
Milk, Grade B, Quarts	14.8	48
" " A, "	6.8	22
" " B, Pints	15.4	48
" " B, Bulk	7.1	26
Buttermilk	48.7	176
Cream, Light	19.9	69
" Extra Heavy	15.3	51
Receipts of Milk		
N. Y. C., 1920-31	4.2	18
Boston, 1920-31	5.3	23
Receipts of Cream and Condensed Milk at N. Y. C., 1905-09	29.7	98
1919	32.8	111
1931	20.2	70
MOVEMENT OF MILK AND CREAM FROM FARMS TO CITIES		
Receipts of Milk at Cream-Shipping Stations, N. Y. Area, 1924	30.5	112
Delivery of Milk to 30 Shipping Stations, N. Y. Area, 1910-14	16.1	55
1920-24	13.4	45
Daily Deliveries per Dairy, N. Y. District, 1922-30	15.3	58
Raw Milk Production, Minneapolis District, 1920-31	13.2	47
Milk Sales by Farms		
Chicago District, 1920-22	13.2	44
Inner Part of Chicago District, 1918-22	12.9	38

TABLE III (CONTINUED)

Series	Average Deviation	Range
MOVEMENT OF MILK FROM FARMS (N. Y. AREA)		
SALES OF MILK IN RELATION TO COWS FRESHENING		
70 Farms Producing Grade A Milk, 1927-28		
Sales of Milk	17.8	70
Proportion of Cows Freshening	64.8	267
450 Farms Producing Grade B Milk, 1927-28		
Sales of Milk	17.3	65
Proportion of Cows Freshening	43.5	195
641 Farms Producing Milk, 1927-28		
Sales of Milk	15.2	58
Proportion of Cows Freshening	43.0	191
Winter Dairies, 1921-25		
Cows Milking	12.6	46
Cows Freshening	69.6	250
Cows Dry	62.9	228
SALES OF MILK FROM 641 FARMS GROUPED BY		
Pasture per Cattle Unit, 1927-28		
Group I (1.5 acres of pasture)	14.3	57
" II (2.9 " " ")	14.7	53
" III (4.8 " " ")	16.7	61
" IV (7.5 " " ")	24.2	84
Silage Fed per Cattle Unit, 1927-28		
Group I (none)	22.7	82
" II (1.4 tons of silage)	22.8	83
" III (2.9 " " ")	13.0	42
" IV (5.1 " " ")	16.8	54
Amount of Milk Produced per Cattle Unit, 1927-28		
Group I (3.3 thousands of lbs. of milk)	40.5	141
" II (4.5 " " " " ")	29.3	110
" III (5.4 " " " " ")	20.8	79
" IV (6.5 " " " " ")	14.0	55
" V (7.3 " " " " ")	12.3	43
" VI (8.4 " " " " ")	15.3	43
" VII (9.9 " " " " ")	13.5	49

appears that this commodity is the one most affected by the shift of the household trade from retail deliveries to store purchases.

Cream

Wholesale sales of extra-heavy cream are greatest at the height of the berry season, being about 75 per cent above the low point in December. Sales of light cream and condensed milk, on the other hand continue to rise until the last week in June, since the ice cream demand affects them more than it does sales of the high-testing cream.

This analysis affords an adequate explanation of the diverse patterns in the sale of milk and cream products at retail and wholesale. The comparison in Table III shows clearly that: (1) with the exception of buttermilk, retail sales of milk and cream are characterized by mild seasonal variations; (2) sales at wholesale are characterized by a seasonal amplitude higher than that for sales at retail; (3) although grade B milk (quarts) sales at retail are subject to a much smaller seasonal than those of grade A milk, the reverse is true of sales at wholesale. This may be attributable to the fact that most grade A milk sold at wholesale goes to hospitals and institutions that demand milk the year round, while sales of grade B are made primarily to restaurants and retail stores, where the demand fluctuates considerably with the weather and the vacation movement.

A summary measure of total consumption by final consumers is presented by the receipts of milk or cream at any city (Chart 5). Both products are perishable and hence cannot be kept in stock for any length of time; and the industrial demand for them in a city like New York or Chicago is likely to be negligible as compared with consumers' demand. Indexes for receipts of milk in New York City indicate clearly that seasonal variations are mild. Receipts are slightly larger than average in summer and slightly smaller than average in winter. In total consumption, therefore, not the vacation exodus from the city but the increased demand by adults in warm weather is the predominant factor. A similar picture is presented by receipts in Boston.

Total demand for cream and condensed milk is subject to a strikingly different seasonal swing, constant in pattern but rather variable in magnitude. The peak occurs in June, before the vacation exodus has affected the urban population, and is evidently connected with the consumption of berries. Variations in the demand for heavy cream for use with berries out-

weigh the milder fluctuations in the consumption of light cream for coffee and ice cream.

b. *Deliveries to Shipping Stations, Production and Sales by Farms*

Data throwing light on seasonal variations in milk supply are available only for single districts. Fortunately for purposes of comparison, however, these cover the same districts for which information is available on receipts and sales at retail and wholesale. Furthermore, though some series cover only one year, the seasonal swing is so large as compared with other changes that it can be measured with reasonable accuracy.

Of the seasonal indexes presented on Chart 5 two yield definite information on the receipt of milk by plants that supply New York City. These receipts do not accurately reflect the production of milk, for, of course, farms may prefer to retain varying proportions of milk output in the different months of the year. Besides, milk shipping stations are not the only recipients of milk; condenseries, butter and cheese factories, etc., also consume milk. But since milk shipping plant receipts do reflect the stage in supply nearest to its arrival in the urban center, the difference in seasonality between milk deliveries to the shipping stations and milk receipts at New York City is striking and at first incomprehensible. The seasonal pattern of milk deliveries to the shipping stations is fairly similar to that in receipts, with a peak in May or June and low levels during the winter, but the difference in amplitude is striking. It would seem either that the shipping stations retain some of the milk they receive or that there is some diversion of the supply between the shipping stations and New York. The former proves to be the case.

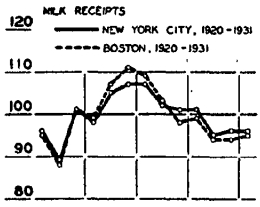
In 1922 and 1923, fluid-milk-shipping stations handled 56 per cent of all the milk delivered by farmers to the milk plants in these counties. Of the milk handled by these plants, 69 per cent was shipped as fluid milk and 22 per cent was shipped as cream, only 9 per cent being used for manufacturing.[12]

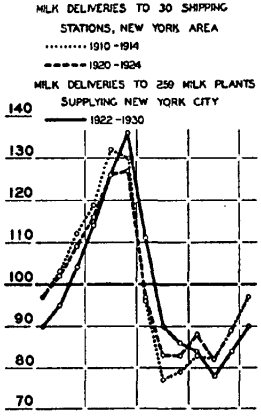
Comparison of milk deliveries to shipping stations with milk receipts at New York brings out clearly the disparity

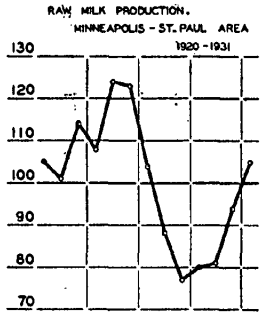
[12] L. J. Norton and Leland Spencer, *A Preliminary Survey of Milk Marketing in New York*, Cornell University Agricultural Experiment Station, Bulletin 445, November 1925, p. 24.

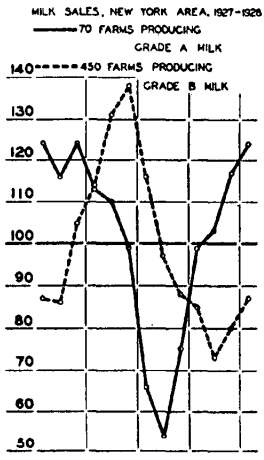
CHART 5

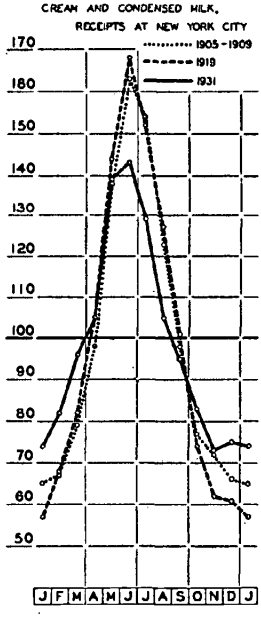
SEASONAL MOVEMENT OF MILK AND CREAM FROM FARMS TO CITIES

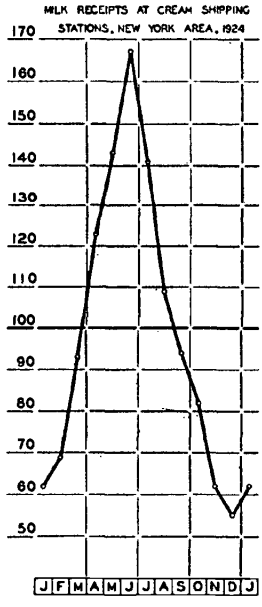


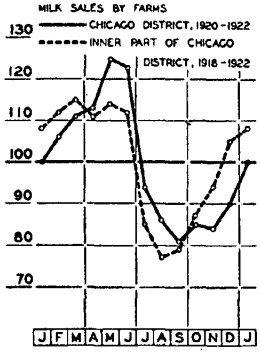












between the seasonal movement of demand and supply that is characteristic of the raw milk industry. Deliveries at shipping stations reflect total sales by farms. Receipts at New York measure total demand. The disparity between demand and supply is overcome by the conversion of milk into cream. In the industry as a whole the seasonal disparity between the supply of fluid milk and the demand for it by final consumers explains the seasonality in the production of the more durable dairy products, especially butter and cheese.

Seasonal variations in raw milk deliveries to shipping stations are an almost exact reproduction of fluctuations in total output of milk. This may be gathered from an inspection of the indexes relating to the Minneapolis-St. Paul, the Chicago and the New York districts. The pattern in each, with its peak in May-June, its trough in September-November, is similar to the patterns for New York State. There is apparently some powerful common factor that makes for one and the same type of seasonal swing in milk production in diverse regions. And if the indexes for receipts of milk in New York City and Boston may be taken as typical of all urban centers, the disparity in amplitude between urban consumption and total production in the United States becomes a country-wide characteristic of the industry.

Farms sell the larger portion of their milk and in most instances milk sold may be considered as measuring production. Thus, the farms that produce grade A and grade B milk in the New York milk-producing area sell 96 and 92 per cent, respectively, of their production in the form of loose milk.[13] The indexes of their sales, even though they cover only one year, may be considered as representative of the seasonal pattern in milk production.

Farms that produce grade B milk are the more numerous and engage chiefly in summer dairying. Farms that produce grade A milk usually engage in a more intensive type of dairying and most of their cows freshen in the autumn. This difference between the seasonal patterns of sales, which is indicative of a difference in the basic dairying system, does not seem to be necessitated by any difference in consumers' demand, for

[13] M. P. Catherwood, *A Statistical Study of Milk Production for the New York Market,* Cornell University Agricultural Experiment Station, Bulletin 518, April 1931, p. 90.

consumers' demand, as expressed in sales both at retail and wholesale, follows more or less the same pattern for grade A and grade B milk. However, since most of grade B milk is consumed by adults, its summer peak of consumption is more conspicuous than that of grade A.

The production of cream, if it may be judged by receipts at the cream shipping stations (Chart 5), follows very closely urban demand as expressed by receipts at the urban center.

c. *Sales by Farms and the Dairying System*

The seasonal factors in production become clear upon inspection of Chart 6, which presents the data on cows freshening on a number of farms in the New York dairy district, all farms and by groups. The close relation between changes in milk sold (that is, milk production) and number of cows freshening is clear. For all farms, both those producing grade A, for which the peak of freshening is in September, and those producing grade B, for which the peak is in March, the high and low levels of milk production regularly lag behind the high and low points in the number of cows freshening.

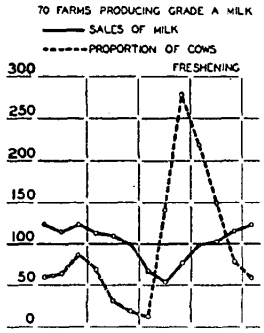
It is not the number of animals freshening in a given month but rather the cumulation of cows milking that determines the volume of milk production. At any given time cows milking outnumber those freshening. Consequently, the seasonal variation in the number of cows milking and, therefore, in milk production, is likely to be of a much smaller magnitude than in the number of cows freshening.

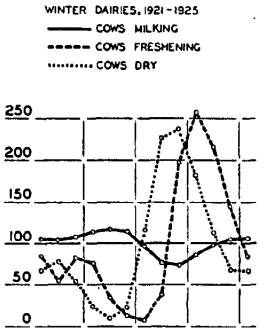
This expected difference in the size of the seasonal swing in the number of animals freshening and in milk production is found in the data on the number of cows milking, dry and freshening on one group of winter dairying farms in the New York district (Chart 6). The seasonal swing in the number of cows both dry and freshening is as wide as that observed in the other series of the same type. But the variation in the number of cows milking is much more comparable in respect of amplitude to the seasonal swings in the amount of milk sold, and should be, if anything, milder.

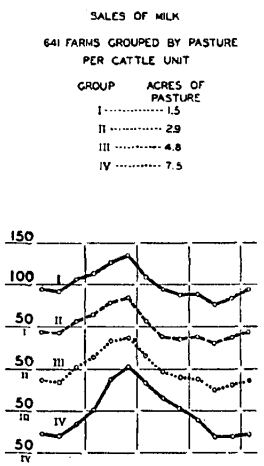
The most important cause of seasonal variations in the number of cows freshening and in the production of milk is the factor that exercises such far-reaching influences in determining the seasonals of all crops, namely, the climate. To have cows freshen in spring is convenient because in succeeding

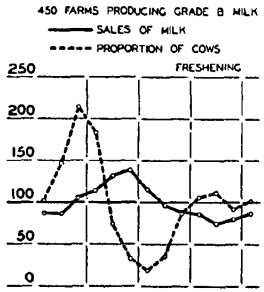
CHART 6

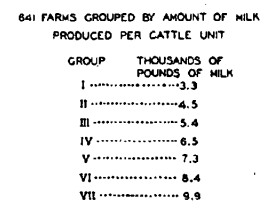
SEASONAL MOVEMENT OF MILK FROM FARMS BY TYPE OF DAIRYING, NEW YORK AREA, 1927 - 1928

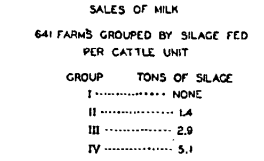


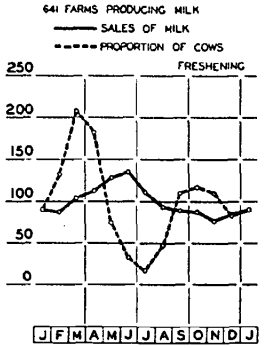


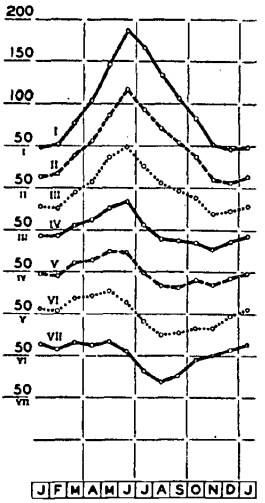


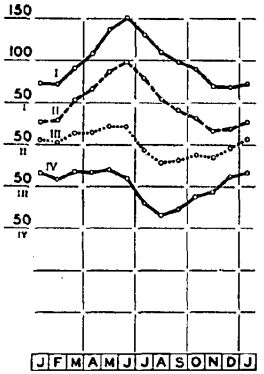












months, when increased feeding is necessary for maximum yield of milk, pasture is available. A cow that freshens in autumn has to be kept indoors during the winter and fed a rather expensive diet of grain and silage. Hence winter dairying is practised chiefly by farms producing grade A milk or other of the more expensive milk products, for which the returns justify the more intensive and costly dairying system.

Catherwood's monograph, referred to above, throws a great deal of light on these causes of seasonal variations in milk output. Some of his indexes are presented on Chart 6. One group indicates the relation between seasonal variations in milk sold and the amount of pasture available per animal. When the pasture available is rather limited there is less tendency to rely upon outdoor feeding and the summer peak in production is less prominent. As the pasture allowance per animal increases the reliance upon outdoor feeding during the summer becomes greater and the summer peak more marked. Thus, Group IV, in which the pasture allowance is greatest, shows the most conspicuous summer peak in milk production.

Another group of indexes illustrates the relation between seasonality in milk production and the amount of indoor feed per animal. The flattening of the summer peak in milk output as the amount of silage fed per cattle unit becomes larger is striking. Thus, in Group I, where no silage is fed and pasture is relied upon entirely, the summer peak in milk output is high. On the other hand, in Group IV, where the amount of silage fed is rather large, the seasonal pattern in milk production is indicative of a winter type of dairying.

Still another group of indexes shows that summer dairying is of a much less intensive type than winter dairying. The farms are grouped according to the yield of milk per cow, and as the amount increases, the summer peak in milk production disappears, giving place gradually to the pattern associated with winter dairying, that is, rather high levels from December through May and a summer trough. As the intensity of the dairying system increases, the seasonal swing in the production of milk tends to decrease. As the industry reaches a higher technical level it becomes less subject to the disturbing influences of the seasonal factor that makes for the repeated variations in milk production.

2. Butter and Oleomargarine

a. *Butter*

In 1920 and 1921 the output of factory (creamery) and farm butter together consumed about 36 per cent of total milk produced in the United States.[14] Of this 36 per cent slightly over 20 per cent was accounted for by creamery butter and the remainder by farm butter. How important this use of milk is in comparison with its utilization in other dairy products may be gathered from the percentage of the total quantity of milk produced that was utilized for *all* manufacturing purposes, namely 47.

The data analyzed and presented below cover only creamery butter. For the production of butter on farms no monthly data are available, nor do large quantities of farm butter enter into the receipts at the most important markets or into the volumes in cold storage, both reported by the Department of Agriculture.

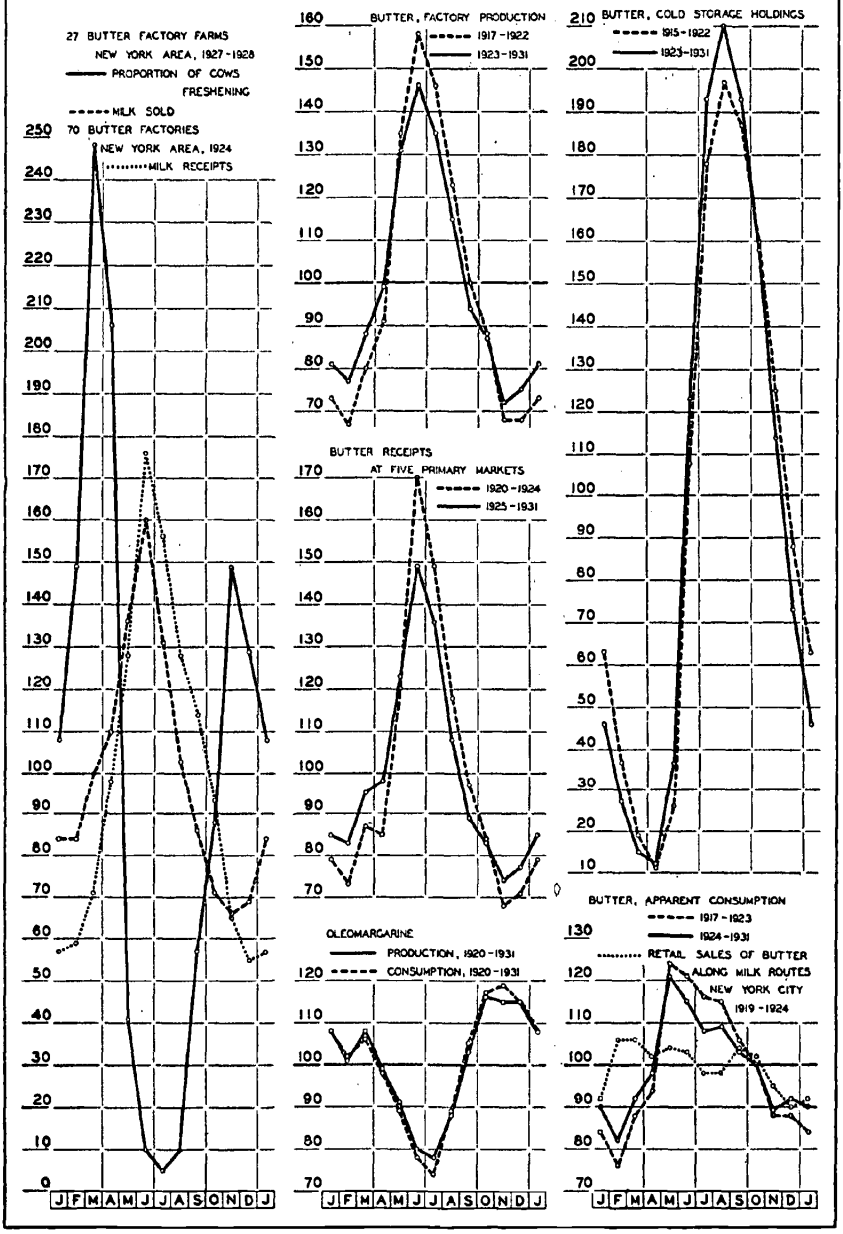
Before the seasonal behavior of butter production is examined it may be of interest to consider seasonal movements in the supply of milk to butter factories. In the first section of Chart 7 are presented fluctuations in the number of cows freshening and in milk sold on the farms that supply the butter factories (New York dairy district 1927-28). With these are compared changes in receipts of milk by 70 butter factories in the New York district in 1924. It is clear from the chart that farms which supply the butter factories carry on summer dairying primarily. Indeed, this is one of the most stable relationships. Butter factories, as well as most of the other industrial consumers of milk, pay low prices as compared with those obtained for fluid milk shipped to city consumers. In view of such low returns, only the less expensive type of dairying, that is, the less intensive summer type, is financially feasible. One of the most interesting transformations in any milk producing area is the shift from summer to winter dairying as the demand for fluid milk by urban consumers increases sufficiently to make the more expensive type of dairying profitable.

It is curious that fluctuations in the volume of milk sold by dairy farms are smaller than in receipts of milk by the butter

[14] Department of Agriculture, *Yearbook 1922*, p. 293.

CHART 7

SEASONAL MOVEMENT OF BUTTER AND OLEOMARGARINE



factories (Table IV). Such a disparity might arise from the somewhat different samples and years covered. On the other hand, it is known that butter producers are receiving milk not only from their regular sources of supply (that is, the farms whose milk sales were measured above) but also from

TABLE IV

AMPLITUDE OF SEASONAL VARIATIONS: BUTTER AND OLEOMARGARINE

Series	Average Deviation	Range
BUTTER		
27 Butter Factory Farms, N. Y. Area, 1927-28		
Sales of Milk	23.3	94
Cows Freshening	64.8	243
70 Butter Factories, N. Y. Area, 1924		
Milk Receipts	33.7	121
Factory Production, 1917-22	27.2	91
1923-31	21.2	74
Receipts at 5 Primary Markets, 1920-24	26.1	102
1925-31	19.3	75
Cold Storage Holdings, 1915-22	59.2	186
1923-31	65.1	198
Apparent Consumption, 1917-23	13.7	48
1924-31	9.4	39
Retail Sales, Along Milk Routes, N. Y. C., 1919-24	4.5	16
OLEOMARGARINE		
Production, 1920-31	10.8	38
Consumption, 1920-31	12.0	45

outsiders, the purchases from outsiders being made primarily in the early summer months when there is a surplus of fluid milk on hand. For this reason receipts of milk by butter factories would necessarily show a wider seasonal swing than sales of milk by the regular butter factory suppliers.

As is indicated by the changes in the amount of butter held in cold storage (Chart 7), the rather large seasonal swing in the supply of butter to the primary markets is not caused by any corresponding variation in final demand. These stocks, reported for almost all the butter held in public and private cold storage warehouses, average about half a month's total butter

production (but about one and a half months' receipts at the primary markets). At the peak, in August, the stocks cumulate to the equivalent of about one month's production, or three months' receipts at the primary markets.

The pattern indicates that these stocks accumulate as a result of too extensive a supply during the summer and become depleted through the winter. Thus the decline in stocks begins in September, the first month in which the seasonal index in production and receipts falls below 100, and the rise begins in May, the first month in which the seasonal for both receipts and production of butter is above 100.

Apparent consumption of butter is a series derived from production, exports, imports and stocks in cold storage. As such it really represents disappearance into trade channels, but since the trade does not call for butter unless it is needed for prompt sale, this index of apparent consumption constitutes a good measure of final consumption. The seasonal index for this series, computed again for two periods (see Chart 7), delineates a pattern somewhat similar to that of butter production and receipts. The significant feature is the small size of the seasonal swing (Table IV). It is thus apparent that the large seasonal swing in the series covering production and receipts of butter is attributable to factors in the supply of the raw material.

While apparent consumption represents disappearance of the commodity into the trade, some data reflecting actual consumption by ultimate consumers are available. The seasonal variations in consumption are measured, if only partially, by retail sales of butter on milk routes, data collected and analyzed for New York City by H. A. Ross in a study quoted above. Undoubtedly these data do not record the bulk of retail demand, since most butter is purchased from dairies rather than from milkmen. The index (Chart 7) is probably typical only of family demand, reflecting more than does total consumption the vacation exodus. However, the narrowness of the seasonal amplitude is significant, further confirming the comparative constancy of consumers' demand for butter.

b. *Oleomargarine*

The main raw materials in oleomargarine are oleo oil (obtained from beef fat), cocoanut oil, neutral lard (obtained

from lard), milk and cottonseed oil. The last two are subject to marked seasonal variations in production, but only milk is perishable. The importance of the ingredients available in a fairly continuous supply is much greater than of the materials whose output is seasonally variable.

Since on the side of production oleomargarine is not subject to the variability characteristic of commodities produced from seasonal and perishable raw materials, the seasonal variation in its output is relatively mild. The average deviation of the index is about half the size of that for butter production. Of more interest is the pattern; this moves directly opposite to that in butter output, running at low levels in summer and at high in winter, and appears to be due largely to an adjustment in the production of a substitute to the output of the principal commodity. When butter is plentiful and relatively cheap in summer, there is smaller demand for the cheaper but less desirable oleomargarine. Conditions are reversed in winter.[15]

Repetition of the pattern in the consumption of oleomargarine confirms this hypothesis. In its seasonal behavior consumption follows precisely the pattern traced by production, with a slightly wider amplitude.

Oleomargarine—an example of a substitute commodity—acts to supplement the output of the principal commodity, butter, in such a way as to correct some of the latter's seasonal variations. Other substitute goods may behave similarly. If the price of the principal commodity is sufficiently flexible to reflect changes in the volume of output; if purchasers' demand is sufficiently elastic to be directed by such price changes towards greater or smaller purchases of the substitute; if the production of the substitute can be varied with changes in demand by prospective purchasers, then the seasonal pattern in the output of the substitute commodity will be inverted to that in the production of the principal commodity. Under such conditions commodities should show an inverse correlation of seasonal variations, just as in complementary commodities we might expect a positive correlation of seasonal patterns.

[15] See K. Snodgrass, *Margarine as a Butter Substitute,* Food Research Institute, Leland Stanford University, Fats and Oil Studies, no. 4, 1930, pp. 208, 250-2.

D. Fruits and Vegetables

GENERAL CHARACTERISTICS

The propriety of classifying fruits and vegetables in Group I may at first be questioned. The group covers commodities for which final demand is relatively even through the year, but in the temperate zones fruits and vegetables are consumed mostly during the summer. However, it seems safe to assert that only a minor part of this seasonal variation in consumption is due to the direct influence of seasonal changes in final demand. Fruits and vegetables constitute part of a well-rounded diet throughout the year. Their heavier consumption in summer may be attributed largely to their scarcity during winter months and much less to increased demand in the warm seasons. This granted, it would still appear that perishable fruits and vegetables might resemble milk in that a part could be converted by canning, drying and other manufacturing processes into durable products. We find, however, that unlike milk products, the products manufactured from fruits and vegetables account for a relatively minor fraction of total output. Furthermore, fruits and vegetables cannot be converted at will into durable products; manufacturing utilization requires definite qualities in the raw materials, qualities often incompatible with those needed for profitable sale to final consumers.

" Canning quality " or " drying quality " is a very different thing from table or dessert quality; the material must be one which will pass through the manufacturing processes with the retention of satisfactory physical appearance and flavor, and many of our choicest table and dessert varieties are unable to endure this test.

For this reason the development of the manufacture of fruit and vegetable products to a position of importance in any territory results in a sharp differentiation between the growing of materials for manufacturing purposes and the growing of fruits and vegetables for market. This is especially true for the canning industry, in which the selective process just mentioned has been longest in operation. From the multiplicity of varieties of a given fruit or vegetable grown in his district, the canner selects a small number, sometimes a single one, possessing the combination of characters which he regards as most desirable in the finished product, employing these selected varieties to the exclusion of others. In the case of vegetables, many canneries grow their stocks of seed from selected strains with as much care to prevent contamination as is exercised by the best seedsmen. These selected seeds

are supplied under contract to growers who deliver the crop to the cannery.

In fruits an equally rigid selection of varieties is made, with the result that in a region in which canning becomes an important industry, the newer plantings of tree or bush fruits are made with reference to the requirements of the canners. As a consequence of the employment of selected varieties, the growing of crops for canning is so far divorced from the growing of fruits and vegetables for market that only in exceptional cases can the grower choose between placing his crop on the market for fresh products and delivering it to the cannery. For the same reason, the establishment of a cannery in a district can offer little immediate relief for the problem presented by a surplus of miscellaneous perishable crops. The cannery encounters very strong competition in a field in which standards of appearance and quality are constantly being elevated, and it would be business suicide to pack materials as they came to hand without reference to maintaining uniformity in the product.[16]

Perishable fruits and vegetables constitute, therefore, a third subgroup of Group I, different from those represented by wheat flour and the dairy products. The solution of the seasonal problem in this instance is obviously that of making final demand conform to the seasonal variations in supply. Charts 8 through 12 and Table V indicate clearly that for the perishable commodities the series nearest consumers' demand fail to evidence any appreciable damping of seasonal amplitude as compared with the indexes for harvesting and shipments. Nor does there seem to be any definite shift in timing, comparable to that found in the other two subgroups of Group I. This conclusion is valid for such fruits as pears, grapes, peaches, cantaloupes, watermelons and strawberries, and, by inference, for such vegetables as asparagus, cucumbers and eggplant. On the other hand, such relatively durable commodities as apples, potatoes, onions, tomatoes and cabbage show a marked drop in seasonal amplitude from harvest to shipments, or from shipments to unloads, accompanied frequently by a shift in seasonal pattern.

Two qualifications of this general conclusion may be stated: (1) the available data fail to reflect the actual purchase of the commodity by final consumers and this may prove to be seasonally more stable than unloads; (2) some amount of canning and preserving may be done by the final consumers themselves, in an effort to stabilize their consumption. Both qualifications, however, appear rather unimportant and do not seem to invalidate the general conclusion.

[16] *Agriculture Yearbook 1925*, p. 603.

While output of fruits and vegetables is generally subject to marked seasonal fluctuations, the amplitude varies appreciably from one commodity to another. Also, marked differences appear from commodity to commodity, even within the perishable and non-perishable divisions, in whatever seasonal disparity exists between harvest and shipments and shipments and unloads. These differences, of interest in themselves and as variations in the exact scope of the general conclusion just stated, are now discussed.

DETAILED COMMENTS

1. Harvest and Shipments of Fruits

Charts 8 and 9 present the seasonal patterns in harvesting and in carlot shipments of fruits. The seasonal factors operating in the case of each individual fruit are fairly clear and

TABLE V

AMPLITUDE OF SEASONAL VARIATIONS: FRUITS AND VEGETABLES

Series	Average Deviation	Range
FRUITS		
Apples		
Harvest Estimate	121.4	546
Carlot Shipments, 1920-31	81.5	408
1924-26	86.5	416
Unloads, 12 Markets, 1918-22	55.8	251
Pears		
Harvest Estimate	132.0	533
Carlot Shipments, 1924-26	119.8	372
Grapes		
Harvest Estimate	136.0	576
Carlot Shipments, 1924-31	128.2	535
1924-26	128.4	485
Peaches		
Harvest Estimate	119.2	412
Carlot Shipments, 1918-31	131.0	422
1924-26	132.5	470
Unloads, 12 Markets, 1918-22	122.0	455
Cantaloupes		
Harvest Estimate	123.2	440
Carlot Shipments, 1924-26	115.9	394
Unloads, 12 Markets, 1918-22	121.4	400

TABLE V (CONTINUED)

Series	Average Deviation	Range
Watermelons		
Harvest Estimate	132.5	478
Carlot Shipments, 1924-26	138.8	610
Strawberries		
Harvest Estimate	132.7	593
Carlot Shipments, 1924-26	138.2	659
Unloads, 12 Markets, 1918-22	141.8	645
Cranberries		
Harvest Estimate	152.0	805
Carlot Shipments, 1924-26	129.7	446
VEGETABLES		
White Potatoes		
Harvest Estimate	119.8	470
Carlot Shipments, 1920-31	16.3	102
Unloads, 12 Markets, 1918-22	23.3	97
Sweet Potatoes		
Harvest Estimate	132.5	589
Carlot Shipments, 1924-26	65.6	253
Onions		
Harvest Estimate	102.4	390
Carlot Shipments, 1920-31	29.2	143
1924-26	29.8	164
Unloads, 12 Markets, 1918-22	25.0	88
Tomatoes		
Harvest Estimate	113.2	476
Carlot Shipments, 1918-31	68.7	277
1924-26	71.8	278
Unloads, 12 Markets, 1918-22	75.7	290
Cabbage		
Harvest Estimate	96.5	485
Carlot Shipments, 1924-26	30.8	167
Unloads, 12 Markets, 1918-22	36.8	156
Beans		
Dry Beans, Harvest Estimate	141.2	659
Lima Beans, Harvest Estimate	122.0	521
String Beans, Carlot Shipments, 1924-26	85.6	329
Celery		
Carlot Shipments, 1924-26	52.0	160
Unloads, 12 Markets, 1918-22	48.0	175

CHART 8

SEASONAL MOVEMENT OF FRUIT

——HARVEST, ESTIMATE; ------CARLOT SHIPMENTS, 1924 - 1928

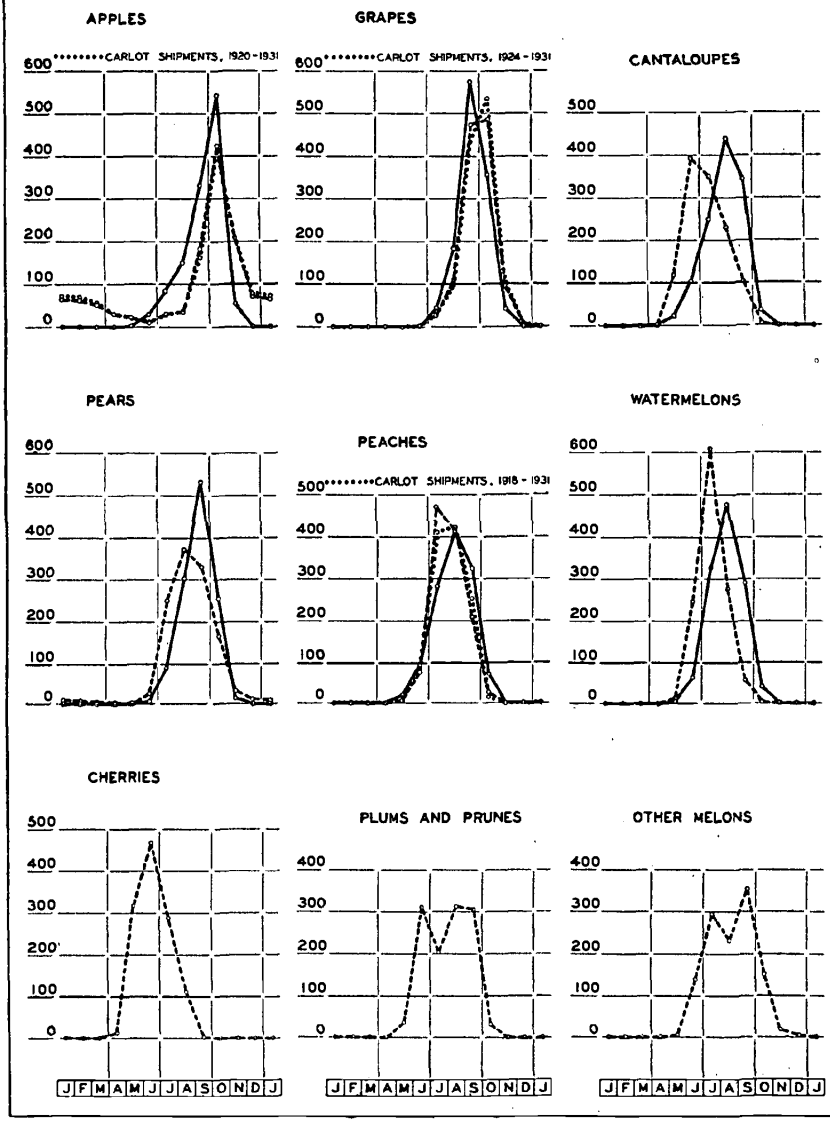
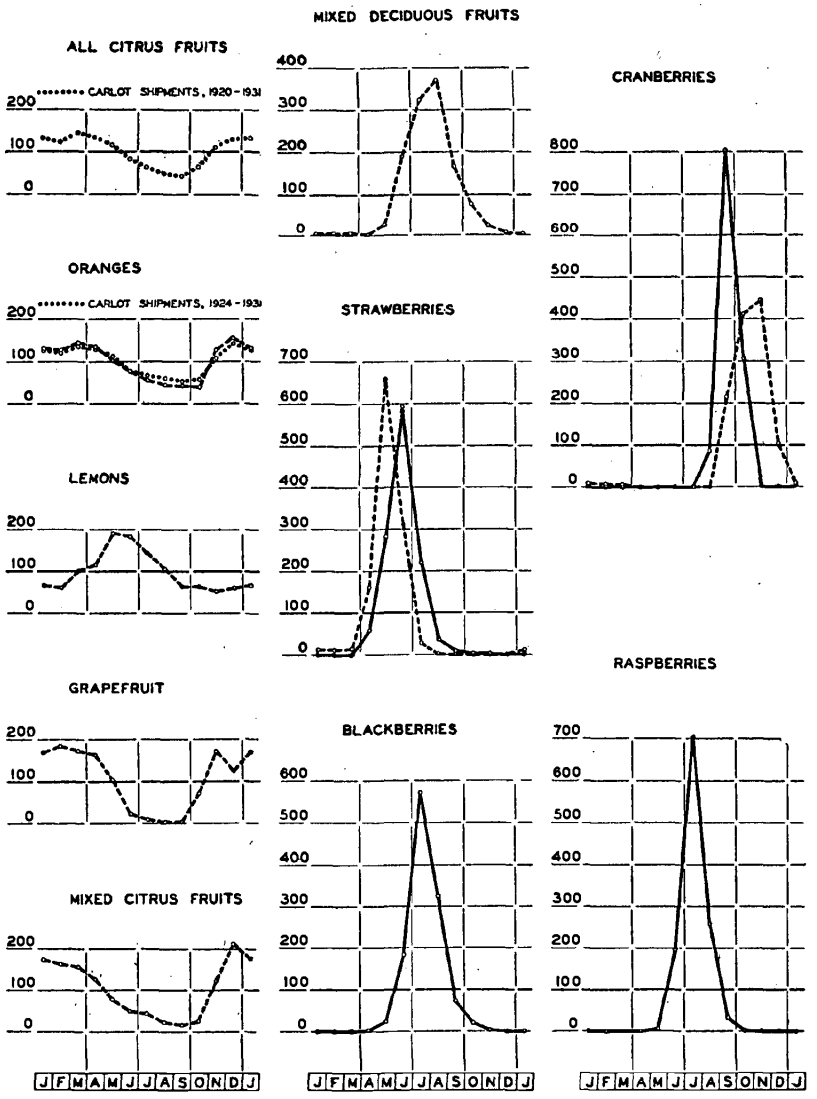


CHART 9

SEASONAL MOVEMENT OF FRUIT

——— HARVEST, ESTIMATE; ------- CARLOT SHIPMENTS, 1924 - 1926



there is no need to comment upon each single index. However, some outstanding general features may be mentioned briefly.

Harvesting. 1. The violence of seasonal swings in harvesting is striking. The indexes of fruit harvests are generally of wider amplitude than that of wheat. Of the ten fruits for which harvesting indexes are available, only three, peaches, cantaloupes and watermelons, show a lower range than wheat. In the other seven the smallest range is in pears, the largest in cranberries; the smallest average deviation is in peaches, the largest in cranberries.

Berries, especially cranberries and raspberries, show the most violent swing. Citrus fruits would probably show the mildest harvest seasonal were their picking measured. The absence of harvest dates is itself an indication that this would be true since it is a consequence of the fact that grapefruit, oranges and lemons are grown so that they may be harvested over a large part of the year.

2. In timing peaks tend, of course, to concentrate in the autumn. In their chronological order the peaks are as follows, from berries through melons to the deciduous fruits: the earliest, in June, in strawberries; in July, in blackberries and raspberries; in August, in peaches, cantaloupes and watermelons; in September, in pears, grapes and cranberries; in October, in apples.

Carlot Shipments. 1. The sizes of the seasonal swing in the shipments of various fruits differ curiously. Citrus fruits, as a group and individually, show very mild variations. This may be due to the nature of the fruit, which may be left on the tree for some time after it is ripe, or to the organized character of the industry, especially in the section concerned with growing oranges and lemons. About two-thirds of the oranges and almost all the lemons come from California. And "the citrus industry in California is very highly organized, over 70 per cent of the crop being handled through a cooperative organization which has proved a leading factor in developing improved methods of production, packing and marketing." [17]

In contrast to citrus fruits, the following rather miscellaneous list shows large seasonal swings in shipments: strawberries, cranberries, watermelons, cherries, grapes, peaches. The reason lies obviously in the highly perishable nature of these

[17] *Agriculture Yearbook 1926*, p. 241.

fruits, when fresh. Even under refrigeration strawberries, grapes, peaches and watermelons can be kept only a short while and cranberries and cherries not much longer. Moreover, each of these fruits is grown in a concentrated area and under conditions that make picking possible during only a brief period each year. The supply of fresh fruit cannot, therefore, be continuous.

The following fruits show a milder seasonal swing in shipments: apples, pears, plums and prunes, cantaloupes, mixed deciduous fruits, other melons (chiefly Casaba). They have only one picking season but are grown over a wide geographic area and can, with the possible exception of cantaloupes, be kept in cold storage for some time. Both these latter factors make for a smaller seasonal in shipments than is characteristic of the group of berries, peaches, cherries and watermelons. On the other hand, this group is not harvested as continuously as are citrus fruits, nor are shipments subject to the same control.

2. The timing of shipments, whenever peaks can be definitely established, appears to be as follows: February, grapefruit; March, oranges; May, lemons and strawberries; June, cantaloupes and cherries; July, peaches and watermelons; August, pears, plums and prunes, and the mixed deciduous fruits; September, other melons; October, apples, grapes; November, cranberries; December, mixed citrus fruits. Thus the distribution through the year appears to be even. But the two most important items in this array are oranges and apples and their peaks are some six months apart. A summation of the carlot shipments of all fruits would not yield as even a distribution through the year as is suggested by the listing of peaks.

Harvesting and shipments. For eight fruits estimates of harvest and data on carlot shipments are alike available, and a comparison of the seasonal indexes is suggested. The size of seasonal swings in carlot shipments ought to be less than in harvesting and the timing should lag behind or at the earliest be coincident with harvesting. But the behavior of the fruit series is not in accord with these expectations.

Seasonal variations in the harvesting of apples, pears, cantaloupes, cranberries and grapes are greater than those in their shipments. For some of these fruits, such as cranberries, the differences are striking. In grapes the difference is smaller

than in any of the other four fruits. On the other hand variations in the harvesting of peaches are of smaller magnitude than those in shipments. Nor does the seasonal swing in shipments of watermelons and strawberries show any decline as compared with that in harvesting. The reasons are not particularly clear. There is, of course, a possibility of error in the harvest estimates of the Department of Agriculture. But it may also be suggested that the perishable nature of these three commodities and the consequent influence on prices necessitates prompt and concentrated shipments by producers in an attempt to be the first on the market and thereby obtain the highest price. As the crop matures, shipments to distant centers tend to fall off, since the ripe fruit might spoil in transportation. Also, in the case of some fruits, such as watermelons, it is the best part of the crop that is picked first and shipped out to the higher price markets. A larger part of the ripe crop during the harvest peak may be consumed locally, or, whenever a canning crop is being produced, in canning. For these three fruits, then, the seasonal swing in shipments might be wider than that in harvesting and a peak might be reached earlier.

These expectations are confirmed. In all three instances in which the seasonal swing in shipments is wider than that in harvesting the peak in shipments precedes the peak in harvesting. Thus, in strawberries the peak in shipments is in May, in harvesting in June; in both watermelons and peaches the two peaks are in July and August. Evidently, a much greater proportion of the earlier crop of these fruits goes into carlot shipments than of the later.

But in two other fruits, pears and cantaloupes, for which seasonal variations in harvesting are greater than those in shipments, the seasonal peak in shipments precedes the peak in harvesting. In causing differences in the size of seasonal swings perishability apparently exercises a greater influence than the profit to be derived from early marketing. While there is an attempt to exploit the early market for pears and cantaloupes and the peak in shipments consequently precedes the peak in harvesting, shipments do not rise and decline as do those of the more perishable fruits such as strawberries and peaches.

The other three fruits, apples, grapes, and especially cranberries, have a peak in shipments either coinciding with or

lagging behind the peak in harvesting. For cranberries the lag is two months and the decline in amplitude from harvesting to shipments is appreciable, possibly because the large local industrial consumption of cranberries relieves the market from absorbing the surplus of fresh berries during the harvest period. The November peak in shipments may be associated with the Thanksgiving holiday demand.

2. Harvest and Shipments of Vegetables

The general features of the comparison of the seasonal variations in the flow of vegetables appear to be as follows (Charts 10 and 11):

Harvesting. 1. Vegetable harvests have on the average much milder seasonal swings than fruit harvests. The mildest is in onions and cabbage, with potatoes and tomatoes next. These four vegetables lead in quantity grown, are widely distributed regionally and are subject to a fairly steady demand. Sweet potatoes, a subtropical vegetable and somewhat of a luxury, and dry beans, a rapidly maturing vegetable harvested in September, show the widest seasonal ranges.

2. In timing, concentration of peaks in the autumn is even more conspicuous for vegetables than for fruits. The distribution is as follows: September, beans, onions and tomatoes; October, cabbage, white potatoes and sweet potatoes. However, harvest estimates are not given for several vegetables that mature in late spring and in summer.

Carlot Shipments. 1. The individual vegetables for which seasonal indexes of shipments are available again show a smaller magnitude of seasonal changes than was observed in fruits. Thus, the highest range in vegetables is 501 (asparagus) while for the majority the range runs between 150 and 300. In fruits the highest range was more than 600, while most series showed ranges of about 400 and higher. This milder seasonal variation in vegetables is undoubtedly due partly to their greater regional diffusion and the consequent dispersion of their harvesting peaks and partly to the fact that most vegetables are less perishable than fruits.

The sequence of these vegetables, when arrayed according to the amplitude of the seasonal swing of their shipments, fulfills expectations (Table V, and Appendix I, Part 1). The

CHART 10

SEASONAL MOVEMENT OF VEGETABLES

——HARVEST, ESTIMATE; ------CARLOT SHIPMENTS, 1924 - 1926

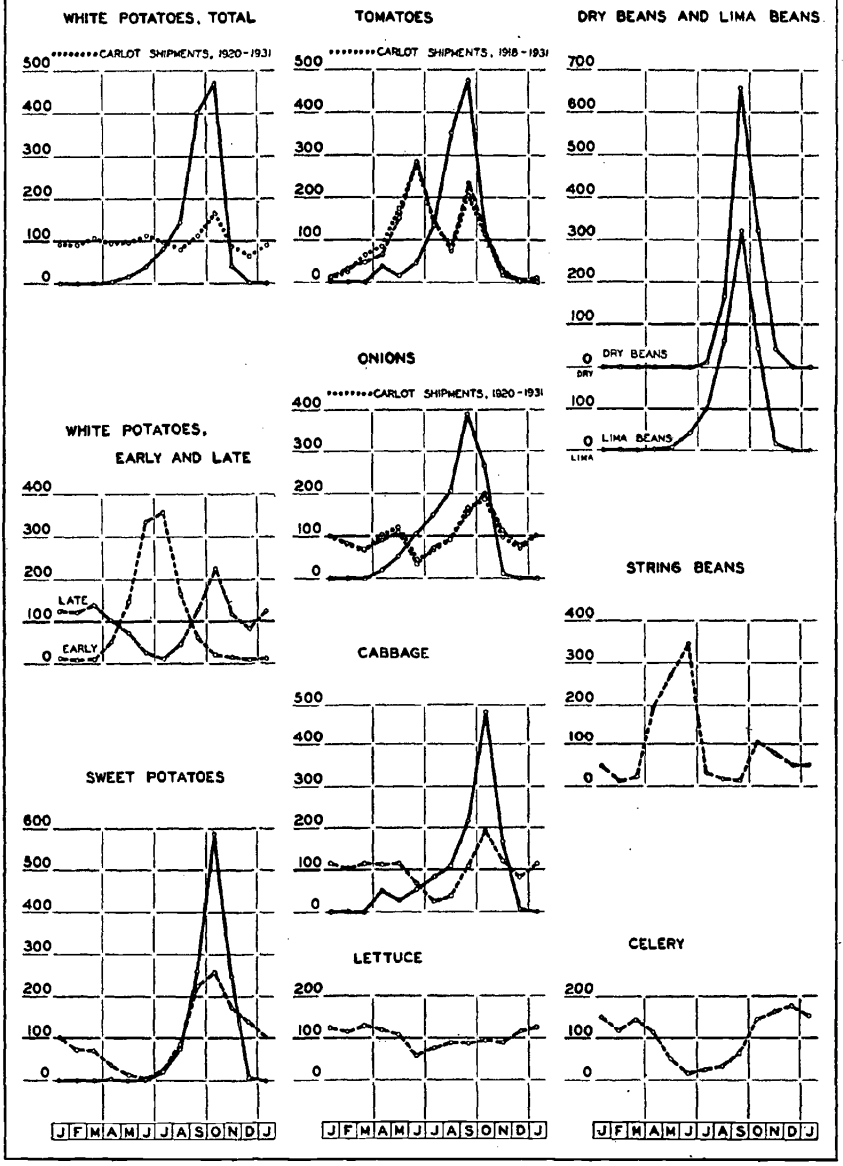
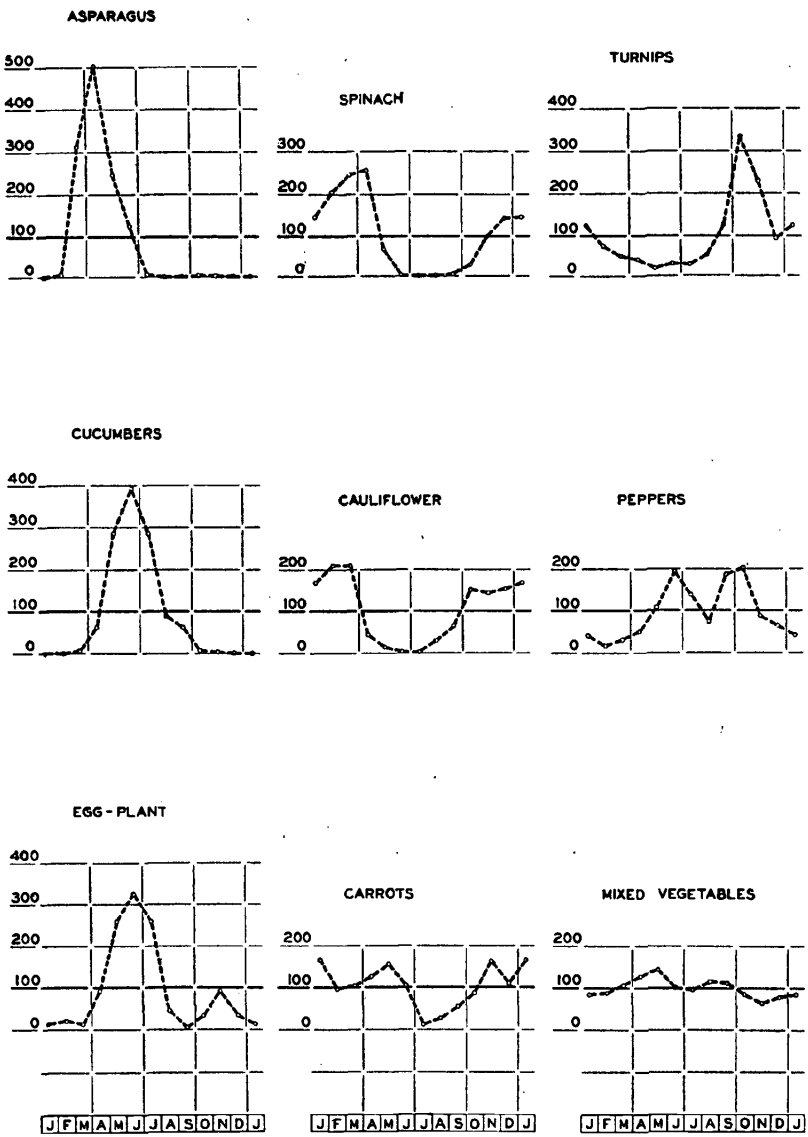


CHART II

SEASONAL MOVEMENT OF VEGETABLES:

CARLOT SHIPMENTS, 1924-1926



mildest seasonal variations are found in the geographically diffused, comparatively cheap vegetables subject to constant demand: lettuce, potatoes, carrots, celery, onions, cabbage. The greatest variability is shown by the more expensive vegetables which have only one crop a year, a short harvesting season and are subject to luxury demand for the early part of the crop: asparagus, cucumbers and early potatoes.

The vegetables characterized by rather mild seasonal variations—white potatoes (total), cabbage, carrots and onions—tend to have two peaks in shipments. In celery and lettuce only one peak and trough actually occur but they are more in the nature of plateaus than of sharp turning points. On the other hand, vegetables that show a high seasonal swing in shipments have only one peak, indicating a single harvesting season. This is especially marked in asparagus, cucumbers and early white potatoes. String beans and eggplant, which have a prominent single peak in the early summer, have a mild second peak in October or November.

2. The presence of double peaks in some series renders the comparison of timing less significant and somewhat more difficult. Disregarding the second peak, however, and considering for each series only the month of the most prominent peak in shipments, we obtain the following sequence: January, carrots; February, none; March, cauliflower, lettuce; April, spinach, asparagus; May, mixed vegetables; June, tomatoes, string beans, cucumbers, eggplant; July, early white potatoes; August, none; September, none; October, total white potatoes, late white potatoes, sweet potatoes, cabbage, onions, turnips, peppers; November, none; December, celery.

This list of peaks indicates roughly a subdivision of the vegetables into the spring type, shipped largely from April through June (spinach, lettuce, asparagus, tomatoes, string beans, eggplant, cucumbers, etc.) and the fall and winter type, chiefly root vegetables, such as potatoes, turnips, onions, carrots. The root vegetables are subject to milder seasonals, while the spring vegetables are on the whole subject to more violent seasonal swings.

Harvests and shipments. 1. It is possible to compare seasonal variations in harvesting and shipments for five rather important vegetables: white potatoes, sweet potatoes, tomatoes, cabbage and onions. Vegetables, in contrast with fruits,

show much smaller seasonal swings in shipments than in harvesting. The difference is most striking for potatoes and cabbage but it is significant also in the other three pairs of series.

2. Timing seems also to accord with expectations. In white potatoes, sweet potatoes and cabbage the peaks in harvesting and shipments occur simultaneously, while in onions shipments lag one month behind harvesting. But in cabbage, onions, and especially in white potatoes, there are two peaks in shipments as compared with one in harvesting, possibly because harvest estimates are given for the bulk of the crop only; none are given for the secondary part of the crop grown to supply early demand.

3. Unloads of Fruits and Vegetables

While unload figures do not reveal urban consuming capacity, they do reflect a stage in the flow of the commodity further removed from shipments. And although not accurate, they measure the consumption of the population in and about most of the cities. For the perishable fruits and vegetables especially, unloads reflect urban consumption accurately. It is therefore of interest to compare the seasonal variations in unloads with those in shipments and to ascertain the divergencies from commodity to commodity.

Unloads and shipments. Seasonal variations in shipments were studied for the country as a whole. Totals for unloads are not available, except during the early period 1918-23 when they are given for each of nine commodities in only twelve markets.[18] A comparison of seasonals in each of these nine commodities for the early years with those for the later period reveals no essential difference. Therefore the monthly means for 1918-22, given in Bulletin No. 7, were converted into seasonal indexes for unloads for the twelve markets covered: New York, Chicago, Philadelphia, Pittsburgh, St. Louis, Cincinnati, St. Paul, Minneapolis, Kansas City, Washington, Cleveland and Detroit. As these are among the largest cities in the United States, they account for a major portion of unloads,

[18] Nine products are covered for 12 cities for the years 1918-23, Statistical Bulletin of the Department of Agriculture, No. 7, April 1925; 16 products for 36 cities for the years 1924-26, Statistical Bulletin No. 23, August 1928; and 18 products for 66 cities for the years 1927-28, Statistical Bulletin No. 30, May 1930.

even when compared with the more complete data for sixty-six cities given for the years 1927-28.

These seasonal indexes for unloads can be compared with those for shipments of the same nine commodities. Chart 12 shows the close similarity between shipments and unloads. This is natural since what is shipped must be unloaded and only a relatively small proportion of total shipments can be stored in transit. Whatever discrepancy may arise between seasonality in shipments and in unloads is therefore associated either with storing in transit or reshipments, or to the inclusion in shipments of totals for the United States while unloads are given only for twelve principal cities. The latter fact is probably the more important, for the size of the city as well as its wealth influences the seasonality of its consumption, and therefore, of unloads.

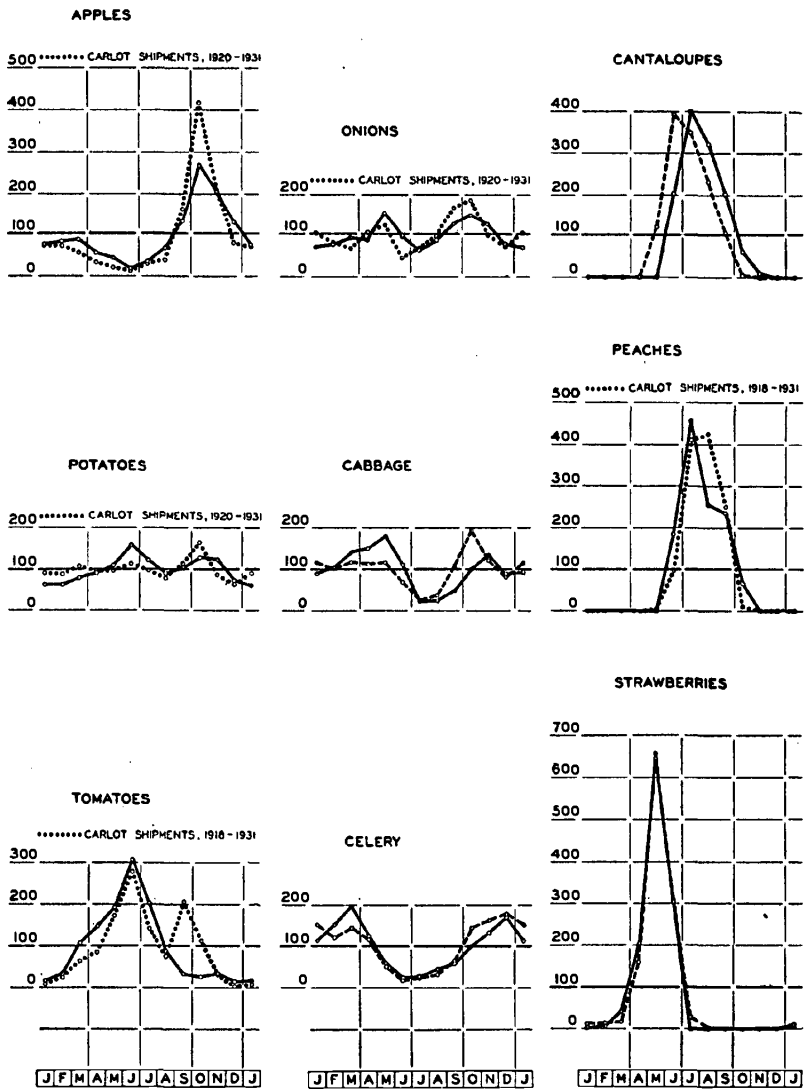
Chart 12 reveals a rather significant difference between fruits and vegetables. For fruits, which all happen to be of the luxury-perishable type, the seasonal movements in unloads and in shipments are closely similar. In cantaloupes unloads tend to lag a month behind shipments; in peaches they tend to precede, if anything, indicating that the twelve cities obtain the bulk of the crop earlier than does the country as a whole. In strawberries there is perfect coincidence in timing. There is also close similarity in the size of the seasonal variations in the four fruits (see Table V). Only in the case of apples, which can be stored for a relatively long period, is there an appreciable diminution of the seasonal swing from shipments to unloads. For other fruits no significant difference between the two seasonals is shown. And in the most perishable, strawberries, the agreement is closest.

While the seasonal patterns of the various vegetables are on the whole quite similar in respect of both shipments and unloads, they reveal significant differences in timing. There seems to be a tendency on the part of the twelve large markets to absorb the earlier part of the crop. Thus, in cabbage, whose seasonal pattern is characterized by two peaks, one in May and the other in October-November, it is the later peak that is on a higher level in shipments, but it is the earlier peak that is on a higher level in unloads. The same is true of celery and there is a similar change in the relative position of the early and the late peaks in onions. In tomatoes

CHART 12

SEASONAL MOVEMENT OF FRUITS AND VEGETABLES

——— UNLOADS AT 12 CITIES, 1918 - 1922; - - - - - CARLOT SHIPMENTS, 1924 - 1926



shipments have a double peak, one in June and the other in September, but unloads have only one, in June. The difference is most conspicuous in potatoes. Of the two significant peaks in shipments that occurring in October is on a higher level than that occurring in June. But in unloads the June peak is higher than the October. The large cities appear to prefer the early part of the vegetable supply, the part that is obtainable in the spring and early summer rather than during late autumn and winter. Also, some vegetables, such as tomatoes, are shipped green and are ripened by the distributors themselves in special plants. There is nothing to suggest that this showing might be due to the geographic location of the cities for most are northern cities and would have to import their early crop from states other than those in immediate proximity.

In the comparative amplitudes of seasonal movements in shipments and unloads of vegetables a distinct difference is shown only for onions, for which the seasonal variations in unloads tend to be milder than those in shipments. In the other vegetables, just as in fruits, there are no significant differences.

It is hazardous to conjecture what would be the size of the seasonal swing in total unloads in the United States. While the twelve cities tend to manifest (other things being equal) more conspicuous seasonal variations than would the country as a whole, they are *large* cities and tend to have milder variations than would smaller cities. The net balance of these probable corrections in opposite directions cannot even be surmised.

However, in so far as unloads reflect consumption by urban population, this final consumption of perishable fruits and vegetables is subject to seasonal swings not much smaller in size than the seasonal movement from the growing areas. In view of the perishability of most of the fruits and of a considerable number of the vegetables we cannot but assume that what is unloaded must be consumed within a relatively brief period, and that, therefore, unloads reflect, if roughly, the flow of products into the hands of ultimate consumers. While this flow is not as seasonally variable as are harvests, it still reflects most of the discontinuity in supply.